1 Declaration

This Record of Decision (ROD) presents the selected remedies for Operable Unit (OU)-2A Installation Restoration (IR) Sites 9, 13, 19, 22, and 23 at the former Naval Air Station (NAS) Alameda (now known as Alameda Point). The remedies were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, Title 42 *United States Code* Section (§) 9601, et seq., and in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 *Code of Federal Regulations* (*CFR*) Part 300, et seq.

1.1 Site Name and Location

This ROD addresses OU-2A, which includes IR Sites 9, 13, 19, 22, and 23 at Alameda Point. The U.S. Environmental Protection Agency's (U.S. EPA) CERCLA Information System identification number for former NAS Alameda is CA2170023236. Alameda Point was added to the National Priorities List (NPL) of Superfund sites on July 22, 1999.

1.2 Remedy Selection

The Department of the Navy (Navy) and U.S. EPA jointly selected the remedies for OU-2A. The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board) (collectively known as "supporting regulatory agencies") concur on the selected remedies for OU-2A. The Navy, as lead federal agency, provides funding for site cleanup at Alameda Point. A Federal Facility Agreement (FFA) was signed by the Navy and U.S. EPA on July 5, 2001, and by Cal/EPA DTSC and the Water Board in 2005. The FFA documents how the Navy intends to meet its statutory obligations and implement CERCLA in partnership with U.S. EPA, Cal/EPA DTSC, and the Water Board.

This ROD is based on information documented in the **Administrative Record**[1] file. Information

[1] **Bold blue text** identifies detailed site information available in the Administrative Record and listed in the References Table. This ROD is also available on CD whereby **bold blue text on the CD** serves as a hyperlink to referenced information. The excerpts referenced by the hyperlinks are part of the ROD. The hyperlink will open a text box at the top of the screen. A blue box surrounds applicable information in the hyperlink. To the extent there may be any inconsistencies between the referenced information attached to this ROD via hyperlinks and the information in the ROD itself, the language in ROD supersedes the attachments.

was developed by extensive field investigations, laboratory analyses, interpretation of data, evaluation of current and future conditions, and assessment of potential human health and ecological risks for IR Sites 9, 13, 19, 22, and 23.

1.2.1 Remedies Described in the August 2011 Proposed Plan

The following remedies, listed by IR Site, were presented in the Proposed Plan:

- **IR Site 9:** Monitored natural attenuation (MNA) and institutional controls (ICs) until remediation goals (RGs) are met.
- **IR Site 13:** In-situ Bioremediation (ISB), MNA, and ICs until RGs are met.
- **IR Site 19:** MNA and ICs until RGs are met.
- **IR Site 22:** No action.
- **IR Site 23:** No action.

1.2.2 Groundwater Beneficial Use Evaluation

Since the completion of the Proposed Plan in August 2011, the Navy and the regulatory agencies have evaluated the potential of shallow groundwater adjacent to and beneath OU-2A to serve as a future drinking water source. This evaluation used several lines of evidence and concluded that groundwater beneath OU-2A does not meet the requirements to be a potable water source under federal and state regulations/guidelines. Lines of evidence included proximity to San Francisco Bay and potential for salt water intrusion, high salinity, current county restrictions on well installation in shallow groundwater, and potential for surface runoff to contaminate groundwater. The Navy provided this information to the California Water Board by a letter dated August 6, 2012 (Appendix A). Additionally, the City of Alameda informed the Navy and regulatory agencies that the City does not intend to use shallow groundwater as a domestic or municipal source of water at Alameda Point in a letter dated January 23, 2012 (Appendix A, Attachment 1). The Base Realignment and Closure (BRAC) Cleanup Team (BCT) evaluated this information and have concurred that the shallow groundwater does not meet the criteria for a potential drinking water aquifer. The Water Board concurred with the groundwater beneficial use exception by letter dated September 13, 2012 (Appendix A, Attachment 2). The EPA concurred with the groundwater beneficial use exception by letter dated September 28, 2012 (Appendix A, Attachment 3).

1.2.3 Selected Remedies

As a result of the groundwater beneficial use evaluation, the remedies proposed in the August 2011 OU-2A Proposed Plan have been changed to reflect the updated site model which now excludes site groundwater as a drinking water source. The remedies developed and evaluated in the **Feasibility Study** Report and presented in the **Proposed Plan** for groundwater at IR Sites 9,

13, and 19 were based on remediating groundwater to drinking water standards. The RGs were either the U.S. EPA or CAL/EPA maximum contaminant levels (MCLs). Because shallow groundwater has been demonstrated not to be a potential source of drinking water, achieving MCLs is no longer a remedial action objective. Because drinking water standards are no longer applicable or relevant and appropriate requirements (ARARs) direct exposure to groundwater contamination will be addressed by institutional controls. The selected remedy will address the remaining exposure pathway for volatile contaminants to reach on-site receptors which is through vapor intrusion.

The selected remedies at OU-2A are as follows:

- **IR Site 9:** ICs restricting use of groundwater.
- **IR Site 13:** ISB, MNA, and ICs requiring the installation of an approved vapor control system for any new residential construction until vapor intrusion RGs are met and restricting use of groundwater.
- **IR Site 19:** ICs restricting use of groundwater.
- **IR Site 22:** No action.
- **IR Site 23:** No action.

ISB and MNA at IR Site 13 will reduce concentrations of benzene and ethylbenzene to levels that will eliminate the need for vapor controls (see Table 2-4). In addition, ICs at IR Sites 9, 13, and 19 will prevent extraction and use of groundwater. The restrictions will prevent exposure to onsite receptors to the groundwater ingestion pathway.

The ICs described in Section 2.9 will be legal and administrative mechanisms that limit the exposure of future landowners and users of the property to groundwater and to vapors from groundwater to maintain the integrity of the selected remedies. The restriction will be incorporated into the federal deed(s) and a covenant to restrict the use of property (CRUP) as environmental restrictive covenants that run with the land and are enforceable by the United States and by DTSC and any other signatory state entity.

The land use controls (LUCs) applicable to future residential construction will require vapor intrusion mitigation for residential buildings constructed over the plume until the plume's average COC concentrations (95% upper confidence limit of the mean) in groundwater are less than the residential vapor intrusion risk-based criteria, at which time LUCs will be terminated.

1.3 Assessment of the Sites

The Navy and the regulatory agencies have concluded that no further action is required for soil at all five IR sites and that no groundwater action is required at Sites 22 and 23. Remedial actions are required for groundwater at IR Sites 9, 13, and 19. These decisions were evaluated to be protective of human health and the environment and are based on the following:

- Site histories

- Field investigations
- Laboratory analytical results
- Previous response actions
- Evaluation of potential ecological and human health risks
- Current land use and reasonably anticipated future land use.

With the planned implementation of ICs restricting use of OU-2A groundwater, there are no remaining groundwater contaminants of concern (COC) at IR Sites 9 and 19, and benzene and ethylbenzene are the only groundwater COCs at IR Site 13 in OU-2A. This determination is based on the conclusion of the beneficial use evaluation that site groundwater does not meet the criteria for a potential drinking water source.

The human health risk assessment (HHRA) evaluated methods of exposure to contamination in soil and groundwater in the following pathways: the ingestion of soil and groundwater, inhalation of vapors in indoor and outdoor air, inhalation of vapors in indoor air while showering, inhalation of particulates from soil in outdoor air (dust), dermal contact with soil, and ingestion of homegrown produce. These pathways were based on the current and potential future use of the sites. The ecological risk assessment evaluated risks to ecological receptors and concluded there are no unacceptable risks to ecological receptors.

Based on results of the CERCLA investigations conducted, the risk assessment determined the risk from vapor intrusion from groundwater at IR Sites 9 and 19 is within the risk management range for residential use. At IR Sites 9 and 19, based on the conclusion of the beneficial use evaluation, to ensure groundwater is not used as a potable water source, ICs will be implemented to prohibit well installation and development. Risk at Site 13 is also within the management range; however Site 13 requires a response action due to localized benzene concentrations in shallow groundwater posing a vapor intrusion risk. The Navy has selected ISB, MNA, and ICs to treat benzene and ethylbenzene at Site 13. Results of investigations at IR Site 22 show elevated concentrations of petroleum hydrocarbon constituents that are contributing to risk; however, those constituents are being addressed by the Navy's Petroleum Program. The risk assessment results indicate that soil at IR Sites 9, 13, 19, 22, and 23 does not pose an unacceptable risk to human health or the environment. Risk associated with the Marsh Crust was addressed in the 2001 Remedial Action Plan/Record of Decision (RAP/ROD) which included the Subtidal Area where OU-2A is located.

1.4 Statutory Determinations

The Navy has concluded that remedial action is necessary at IR Sites 9, 13, and 19 because elevated concentrations of COCs pose a potential risk to human health. Remedial action will consist of ISB, MNA, and ICs for IR Site 13 and ICs to restrict contact with or use of OU-2A groundwater at IR Sites 9 and 19. No further action (NFA) is necessary for soil at IR Sites 9, 13, 19, 22, and 23 or groundwater at IR Sites 22 and 23. The selected remedies are protective of human health and the environment and comply with Federal and State requirements. The selected remedies obviate the need for and satisfy potential requirements of the Resource

Conservation and Recovery Act (RCRA) or other applicable State hazardous waste or water quality protection laws with the following exception: the Regional Water Board retains its authority to regulate the Tarry Refinery Waste (TRW) and/or co-located petroleum in the future at Sites 13 and 23. A CERCLA Five-Year Review is required for groundwater at IR Sites 9, 13, and 19 to ensure ICs restricting groundwater use are in place and remain protective. A CERCLA Five-Year Review is required for groundwater at IR Site 13 until vapor intrusion RGs are met. A CERCLA Five-Year Review is not required for soil at IR Sites 9, 13, 19, 22, and 23 or groundwater at IR Sites 22 and 23 because the risk assessments concluded that no remedial action is required, and that these sites satisfy the requirements for unrestricted reuse.

1.5 Data Certification Checklist

The information provided in Table 1-1 is included in Section 2 of this ROD. Additional information can be found in the Administrative Record file for this site.

Table 1-1: Data Certification Checklist

Checklist Item	Description
Identification of chemicals of potential concern and their concentrations.	Chemicals of potential concern were characterized for OU-2A based on data from several investigations. Descriptions of these investigations are provided in Section 2.3 of this ROD.
Current and reasonably anticipated future land use assumptions.	Current and potential future site uses are discussed in Section 2.4.
Risk assessments for the chemicals of potential concern.	A baseline human health risk assessment and an ecological risk evaluation were conducted as part of the remedial investigation and feasibility study using data representative of current conditions at OU-2A. Results of the risk assessments are presented in Section 2.5 of this ROD.
How source materials constituting principal threats are addressed.	There are no principal threat wastes at OU-2A, as described in Section 2.6.

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1.6 Authorizing Signatures

This signature sheet documents the Navy's and USEPA's co-selection of: (1) remedial actions for groundwater at IR Site13 consisting of ISB, MNA and ICs; and ICs at IR Sites 9 and 19; (2) NFA for groundwater at IR Sites 22 and 23; and (3) NFA for soil at IR Sites 9, 13, 19, 22, and 23. It also documents the State of California's FFA signatories', the Department of Toxic Substances Control and the San Francisco Bay Regional Water Quality Control Board, concurrence with this ROD. The respective parties may sign this sheet in counterparts.

Signature — Date: SEPT 24, 2012

Mr. Derek Robinson
Base Realignment and Closure Environmental Coordinator
Base Realignment and Closure Program Management Office West
Department of the Navy

Signature — Date: 11/21/12

Mr. Michael M. Montgomery
Assistant Director
Federal Facilities and Site Cleanup Branch, Region 9
United States Environmental Protection Agency

The State of California, Department of Toxic Substances Control had an opportunity to review and comment on the Record of Decision and the Department of Toxic Substances Control comments were addressed.

Signature — Date: 09/25/2012

Karen M. Toth
Unit Chief
Berkeley Office
California Environmental Protection Agency
Department of Toxic Substances Control

Signature — Date: 10/24/12

Mr. Bruce H. Wolfe, Executive Officer
California Environmental Protection Agency
San Francisco Bay Regional Water Quality Control Board

TREVET

9888 CARROLL CENTRE ROAD, STE 228
SAN DIEGO, CA 92126
(858) 578-8859

Trevet Project No. 5004-A074-002
Contract No. N62473-11-C-5004

REF: TRVT-5004-0000-0009

February 22, 2013

Don Hatchett
Contracting Officer
BRAC Program Management Office
1455 Frazee Road, Suite 900
San Diego, California 92108

Subject: **Final**
Record of Decision for Operable Unit (OU) 2A
Alameda Point, Alameda, California
September 2012

Dear Mr. Hatchett:

We are pleased to submit the following:

Five (5) complete copies of the Final Record of Decision for Operable Unit (OU) 2A, complete with CDs.

Sincerely,

Pete Stang
Project Manager

Enclosure

TREVET
9888 CARROLL CENTRE ROAD, STE 228
SAN DIEGO, CA 92126
(858) 578-8859

TRANSMITTAL/DELIVERABLE RECEIPT

Document Control No. TRVT-5004-000-0009

TO: Contracting Officer
BRAC PMO
Mr. Don Hatchett
1455 Frazee Rd., Suite 900
San Diego, CA 92108

DATE: February 22, 2013
Contract #: N62473-10-C-5004
LOCATION: Naval Air Station Alameda

FROM: Pete Stang, Project Manager

DESCRIPTION: Final Record of Decision, Operable Unit (OU) 2A
Alameda Point, Alameda, California
September 2012

TYPE: X Contract Deliverable ___ CTO Deliverable ___ Change Notice/Project Note

VERSION: Final (e.g., Draft, Draft Final, Final, etc.) REVISION #: 0

ADMIN RECORD: (PM to Identify) Yes X No ___ Category: ___ Confidential: ___

SCHEDULED DELIVERY DATE: 2/22/2013 ACTUAL DELIVERY DATE: 2/22/2013

NUMBER OF COPIES SUBMITTED: O/8C/8E/8D

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2 Decision Summary

The following sections provide a brief description and history of each IR site, characteristics of OU-2A, a summary of previous investigations at each OU-2A site, current and potential future land uses at OU-2A, a summary of site risks, and a discussion of the principal threat wastes. Remedial action objectives, a description and evaluation of remedial alternatives, the selected remedies, and information about community participation opportunities are also presented.

2.1 Site Description and History

OU-2A is located at the former NAS Alameda, now referred to as **Alameda Point**. Historical **operations** at the installation supported a wide variety of air operations across the facility by the Navy and former tenants. Alameda Point is located on the western tip of Alameda Island, which is on the eastern side of San Francisco Bay (Figure 2-1). The eastern portion of the base was used for industrial purposes in the late 1800s by the Pacific Coast Oil Company. The Navy acquired the land in 1936, and the base was constructed following several iterations of filling the tidelands and marshlands. Areas of OU-2A were filled from 1942-1946. NAS Alameda ceased operations in 1997.

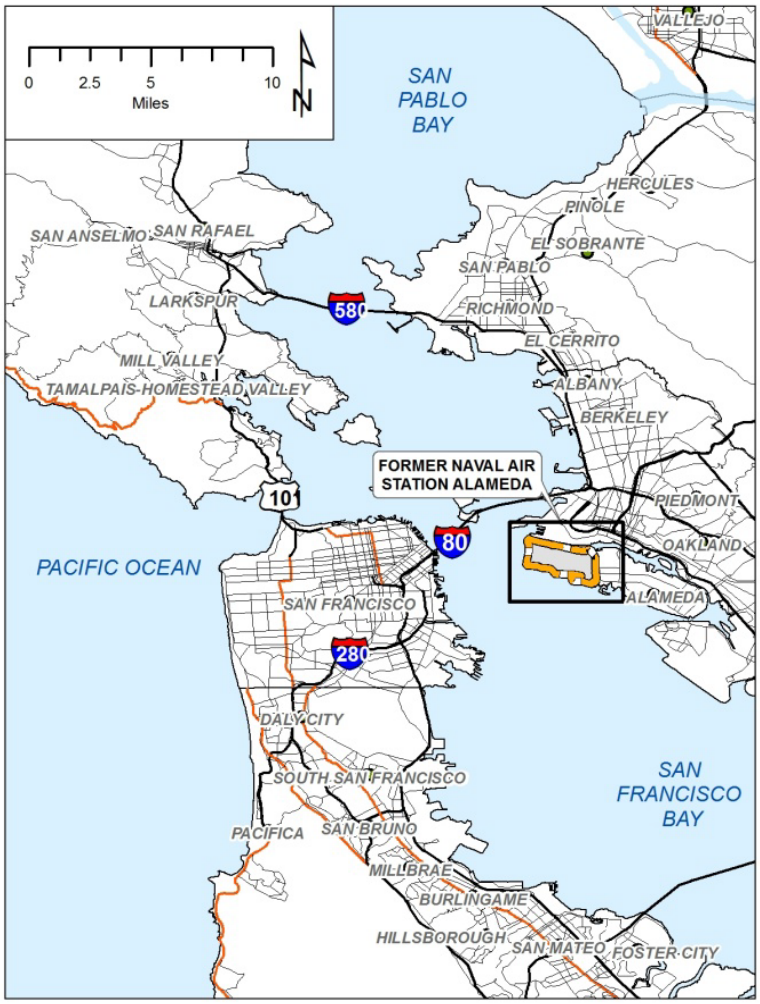

Figure 2-1 Alameda Point Location Map

As a management tool to accelerate site investigation, cleanup, and reuse, a comprehensive OU strategy was developed, separating 34 CERCLA sites into a total of 10 OUs: OU-1, OU-2A, OU-2B, OU-2C, OU-3, OU-4A, OU-4B, OU-4C, OU-5, and OU-6.

OU-2A is located in the southeastern corner of Alameda Point (Figure 2-2). The five CERCLA sites that comprise OU-2A included in this ROD are:

- IR Site 9 – Paint Stripping Facility
- IR Site 13 – Former Oil Refinery
- IR Site 19 – Hazardous Waste Storage
- IR Site 22 – Former Service Station
- IR Site 23 – Missile Rework Operations/Former Plane Defueling Area

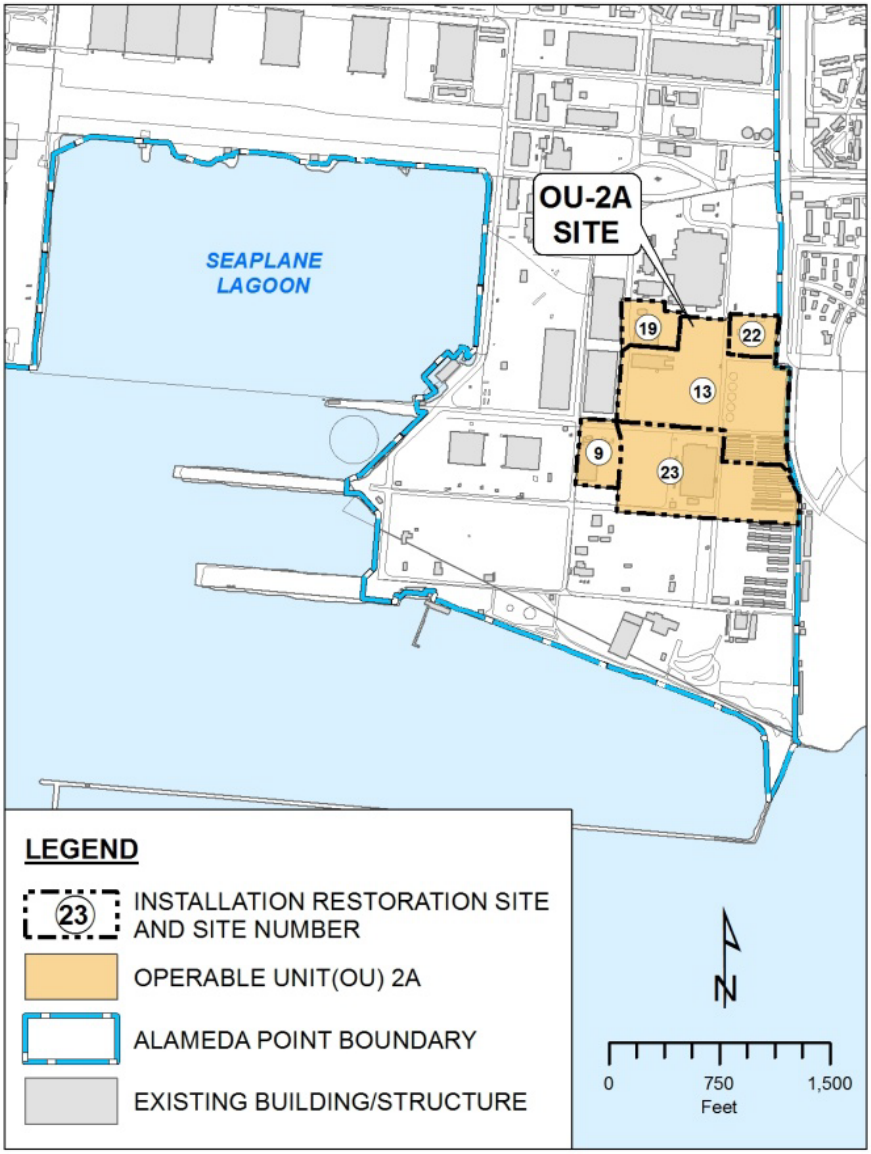

Figure 2-2 OU-2A Location Map

2.1.1 IR Site 9 – Paint Stripping Facility

IR Site 9 is an approximately 2.9-acre site located in the southwestern corner of OU-2A (Figure 2-3). There are currently two buildings on the site. Building 410, constructed in 1958 and used as an aircraft paint stripping facility, has been used for storage since the early 1990s. Building 351 to the north of Building 410 served as a support building for Building 410 and housed lunch and locker rooms.

The Industrial Waste Treatment Plant (IWTP) 410 in Structure 588, to the east of Building 351, treated paint stripping wastes was operated and closed as required by a RCRA permit. The IWTP and 11 associated above-ground storage tanks (ASTs) have been removed from IR Site 9 and the IWTP was **certified closed by DTSC** in 1998.

IR Site 9 includes areas where the Marsh Crust is known to exist and is subject to excavation restrictions known as the **Marsh Crust** Ordinance that limits the extent of excavations to designated threshold depths.

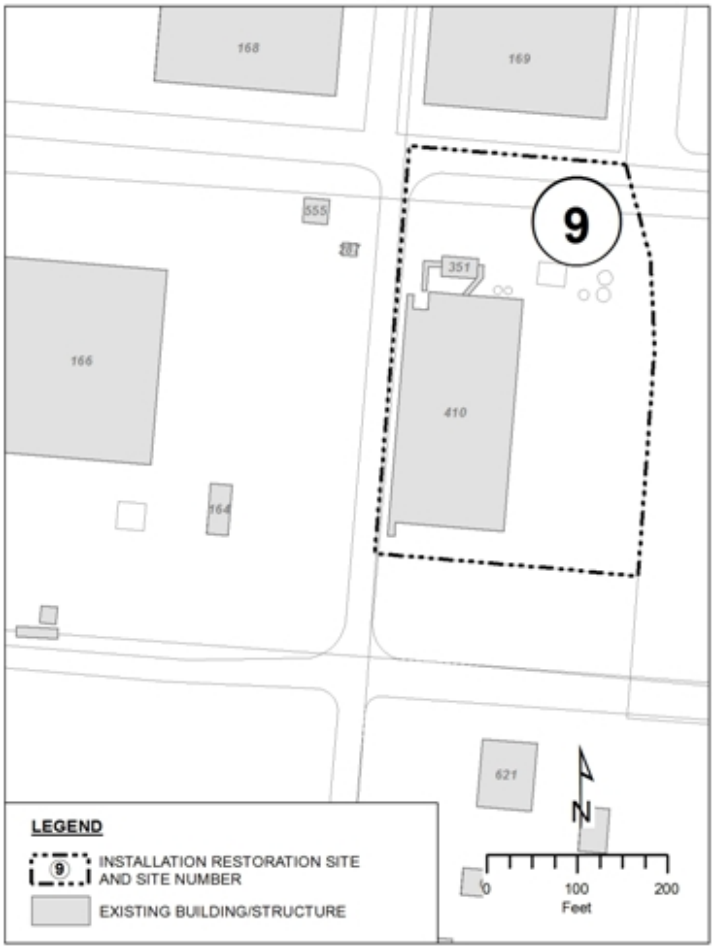

Figure 2-3 IR Site 09 Layout and Features

2.1.2 IR Site 13 – Former Oil Refinery

IR Site 13 covers approximately 17.5 acres in the northern half of OU-2A (Figure 2-4). IR Site 13 includes Building 397, which was constructed in 1958 and used as an aircraft overhaul plant and engine test facility. Most of the remaining portions of the site are either paved or open space. Buildings 298, 401, and Structure 258, and underground fuel lines from Building 397 to Building 372, were formerly within IR Site 13. Historically, the Pacific Coast Oil Works Company petroleum refinery operated within the site from 1879 until 1903. No refinery structures remain within IR Site 13. It is assumed that refinery wastes and asphaltic residues were disposed at IR Site 13 and the surrounding tidal lands. The wastes are referred to as tarry refinery waste (TRW).

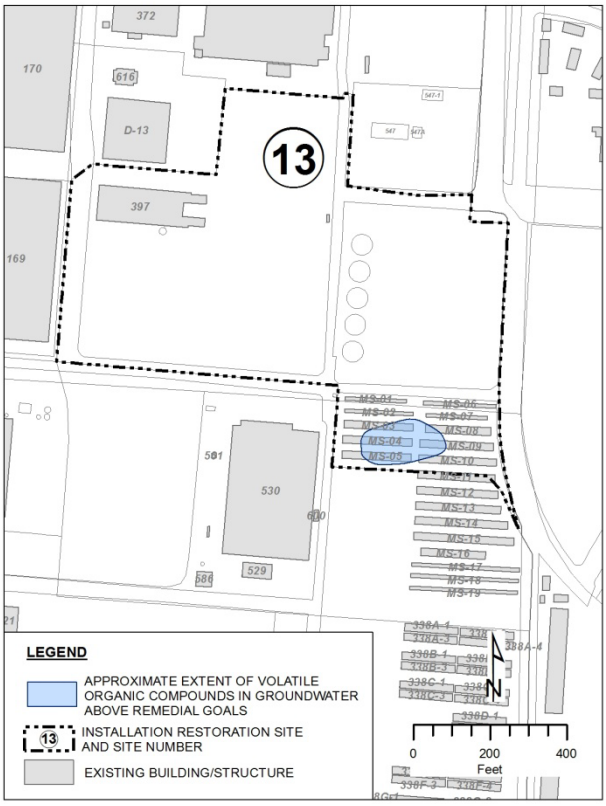

Figure 2-4 IR Site 13 Layout and Features

IR Site 13 includes areas where the Marsh Crust is known to exist. In 2001, prior to the listing of Alameda Point on the NPL, the Navy and the State regulators signed the RAP/ROD for the Marsh Crust at the Fleet and Industrial Supply Center Oakland Alameda Facility/Alameda Annex and for the Marsh Crust and Former Subtidal Area at Alameda Point, which selected an institutional controls remedy for the Marsh Crust at Alameda Point, including portions of the sites that are included in this ROD. The selected remedy requires a deed restriction and a CRUP for any property transferred from federal ownership. The deed restriction and the CRUP require compliance with the City of Alameda's Marsh Crust Ordinance. The IC provisions selected by this ROD will also be used to implement the restrictions selected by the 2001 RAP/ROD. Based on the 2001 Marsh Crust RAP/ROD the Marsh Crust Ordinance limits the extent of excavations to designated threshold depths.

Five former ASTs were located within IR Site 13 but were removed in 1990. Four oil/water separators (OWSs) were located within IR Site 13, three of which were closed in place, and the fourth was removed. Naval Aviation Depot Alameda (NADEP) generation accumulation point (GAP) 62, a storage area for drums of hazardous waste, was also located within the IR Site 13 boundary.

A former fuel line that served Building 397 is part of the Navy's Petroleum Program site, referred to as Corrective Action Area (CAA) 13. The Petroleum Program is addressing CAA-13 and petroleum-related concerns within IR Site 13. In 1991, there was a large JP-5 fuel leak that was addressed as part of the Petroleum Program.

2.1.3 IR Site 19 – Hazardous Waste Storage Area

IR Site 19 covers approximately 2.3 acres in the northwestern corner of OU-2A (Figure 2-5). Currently there are two structures within IR Site 19. Building 616 was built in 1982 for office and storage space; and Yard D-13, a RCRA-permitted hazardous waste storage area that stopped accepting wastes in 1996, and received closure from DTSC in 1999. Building 609 was demolished in 1991. It was constructed in 1975 and was used for building and storing engines. Two on-site USTs, designated for spill control and that were never used, were closed in place.

IR Site 19 includes areas where the Marsh Crust is known to exist and is subject to excavation restrictions known as the Marsh Crust Ordinance. This ordinance limits the extent of excavations to designated threshold depths.

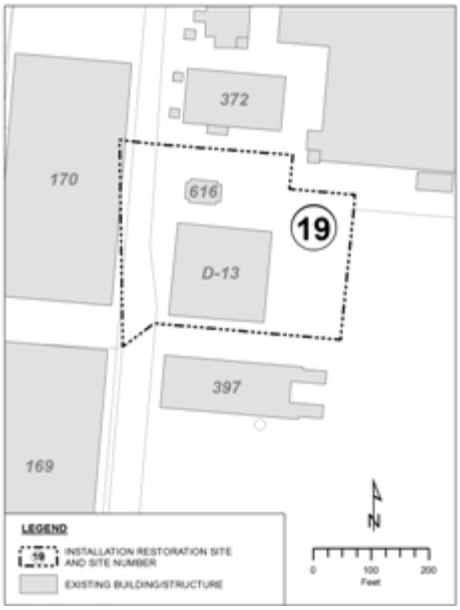

Figure 2-5 IR Site 19 Layout and Features

There are ongoing Petroleum Program activities within IR Site 19, including the southern portion of Petroleum Program Site CAA-4B where fuel lines were used to transport jet fuel.

2.1.4 IR Site 22 – Former Service Station

IR Site 22 covers approximately 2.1 acres in the northeastern corner of OU-2A (Figure 2-6). The site was used for barracks until the 1970s when the former service station was constructed. All buildings associated with the service station (Building 547, 547A, and Structure 547-1) have been demolished, although some of the foundations remain on-site.

IR Site 22 includes Petroleum Program Site CAA-4C. Three former underground storage tanks (USTs) associated with the service station, one of which reportedly leaked and was repaired, were removed in 1994. An OWS remains on site. Fuel lines which also leaked and were repaired were removed. There are no records of ASTs associated with the site.

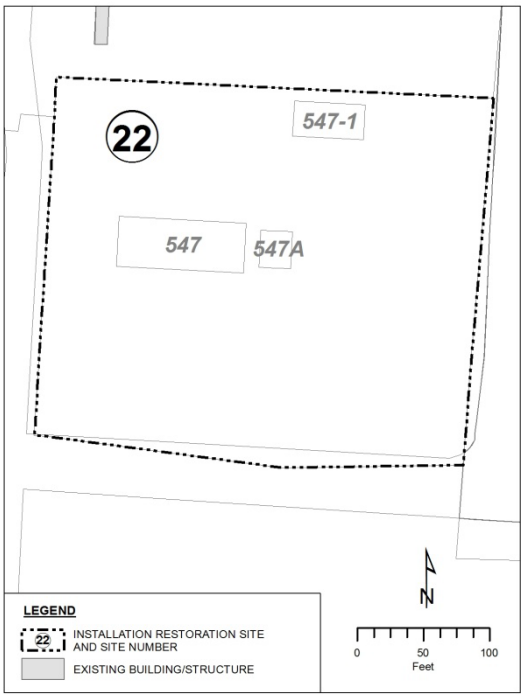

Figure 2-6 IR Site 22 Layout and Features

2.1.5 IR Site 23 – Missile Rework Operations/Former Plane Defueling Area

IR Site 23 covers approximately 14 acres in the southern half of OU-2A (Figure 2-7). Between 1953 and the early 1970s portions of the site were used for airplane defueling activities. The main structure at IR Site 23 is Building 530, constructed in 1973 for missile rework operations. Operational support functions were provided at Buildings 529 and 600, two smaller adjacent buildings. The site is currently used for vehicle storage and parking. Historically, the Pacific Coast Oil Works Company petroleum refinery operated within the site from 1879 until 1903. No refinery structures remain within IR Site 23. It is assumed that refinery wastes and asphaltic residues were disposed at IR Site 23 and the surrounding tidal lands. The tarry refinery wastes are referred to as TRW.

IR Site 23 includes areas where the Marsh Crust is known to exist and is subject to excavation restrictions known as the Marsh Crust Ordinance that limits the extent of excavations to designated threshold depths.

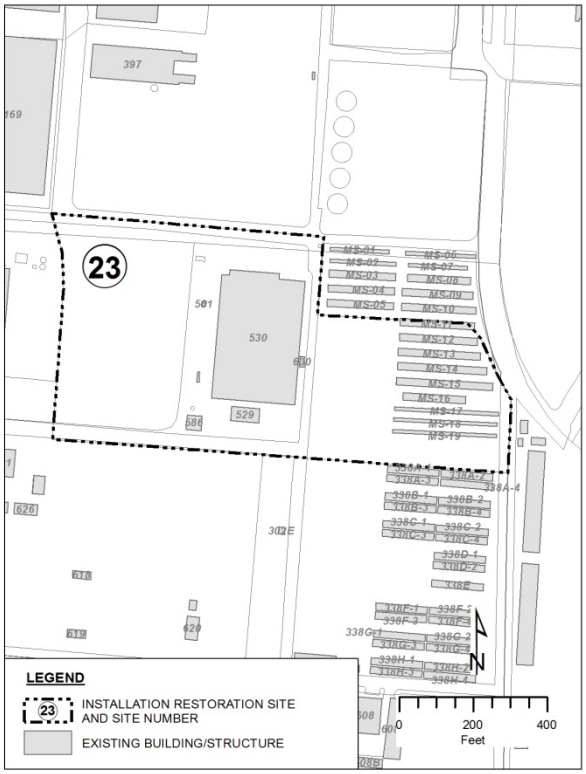

Figure 2-7 IR Site 23 Layout and Features

Three ASTs (AST 530 A through C) have been removed from the site. There are no USTs associated with the site. There are two OWSs (529 and 530) and the three former ASTs (530A-C) associated with the former defueling activities at the site that are being investigated by the Petroleum Program.

2.2 Site Characteristics

OU-2A is characterized by flat topography. There are no streams or surface water bodies at the site. Alameda Point **geology** is characterized by unconsolidated sedimentary deposits. The units that have been encountered during previous investigations at OU-2A include: (1) artificial fill; (2) Bay Sediment Unit (BSU); (3) the Posey/Merritt/San Antonio Formation; (4) Yerba Buena Mud; and (5) the Alameda Formation.

The artificial fill is the uppermost unit that underlies most of OU-2A, ranging in thickness from 0 feet to 15 feet below ground surface (bgs). The artificial fill is thickest in the western portion of IR Site 9 and decreases in thickness until it pinches out at IR Site 22 and the northeast corner of IR Site 13. The BSU underlies the artificial fill material at IR Site 9 and the western portions of IR Sites 13, 19, and 23, where it pinches out along the former shoreline of Alameda Island. Northeast of the former shoreline, the BSU is absent. The BSU reaches a maximum thickness of

9 feet at IR Sites 9 and 13. The Posey/Merritt/San Antonio Formation is present at the ground surface in the eastern portion of IR Site 22 and in the northeast portion of IR Site 13. In the western portion of IR Site 22 and the central portions of IR Sites 13, 19, and 23, the Posey/Merritt/San Antonio Formation underlies the artificial fill. At IR Site 9 and the western portions of IR Sites 13, 19, and 23, the Posey/Merritt/San Antonio Formation underlies the Bay Sediments. The Yerba Buena Mud is a widespread, homogeneous estuarine mud encountered at depths of approximately 79 to 100 feet bgs at OU-2A. The Alameda Formation underlies the Yerba Buena Mud and ranges in thickness from 250 feet at the western edge of Alameda Point to 850 feet on the eastern side of the Alameda Point.

The Marsh Crust layer, between the fill layer and the BSU, is encountered between 10 and 20 feet bgs in the eastern portion of the installation.

The **hydrogeology** at OU-2A includes a shallow unconfined water-bearing zone down to the top of the Yerba Buena Mud which acts as an aquitard at OU-2A and other areas at Alameda Point. Groundwater generally flows west towards Sea Plane Lagoon. Groundwater is typically encountered 5 to 6 feet bgs.

The hydrostratigraphic units at OU-2A include an unconfined water-bearing zone, the BSU, the Yerba Buena Mud (an aquitard), and the Alameda Aquifer. The unconfined water-bearing zone extends to depths of 79 feet to 100 feet bgs and encompasses geologic units including artificial fill deposits, BSU, and the Posey/Merritt/San Antonio Formation. The fine-grained deposits constituting BSU (silts and clays) within the water-bearing zone are laterally discontinuous and relatively thin. Therefore, the BSU in this area of Alameda Point is an ineffective aquitard at OU-2A. The BSU is present at IR Site 9 and at portions of IR Sites 13 and 21.

The Yerba Buena Mud occurs at depths of 79 feet to 100 feet bgs at OU-2A. The Yerba Buena Mud acts as an effective confining layer between the shallow, relatively saline groundwater above this aquitard and the underlying freshwater Alameda Formation Water-Bearing Zone. The Alameda Formation Water-Bearing Zone represents deep groundwater underlying the Yerba Buena Mud in Alameda Formation sediments.

In 2011, discussions began between the Navy and the BCT regarding the beneficial uses of groundwater at sites adjacent to OU-2A, in the southeastern portion of Alameda Point. After further evaluation, the Navy sent a letter dated August 6, 2012 (Appendix A), containing data with multiple lines of evidence which supports the conclusion that shallow groundwater (i.e., groundwater above the Yerba Buena Mud) in the southeast portion of Alameda Point is not of sufficient quantity or quality to be considered a future potential drinking water source, pursuant to State Water Resources Control Board (SWRCB) Resolution No. 88-63 and SWRCB Resolution No. 89-39, “Sources of Drinking Water”.

In a letter dated January 23, 2012 (Appendix A, Attachment 1), the Alameda Reuse and Redevelopment Authority (ARRA) stated that it does not foresee ever using shallow groundwater at Alameda Point as a drinking-water supply, and will continue to use East Bay Municipal Utility District as the supplier of potable water. Further, the ARRA requested that the Navy direct remediation efforts to addressing contamination that significantly impacts reuse and redevelopment of the former base, rather than toward cleaning shallow groundwater in the

southeast portion of Alameda Point to meet maximum contaminant levels for drinking-water supplies. The Water Board and USEPA concurred with the groundwater use exception in September (Appendix A, Attachment 2, Attachment 3).

The **ecology** of OU-2A is considered intensively developed. Typical urban wildlife is not likely to be present in the non-landscaped areas where there is less available habitat.

2.3 Previous Investigations, Removal Actions, and Treatability Studies

Various environmental investigations have been performed for soil and groundwater at OU-2A sites in conformance with CERCLA, the former NAS Alameda Environmental Baseline Survey (EBS), the Petroleum Program, and RCRA. These investigations characterized the physical attributes, including geology and hydrogeology, nature and extent of chemicals and their impact, risks to human health and the environment, and feasibility of potential soil and groundwater remediation technologies. The following sections provide a summary of the investigations and treatability studies conducted at each of the IR Sites within OU-2A. The OU-2A Remedial Investigation (RI) Report provided a table summarizing historical investigations by site through 2005. Additional data gap investigations were conducted between 2007 and 2010. Table 2-1 provides a summary of environmental investigations conducted at OU-2A.

Table 2-1: Summary of Historical Environmental Investigations

Environmental Investigation		IR Site 9	IR Site 13	IR Site 19	IR Site 22	IR Site 23
Prior to IR Program	Initial Assessment Study		✓			
RCRA	Multiple	✓	✓	✓	✓	✓
CERCLA	Phases 1A and 2A Investigation, 1991	✓	✓	✓	✓	✓
	Follow-on Investigation, 1994	✓	✓	✓	✓	✓
	Follow-on Investigation, 1998	✓	✓	✓	✓	✓
	Groundwater Sampling and Tidal Influence	✓	✓	✓	✓	✓
	Supplemental RI Data Gap Sampling, 2001	✓	✓	✓	✓	✓
	Basewide Groundwater Monitoring, 2002	✓	✓	✓	✓	✓
	PAH Investigation	✓	✓	✓	✓	✓
	TRW Investigation		✓			
	Data Gaps Investigation, 2007-2008	✓	✓	✓	✓	
	Supplemental Data Gaps Investigation 2009-2010	✓	✓	✓	✓	
EBS	Phase IIA EBS	✓		✓	✓	✓
	Phase IIB EBS			✓		✓
Petroleum	Fuel Lines and UST Investigations		✓	✓	✓	✓

Table 2-1: Summary of Historical Environmental Investigations (continued)

Environmental Investigation		IR Site 9	IR Site 13	IR Site 19	IR Site 22	IR Site 23
Removal Actions	Intermediate Maintenance Facility Removal Action		✓			
	Basewide Fuel Line Removal Action Confirmation Sampling		✓	✓		
	Dual Vapor Extraction		✓			✓
	Chemical Oxidation Removal Action	✓				

Acronyms/Abbreviations:

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
EBS environmental baseline survey
IR Installation Restoration
PAH polycyclic aromatic hydrocarbon
RCRA Resource Conservation and Recovery Act
RI remedial investigation
TRW tarry refinery waste
UST underground storage tank

2.3.1 IR Site 9 – Paint Stripping Facility

Environmental investigations are summarized in the OU-2A **RI Report for IR Site 9** and include investigations conducted before the IR program, for the IR Program (the CERCLA process), for the EBS, and for removal actions. Multiple Petroleum Program actions have been conducted at IR Site 9, including free-product removal.

The evaluation of the nature and extent of contamination in soil and groundwater concluded that all of the chemicals reported across IR Site 9 are consistent with historical site activities, such as paint stripping and defueling. Most of the maximum reported concentrations of those chemicals related to paint-stripping (tetrachloroethene [PCE] and 1,2-dichloroethene [1,2-DCE]) were located in soil near storm sewers and industrial wastewater lines connected to IWTP 410. Benzene, toluene, ethylbenzene and xylene (BTEX) components in soil were determined to be related to releases of petroleum fuel associated with defueling activities near Building 410, and cleanup will be completed under the Petroleum Program.

Leaks in storm sewer and industrial waste lines in and around Building 410 are believed to be the source of solvents and volatile organic compounds (VOCs) (1,2,3-trichloroproprane [1,2,3-TCP], naphthalene, 2-methylnaphthalene, 1,1,1-trichloroethane [1,1,1-TCA], 1,1-dichloroethane [1,1-DCA], PCE, trichloroethene [TCE], 1,2-DCE, and vinyl chloride [VC]) in groundwater at IR Site 9.

The reported results from the data gap investigations as well as reported results for groundwater sampling in the Spring and Fall of 2008 as part of the basewide groundwater monitoring program were used to evaluate soil and groundwater. The Feasibility Study (FS) Report indicated none of the reported concentrations of VOCs, semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals in **IR Site 9 soil** exceeded screening criteria (U.S. EPA regional screening level [RSL], DTSC Lead Spreadsheet based value of 207 milligrams per kilogram [mg/kg], or background for metals and PAHs).

The FS reported VOCs in **IR Site 9 groundwater** that exceeded their respective screening levels

(the screening levels used in the RI and FS reports for groundwater included maximum contaminant levels for organic chemicals; however, based on the groundwater use exception they are no longer ARARs) in the shallow groundwater (5 to 15 feet bgs) included: VC, benzene, cis-1,2-DCE, and 1,2,3-TCP. The following VOCs were reported at concentrations exceeding their respective screening levels from 20 to 50 feet bgs: 1,1-DCA; 1,1-dichloroethene [1,1-DCE]; cis-1,2-DCE; VC; and methyl tert-butyl ether (MTBE). In addition, arsenic exceeded the screening level concentration in two locations in shallow groundwater and one location in deep groundwater.

A **pilot study** was conducted to assess the feasibility of in-situ chemical oxidation (ISCO) for remediation of VOCs in IR Site 9 groundwater in the shallow (5 feet to 15 feet bgs) and intermediate (23 feet to 43 feet bgs) zones in November 2002. As part of the pilot tests, injection and observation wells and monitoring wells were installed in the shallow and intermediate groundwater zones, and chemical oxidant was injected into injection wells. For the shallow zone, significant reductions in contaminant concentrations were observed in a monitoring well located approximately 23 feet from the injection well, following oxidant injection. For the intermediate zone, some wells showed a decrease in 1,1-DCA, the primary contaminant, while some showed an increase. Additional pilot testing was recommended 25 feet to 35 feet away from the previous injection well.

Removal actions were performed using an ISCO process to treat VOCs in the shallow groundwater zone (between 8 feet and 15 feet bgs) east of Building 410, and VOCs in the intermediate zone (between 20 feet and 40 feet bgs) primarily northwest, west, and southwest of Building 410. Three oxidant injections events were conducted separately in two water-bearing zones between 2005 and 2006. After three injection events, the number of shallow-zone monitoring wells with concentrations of cis-1,2-DCE and VC above screening levels was reduced; however, concentrations above screening levels were still reported. In intermediate-zone wells, 1,1-DCA concentrations increased and decreased in various wells. VC concentrations generally decreased. However, both 1,1-DCA and VC were reported at concentrations above screening levels.

No additional injection of oxidant was conducted following the third injection event and performance monitoring as part of the removal action for the first and second water-bearing zones at IR Site 9. It was recommended that groundwater monitoring continue and the decision on the need for additional ISCO treatment be made following at least three quarters of additional groundwater sampling. However, the previous ISCO injections have successfully reduced VOC in groundwater to concentrations that do not pose unacceptable risk from potential vapor intrusion under residential use scenarios. Therefore, because MCLs are no longer ARARs, no additional ISCO injections are necessary.

2.3.2 IR Site 13 – Former Oil Refinery

Environmental investigations are summarized in the OU-2A **RI Report for IR Site 13** and include investigations conducted before the IR program, for the IR Program (the CERCLA process), for the EBS, and for removal actions and treatability studies. Site CAA-13 was identified and investigated as part of the Petroleum Program. The evaluation of the nature and

extent of contamination in soil and groundwater concluded that most chemicals reported at IR Site 13 are consistent with historical site activities, which included the former oil refinery and aircraft storage, overhaul, and defueling.

Petroleum fuels such as diesel fuel, aviation fuel, gasoline, and motor oil were likely stored in ASTs 324 through 328. Jet fuel was used at IR Site 13 at the jet engine rehabilitation and testing facility in the east end of Building 397. In addition, 3,500 to 17,000 gallons of jet fuel were released to the storm drain system on the east end of Building 397 in 1991. The Petroleum Program addressed **the release**.

Based on recommendations in the OU-2A RI Report, additional sampling was conducted in 2007 and 2008 to address data gaps, and as part of the **Site Characterization and Analysis Penetrometer System (SCAPS) Laser Induced Flouresence (LIF)** Tarry Refinery Waste (TRW) investigation. Further characterization of soil and groundwater at Site 13 was performed as part of a **Data Gap Investigation** in 2007 and 2008. The RI Report results, the data gap investigation results, as well as results from groundwater sampling in the Spring and Fall of 2008 as part of the basewide groundwater monitoring program, were used to perform the updated Human Health Risk Assessment (HHRA) in the OU-2A **FS Report Appendix B**. The FS documented that no SVOCs, pesticides, or PCBs in **IR Site 13 soil** exceeded screening criteria, but concentrations of metals (arsenic, chromium, cobalt, iron, lead and vanadium) exceeded screening criteria at a limited number of locations. The HHRA concluded those metals to be within the range of background concentrations established for Alameda. The PAHs expressed as benzo(a)pyrene (B[a]P)-equivalent concentrations, range from non-detect to a maximum reported value of 7.6 mg/kg in IR Site 13 soil. The SCAPS LIF TRW investigation delineated total petroleum hydrocarbons (TPH) and PAHs associated with TRW as well as VOCs that were associated with a petroleum plume in the eastern portion of IR Site 13. Soil samples collected during the SCAPs investigation reported TPH in the diesel range, but no PAHs expressed as B(a)P-equivalent concentrations above the screening level within the portion of IR Site 13 identified as containing TRW. Soil samples were also analyzed for pH level, and the low pH conditions previously reported are no longer present. The updated HHRA in the Final FS Report concluded that the PAHs reported at Site 13 since the RI, including samples associated with the TRW, were consistent with the Alameda Point established acceptable range. The HHRA concluded that TRW does not pose a risk to human health or the environment; therefore, no further CERCLA action for TRW at IR Site 13 is required. The Petroleum Program continues to address total petroleum hydrocarbons at Site 13.

The FS reported that concentrations of benzene did not exceed the screening level in any groundwater samples collected in the southern portion of IR Site 13 during the data gap study of **groundwater at IR Site 13**, however, benzene was reported at concentrations exceeding the screening level for groundwater in two samples collected from Hydro Punches during the supplemental data gap investigation. Ethylbenzene, xylene (total), and toluene were also reported in groundwater at concentrations that exceeded their respective screening levels during the data gap investigation. This area is not associated with the TRW and has a planned groundwater remedial action due to a potential risk from vapor intrusion (see Section 2.9.2). VC was reported at concentrations exceeding the screening level during the data gap investigation, but the sample collected during the supplemental data gap investigation did not exceed the screening level. Arsenic was reported at concentrations above the screening level during the data

gap study, but was reported at less than the screening level during the Spring 2008 groundwater monitoring event that was part of the basewide groundwater monitoring program.

Several **treatability studies and removal actions have been conducted at IR Site 13**. In 1998, a treatability study for intrinsic bioremediation to treat hydrocarbons was conducted, and in 2000 a study of emulsion recycling of the TRW was conducted. Several removal actions have also been conducted at IR Site 13. A portion of the TRW was removed in 1940. Lead in soil was removed in 1993. A time-critical removal action (TCRA) was conducted in 2004 within the former oil refinery that included installation of a 6-foot-tall chain-link fence in April 2004 to prevent potential human exposure to TRW. As noted above, the HHRA for Site 13 concluded TRW does not pose a risk to human health nor the environment, and no further CERCLA action is required for TRW. As a result, the fence is no longer required.

2.3.3 IR Site 19 – Hazardous Waste Storage Yard

Environmental investigations are summarized in the OU-2A **RI Report for IR Site 19** and include investigations conducted before the IR program, for the IR Program (the CERCLA process), for the EBS, and for removal actions. The northwest corner of IR Site 19 is part of **Petroleum Site CAA-4B** where soil and groundwater are being investigated for petroleum and lead contamination. The contamination is in the vicinity of Building 372 and two USTs associated Building 372. Building 372 and the two associated USTs are located in IR Site 4 in OU-2B. The evaluation of the nature and extent of contamination in soil and groundwater concluded that most chemicals reported at IR Site 19 are consistent with historical site activities, which included hazardous materials storage at Building 616 and Yard D-13. Most of the chemicals related to **hazardous waste storage** (DCA, TCA, benzene, PCE, TCE, and PAHs) were reported within the vicinity of Yard D-13 and Building 616. Reported concentrations of 1,1-DCA, PCE, and TCE in shallow soil near the solvent storage area in the southern portion of Yard D-13 may have been the result of spills in the area that reached the soils through cracks or other openings in the floor. B(a)P is likely associated with PAHs present in fill material used to build Alameda Point.

PCE and TCE were reported in groundwater in the southern portion of Yard D-13 and near Building 616. Benzene was also reported in low concentrations in groundwater in the southern portion of Yard D-13.

Based on recommendations in the OU-2A RI Report, additional sampling was conducted in 2007 and 2008 to address data gaps, and supplemental data gap investigations were conducted in 2009 and 2010. The reported results from the data gaps investigations, as well as reported results for groundwater sampling in Spring and Fall of 2008 as part of the basewide groundwater monitoring program, were used to evaluate soil and groundwater. The FS documented that neither pesticides nor PCBs were reported above their respective reporting limits in **soil at IR Site 19**. None of the reported VOCs, SVOCs, and metals (except lead) in IR Site 19 soil exceeded screening criteria (U.S. EPA RSL, DTSC Lead Spreadsheet based value of 207 mg/kg, or the agreed background value for arsenic and PAHs [expressed as B(a)P-equivalent concentrations). One soil sample out of 51 reported lead at concentrations exceeding the screening level of 207 mg/kg. PAHs, expressed as B(a)P-equivalent concentrations, ranged from non-detect to a maximum reported value of 1.1 mg/kg.

The FS reported that TCE, PCE, and VC exceeded their respective screening levels in groundwater samples collected during the data gap study and the Fall 2008 Basewide groundwater sampling events of **groundwater at IR Site 19**. Based on these results, additional sampling was conducted as part of the supplemental data gaps investigation to assess the horizontal and vertical extents of the VOC plume at IR Site 19. TCE was reported at concentrations below the screening level during the supplemental data gaps investigation.

As part of the basewide **removal action** to address active and inactive fuel lines across Alameda Point, two locations along the inactive fuel line running north-south across the western portion of IR Site 19 were sampled and filled with grout as part of closure in place. TPH-gasoline was reported in one sample. No treatability studies have been conducted at IR Site 19.

2.3.4 IR Site 22 – Former Service Station

Environmental investigations are summarized in the OU-2A **RI Report for IR Site 22** and include investigations conducted before the IR program, for the IR Program (the CERCLA process), for the EBS, and for removal actions. The IR Site 22 boundaries are roughly the same as Petroleum Program Site CAA-4C. The evaluation of the nature and extent of contamination in soil and groundwater concluded that most of the chemicals reported across IR Site 22 are consistent with historical site activities, which included a gasoline station and car wash. A corrective action began in 2004 to address the impacts of significant levels of petroleum hydrocarbons in soil and groundwater. Most of the maximum reported concentrations of the chemicals related to petroleum fuels used at IR Site 22 (BTEX, lead, naphthalene, 2-methylnaphthalene, isopropylbenzene, and n-propylbenzene) were located near the fuel islands or fuel lines.

Based on recommendations in the OU-2A RI Report, additional sampling was conducted in 2007 and 2008 to address data gaps, and supplemental data gap investigations were conducted in 2009 and 2010. The reported results from the data gap investigations were used to evaluate soil and groundwater. The FS indicated that PCBs were not reported above their laboratory reporting limits and neither pesticides nor SVOCs were reported to exceed their respective screening levels in **soil at IR Site 22**. Concentrations of lead and arsenic were reported at concentrations above screening levels. PAHs, expressed as B(a)P-equivalent concentrations, ranged from non-detect to a maximum reported value of 0.76 mg/kg.

The FS reported 1,2-DCA, BTEX, arsenic, iron, manganese, and thallium exceeded their respective screening levels in **groundwater samples collected at IR Site 22** at least one time between 2002 and 2008. A review of the 2008 basewide groundwater monitoring program report confirmed that metals in IR Site 22 groundwater are not indicative of a release.

Several **removal actions have been conducted at IR Site 22** as part of the Petroleum Program. These include a tank removal in 1994 (USTs 547-1 through 547-3), fuel line removals in 1995, and a dual-vapor extraction system operation in 2004. No treatability studies have been conducted at IR Site 22.

2.3.5 IR Site 23 – Missile Rework Operations/Former Plane Defueling Area

Environmental investigations are summarized in the OU-2A **RI Report for IR Site 23** and

include investigations conducted for the IR Program (the CERCLA process), for the EBS, and for removal actions. In 2000, boundaries for IR Sites 13 and 10B were revised to form IR Site 23 (former IR Site 10B was eventually incorporated into IR Site 13). The IR Site 23 boundaries include portions of Petroleum Program Site CAA-13. A dual-vapor extraction system has been operating since 2004 to **remove free product** from Petroleum Program Site CAA-13. The evaluation of the nature and extent of contamination in soil and groundwater concluded that most of the chemicals reported across IR Site 23 are consistent with historical activities that occurred at the site, which included airplane defueling and the former oil refinery. In addition, petroleum releases at IR Site 13 are another likely source of petroleum contamination at IR Site 23.

Previous site activities associated with plane defueling and the operation of the former refinery were identified as a source of petroleum hydrocarbons in soil. The FS Report summarized the results reported in the RI Report: none of the reported concentrations of VOCs, SVOCs, PCBs and metals in **IR Site 23 soil** exceeded their respective screening levels. Chemicals identified in **groundwater at IR Site 23** included petroleum and associated chemicals such as BTEX, naphthalene, trimethylbenzenes, and lead. In general, groundwater in the western portion of IR Site 23, the plane defueling area, is impacted by these chemicals and a petroleum plume is present.

A **corrective action**, dual-vacuum extraction and biosparging, was conducted between 2002 and 2006 within the boundary of IR Site 23 to address petroleum hydrocarbon compounds at Petroleum Program Site CAA-13. The dual-vacuum extraction and biosparge remediation systems were implemented to address separate-phase and dissolved-phase hydrocarbons in groundwater and the vadose zone. Results of analyses of groundwater samples collected during post-remediation monitoring showed that two small areas in the central and northern portions of the site contained dissolved hydrocarbons at levels that exceeded the preliminary remediation criteria established by the TPH strategy. Results of analyses of soil samples found that no petroleum fraction or fuel-related compounds exceeded the preliminary remediation criteria established by the Petroleum Program.

2.4 Current and Potential Future Site Uses

NAS Alameda closed in 1997. Current land use in the OU-2A area includes vehicle parking and storage facilities, including boats and recreational vehicles. There are some ongoing activities related to general maintenance and security. The **future land use** planned for OU-2A is commercial-mixed use. This includes office, research and development, warehousing, light industrial, maritime industrial, manufacturing, service-commercial, retail, and residential, where appropriate. Since the reuse plans include components of residential reuse, the risk assessments evaluated both residential and commercial exposure scenarios, with residential use representing the greatest potential exposure to contamination.

2.5 Summary of Site Risks

As part of the OU-2A RI Report, a baseline HHRA and an **Ecological Risk Assessment** (ERA) were conducted in 2004 using data collected during RI sampling activities. A **revised HHRA** was performed in 2009 as part of the OU-2A FS to include evaluation of the additional data collected subsequent to the RI. There were no revisions to the ERA performed during the RI

phase. The objective of the risk assessments was to estimate the risk to human and ecological receptors from exposure to chemicals in OU-2A soil and groundwater. The risk assessments were conducted according to accepted regulatory standard methods, and a list of specific chemicals and exposure pathways was established to measure potentially unacceptable risk at the sites. The methodologies and results of the revised HHRA are presented in detail in the OU-2A FS Report. The ERA methodologies and results are presented in detail in the RI Report. A Conceptual Site Model (CSM) highlighting potential exposure pathways between contaminants in OU-2A media and human receptors (Figure 2-8) based on the planned future uses was developed, and a CSM for ecological receptors (Figure 2-9) was also developed. A summary of findings for the HHRA and ERA is provided below.

2.5.1 Human Health Risk Assessment

In accordance with U.S. EPA guidance, the risk management range for cancer risk is considered to be 10^{-4} to 10^{-6}. U.S. EPA guidance states that "where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} and the non-carcinogenic hazard quotient (HQ) is less than one (1.0), action generally is not warranted unless there are adverse environmental impacts." Site-specific factors are typically considered at sites where the cancer risks are 10^{-4} to 10^{-6}. Cancer risks below 10^{-6} are generally considered insignificant and no action is required. For cancer risks above the risk management range of 10^{-4} to 10^{-6}, action is generally required.

The findings of the revised baseline HHRAs, including the total cancer risks and non-cancer hazards, are summarized below. The risks were calculated for the following three exposure groups:

- **Exposure Group 1**. All soil and groundwater pathways (residential development and residential use of groundwater) – for ingestion of soil and groundwater, inhalation of vapors in indoor and outdoor air, inhalation of vapors in indoor air while showering, inhalation of particulates from soil in outdoor air, and dermal contact with soil.

- **Exposure Group 2**. Pathways for soil and vapors from VOCs in groundwater (reasonable current and future use exposure, which includes residential development with the current municipal water supply) – for ingestion of soil and homegrown produce, inhalation of particulates from soil in outdoor air, inhalation of vapors in indoor and outdoor air, and dermal contact with soil.

- **Exposure Group 3.** Exposure pathways for residential use of groundwater – for ingestion of groundwater and inhalation of vapors in indoor air while showering.

The risks were also calculated to include and exclude risk due to background constituents. The exposure pathways under Group 2 represent the most reasonable residential exposure pathways, because shallow groundwater at OU-2A has been demonstrated not to be a potential future drinking-water source. Details presented in the revised HHRA of the FS Report include the exposure pathways, total U.S. EPA cancer risk, hazard index estimates, and primary risk drivers from the HHRA as presented in Table 2-2.

Based on the groundwater beneficial use exception and the planned future implementation of ICs

to restrict the use of groundwater, groundwater is no longer considered a drinking water supply in southeastern Alameda Point, and the vapor intrusion pathway is the only remaining exposure pathway. The exposure groups presented in the HHRA included in the FS Report are no longer applicable because the risk is measured from vapor intrusion only, as presented in Table 2-3.

Navy and U.S. EPA both independently evaluated changes to toxicity criteria for TCE and PCE since the risk assessment was completed, and determined that the remedy at OU-2A remains protective of human health and the environment based on the updated toxicity criteria. The Navy also evaluated the change to the lead standard and determined that the remedy remains protective of human health and the environment.

Figure 2-8
Human Health Risk Assessment Conceptual Site Model (Source: Final Feasibility Study Report, OU-2A)

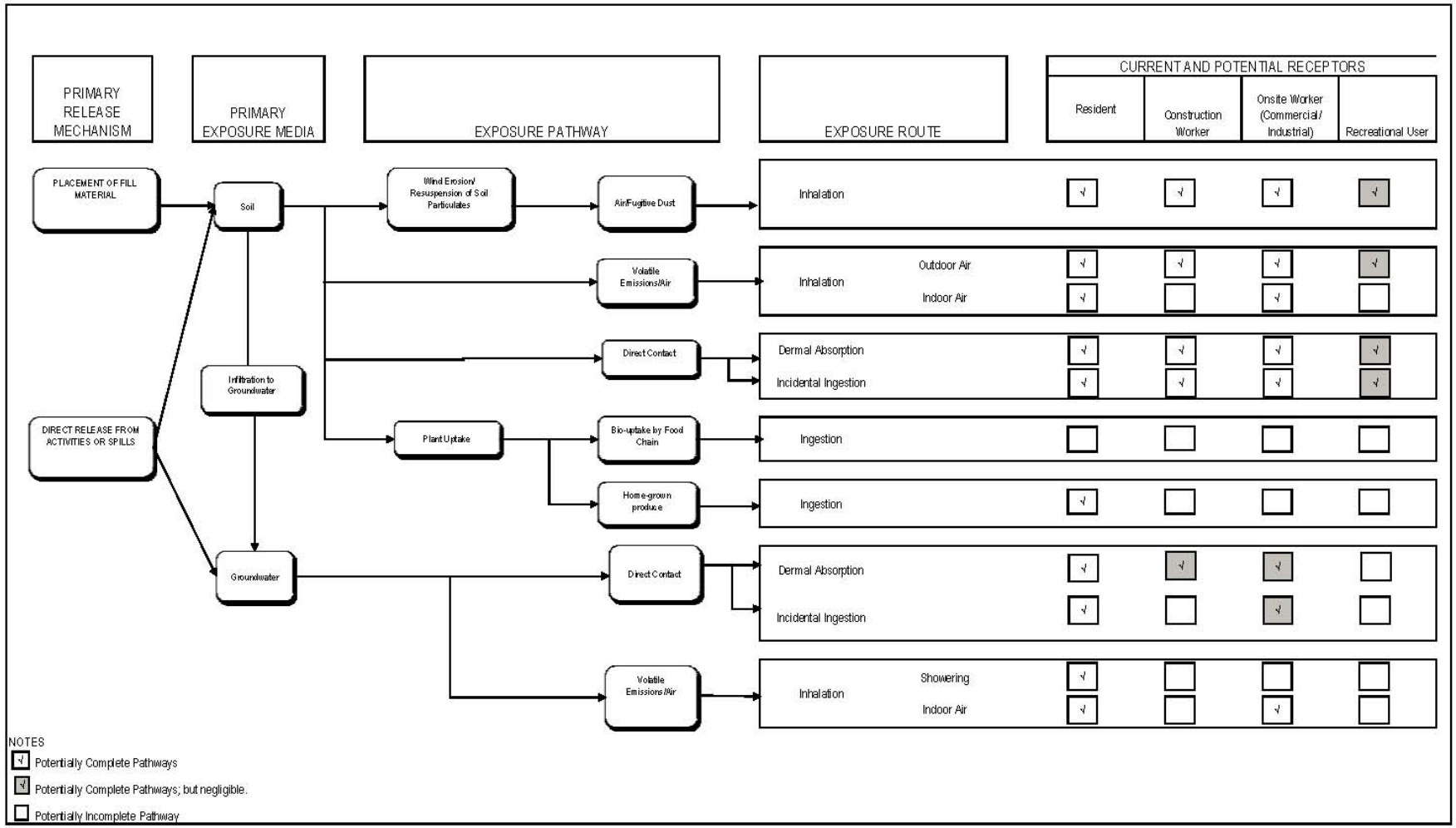

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Table 2-2: HHRA Results for Each Residential Exposure Group for Soil and Groundwater (Source: Final Feasibility Study Report, OU-2A)

		IR Site 9		IR Site 13		IR Site 19		IR Site 22		IR Site 23	
Exposure Group Number	Residential Exposure Group Definition	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index
HHRA Results by Exposure Group, Soil (0 - 2 feet bgs) and Groundwater											
1	All soil and groundwater exposure pathways **Total[a]**	$1x10^{-3}$	78	$1x10^{-3}$	24	$4x10^{-4}$	7	$3x10^{-3b}$	141	$6x10^{-4}$	10
2	Exposure pathways for soil and vapors from VOCs in groundwater **Total[a]**	$2x10^{-5}$	3	$6x10^{-5}$	4	$3x10^{-5}$	3	$2x10^{-4b}$	6	$3x10^{-5}$	3
3	Exposure pathways for residential use of groundwater **Total[a]**	$1x10^{-3}$	76	$1x10^{-3}$	20	$4x10^{-4}$	4	$3x10^{-3b}$	136	$6x10^{-4}$	7
HHRA Results by Exposure Group, Soil (0 - 8 feet bgs) and Groundwater											
1	All soil and groundwater exposure pathways **Total[a]**	$1x10^{-3}$	81	$1x10^{-3}$	23	$4x10^{-4}$	7	$3x10^{-3b}$	157	$6x10^{-4}$	10
2	Exposure pathways for soil and vapors from VOCs in groundwater **Total[a]**	$6x10^{-5}$	6	$9x10^{-5}$	3	$3x10^{-5}$	3	$3x10^{-4b}$	22	$3x10^{-5}$	3
3	Exposure pathways for residential use of groundwater **Total[a]**	$1x10^{-3}$	76	$1x10^{-3}$	20	$4x10^{-4}$	4	$3x10^{-3b}$	136	$6x10^{-4}$	7

Note:

[a] includes all chemicals of potential concern

[b] Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program. For groundwater, benzene is a major cancer and non-cancer risk driver due to vapor intrusion into indoor air. As a former gasoline service station, Site 22 is being addressed under the Petroleum Program. The carcinogenic risk at IR Site 22 from exposure to groundwater via vapor intrusion only is within the risk management range.

Acronyms/Abbreviations:

bgs – below ground surface
HHRA – human health risk assessment
HI – hazard index
OU – operable unit
IR – Installation Restoration
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

Table 2-3: HHRA Totals by Pathway for Residential Vapor Intrusion in Soil and Groundwater (Source: Final Feasibility Study Report, OU-2A)

	IR Site 9		IR Site 13		IR Site 19		IR Site 22		IR Site 23	
	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index
Inhalation of Vapors in Indoor Air Originating in Soil (0-2 feet bgs)										
Total	$0x10^{-0}$	0.26	$2x10^{-7}$	0.16	$8x10^{-9}$	1	$0x10^{-0}$	1	$0x10^{-0}$	0
Total (excluding background)	$0x10^{-0}$	0.26	$2x10^{-7}$	0	$8x10^{-9}$	1	$0x10^{-0}$	1	$0x10^{-0}$	0
Inhalation of Vapors in Indoor Air Originating in Soil (0-8 feet bgs)										
Total	$2x10^{-8}$	1	$4x10^{-6}$	1	$2x10^{-6}$	1	$1x10^{-5}$	17	$0x10^{-0}$	0
Total (excluding background)	$2x10^{-8}$	1	$4x10^{-6}$	1	$2x10^{-6}$	1	$1x10^{-5}$	17	$0x10^{-0}$	0
Inhalation of Vapors in Indoor Air Originating from Groundwater										
Total	$2x10^{-6}$	0.2	$1x10^{-5}$	0.1	$4x10^{-6}$	0.1	$2x10^{-4}$ [a]	2	$4x10^{-7}$	0
Total (excluding background)	$2x10^{-6}$	0.2	$1x10^{-5}$	0.1	$4x10^{-6}$	0.1	$2x10^{-4}$ [a]	2	$4x10^{-7}$	0

Note:
[a] Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program. For groundwater, benzene is a major cancer and non-cancer risk driver due to vapor intrusion into indoor air. As a former gasoline service station, Site 22 is being addressed under the Petroleum Program. The carcinogenic risk at IR Site 22 from exposure to groundwater via vapor intrusion only is within the risk management range.

Acronyms/Abbreviations:

bgs – below ground surface
HHRA – human health risk assessment
HI – hazard index
IR – installation restoration
OU – operable unit
U.S. EPA – United States Environmental Protection Agency

2.5.1.1 IR SITE 9

The identification of soil and groundwater COCs at IR Site 9 was based on human health risk considerations and potential ARARs. No action is required for soil based on the HHRA. Prior to the groundwater beneficial use evaluation, MCLs were ARARs. MCLs are no longer applicable. The **organic analytes identified as COCs at IR Site 9** based on human health risk considerations were 1,2,3-TCP and VC. The COCs based on the potential ARARs were: VC; 1,1-DCA; cis-1,2-DCE; benzene; MTBE; and 1,1-DCE. Inorganic analytes were reviewed to determine if their presence was indicative of a release, or if they exceeded background risks. The **inorganic analytes reviewed for IR Site 9** included metals. The evaluation determined that there was no indication of release of any of the metals. The only inorganic analyte to exceed screening levels was arsenic, which the FS report concluded was not indicative of a release.

Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens, and the hazard index (HI) is 3.0 in surface soil (0-2 feet bgs) and 6.0 is subsurface soil (0-8 feet bgs). For soil, a majority of the risk is associated with ingestion of soil and homegrown produce. In surface soils arsenic is the primary contributor to risk, while in subsurface soils arsenic, PCBs, and pesticides are the contributors. The risk due to arsenic is attributable to background risk. PCBs and pesticides were only reported in one sample, below EPA residential RSLs. Additional sampling adjacent to this location were either non-detect or below their respective screening levels. This additional site characterization indicates PCBs and pesticides do not represent an unacceptable risk at IR Site 9. For groundwater, VC is the primary contributor to the carcinogenic risk, due to the vapor intrusion exposure pathway; however, this risk is within the risk management range. The **feasibility study evaluation for soil at IR Site 9** indicated no further action or evaluation of response alternatives was required, based on revised results of additional PAH and PCB sampling conducted during preparation of the FS report.

Based on the groundwater evaluation at OU-2A, groundwater at IR Site 9 does not meet the drinking water standard. The carcinogenic risk at IR Site 9 from vapor intrusion is within the risk management range and the HI is below 1.0. As a result, no action is required to address vapor intrusion at IR Site 9; however, an IC will be enforced to restrict the use of groundwater for drinking water within the impacted area.

2.5.1.2 IR SITE 13

The identification of soil and groundwater COCs at IR Site 13 was based on human health risk considerations and potential ARARs. No action is required for soil based on the HHRA. Prior to the groundwater beneficial use evaluation, MCLs were ARARs. MCLs are no longer applicable. The **organic analytes identified as COCs at IR Site 13** based on human health risk considerations were benzene and ethylbenzene. The COCs based on the potential ARARs were: benzene, ethylbenzene, toluene, and total xylene. Inorganic analytes were reviewed to determine if their presence was indicative of a release, or if they exceeded background risks. The **inorganic analytes reviewed for IR Site 13** included metals. The evaluation determined that there was no indication of release of any of the metals. The only inorganic analyte to exceed screening levels was arsenic, which the FS report concluded was not indicative of a release.

Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens, and the HI is 4.0 in surface soil (0-2 feet bgs) and 3.0 in subsurface soil (0-8 feet bgs). For soil, a majority of the risk is associated with ingestion of soil and homegrown produce. In surface and subsurface soils, arsenic and PAHs expressed as B(a)P equivalents are the primary contributors to risk. The risk due to arsenic is attributable to background risk. Extensive sampling in the areas identified as containing TRW at IR Site 13 indicates that PAHs in shallow soil are below the Alameda Point screening value, and PAH concentrations in soil at depths greater than four feet are consistent with other locations on Alameda Point. The **feasibility study evaluation for soil at IR Site 13** indicated no further action or evaluation of response alternatives was required.

The site-wide risk at IR Site 13 from residential exposure to groundwater via vapor intrusion only is within the risk management range and the HI is below 1.0. Benzene is the primary contributor to risk. Results of groundwater sampling conducted between 2000 and 2009 indicated benzene was localized in extent. There were no significant reductions in benzene concentrations over this nine year time period. Therefore a response action to reduce benezene concentrations in groundwater is warranted due to the locally elevated benzene in shallow groundwater potentially posing a localized vapor intrusion risk. The vapor intrusion pathway will be the only potentially complete pathway for human exposure to benzene and ethylbenzene at the site following the enforcement of the restriction of domestic use of groundwater at IR Site 13.

2.5.1.3 IR SITE 19

The identification of soil and groundwater COCs at IR Site 19 was based on human health risk considerations and potential ARARs. No action is required for soil based on the HHRA. Prior to the groundwater beneficial use evaluation, MCLs were ARARs. MCLs are no longer applicable. The **organic analytes identified as COCs at IR Site 19** based on human health risk considerations were PCE, TCE, and VC. The COCs based on the potential ARARs were PCE, TCE, and VC. Inorganic analytes were reviewed to determine if their presence was indicative of a release, or if they exceeded background risks. The **inorganic analytes reviewed for IR Site 19** included metals. The evaluation determined that there was no indication of release of any of the metals.

Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens, and the HI is 3.0 in surface soil (0-2 feet bgs) and 3.0 in subsurface soil (0-8 feet bgs). For soil, a majority of the risk is associated with ingestion of soil. In surface and subsurface soils, arsenic and PAHs expressed as B(a)P equivalents are the primary contributors to risk. The risk due to arsenic is attributable to background risk. The B(a)P concentrations are below Alameda Point screening levels. For groundwater, PCE, TCE, and VC are the primary contributors to the carcinogenic risk due to the vapor intrusion exposure pathway; however, this risk is within the risk management range. The **feasibility study evaluation for soil at IR Site 19** indicated that no further action or evaluation of response alternatives was required.

Based on the groundwater evaluation at OU-2A, groundwater at IR Site 19 does not meet the drinking water standard. The carcinogenic risk at IR Site 19 from vapor intrusion is within the risk management range and the HI is below 1.0. As a result, no action is required to address vapor intrusion at IR Site 19; however, an IC will be enforced to restrict the use of groundwater for drinking water within the impacted area.

2.5.1.4 IR SITE 22

The identification of **soil and groundwater COCs at IR Site 22** was based on human health risk considerations and potential ARARs. No action is required for soil or groundwater based on the HHRA.

Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens in both surface and subsurface soil. The total U.S. EPA cancer risk (including both CERCLA and Petroleum related contaminants) is slighter greater than the risk management range. The total HI is 6.0 in surface soil (0-2 feet bgs) and 22 in subsurface soil (0-8 feet bgs). The elevated cancer risk and HI are attributed to the presence of constituents related to the petroleum release that will be addressed separately by the Petroleum Program. For soil, a majority of the risk is associated with ingestion of soil. In soils arsenic is the primary contributor to risk, but risk due to arsenic is attributable to background risk. Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program. For groundwater, benzene is a major cancer and non-cancer risk driver due to vapor intrusion into indoor air. As a former gasoline service station, Site 22 is being addressed under the Petroleum Program. The carcinogenic risk at IR Site 22 from exposure to groundwater via vapor intrusion only is within the risk management range.

At IR Site 22, no COCs requiring CERCLA response actions were identified for soil or groundwater.

2.5.1.5 IR SITE 23

The identification of **soil and groundwater COCs at IR Site 23** was based on human health risk considerations and potential ARARs. No action is required for soil or groundwater based on the HHRA.

Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens, and the HI is 3.0 in surface soil (0-2 feet bgs) and surbsurface soil (0-8 feet bgs). For soil, a majority of the risk is associated with ingestion of soil. In soils arsenic and PAHs expressed as B(a)P equivalents are the primary contributors to risk, but risk due to arsenic is attributable to background risk, and the B(a)P-equivalent concentrations were less than the Alameda Point screening value. For groundwater, the majority of the cancer risk is attributable to arsenic and 1,2-dibromo-3-chloropropane. The majority of the HI is attributable to arsenic, manganese, and 1,2-dibromo-3-chloropropane. The carcinogenic risk at IR Site 23 from exposure to groundwater via vapor

intrusion only is below the risk management range.

At IR Site 23, no COCs requiring CERCLA response actions were identified for soil or groundwater.

2.5.2 Ecological Risk Assessment

OU-2A has limited habitat for ecological receptors, so a modified ERA was performed in the RI to provide a conservative estimate of ecological risk. Current and future land uses for the site were evaluated to identify complete exposure pathways, and it was determined there were no complete aquatic pathways. Soil data collected during the OU-2A RI were evaluated to identify chemicals of potential ecological concern. The identified problem formulation focused on areas, receptors pathways, and chemicals to be considered in the risk assessment, and a CSM was developed (Figure 2-9). The complete exposure pathways considered were direct exposure to soil and food chain exposure.

2.5.2.1 IR Site 9

The results of the ERA indicate that the residual chemicals at IR Site 9 have very limited potential to impact terrestrial ecological receptors. Based on the ERA and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

2.5.2.2 IR Site 13

The results of the ERA indicate potential risk to passerines from zinc. No significant risk to small mammals and raptors occurs from exposure to IR Site 13 soils. Based on the lack of habitat at IR Site 13 and the planned future use of the site, any risk to passerines from zinc was determined not to require further evaluation or mitigation.

2.5.2.3 IR Site 19

The results of the ERA indicated no significant risk to small mammals, passerines, or raptors from exposure to IR Site 19 soils. Based on the low HQs, lack of habitat at IR Site 19, and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

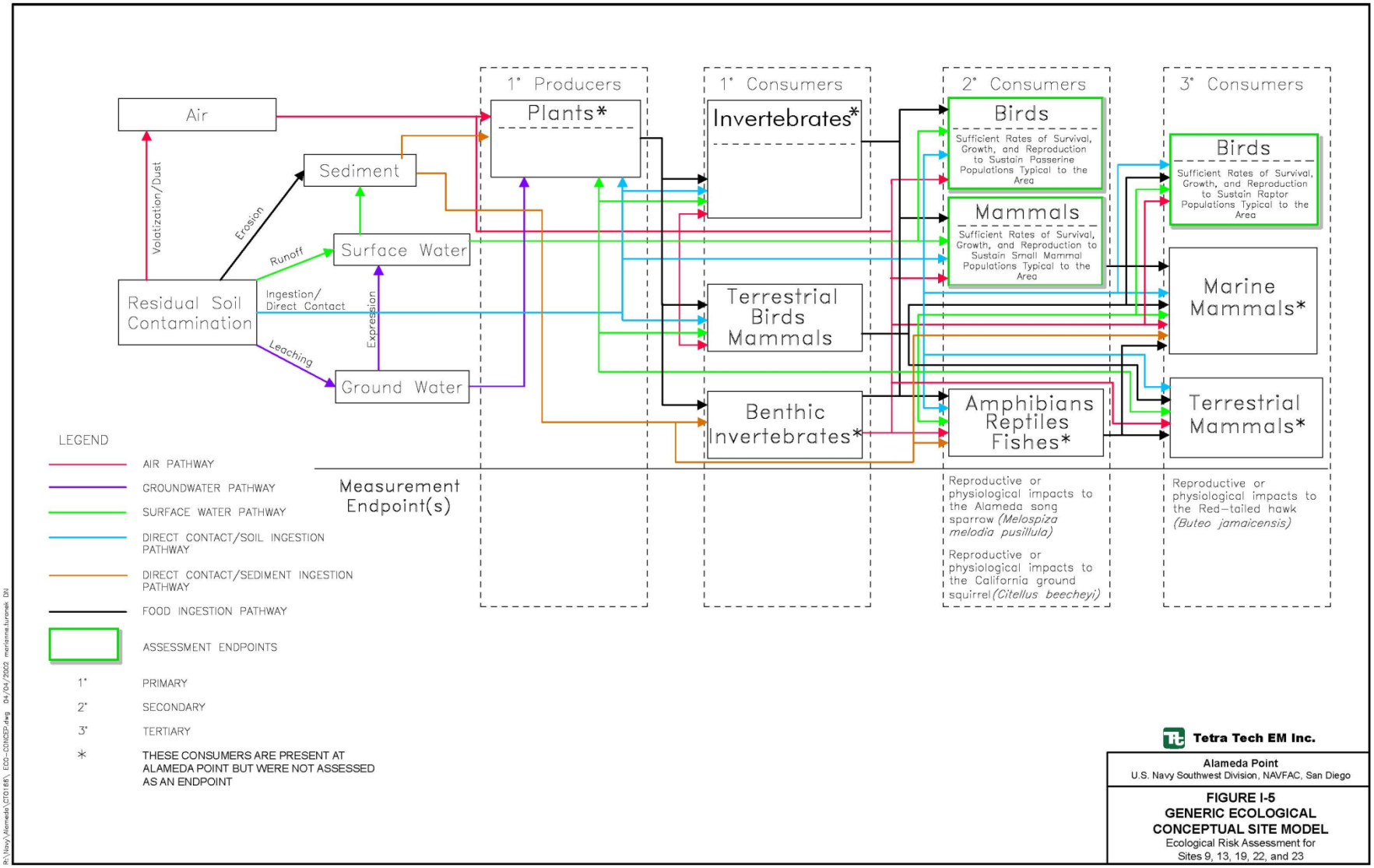
2.5.2.4 IR Site 22

The results of the ERA indicate potential risk to small mammals, passerines, and raptors from lead. However, based on the lack of habitat at IR Site 22 and the planned future use of the site, any risk associated with exposure to lead will be low.

2.5.2.5 IR Site 23

The results of the ERA indicate potential risk to passerines from cadmium. Based on the low HQ, the limited habitat at IR Site 23, and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

Figure 2-9
Ecological Risk Assessment Conceptual Site Model (Source: Final OU-2A Remedial Investigation Report)



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2.5.3 Basis for Response Action for Groundwater at IR Sites 9, 13 and 19

Potentially unacceptable human health risks from vapor intrusion were identified in groundwater at IR Site 13. Therefore, a response action is necessary to protect human health and the environment from actual or threatened releases. Table 2-4 lists COCs by site with commercial/industrial RGs and residential vapor intrusion LUC termination criteria.

The groundwater beneficial use evaluation results in a revision of the exposure pathways at IR Site 9 and 19. With the removal of a complete future residential groundwater ingestion pathway, vapor intrusion is the only exposure pathway to site related VOCs; therefore, ICs are necessary to restrict installation and development of groundwater wells.

2.5.4 Basis for No Further Action for Soil and Groundwater at IR Sites 22 and 23, and Soil at IR Sites 9, 13, and 19

No further action is required for soil at all OU-2A sites and for groundwater at IR Sites 22 and 23 because:

- Human health risks were determined to be consistent with ambient conditions, or were within the risk management range of 10^{-4} to 10^{-6} for cancer risk (excluding the petroleum program related constituents in IR Site 22 soil); and

- No unacceptable risk was identified for any of the ecological receptors at OU-2A.

The Regional Water Board retains its authority to regulate the Tarry Refinery Waste (TRW) and/or co-located petroleum in the future at Sites 13 and 23.

2.6 Principal Threat Waste

Principal threat wastes are hazardous or highly toxic source materials that result in ongoing contamination to surrounding environmental media, generally cannot be reliably contained, or are present at significant risk to human health or the environment should exposure occur. Based on results of the HHRA, potential cancer risks related to exposure to COCs are within the NCP's risk management range (10^{-6} to 10^{-4}). These risk results do not constitute a principal threat waste under current and reasonably anticipated future land uses. Although no threshold level has been established to equate to a "principal threat," treatment alternatives generally should be evaluated when potential risks are 10^{-3} or greater. Therefore, there are no wastes constituting principal threats at OU-2A.

2.7 Remedial Action Objectives

Remedial action objectives (RAOs) provide the foundation used to develop the remedial alternatives for a site. RAOs are established based on attainment of regulatory requirements, standards, and guidance (i.e., ARARs); identification of contaminated media and COCs; potential receptors and exposure scenarios; and calculated human health and ecological risks. RAOs establish the basis for identifying areas requiring remedial action, screening technologies or processes to accomplish remediation, and assessing a remedial alternative's ability to achieve

the required objectives. Based on the data available for IR Sites 9, 13, and 19, and the results of the risk assessments documented during the OU-2A RI and FS, groundwater was determined to be the medium of interest for developing appropriate risk management strategies. RAOs were developed to provide protection against the risks identified. Each RAO specifies a receptor and the relevant exposure route associated with unacceptable risk requiring mitigation. Based on the findings, the RAO for IR Sites 9, 13, and 19 is: prevent municipal and domestic use of groundwater.

RGs are the basis for measuring the success of the cleanup. The RAOs for IR Sites 9 and 19 are to prevent exposure to on-site receptors to the groundwater ingestion pathway. Vapor intrusion risk-based RGs for groundwater at IR Site 13 are presented in Table 2-4 below. The commercial RGs are presented as the RG that will meet the criteria for the current site use, commercial/industrial. The implementation of the interim IC which restricts but does not prohibit, the use of the property for residential use, will provide the requirement that residential uses incorporate appropriate vapor intrusion risk management requirements.

Table 2-4: Residential and Commercial Vapor Intrusion Criteria for Groundwater – IR Site 13

Chemical of Concern	Residential LUC Termination Criteria (µg/L)	Commercial RG (µg/L)
IR Site 13		
Benzene	11.26	37.84
Ethylbenzene	31.46	105.69

Notes:
These goals have been revised based on risk due to vapor intrusion since the Proposed Plan based on the groundwater beneficial use exception.
The commercial vapor intrusion criteria is the Site 13 remedial action RG, and the residential vapor intrusion value is the IC termination criteria for residential reuse restrictions.

Acronyms/Abbreviations:

µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
IC	institutional controls
IR	Installation Restoration
RG	remediation goal

2.8 Description and Evaluation of Remedial Alternatives

In accordance with CERCLA guidance, several general remedial alternatives were evaluated and screened to refine the remedy selection process, as detailed in the OU-2A FS. The alternatives were evaluated based on **the nine NCP criteria**. Due to the nature of COCs found in groundwater at **IR Sites 9 and 19** (chlorinated VOCs) as compared to **IR Site 13** (petroleum hydrocarbon VOCs), identification and screening of technology types and process options were carried out for IR Sites 9 and 19 together, and IR Site 13 separately. As described below, four alternatives were evaluated in the Proposed Plan for IR Sites 9 and 19 as well as for IR Site 13.

2.8.1 Description of Remedial Alternatives Presented in the Proposed Plan

The four remedial alternatives for groundwater that were evaluated in detail in the OU-2A FS are presented in Table 2-5, along with general descriptions and estimated costs.

Table 2-5: Summary of Groundwater Remedial Alternatives Presented in Proposed Plan-IR Sites 9, 13, and 19

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost ($ in millions)	Description
Alternative 1: No Action	0	0	CERCLA requires the evaluation of a No Action alternative to establish a baseline for comparison with other alternatives. Under this scenario, no action would be performed to remediate groundwater at IR Sites 9, 13, and 19.
Alternative 2: Monitored Natural Attenuation (MNA) and Institutional Controls (IC)	21 (IR Sites 9 and 19) 14 (IR Site 13)	$2.8 (IR Sites 9 and 19) $2.4 (IR Site 13)	Alternative 2 would rely on natural attenuation processes and monitoring for remediation of COC-impacted groundwater at IR Sites 9, 13, and 19. The natural attenuation processes may include a variety of physical, chemical, or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. Alternative 2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to assess further migration in groundwater. The ICs including land-use and/or groundwater-use restrictions would be implemented under Alternative 2 to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below RGs through implementation of MNA. In addition, ICs will include restrictions on activities which could interfere with the effectiveness of the remedies until goals are achieved including protection of remediation systems and limits on the extraction of contaminated groundwater. Alternative 2 for IR Sites 9 and 19 was modified following the completion of the Proposed Plan, it now includes only ICs.
Alternative 3: In-Situ Chemical Oxidation (ISCO), MNA, and ICs	<5	$4.6 (IR Sites 9 and 19) $2.1 (IR Site 13)	Alternative 3 would include injection of chemical oxidant into the subsurface to chemically oxidize the COCs present in groundwater at IR Sites 9, 13, and 19 into innocuous products such as carbon dioxide and water. Several commercially available oxidants may be used for ISCO such as Fenton's reagent, activated persulfate or ozone. Groundwater monitoring would be conducted following injection of chemical oxidant to assess the decreases in COC concentrations. Based on the analysis of groundwater monitoring data active treatment using ISCO may be stopped before the concentrations of COCs are reduced to levels below the RGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below RGs. Similar to Alternative 2, ICs including land-use and/or groundwater-use restrictions would also be implemented as part of Alternative 3 until the concentrations of COCs are reduced to levels below RGs.

Table 2-5: Summary of Groundwater Remedial Alternatives Presented in Proposed Plan-IR Sites 9, 13, and 19 (continued)

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost ($ in millions)	Description
Alternative 4: In-Situ Bioremediation, MNA, and ICs	<5	$7.0 (IR Sites 9 and 19) $2.4 (IR Site 13)	At IR Sites 9 and 13, aerobic bioremediation may be implemented. Aerobic bioremediation would include emplacement of the source of molecular oxygen into the subsurface. An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The bioremediation design including bioremediation strategy, anaerobic versus aerobic, and injection strategy, direct injection versus groundwater recirculation loop would be finalized during the remediation design stage. COCs at IR Site 19 are readily amenable to anaerobic reductive dechlorination. Therefore, bioremediation at IR Site 19 would include emplacement of an electron donor into the subsurface to promote more strongly reducing conditions in the aquifer and to serve as a source of electron donor for the microorganisms that degrade PCE and TCE. Some common electron donors include molasses, vegetable oil, methanol, and lactate. These electron donors can also serve as a source of carbon for the microorganisms. Groundwater monitoring would be conducted following injection of bioremediation amendments to assess the decreases in COC concentrations. Based on the analysis of groundwater monitoring data active treatment using in-situ bioremediation would be stopped before the concentrations of COCs are reduced to levels below the RGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below RGs. Similar to Alternative 2, ICs including land and/or groundwater-use restrictions would also be implemented as part of Alternative 4 until the concentrations of COCs are reduced to levels below RGs.

Acronyms/Abbreviations:

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
COC – contaminant of concern
IC - institutional control
IR- Installation Restoration
ISCO – in-situ chemical oxidation
MNA – monitored natural attenuation
PCE - tetrachloroethene
RG – remediation goal
TCE - trichloroethene

2.8.2 Comparative Analysis of Alternatives for IR Sites 9 and 19 and IR Site 13

The results of the comparative analysis of the remedial alternatives that were evaluated in detail in the OU-2A FS and presented in the Proposed Plan with respect to the nine NCP evaluation criteria are summarized in Table 2-6 (IR Sites 9 and 19) and in Table 2-7 (IR Site 13).

Table 2-6: Comparative Analysis of Groundwater Remedial Alternatives IR Sites 9 and 19 As Presented in the Proposed Plan

NCP Criterion	Alternative 1 No Action	*SELECTED REMEDY* Alternative 2 MNA and ICs	Alternative 3 ISCO, MNA, and ICs	Alternative 4 In-situ Bioremediation, MNA, and ICs
Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes
Compliance with ARARs	NA	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	○	◑	●	●
Reduction in Toxicity, Mobility, and Volume through Treatment	○	◑	●	●
Short-Term Effectiveness	●	●	◑	◑
Implementability	●	●	◑	○
Costs[a]	No Cost	●	◑	○
State Acceptance	The State of California agrees with the alternative selected for IR Sites 9 and 19.			
Community Acceptance	The Proposed Plan was presented for the community and discussed in a public meeting. See responsiveness summary in Section 3 of this ROD.			

Notes:

○ = Poor ◑ = Fair ● = Good

[a] Cost evaluation is based on the net present value (NPV). The lower cost receives a high rating because it is more cost effective.

Acronyms/Abbreviations:

ARAR - applicable or relevant and appropriate requirement
IC - institutional control
IR – Installation Restoration
ISCO – in-situ chemical oxidation
MNA – monitored natural attenuation
NA - not applicable
NCP - National Oil and Hazardous Substances Pollution Contingency Plan
ROD – Record of Decision

Table 2-7: Comparative Analysis of Groundwater Remedial Alternatives IR Site 13 As Presented in the Proposed Plan

NCP Criterion	Alternative 1 No Action	Alternative 2 MNA and ICs	Alternative 3 ISCO, MNA and ICs	***SELECTED REMEDY*** Alternative 4 In-situ Bioremediation, MNA, and ICs
Overall Protection of Human Health and the Environment	NO	Yes	Yes	Yes
Compliance with ARARs	NA	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	○	◑	●	●
Reduction in Toxicity, Mobility, and Volume through Treatment	○	◑	●	●
Short Term Effectiveness	●	◑	●	●
Implementability	●	●	○	◑
Costs[a]	No Costs	●	●	◑
State Acceptance	The State of California agrees with the alternative selected for IR Site 13.			
Community Acceptance	The Proposed Plan was presented for the community and discussed in a public meeting. See responsiveness summary in Section 3 of this ROD.			

Notes:

○ = Poor ◑ = Fair ● = Good

[a] Cost evaluation is based on the net present value (NPV). The lower cost receives a high rating because it is more cost effective.

Acronyms/Abbreviations:

ARAR - applicable or relevant and appropriate requirement
IC - institutional control
ISCO – in-situ chemical oxidation
MNA – monitored natural attenuation
NA - not applicable
NCP - National Oil and Hazardous Substances Pollution Contingency Plan
ROD - Record of Decision – in-situ chemical oxidation

Following the presentation of the Proposed Plan, the Navy has found that shallow groundwater is not expected to be used as a potable water source in the foreseeable future. The remedies discussed in the **Feasibility Study Report** and the Proposed Plan for groundwater at IR Sites 9, 13, and 19 evaluated the risk to the on-site receptor from groundwater as a drinking water source.

The groundwater use evaluation results in a change to the ARARs; i.e., drinking water criteria are no longer the applicable criteria for groundwater, but the vapor intrusion criteria remain applicable. The human health risk from vapor intrusion risk drives the requirements for remedial action at IR Sites 9, 13, and 19. At Sites 9 and 19 the change in criteria results in a change in remedy from MNA and ICs to ICs only. The ICs include a prohibition to the installation of groundwater wells within OU-2A.

The groundwater action for Site 13 remains unchanged since the Proposed Plan.

2.8.2.1 Threshold Criteria

The threshold criteria must be satisfied by each alternative and relate directly to statutory findings.

Overall Protection of Human Health and the Environment. *Under this criterion, the alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of remediation goals. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.*

IR Sites 9 and 19 and IR Site 13

All alternatives, except Alternative 1 (No Action), were evaluated as being protective of human health and the environment. Under Alternative 1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective RGs. Alternative 2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative 2 provides protection by implementation of land-use and/or groundwater-use restrictions to minimize the potential for exposure to COCs above their respective RGs.

Alternatives 3 and 4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives 3 and 4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective RGs.

Compliance with ARARs. *CERCLA 121(d)(1) and NCP §300.430 (f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain Federal and State legally applicable or relevant and appropriate requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under §121(d)(4).*

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that specifically address hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site. Only those State standards that are identified by a state in a timely manner that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

Chemical-specific ARARs are health- or risk-based numerical values or methods that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions on the concentrations of hazardous substances or on conducting activities solely because they are in specific locations. Specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site.

IR Sites 9 and 19 and IR Site 13

Since Alternative 1 entails no remedial action, ARARs would not be triggered. Alternatives 2 through 4 were evaluated as complying with all identified ARARs (see Appendix B of the ROD for a list of ARARs for the selected remedies). ARARs were revised following the groundwater beneficial use evaluation.

2.8.2.2 Balancing Criteria

Primary balancing criteria are used to weigh major trade-offs among alternatives.

Long-Term Effectiveness and Permanence. *Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the considerations of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.*

IR Sites 9 and 19 and IR Site 13

Under Alternative 2 (rated Fair in Tables 2-6 and 2-7), natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. Natural attenuation is also expected to reduce further migration of COCs. Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of this groundwater alternative because hazardous substances may remain on-site in concentrations above risk-based levels. Following the completion of the Proposed Plan, the groundwater beneficial use evaluation changes the risk driver at IR Sites 9 and 19 to vapor intrusion and the alternative is revised to include only ICs, which rate Fair.

Under Alternatives 3 and 4 (both rated Good in Tables 2-6 and 2-7), concentrations of COCs in groundwater would be permanently reduced through active in-situ treatment methods such as ISCO and bioremediation.

ICs would be required under Alternatives 2, 3, and 4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective RGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

Reduction in Toxicity, Mobility, and Volume through Treatment. *Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.*

IR Sites 9 and 19 and IR Site 13

Alternative 2 (rated Fair in Tables 2-6 and 2-7) relies on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Following the completion of the Proposed Plan, the groundwater beneficial use evaluation changes the risk driver at IR Sites 9 and 19 to vapor intrusion and the alternative is revised to include only ICs, which rate Fair.

Alternatives 3 and 4 (both rated Good in Tables 2-6 and 2-7) employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternative 3 includes implementation of ISCO and Alternative 4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective RGs.

Short-Term Effectiveness. *Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may exist to workers, the community, and the environment during construction and operation of the remedy until cleanup goals are achieved.*

IR Sites 9 and 19

The short-term effectiveness includes risks to workers and community members or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative 1 since no remedial action would be implemented. Alternative 2 (rated Good in Tables 2-6 and 2-7) would include limited remedial construction operations including installation of additional monitoring wells. Following the completion of the Proposed Plan, the groundwater beneficial use evaluation changes the risk driver at IR Sites 9 and 19 to vapor intrusion and the alternative is revised to include only ICs, which is rated Good.

Alternatives 3 and 4 (both rated Fair in Tables 2-6 and 2-7) would include handling and injection of reagents into the subsurface and drilling. The reagents involved under Alternative 3 may include potentially hazardous oxidants. Therefore, risks to site workers under Alternatives 3 and 4 are greater compared to Alternative 2.

The sustainable environmental remediation analysis indicated the potential environmental impacts are higher for Alternatives 3 and 4 compared to Alternative 2. This is due to higher estimated pollutant and greenhouse gas (GHG) emissions, energy use, and injury and fatality risks for workers during implementation of Alternatives 3 and 4 compared to Alternative 2.

Alternative 2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long cleanup time compared to Alternatives 3 and 4. Following the completion of the Proposed Plan, the groundwater beneficial use evaluation changes the risk driver at IR Sites 9 and 19 to vapor intrusion and the alternative is revised to include only ICs.

IR Site 13

Short-term effectiveness includes risks to workers and community members or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative 1 since no remedial action would be implemented. Based on the sustainable environmental remediation evaluation, the potential environmental impacts are estimated to be higher for Alternative 2 (rated Fair in Tables 2-6 and 2-7) compared to Alternatives 3 and 4 (both rated Good in Tables 2-6 and 2-7). The estimated pollutant emissions for Alternative 2 are comparable to Alternatives 3 and 4. The estimated dust and GHG emissions, energy use, water use, and injury/fatality risks for Alternative 2 are higher compared to Alternatives 3 and 4.

Alternative 2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long time to achieve RGs compared to Alternatives 3 and 4.

Implementability. *Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with governmental entities are also considered.*

IR Sites 9 and 19

There are no implementability concerns associated with Alternative 1 since no action will be taken. Alternative 2 (rated Good in Tables 2-6 and 2-7) would be the simplest to construct and operate. The implementation of Alternative 2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel, laboratory facilities, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable. Following the completion of the Proposed Plan, the groundwater beneficial use evaluation changes the risk driver at IR Sites 9 and 19 to vapor intrusion and the alternative is revised to include only ICs.

Alternative 3 (rated Fair in Tables 2-6 and 2-7) would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19.

The implementation of bioremediation under Alternative 4 (rated Poor in Tables 2-6 and 2-7) may require bench/pilot tests to assess the feasibility of bioremediation for treatment of COCs at IR Site 9 and 19. Therefore, technical implementation of bioremediation at IR Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.

IR Site 13

There are no implementability concerns associated with Alternative 1 since no action will be taken. Alternative 2 (rated Good in Tables 2-6 and 2-7) would be the simplest to construct and operate. The implementation of Alternative 2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and

material/supplies for groundwater sampling and analysis are generally readily implementable.

Alternative 3 (rated Poor in Tables 2-6 and 2-7) would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to design the full-scale ISCO implementation at IR Site 13. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.

Alternative 4 (rated Fair in Tables 2-6 and 2-7) would include implementation of in-situ bioremediation. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.

Costs. *The types of costs assessed include capital costs (both direct and indirect) and annual operation and maintenance (O&M) costs. Both types were assessed based on net present value.*

IR Sites 9 and 19 and IR Site 13

There are no costs associated with Alternative 1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative 2 (rated Good in Tables 2-6 and 2-7) is least expensive. Costs of Alternative 3 (rated Fair at IR Sites 9 and 19, and Good at IR Site 13 in Tables 2-6 and 2-7) are between those of Alternatives 2 and 4. Alternative 4 (rated Poor at IR Sites 9 and 19, and Fair at IR Site 13 in Tables 2-6 and 2-7) is most expensive.

2.8.2.3 Modifying Criteria

The modifying criteria are taken into account following comment on the OU-2A FS Report and proposed plan, and are addressed in the final decision.

State Acceptance. *Regulatory involvement has been solicited throughout the CERCLA process. The State has concurred with the preferred alternative presented in the Proposed Plan and the selected remedy documented in this ROD.*

Community Acceptance. *The Proposed Plan was issued for public review between August 1, 2011 and August 31, 2011 and was discussed at a public meeting held August 31, 2011. The Responsiveness Summary (see Section 3.0) addresses the public's comments and concerns related to the preferred remedies identified in the Proposed Plan.*

IR Sites 9 and 19 The Responsiveness Summary (see Section 3.0) addresses the public's comments and concerns related to the preferred remedies identified in the Proposed Plan.

IR Site 13 The Responsiveness Summary (see Section 3.0) addresses the public's comments and concerns related to the preferred remedies identified in the Proposed Plan.

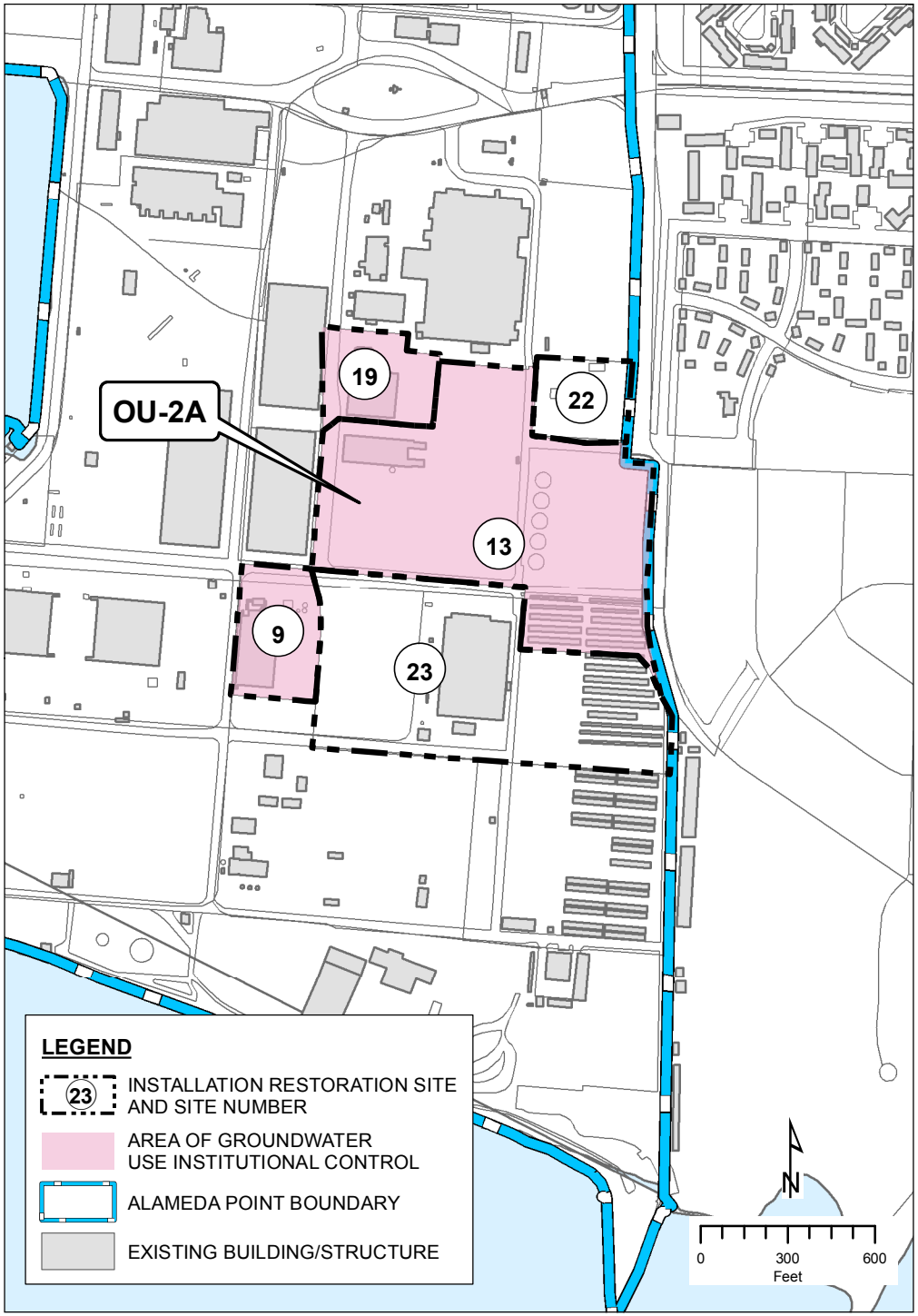

FIGURE 2-10 GROUNDWATER USE INSTITUTIONAL CONTROL

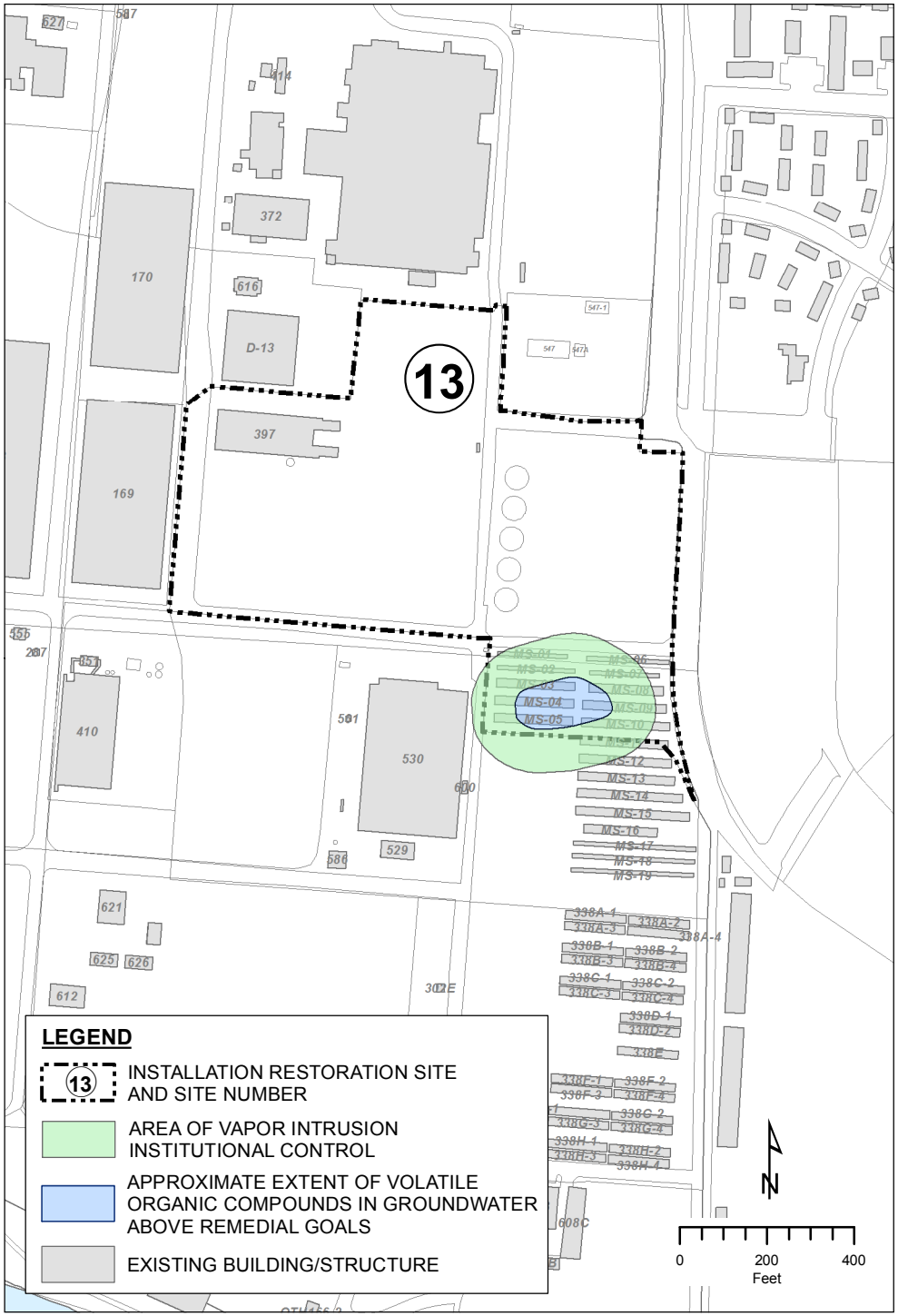

FIGURE 2-11 VAPOR INTRUSION INSTITUTIONAL CONTROL

2.9 Selected Remedies

The sections below discuss the rationale for the selected remedies for IR Sites 9, 13, and 19. A description of the selected remedies, the expected outcomes of the selected remedies, and statutory determinations are presented. The Regional Water Board retains its authority to regulate the Tarry Refinery Waste (TRW) and/or co-located petroleum in the future at Sites 13 and 23.

2.9.1 Selected Remedy for IR Sites 9 and 19

The selected remedy at IR Sites 9 and 19 is ICs prohibiting domestic use of groundwater.

2.9.1.1 Rationale for Selected Remedy for IR Sites 9 and 19

As a result of the beneficial use exception at OU2A, groundwater will not be restored to levels which would allow it to be used for municipal or domestic use. Therefore the potential exposure pathways of ingestion of groundwater and dermal contact with groundwater will be addressed by ICs prohibiting the extraction or use of contaminated groundwater. Vapor intrusion is the remaining exposure pathway to on-site receptors. The risk associated with inhalation of VOCs due to vapor intrusion at IR Sites 9 and 19 is within the risk management range for residential use.

2.9.1.2 Description of Selected Remedy for IR Sites 9 and 19

The groundwater beneficial use evaluation resulted in drinking water criteria no longer being RAOs. At Sites 9 and 19 the change in RAOs results in a change in the proposed remedy from MNA and ICs to ICs only. The ICs are legal and administrative mechanisms used to limit the potential for human exposure to impacted groundwater by restricting its extraction and use. The areas subject to the restriction are shown on Figures 2-10 and 2-11. The restrictions will remain in place until the concentrations of hazardous substances in the groundwater are at such levels to allow for unrestricted use and unlimited exposure. The restrictions will be incorporated into both the federal deed(s) for the transfer of property within IR Sites 9 and 19 as well as the Covenants to Restrict the Use of Property which will be executed prior to the transfer of title to such property. Further details for the implementation, monitoring, maintenance, and enforcement of the ICs will be described in the LUC RD which will include:

- Requirements for CERCLA five-year remedy review;
- Frequency and requirements for periodic monitoring or visual inspections;
- Reporting results from monitoring and inspections;
- Notification procedures to the regulators for planned property conveyance, corrective action required, and/or response to actions inconsistent with ICs for the remedy;
- Consultation with U.S. EPA, DTSC, Water Board, and other government agencies regarding wording for land use restrictions and parties to be provided copies of the deed language once executed;

The Navy shall be responsible for implementing, monitoring, maintaining, inspecting, reporting, and enforcing the necessary ICs described in this ROD in accordance with the approved RD reports per FFA. Although the Navy may later transfer these procedural responsibilities to

another party by contract, property transfer agreement, or other means, the Navy shall retain ultimate responsibility for remedy integrity. Should any of the ICs fail, the Navy shall ensure that appropriate actions are taken to reestablish protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the Navy's costs for mitigating any discovered IC violation(s). The ICs shall be maintained until such time as VOC concentrations have been reduced to levels that allow for unrestricted site use and unlimited exposure.

The Navy and FFA signatories and their authorized agents, employees, contractors, and subcontractors shall have the right to enter upon OU-2A to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary.

The RAO for IR Sites 9 and 19 is to prevent municipal and domestic use of groundwater.

2.9.1.3 Expected Outcomes of the Selected Remedy for IR Sites 9 and 19

Once the selected remedy has been implemented, risks to human health and the environment will be acceptable for residential reuse, and the RAO will be achieved. This alternative will take little time to implement, will pose very few operational challenges, and will not be characterized by any real short- or long-term risk associated with the remedy itself.

2.9.1.4 Statutory Determinations for IR Sites 9 and 19

In accordance with the NCP, and the implementation of ICs for groundwater at IR Sites 9 and 19 meets the following statutory determinations.

Protection of Human Health and the Environment: The selected remedy is needed to protect human health by preventing exposure to COCs through the implementation of ICs.

Compliance with ARARs: The selected remedy will meet potential chemical-specific, location-specific, and action-specific ARARs.

Cost-Effectiveness: The selected remedy is the most cost-effective remedy and will provide overall effectiveness in proportion to its costs. The remedy is readily implementable and has been widely used, thus demonstrating its effectiveness.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable: The selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner.

Preference for Treatment as a Principal Element: Active treatment is not an element of the remedy for IR Sites 9 and 19.

Five-Year Review Requirements: A CERCLA Five-Year review will be conducted no less often than once every five years after implementation of the selected remedy to ensure that the remedy remains protective of human health and the environment.

2.9.2 Selected Remedy for IR Site 13

The selected remedy for groundwater at IR Site 13 is Alternative 4, ISB, MNA, and ICs.

2.9.2.1 Rationale for Selected Remedy for IR Site 13

Alternative 4 was selected because it provides the best balance of trade-offs between the balancing criteria. The remedy will be protective of human health and the environment, and will comply with ARARs for commercial reuse. In addition, based on the sustainability evaluation, Alternative 4 was rated as having an overall lower impact to the environment during implementation than Alternative 3.

Alternative 4 would also include implementation of ICs to ensure protection of human health, attainment of RAOs, and to ensure the integrity of the remedy in place. The ICs would include land-use and/or groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the site is safe for unrestricted reuse.

2.9.2.2 Description of Selected Remedy for IR Site 13

Alternative 4 would include implementation of in-situ bioremediation to treat COCs (benzene and ethylbenzene) in groundwater at IR Site 13. The COCs at IR Site 13 are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. The 1998 Intrinsic Bioremediation Treatability Study indicates that oxygen is a limiting factor in biodegradation of COCs at IR Site 13. Therefore, implementation of bioremediation at IR Site 13 would include delivery of the source of molecular oxygen into the subsurface.

As part of implementation of Alternative 4, pre-design investigations will be conducted to optimize the target treatment zone at IR Site 13 to focus on areas with COC concentrations exceeding commercial vapor intrusion criteria and to refine areas needing residential restrictions (Table 2-4). The pre-design investigations may include membrane interface probe advances, injection testing, and installation of monitoring wells and groundwater sampling and analyses for COCs. In addition, ICs will ensure that potential, future residential users are protected through requirements to install and maintain vapor barriers or venting systems in residential structures until residential LUC termination criteria are met (Figure 2-11).

In-situ bioremediation will be implemented to treat COCs present in groundwater at IR Site 13 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. ISB will significantly reduce concentrations of benzene and ethylbenzene in groundwater. ISB may reduce the concentrations to RGs, however, the remedy train includes a transition to MNA. The duration of the ISB, and the transition from ISB to MNA will be determined through a weight of evidence approach. The weight of evidence will include evaluation of benzene and ethylbenzene concentration trends in groundwater, in situ oxygen concentrations, oxidizing and reducing potential conditions within the plume and other applicable site specific data. MNA will continue until RGs are met, if they are not met during the ISB portion phase of the remedy.

Based on the 'weight of evidence' analysis of these data, active implementation of bioremediation (i.e., delivery of ISB amendments) will be stopped before the concentrations of COCs are reduced to levels below the RGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below RGs. MNA will be implemented following delivery of bioremediation amendments to monitor all areas of the groundwater plume. The performance objectives of each component of the ISB/MNA/ICs remedy will be detailed in the remedial design/remedial action work plan. The monitoring will be limited to groundwater containing COCs at concentrations above RGs.

Alternative 4 would include implementation of ICs and access restrictions to ensure protection of human health, attainment of RAOs, and to ensure the integrity of the remedial and monitoring equipment. The ICs will include land-use and/or groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the site is safe for unrestricted use (i.e., meets LUC termination criteria in Table 2-4). The IC for groundwater use is shown on Figure 2-10. The IC for vapor intrusion is shown on Figures 2-10 and 2-11 (Note that the buffer zone for the vapor intrusion control touches IR Site 23). The restrictions will be incorporated into both the federal deed(s) for the transfer of property within IR Site 13 as well as the Covenants to Restrict the Use of Property which will be executed prior to the transfer of title to such property. Further details are provided in Section 2.9.1.2 above.

2.9.2.3 Expected Outcomes of the Selected Remedy for IR Site 13

Once the selected remedy has been implemented, risks to human health or the environment under the planned future use will be acceptable, and the RAOs will be achieved. After in-situ bioremediation, MNA will monitor the risks associated with COCs in site groundwater through ICs and monitoring to confirm that the long-term contaminant trends in groundwater continue to be stable and are decreasing over time. MNA is an implementable and effective strategy, particularly at a site with largely immobile contaminants and no likelihood of residential use or other groundwater consumption. This alternative will take little time to implement, will pose very few operational challenges, and will not be characterized by any real short- or longer-term risk associated with the remedy itself.

2.9.2.4 Statutory Determinations for IR Site 13

In accordance with the NCP, Alternative 4 the selected remedy of ISB, MNA, and ICs for groundwater at IR Site 13 meets the following statutory determinations:

Protection of Human Health and the Environment: The selected remedy is needed to protect human health by preventing exposure to COCs through the implementation of ICs and monitoring and to confirm that concentrations of COCs continue to be stable to decreasing over time, and thus pose no risk to the environment.

Compliance with ARARs: The selected remedy will meet potential chemical-specific, location-specific, and action-specific ARARs.

Cost-Effectiveness: The selected remedy is the most cost-effective remedy and will provide overall effectiveness in proportion to its costs. The remedy is readily implementable and has been widely used, thus demonstrating its effectiveness.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable: The selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner. In-Situ Bioremediation will permanently breakdown chemical contaminants, MNA will continue the irreversible breakdown, and ICs will effectively achieve RAOs.

Preference for Treatment as a Principal Element: In-situ bioremediation will reduce toxicity, mobility, or volume of contamination directly through treatment. In-Situ Bioremediation, MNA, and ICs mechanisms will reduce contaminant toxicity, mobility, and volume by breaking down chemicals over time.

Five-Year Review Requirements: The estimated remediation duration is less than 5 years. A statutory five-year review will not be necessary because the selected remedies not will result in contaminants being left on-site above levels allowing for unlimited use and unrestricted exposures. However, if RGs have not been met at the time of the next 5-year review (2016), IR Site 13 will be included in the review.

2.10 Community Participation

A Community Involvement Plan (CIP) was originally prepared for Alameda Point in February 1989. The original CIP was developed to document interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup activities and to describe a specific program designed to address these issues and concerns. An updated CIP for Alameda Point was published in March 2010 and incorporated the most recent assessment of community issues, concerns, and informational needs related to the ongoing environmental investigation and remediation program at Alameda Point.

2.10.1 Restoration Advisory Board

In 1993, individuals from the local community began to play an increasingly significant role in the environmental restoration process with the establishment of the Alameda Point Restoration Advisory Board (RAB). Board membership was solicited by the Navy through newspaper notices and included business and homeowner representatives, residents, local elected officials, and regulatory agency staff.

The RAB currently consists of members of the Navy, the community, and regulatory agencies. Meetings are open to the public and are held in the evenings from 6:30 to 9:00 P.M. on the second Thursday of every other month in Building 1, Room 140, at 950 West Mall Square at Alameda Point. RAB members also review and comment on technical documents.

The Navy and regulators report information about the CERCLA Program, including information on OU-2A and the availability of site documents, to the RAB members during the bi-monthly RAB meetings. Copies of the RAB meeting minutes and documents describing environmental investigations and removal actions are available at the following Alameda Point information repository and Administrative Record file.

Alameda Point Information Repository 950 West Mall Square Building 1, Room 240 Alameda, California 94501	Administrative Record Naval Facilities Engineering Command, Southwest Naval Base San Diego, Building 3519 2965 Mole Road San Diego, California 92136

The Alameda Public Library also maintains new Navy environmental documents during review periods. The Alameda Public Library is located at 1550 Oak Street, Alameda, CA 94501. RAB meeting minutes also are available at the Navy BRAC Program Management Office website at http://www.bracpmo.navy.mil.

2.10.2 Public Mailings

Public mailings, including information updates, fact sheets, and Proposed Plans, have been used to ensure a broad distribution of information throughout the local community. Since March 1990, information updates announcing the program process at OU-2A have been delivered to residents living near Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex; and mailed to city, state, and federal officials; agencies; local groups; and individuals identified in the Community Involvement Plan.

Updates and fact sheets have included information concerning:

- Status of environmental investigations
- Removal action activities
- Remedy selection process
- Opportunities for the public to comment on the investigation and remediation activities
- History and geology of Alameda Point
- Access to the Administrative Record for Alameda Point

Proposed Plans provide an overview of environmental investigation results (including ecological and human health risk assessment results), present remedial alternatives for a site or group of sites, and describe the preferred alternative. Proposed Plans, updates, and fact sheets are mailed to 1,400 households, businesses, public officials, and agencies in an effort to reach as many community members as possible. To accommodate community preferences regarding Alameda Point information, the mailing list ranges from 400 to 1,400 recipients depending upon the specific types of information included.

2.10.3 Community Participation at OU-2A

A summary of the OU-2A FS Report was presented to the RAB on March 3, 2011. The FS Report for OU-2A was finalized in June 2011. The Proposed Plan for OU-2A was released to the public on August 24, 2011, at the beginning of the 30-day public comment period to provide information and solicit public input on the Navy's recommended remedy. These documents are

available to the public at the Information Repository maintained at Alameda Point and in the Administrative Record file maintained at the Naval Facilities Engineering Command, Southwest, located in San Diego, California. The Information Repository also contains a complete index of the Administrative Record file.

The 30-day public comment period for the OU-2A Proposed Plan took place from August 24, 2011 through September 24, 2011. In addition, a public meeting was held on August 31, 2011 to present the Proposed Plan and to receive comments from the public. A notice of the public comment period and public meeting was published in the *Alameda Journal* and in the *Oakland Tribune* newspapers.

At the public meeting, the BRAC Environmental Coordinator and the Navy Project Manager were available to discuss OU-2A and describe the selected remedy. Representatives from the Navy and environmental regulatory agencies were available to answer questions. A court reporter prepared a transcript of the meeting (Appendix C). Responses to comments that were received during the public comment period are included in the Responsiveness Summary, Section 3 of this ROD.

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3 Responsiveness Summary

The public-review period for the OU-2A Proposed Plan was conducted from August 24, 2011 to September 24, 2011. A public meeting was held on August 31, 2011, at Alameda Point Main Office Building (Alameda City Hall West), Room 201, 950 West Mall Square, Alameda California. Thirteen people attended the public meeting, including interested public and representatives from the County Board of Supervisors, Navy, U.S. EPA, DTSC, and the Water Board. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript, which is available as part of the administrative record (Appendix C).

Written comments on the Proposed Plan were received from Dale Smith (community co-chair) George Humphreys (vice community co-chair) and additional members of the Naval Air Station Alameda RAB and are addressed below.

Oral comments were also received at the RAB meeting held on September 1, 2011, and are addressed below.

Responses to comments received from the BCT on the Draft Record of Decision for OU-2A are available in Appendix D.

Written Public Comment – General Comment: *We were disappointed that the Navy chose not to present this proposed plan to the RAB at its September 1, 2011 meeting. In the past, we have had an agreement with the Navy to have a RAB presentation on a proposed plan before the obligatory Public Meeting. Questions and comments by the RAB at its regular meeting have generally been accepted as comments from the RAB. Having to attend two meetings, in this case on successive nights, is an imposition on the RAB members' time. It should have been relatively easy for the Navy to make a presentation at the RAB meeting as they prepared the material for the Public Meeting and had the personnel available in the Bay Area. Although we were allowed to introduce the subject at the RAB meeting, the Navy was not forthcoming about providing pertinent information that would assist us in understanding the complexities of the underlying issues. Also, the Navy did not respond to RAB comments on the Feasibility Study. This makes it much more difficult to prepare a formal comment letter and coordinate signatures from those RAB members who wish to sign the comment letter.*

Response: The RAB received an extensive presentation on the OU-2A Feasibility Study (FS) by the Navy at the March 3, 2011, RAB meeting. The FS Report was being finalized at the time and a Proposed Plan was in process. The Navy told the RAB at that time that there will be additional opportunities to comment on the Proposed Plan (e.g., during the 30-day public comment period and public meeting). The RAB presentation on March 3, 2011, was a roundtable discussion to review the alternatives in the FS and give the RAB an opportunity to ask questions about OU-2A and remedies, which the RAB did. Minutes of the March 3, 2011, RAB meeting, along with minutes from other RAB meetings, are posted at Department of Navy - BRAC Program Management Office (PMO).

Availability of the OU-2A Proposed Plan was announced in accordance with CERCLA, and the NCP, specifically the public participation requirements under NCP §300.430(f)(3). Along with

the rest of the public, RAB members had the opportunity to comment on the OU-2A Proposed Plan during the mandated 30-day public comment period, held from August 24 through September 24, 2011, and at the August 31, 2011, Proposed Plan public meeting. Public Notices were posted in the August 24, 2011 *Oakland Tribune* and the August 26, 2011 *Alameda Journal* for the public comment period, Proposed Plan availability, and date of the public meeting. Further, the OU-2A Proposed Plan was mailed to over 800 households, businesses, public officials, and regulatory agencies on the project mailing list.

RAB members had the opportunity to ask questions and request clarification on the OU-2A Proposed Plan and remedies at the September 1 RAB meeting and comments were recorded as part of the meeting minutes. The August 31, 2011, public meeting date allowed accessibility by the broader Alameda community, as well as RAB members, to the public meeting presentation and comment opportunity. Three RAB members attended the Public Meeting held on August 31, 2011, as well as the RAB meeting the following evening.

The Navy provided pertinent information regarding the OU-2A sites, and details on the FS and site histories in the Proposed Plan at the public meeting on August 31, 2011.

As is the practice for publicly reviewed draft documents prepared for Installation Restoration Program sites the Proposed Plan and Feasibility Study Report were discussed at the March 3, 2011 RAB Meeting and the August 31, 2011 Public Meeting.

Written Public Comment – Specific Comment - Soil: *Any soil contaminants exceeding target cleanup goals at specific locations at 4 feet or less below grade should be treated or removed. We believe that it is inappropriate to average contaminant concentrations at "hot spots" with the lower concentrations existing over a larger area (i.e., dilution by calculation).*

Response: The soil contaminants at the OU-2A sites (9, 13, 19, 22, and 23) were evaluated extensively in accordance with EPA guidance documents and acceptable risk assessment practices in several documents which were available to the RAB and public for review. This included the Draft (2004) and Final Remedial Investigation (2005), Draft Feasibility Study (2005), Draft Final FS (2010), and Final FS (2011). A Technical Memorandum (TM) was prepared as an appendix to the Final FS (June 2011). This TM summarized risk management discussions and considerations that serve as the basis of selection of constituents of concern that were carried forward to the FS. The Navy conducted additional characterization at Sites 9 and 22, and the results affirm prior recommendations for no further action for petroleum hydrocarbons in soil at Site 9 and lead in soil at Site 22. The results from the additional groundwater characterization at Sites 9 and 13 provide a refinement of the distribution of VOCs and do not change the alternatives evaluated in the FS based on discussions and agreement with the regulatory team. The Final FS was revised to remove all discussion related to soil alternatives.

The risk assessment was conducted in strict accordance with U.S. EPA Risk Assessment Guidance for Superfund (RAGS) and DTSC protocols. The process of developing the Exposure Point Concentrations (EPCs) for each site is a rigorous process and was performed by the layering of conservative assumptions at each decision point. The results of the risk assessment for soil demonstrate that, even using conservative assumptions, exposure to soil at OU-2A falls

within the risk management range as defined by the NCP and as such no further action is necessary.

Written Public Comment – Specific Comment - Soil: *The tarry refinery wastes should not have been transferred to the petroleum cleanup program. The polycyclic aromatic hydrocarbons (PAH's) are the same contaminants as those involved in cleanups at IR Site 25 (North Coast Guard Housing) and at the Alameda Housing Collaborative area. We are aware of at least two Superfund sites with similar tarry refinery wastes that were handled under CERCLA; these are the McColl site in Fullerton, CA and the Purity Oil Site in Fresno, CA.*

Response: Tarry Refinery Waste (TRW) was evaluated in the IR Program and was not transferred to the Petroleum Program. The TRW was extensively evaluated during the RI and the FS. As discussed at the April 2011 RAB meeting, the TRW was sampled and the risk assessment determined that the TRW did not pose unacceptable risk. Minutes of the April 7, 2011, RAB meeting, along with minutes from other RAB meetings, are posted at Department of Navy - BRAC Program Management Office (PMO).

Public Comment: *Recently, the Navy has been denying the RAB relevant information about the petroleum cleanup program at Alameda Point. In many instances, areas of fuel spill overlap areas of groundwater contamination from solvents, pesticides and other liquid contaminants. The interactions of the fuel and other contaminants are very relevant to the selection and effectiveness of the remedies proposed. We are particularly concerned about the area of tarry refinery wastes that extends over an area approximately 1,000 feet long and 300 feet wide. In spite of a time critical removal action, tarry wastes are still seeping to the surface. Former Naval employees have reported that this was also the site where aviation fuel was drained onto the surface soil. High-octane aviation fuel contained high levels of lead. that would explain the elevated concentrations of lead in the soil.*

Response: The Navy has discussed the petroleum program and petroleum contamination as it relates to CERCLA/IR Program sites at many past RAB meetings since the RAB's inception in 1994. Relevant information about petroleum contamination is included in IR Program documents. The Petroleum Program at Alameda Point is overseen by the Water Board. At the February 3, 2011, RAB meeting, Mr. West (Water Board) provided an overview of the recently updated Petroleum Program Management Plan as part of the BRAC Cleanup Team Update. The Water Board oversees administration of the petroleum program and closure of petroleum program sites. Minutes of the February 3, 2011, RAB meeting are posted at Department of Navy - BRAC Program Management Office (PMO). Information on Alameda Point petroleum sites is also available at the State Water Resources Control Board's Geotracker web site (http://geotracker.waterboards.ca.gov/). In addition, data on petroleum and non-petroleum sites can be found at DTSC's EnviroStor website (http://www.envirostor.dtsc.ca.gov/public/).

At the August 2011 RAB meeting, RAB member Richard Bangert encouraged more frequent petroleum program updates. He acknowledged this topic falls outside of the RAB forum, which addresses IR Program sites. Mr. Robinson replied that the Navy plans to continue to provide yearly or more frequent, updates on the petroleum program and to include the petroleum program as a future meeting topic.

Public Comment: *Alternative G-4, Bioremediation, is our preferred remedial alternative for IR Sites 9 and 19. The Proposed Plan indicates Alternative G-2, Monitored Natural Attenuation, as the Navy and Regulators choice. The 22-year period for natural attenuation is an excessively long period to reach cleanup goals. Table-3 assigns Alternative G-2, monitored natural attenuation, an effectiveness rating of "fair". We believe it should have received a "poor" rating, as it does not involve active treatment. Reliance on Institutional Controls is unsatisfactory because institutional memories and diligence are limited. Examples are the Navy's lack of records regarding drain line connections from Building 5, lack of records of wastes disposed to the cells and burn area at IR Site 1, lack of records on the disposition of rail cars full of defective radiological materials shipped from Canada, lack of records on the NPDES permit for the storm water installation near Shinsei Gardens, lack of records on radium wastes disposed near the seaplane lagoon, PG&E's lack of records on gas pipeline installations and lack of oversight by utility regulators.*

Response: Active remediation was performed at IR Sites 9 and 19. As Mr. Robinson, Navy BRAC Environmental Coordinator and Navy RAB Co-chair, explained at the September 1, 2011, RAB meeting in response to Mr. Humphreys' question, in-situ chemical oxidation (ISCO) (active treatment) was performed at Sites 9 and 19 and it reached its technological limits for treatment. Future land use and high groundwater salinity were also considered in reaching the groundwater remedy of Institutional Controls (ICs).

Institutional controls are administrative and legal controls, established and administered to restrict use of property to limit human exposure to contaminated media, or to protect the integrity of the implemented remedy. ICs are documented (formally recorded) and legally enforceable, and are not reliant upon "institutional memory" or historic records. ICs are implemented as part of a remedy. The effectiveness of ICs as, or part of, a remedy is evaluated during the CERCLA-mandated Five-Year Reviews. Mechanisms are in place to modify ICs, if needed, to assure they, and the remedy for which they were imposed, continue to be protective.

COMMENTS FROM THE PUBLIC MEETING (August 31, 2011):

Mr. Chan: *What is the potential impact of these sites on the proposed second site for the Lawrence Livermore Lab event? …the site that was proposed in the briefings last month or whenever they were here at Alameda Point, does that site overlap with your environmental concern sites here?*

Response: **[**The Navy is] having discussions with the City [of Alameda] to make sure that the Navy's environmental program considers and will, if at all possible, make this site available for future development, whether it's Lawrence Livermore or anything else, and that is a concern of ours…It's something we are always trying to work with the City.

Dr. Gottstein: *Can you point out where the Berkeley project is supposed to go in relation to what we are talking about tonight?*

Response: Mr. Robinson demonstrated on the poster where the area was in relation to OU-2A [Site 9] does slightly overlap; and might touch [Site] 9. [Navy] management has had discussions

with the City to make sure the site would be, if at all possible, ready for future development, including Livermore Laboratories.

COMMENTS FROM THE RAB MEETING (September 1, 2011)

Mr. Humphreys noted that "no action" is proposed for soil and felt that "explain-away" language was used to avoid digging and removing soil for all of the OU-2A sites (9, 13, 19, 22, and 23). Mr. Humphreys was concerned about metals and pesticides in soil, and noted that at other locations where these were reported the soil was excavated.

Response: As evaluated and presented in the RI (2005) and the FS (2011), and in accordance with the NCP and EPA guidance, the risk associated with on-site soil is within the risk management range and no action for soil is warranted at Sites 9, 13, 19, 27, and 23.

Mr. Humphreys noted that monitored natural attenuation (MNA) and ICs for groundwater at IR Sites 9 and 19 would take 22 years. Mr. Humphreys said he does not like ICs or long, drawn-out remedies; his preference is for active remedies that use in situ chemical oxidation (ISCO) or bioremediation.

Response: Active remediation was performed at IR Sites 9 and 19. Mr. Robinson, Navy BRAC Environmental Coordinator and Navy RAB Co-chair explained at the September 1, 2011 RAB meeting in response to Mr. Humphreys question, ISCO was performed at Sites 9 and 19 and reached it technological limits for treatment of the plume. Future land use and high groundwater salinity were also considered in reaching the proposed groundwater remedy of MNA and ICs.

Ms. Smith said that ICs hamper the city of Alameda from releasing the property for reuse for 22 years, and she was not sure the Department of Energy (the agency involved with the proposed Lawrence Berkeley National Laboratory project) would accept the property with ICs on it.

Response: At the September 1, 2011, RAB meeting, Mr. Robinson responded to Ms. Smith's comment that the groundwater ICs would only be imposed on *drinking* the groundwater for 22 years, and that the property is currently suitable for commercial redevelopment.

Mrs. Sweeney asked if a map is available showing the groundwater plume post-ISCO.

Response: Mr. Robinson replied that a map showing the groundwater plume post-ISCO is provided in the OU-2A Feasibility Study.

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4 REFERENCES

[1]**Bold blue text** indicates hyperlinks available on the ROD's reference CD to detailed site information that also is contained in the publicly available Administrative Record file. For access to information contained in the Administrative Record file for Former NAS Alameda, please contact: Administrative Record, Naval Facilities Engineering Command, Southwest, Attn: Ms. Diane Silva, 2965 Mole Road, NBSD Building 3519, San Diego, California, 92136.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
1	Administrative Record	Section 1.2	Administrative Index for OU-2A, IR Sites 9, 13, 19, 22 and 23.
2	Feasibility Study	Section 1.2.3	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Sections 5.5 and 5.6, Pages 5-10 through 5-39. Oneida Total Integrated Enterprises LLC 2011.
3	Proposed Plan	Section 1.2.3	Proposed Plan for Operable Unit 2A Installation Restoration Program Sites 9, 13, 19, 22, and 23, Former NAS Alameda, Alameda California. August 2011.
4	Alameda Point	Section 2.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 1.3.1, Page 1-4, Figure 1-3. SulTech 2005.
5	operations	Section 2.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 1.3.1, Pages 1-6 through 1-7. SulTech 2005.
6	OU-2A	Section 2.1	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.1.2, Page 2-2, Figure 2-3. Oneida Total Integrated Enterprises LLC 2011.
7	IR Site 9	Section 2.1.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 5.1.2, Pages 5-1 through 5-3, Figure 5-1. SulTech 2005.
8	certified closed by DTSC	Section 2.1.1	Letter From Department of Toxic Substances Control to Navy Transition Office, Alameda Point regarding Acceptance of closure certificatnoi report for Building 410 Industrial Wastewater Treatment Plan (IWTP), Naval Air Station Alameda, Alameda CAP EPA ID No. CA2 170 023 236. Dated November 9, 1998.
9	Marsh Crust	Section 2.1.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 2.2.2, Pages 2-5 through 2-6, Figures 1-3 and 2-2. SulTech 2005.
10	IR Site 13	Section 2.1.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.1.2, Pages 6-2 through 6-4, Figures 6-1 and 6-2. SulTech 2005.
11	IR Site 19	Section 2.1.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.1.2, Pages 7-1 through 7-3, Figure 7-1. SulTech 2005.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
12	IR Site 22	Section 2.1.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8.1.2, Pages 8-1 through 8-2, Figure 8-1. SulTech 2005.
13	IR Site 23	Section 2.1.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Sections 9.1.1 through 9.1.2, Pages 9-1 through 9-3, Figures 9-1 and 9-2. SulTech 2005.
14	geology	Section 2.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 4.1, Pages 4-1 through 4-3, Figures 2-2, and 4-1 through 4-11. SulTech 2005.
15	hydrogeology	Section 2.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 4.2, Pages 4-3 through 4-9, Figures 2-2 and 4-12 through 4-15; Tables 4-1 and 4-2. SulTech 2005.
16	ecology	Section 2.2	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.1.3, Page 3-4, Table 3-2. Oneida Total Integrated Enterprises LLC 2011.
17	RI Report for IR Site 9	Section 2.3.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 5.2 through 5-4, Pages 5-4 through 5-33, Figures 5-1 through 5-15; Tables 5-1 through 5-20. SulTech 2005.
18	IR Site 9 soil	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.1, page 3-6 and Table 3-3. Oneida Total Integrated Enterprises LLC 2011.
19	IR Site 9 groundwater	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.1, pages 3-13 through 3-16, Figures 2-4 and 3-9 through 3-13, Tables 3-8 and 3-9. Oneida Total Integrated Enterprises LLC 2011.
20	pilot study	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.1, Pages 2-7 through 2-8. Oneida Total Integrated Enterprises LLC 2011.
21	removal actions	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.1, Page 2-8. Oneida Total Integrated Enterprises LLC 2011.
22	RI Report for IR Site 13	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.2 through 6.4, Pages 6-6 through 6-40, Figures 6-1 through 6-17; Tables 6-1 through 6-17. SulTech 2005.
23	the release	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.1.2, Page 6-4. SulTech 2005.
24	Site Characterization and Analysis Penetrometer System (SCAPS) Laser Induced Flouresence (LIF)	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
25	**Data Gap Investigation**	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.
26	FS Report Appendix B	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B. Oneida Total Integrated Enterprises LLC 2011.
27	IR Site 13 soil	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.
28	groundwater at IR Site 13	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.2.2, Pages 3-13 through 3-19, Figures 3-9 through 3-14; Tables 3-10 and 3-11. Oneida Total Integrated Enterprises LLC 2011.
29	treatability studies and removal actions have been conducted at IR Site 13	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Sections 6.2.5 through 6.2.6, Pages 6-20 through 6-23, Figures 6-2, 6-3, 6-5, 6-6, 6-7 and 6-11; Table 6-11. SulTech 2005.
30	RI Report for IR Site 19	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2 through 7.4, Pages 7-4 through 7-27, Figures 7-1, 7-3 through 7-9; Tables 7-1 through 7-12 and 7-14 and 7-15. SulTech 2005.
31	Petroleum Site CAA-4B	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2.4, Page 7-13, Figure 7-1. SulTech 2005.
32	hazardous waste storage	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 10.3.1, Pages 10-8 through 10-10. SulTech 2005.
33	soil at IR Site 19	Section 2.3.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.3.2, Pages 3-9 through 3-10, Figure 3-6 and Table 3-5. Oneida Total Integrated Enterprises LLC 2011.
34	groundwater at IR Site 19	Section 2.3.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.3.2, Pages 3-19 through 3-20, Figure 3-9 and Tables 3-12, and 3-13. Oneida Total Integrated Enterprises LLC 2011.
35	removal action	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2.5, Pages 7-13 through 7-14, Figure 7-1. SulTech 2005.
36	RI Report for IR Site 22	Section 2.3.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8-2 through 8-4, Pages 8-3 through 8-29, Figures 8-1 through 8-3 and 8-5 through 8-7; Tables 8-1 through 8-14. SulTech 2005.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
37	soil at IR Site 22	Section 2.3.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.4.2, Pages 3-11 through 3-12, Figure 3-7 and Table 3-6. Oneida Total Integrated Enterprises LLC 2011.
38	groundwater samples collected at IR Site 22	Section 2.3.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.4, Pages 3-20 through 3-22, Figure 2-7 and Table 3-14. Oneida Total Integrated Enterprises LLC 2011.
39	removal actions have been conducted at IR Site 22	Section 2.3.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8.2.5, Page 8-14, Figures 8-1 and 8-2. SulTech 2005.
40	RI Report for IR Site 23	Section 2.3.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 9.2 through 9-4, Pages 9-5 through 9-32, Figures 6-14, 9-2 through 9-10; Tables 9-1 and 9-2, 9-8, 9-11 and 9-12. SulTech 2005.
41	remove free product	Section 2.3.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 9.2.5, Pages 9-16 through 9-17. SulTech 2005.
42	IR Site 23 soil	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.3.2, Pages 3-12 through 3-13, Figure 3-8; Table 3-7. Oneida Total Integrated Enterprises LLC 2011.
43	groundwater for IR Site 23	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.5, Page 3-22; Table 3-15. Oneida Total Integrated Enterprises LLC 2011.
44	corrective action	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.3, Pages 2-8 through 2-9; Figures 2-2 and 2-8. Oneida Total Integrated Enterprises LLC 2011.
45	future land use	Section 2.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Sections 3.1.2 and 3.1.3, Page 6. Oneida Total Integrated Enterprises LLC 2011.
46	Ecological Risk Assessment	Section 2.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Appendix I. SulTech 2005.
47	revised HHRA	Section 2.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3-6, Pages 3-24 through 3-32; Tables 3-17 through 3-32. Oneida Total Integrated Enterprises LLC 2011.
48	organic analytes identified as COCs at IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.
49	inorganic analytes reviewed for IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 through 5-5; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
50	feasibility study evaluation for soil at IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.
51	organic analytes identified as COCs at IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.
52	inorganic analytes reviewed for IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 and 5-5; Figures 3-9 through 3-14. Oneida Total Integrated Enterprises LLC 2011.
53	feasibility study evaluation for soil at IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.
54	organic analytes identified as COCs at IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.
55	inorganic analytes reviewed for IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 through 5-5; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.
56	feasibility study evaluation for soil at IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.
57	soil and groundwater COCs at IR Site 22	Section 2.5.1.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Section 8.4.4, Page 30. Oneida Total Integrated Enterprises LLC 2011.
58	soil and groundwater COCs at IR Site 23	Section 2.5.1.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Section 8.5.4, Page 32. Oneida Total Integrated Enterprises LLC 2011.
59	the nine NCP evaluation criteria	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.6.1, Pages 5-19 through 5-22. Oneida Total Integrated Enterprises LLC 2011.
60	IR Sites 9 and 19	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.5.1, pages 5-10 through 5-13. Oneida Total Integrated Enterprises LLC 2011.
61	IR Site 13	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.5.2, Pages 5-14 through 5-19. Oneida Total Integrated Enterprises LLC 2011.
62	Feasibility Study Report	Section 2.8.2	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Sections 5.5 and 5.6, Pages 5-10 through 5-39. Oneida Total Integrated Enterprises LLC 2011.

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ACRONYMS AND ABBREVIATIONS

1,1-TCA	1,1,1-trichloroethane
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2,3-TCP	1,2,3-trichloroproprane
1,2-DCE	1,2-dichloroethene
§	Section
µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
ARRA	Alameda Reuse and Redevelopment Authority
AST	above ground storage tank
B(a)P	Benzo(a)pyrene
BCT	BRAC Cleanup Team
bgs	below ground surface
BRAC	Base Realignment and Closure
BSU	bay sediment unit
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Corrective Action Area
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cis-1,2- DCE	cis-1,2-dichloroethene
CFR	*Code of Federal Regulations*
CIP	Community Involvement Plan
COC	chemical of concern
CRUP	Covenant to restrict the use of property
CSM	Conceptual Site Model
DTSC	Department of Toxic Substances Control
EBS	Environmental Baseline Survey
EPC	exposure point concentration
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FS	Feasibility Study
GAP	generation accumulation point
GHG	greenhouse gas
HHRA	human health risk assessment
HI	Hazard Index

HQ	hazard quotient
IC	institutional control
IR	Installation Restoration
ISB	in-situ bioremediation
ISCO	in-situ chemical oxidation
IWTP	Industrial Waste Treatment Plant
LIF	laser-induced fluorescence
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MNA	monitored natural attenuation
MTBE	methyl tert-butyl ether
NA	not applicable
NADEP	Naval Aviation Depot Alameda
NAS	Naval Air Station
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
NPV	net present value
OU	Operable Unit
OWS	oil/water separators
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PMO	project management office
RAB	Restoration Advisory Board
RAO	remedial action objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RG	remediation goal
RI	remedial investigation
ROD	Record of Decision
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
SCAPS	Site Characterization and Analysis Penetrometer System
SVOC	semi-volatile organic compound
SWRCB	State Water Resources Control Board

TCE	trichloroethene
TCRA	time-critical removal action
TM	technical memorandum
TPH	total petroleum hydrocarbon
TRW	tarry refinery waste
U.S. EPA	U.S. Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board

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APPENDIX A
GROUNDWATER USE EXCEPTION

Letter From Department of Navy to San Francisco Bay Regional Water Quality Control Board regarding request for groundwater use exception from consideration as a municipal or domestic water supply in the southeast portion of the Former Naval Air Station Alameda Point, Alameda, California. Dated August 6, 2012.

Attachment 1: Letter from Alameda Reuse and Redevelopment Authority to Navy, et al. regarding beneficial use of shallow groundwater in southeast portion of Alameda Point. Dated January 23, 2012.

Attachment 2: Letter from Water Board to Navy regarding concurrence with groundwater use exception September 13, 2012.

Attachment 3: Letter from U.S. EPA to Navy regarding concurrence with groundwater use exception September 28, 2012.

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DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
1455 FRAZEE RD, SUITE 900
SAN DIEGO, CA 92108-4310

5090
Ser BPMOW.cs/0477
AUG 6 2012

Mr. John West
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: REQUEST FOR GROUNDWATER USE EXCEPTION FROM CONSIDERATION AS A MUNICIPAL OR DOMESTIC WATER SUPPLY IN THE SOUTHEAST PORTION OF THE FORMER NAVAL AIR STATION ALAMEDA POINT, ALAMEDA, CALIFORNIA - DOCUMENT CONTROL NUMBER (DCN): CH2M-1000-FZN0-0010

Dear Mr. West,

This letter presents data which supports that the shallow groundwater (i.e., groundwater above the Yerba Buena Mud) in the southeast portion of Alameda Point is not of sufficient quality to be considered a future potential municipal or domestic water source pursuant to State Water Resources Control Board Resolution No. 88-63 and State Water Board Resolution No. 89-39, "Sources of Drinking Water". The Department of the Navy (Navy) requests the San Francisco Bay Regional Water Quality Control Board's (Water Board) concurrence that groundwater does not meet municipal and domestic supply (MUN) criteria for the southeast portion of the former Naval Air Station Alameda Point (Alameda Point), Alameda, California. The southeast portion includes the following areas: operable units (OU)-2A (Installation Restoration Program (IR) Sites 9, 13, 19, 22, 23), OU-2B (IR Sites 3, 4, 11, and 21), OU-1 (IR Site 16), OU-6 (IR Site 27), and Transfer Parcels Economic Development Conveyance (EDC)-12 and EDC-17 (Figure 1).

The Navy is requesting this MUN use exception because the shallow groundwater beneath the southeast portion of Alameda Point does not meet the State's requirements to be considered as a future MUN water source. The Navy understands that shallow groundwater is in hydraulic communication with San Francisco Bay, and the Navy is committed to its protection. Risks to ecological receptors have been evaluated in each sites' appropriate CERCLA documentation, and have been found to either be an incomplete exposure pathway, or below screening levels. Risks due to vapor intrusion into indoor air were also evaluated as a potential exposure pathway. If the drinking water exposure pathway is no longer applicable, vapor intrusion risk would drive the cleanup goals for any CERCLA sites requiring a response action.

The Navy understands that the Water Board may identify exceptions to beneficial uses based on the following exceptions criteria stated in State Water Board Resolution No. 88-63 and State Water Board Resolution No. 89-39, "Sources of Drinking Water":

(a) Total dissolved solids (TDS) exceed 3,000 milligrams per liter (mg/L) (5,000 microSiemens per centimeter [µS/cm], electrical conductivity), and it is not reasonably expected by the Water Board that the groundwater could supply a public water system.

(b) There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices (BMPs) or best economically achievable treatment practices.

(c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

(d) The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR) Part 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Part 261.3.

In addition to the exceptions criteria above, the Navy also considered the following in evaluating the shallow groundwater's potential future MUN use:

- The southeast region's proximity to San Francisco Bay and its formerly submerged setting.
- The lack of an effective confining layer present with sufficient thickness and lateral extent to create two separate and distinct water-bearing zones.
- State of California production well construction requirements regarding the length of the sanitary seal for municipal, industrial, and domestic production wells.
- The current and anticipated future MUN water supply to Alameda Point.

The following discussion describes the groundwater conditions at Alameda Point and the factors the Navy believes preclude the use of the shallow groundwater in the southeastern portion of Alameda Point

as a suitable or potentially suitable municipal or domestic water supply.

SOUTHEASTERN AREA GEOLOGY

Three members of the Alameda Formation are present in the southeast portion of Alameda Point. A thin layer of artificial fill overlies the Alameda Formation. Members from top to bottom are the Bay Sediment Unit (BSU), formerly referred to as Young Bay Mud, the Posey/Merritt/San Antonio Members (a sequence of alluvial fan deposits), and the Yerba Buena Mud, also referred to as Old Bay Mud.

The BSU, where present, is composed of sands, silty sands, clay lenses, and clayey sand lenses with shells. The BSU is not present throughout the southeastern portion of the site because of its former depositional setting. The former shoreline exists in the Southeast region; as a result, the BSU is only present in the former off-shore area as shown on Figure 2). Geologic cross sections were developed for the southeastern area, see Figures 3 and 4. As shown in Figure 4, a small BSU lens exists in the central portion of the southeastern area and extends minimally into OU-2A and EDC-12.

The Merritt Sand is described as well-sorted aeolian sand deposited contemporaneously with the Posey and Upper San Antonio Members (Rogers and Figuers, 1991); however, a strictly sand unit was not encountered in borings in the southeast region of Alameda Point. Instead, the alluvial fan deposits between the Young Bay Mud and the Old Bay Mud are inter-fingered and differentiation among them is difficult. The Posey/Merritt/San Antonio Members are composed of clayey sand, silty sand, and clay with sand (TTEC, 2009).

The Yerba Buena Mud is described as a black, organic clay layer that averages 25 to 50 feet thick with a gravel/sand/shell layer commonly in the middle of the unit. The Yerba Buena Mud is a regional aquitard underlying the Upper Unit of the San Antonio member at approximately 70 to 100 feet below ground surface (bgs) at OU-2A and OU-2B within the southeast region (Figures 3 and 4).

SOUTHEASTERN AREA HYDROGEOLOGY

The hydrogeologic unit present in the southeast portion of the site is a shallow unconfined water-bearing zone from the water table at approximately 3 to 6 feet bgs to the top of the Yerba Buena Mud at approximately 70 to 79 feet bgs. This zone includes artificial fill, where present, the BSU where present, the Posey/Merritt/San Antonio Members. In the southeast area, the clay within the BSU was not deposited in sufficient thickness or lateral continuity to create two

separate and distinct water-bearing zones (Figures 4 and 5). This is the critical difference between the central region's hydrostratigraphy and the southeast region described in the Determination of the Beneficial Uses of Groundwater Report (TTEMi, 2000). In the central region of Alameda Point the BSU is present as a laterally continuous clay confining layer which separates two water-bearing zones. In the southeast region, the BSU, where present, contains a higher percentage of sand and lacks a continuous clay layer. Clay is present only occasionally as narrow lenses of limited lateral extent. As a result, the BSU is an ineffective aquitard in the southeastern region resulting in density stratified freshwater in physical contact with saline water (Figure 5). Therefore, it is appropriate that the evaluations used to determine future potential beneficial uses (e.g., total dissolved solids (TDS) measurements) should be made throughout the shallow water-bearing zone in the southeast region.

GROUNDWATER QUALITY: TDS DISTRIBUTION

The Navy has compiled TDS data from eleven IR Sites (3, 4, 9, 11, 13, 16, 19, 21, 22, 23, and 27) in addition to Parcel EDC-12 and EDC-17. TDS from 157 groundwater monitoring wells and 26 hydropunch/Geoprobe wells were used to support the beneficial use exception request. The sample locations and all TDS data in the southeast area are shown in Figure 6. Figures 7 through 9 show TDS concentration contours for shallow (0 to 20 feet bgs), intermediate (20 to 50 feet bgs), and deep (50 feet bgs and greater) depth intervals. TDS data are listed in Table 1.

Based on historical groundwater data (February 1994 through July 20, 2012), TDS values range from 135 mg/L to 62,600 mg/L with an average TDS of approximately 15,274 mg/L. A TDS weighted average with equal distribution of measurements taken from the shallow interval (well screen depths less than 20 feet bgs), mid-interval (well screen depths between 20 and 50 feet bgs) and deep interval (well screen depths greater than 50 feet bgs) was calculated. The average TDS weighted proportionally for measurements taken from the three intervals is 15,274 mg/L. These averages include monitoring well and Hydropunch data. Hydropunch TDS data are as accurate as monitoring well data because the EPA Method (160.1) and Standard Method (2540C) filter the sample in the lab to ensure an accurate dissolved measurement.

In July 2012, the Navy collected seven hydropunch samples (AP12TDS-DP01 through AP12TDS-DP03; AP17TDS-DP01 and AP17TDS-DP02; APIR16TDS-DP01; APIR27TDS-DP01) within EDC-12, EDC-17, IR Site 16, and IR Site 27 to enhance the TDS data set for these areas (Table 1).

The hydropunch samples included one sample (AP17TDS-DP01) from 49 feet bgs and the remaining six hydropunch samples were collected at 50 feet bgs (see Figure 6 and 9). Analytical results for these new TDS samples are listed in Table 1 and the soil boring logs are attached.

The average TDS value and weighted average TDS value exceeds both the Water Board (3,000 mg/L) and U.S. EPA (10,000 mg/L) potential beneficial use standards. Most of the southeast area of Alameda Point is reclaimed tideland or bay, and the high TDS values are representative of historical infilling of the San Francisco Bay.

WELL CONSTRUCTION REQUIREMENTS

The California Department of Water Resources (DWR) has developed standard well construction requirements to prevent contamination of water supply wells by chemicals and biologic hazards related to point and nonpoint sources (DWR, "California Well Standards, 1991" Bulletin 74-90). The California standards require that annular sanitary seals must extend at least 50 feet bgs for community and industrial water supply wells and at least 20 feet bgs for domestic, agricultural, and other types of water supply wells. These well construction requirements would result in screened intervals in saline water that would neither be suitable for domestic, agricultural, industrial, nor municipal beneficial uses.

SALINE WATER INTRUSION

Additional site-specific factors that have also been considered are the proximity to the San Francisco Bay and potential for additional saline water intrusion.

Alameda Point is surrounded by the San Francisco Bay and Oakland Inner Harbor. Before the creation of land at Alameda Point, the majority of the southeastern area of the site was submerged. The Merritt Sand aquifer (occurring east of Alameda Point) is a hydraulically isolated aquifer with limited recharge resulting from a paved urban landscape. This condition increases the likelihood of saline water intrusion from pumping shallow groundwater in contact with San Francisco Bay. As shown in Figure 5, density stratification is occurring creating a narrow band of fresh water in physical contact with saline water. Pumping of shallow groundwater would create additional saline water intrusion farther inland, as has been observed in the past at Alameda Point and adjacent East Bay Plain shallow aquifers (RWQCB, 1999).

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POTENTIAL FOR OFF-SITE PLUME MIGRATION

One of the major concerns for making the unconfined groundwater a potential drinking water source in the 1999 Beneficial Use document was the potential for off-site (eastward) plume migration resulting from backyard wells used for irrigation in times of drought (TTEMi, 2000). The Navy and the regulatory agencies have evaluated twelve years of groundwater monitoring results and it is evident all plumes are being transported via regional groundwater flow to San Francisco Bay. No plume has ever been observed to migrate upgradient off-site. Further, contaminant source reduction is a component of all groundwater remedial actions, where applicable.

CONCLUSIONS AND RECOMMENDATIONS

The data presented in this letter support the conclusion that shallow groundwater located within the southeastern portion of Alameda Point meets the MUN beneficial use exception criteria. The groundwater in these areas exceeds 3,000 mg/L of TDS on average (exception criteria [a]), and the thin freshwater lens present in the southeastern area of the site is in direct contact with saline water from San Francisco Bay and any pumping would result in additional saline water intrusion. Therefore, the Navy requests that the Water Board concur with the request to except the shallow groundwater in the southeastern portion of Alameda Point from municipal and domestic supply from the water table to top of the Yerba Buena Mud aquitard for the purposes of assessing risk and establishing cleanup goals for CERCLA actions.

If you have any questions or comments, please call me at (619) 532-0951 or the Remedial Project Manager, Ms. Cecily Sabedra at (619) 532-0972.

Sincerely,

DEREK J. ROBINSON
BRAC Environmental Coordinator
By direction of the Director

Enclosures: 1. Figures 1 - 9
2. Table 1 Groundwater TDS Concentrations
3. Soil Boring Logs

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References: a. California Regional Water Quality Control Board, San Francisco Bay Region, 1999. *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report, Alameda and Contra Costa Counties*. California, June.
b. Tetra Tech EMI. 2000. *Final Determination of Beneficial Uses of Groundwater Alameda Point, Alameda, California*. July.
c. Tetra Tech EC, Inc. 2009. Final *Technical Memorandum for Data Gap Sampling at Operable Units 2A and 2B*. Alameda Point, Alameda, California. July.

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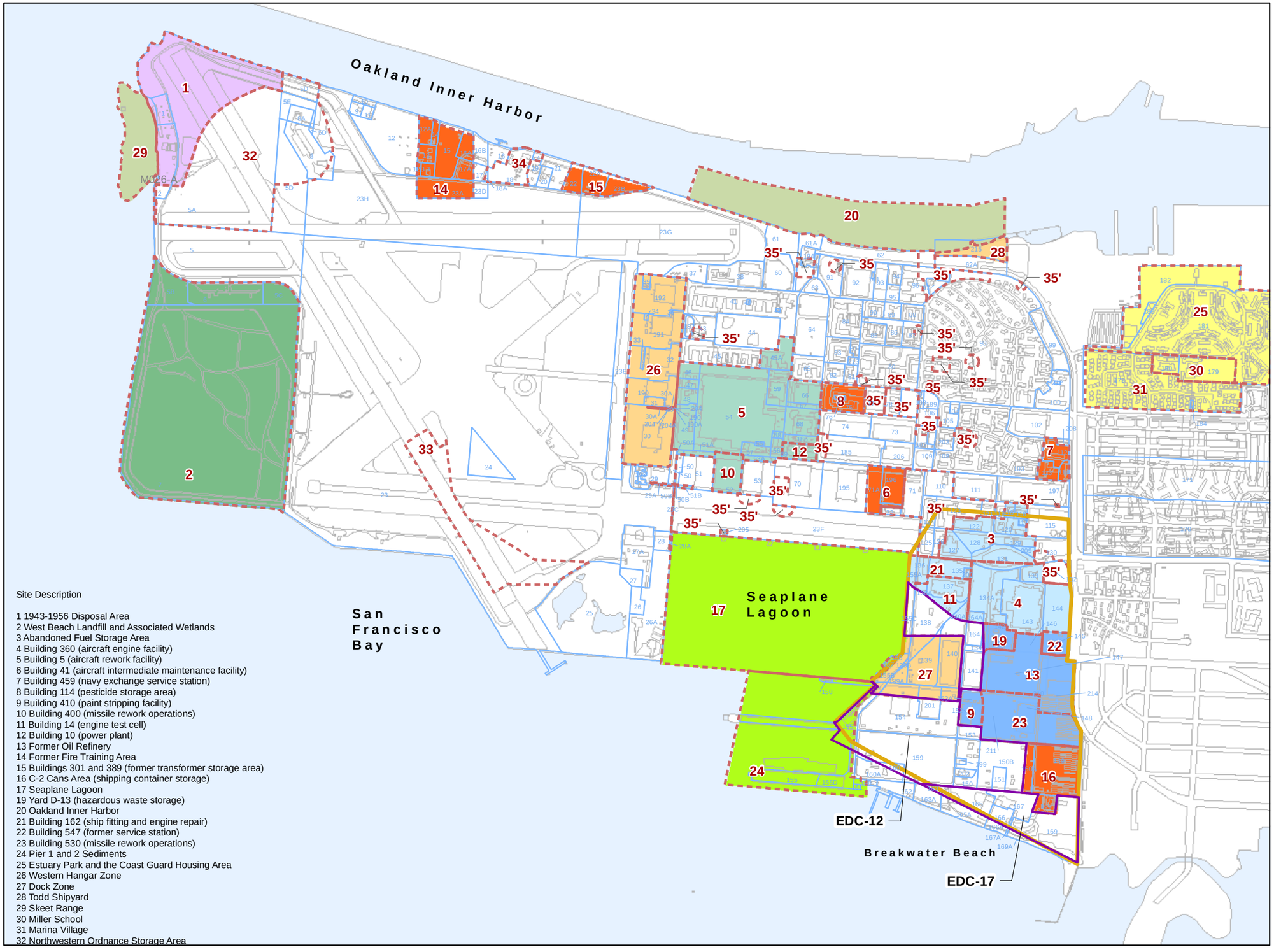

Site Description

1 1943-1956 Disposal Area
2 West Beach Landfill and Associated Wetlands
3 Abandoned Fuel Storage Area
4 Building 360 (aircraft engine facility)
5 Building 5 (aircraft rework facility)
6 Building 41 (aircraft intermediate maintenance facility)
7 Building 459 (navy exchange service station)
8 Building 114 (pesticide storage area)
9 Building 410 (paint stripping facility)
10 Building 400 (missile rework operations)
11 Building 14 (engine test cell)
12 Building 10 (power plant)
13 Former Oil Refinery
14 Former Fire Training Area
15 Buildings 301 and 389 (former transformer storage area)
16 C-2 Cans Area (shipping container storage)
17 Seaplane Lagoon
19 Yard D-13 (hazardous waste storage)
20 Oakland Inner Harbor
21 Building 162 (ship fitting and engine repair)
22 Building 547 (former service station)
23 Building 530 (missile rework operations)
24 Pier 1 and 2 Sediments
25 Estuary Park and the Coast Guard Housing Area
26 Western Hangar Zone
27 Dock Zone
28 Todd Shipyard
29 Skeet Range
30 Miller School
31 Marina Village
32 Northwestern Ordnance Storage Area

LEGEND
- Cercla Site
- Environmental Baseline Survey (EBS) Parcel
- Southeastern Region - Proposed Groundwater Exemption Area
- Transfer Parcel Boundaries
- OU-1
- OU-2A
- OU-2B
- OU-2c
- OU-3
- OU-4a
- OU-4b
- OU-4c
- OU-5
- OU-6
- Road/Runway/Building
- Water

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 1
OPERABLE UNITS AND CERCLA SITES
Alameda Point, Alameda, California

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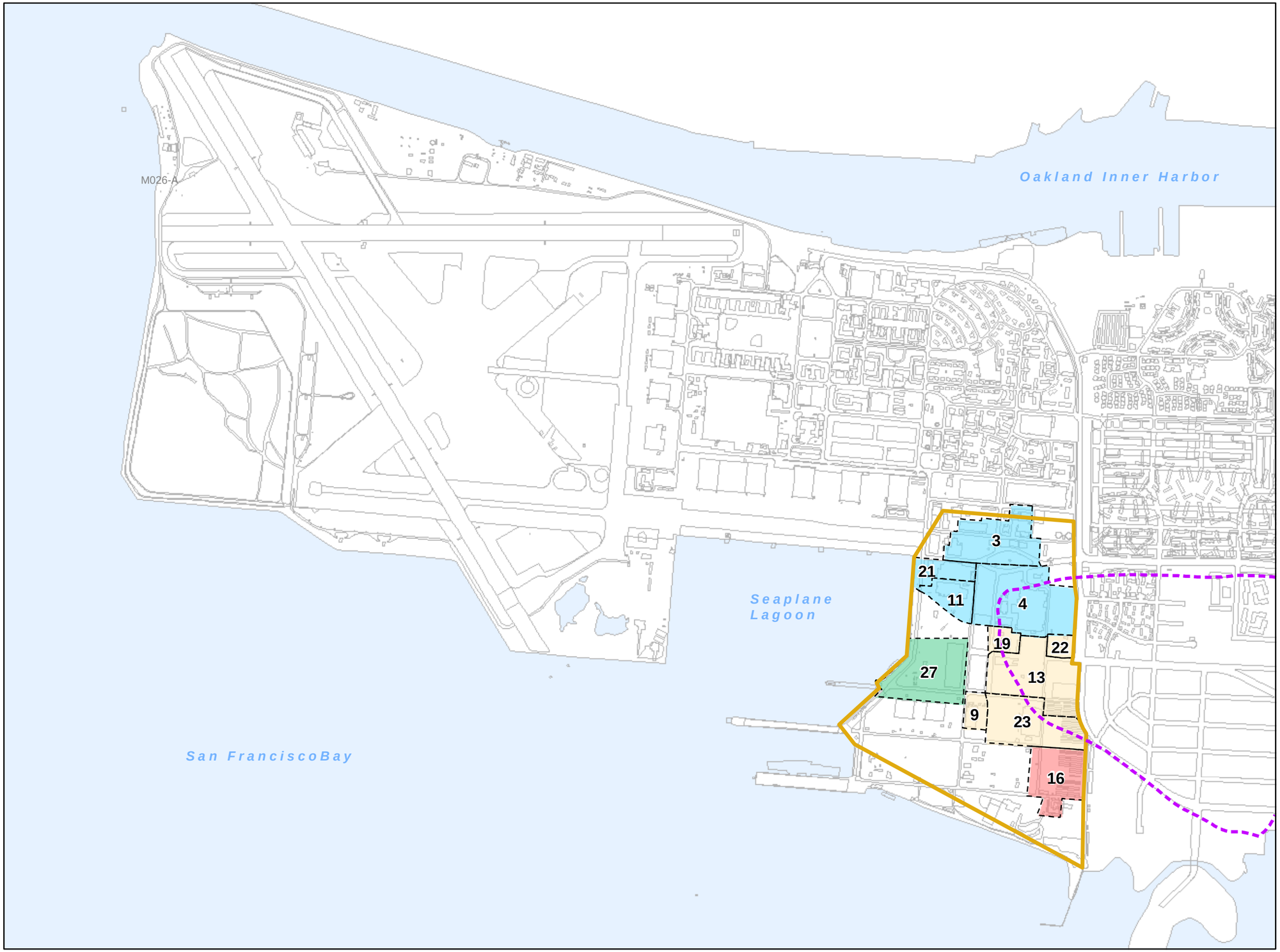

LEGEND

- Approximate Extent of Former Alameda Island Circa 1859 (United States Coast Survey, 1877)
- Proposed Groundwater Exemption Area
- Site and Site Number
- OU-1
- OU-2A
- OU-2B
- OU-6
- Road/Runway/Building
- Water

Notes:

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 2
EXTENT OF FORMER ALAMEDA ISLAND CIRCA 1859
Alameda Point, Alameda, California

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LEGEND

A——A' CROSS SECTION LOCATION

REGION DIVISION LINE

WESTERN REGION IR SITE BOUNDARY

CENTRAL REGION IR SITE BOUNDARY

SOUTHEASTERN REGION IR SITE BOUNDARY

PROPOSED GROUNDWATER EXEMPTION AREA

750' 0 750' 1500'

SCALE: 1" = 1500'

FIGURE 3
Subregions and Cross Section Locations
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999.

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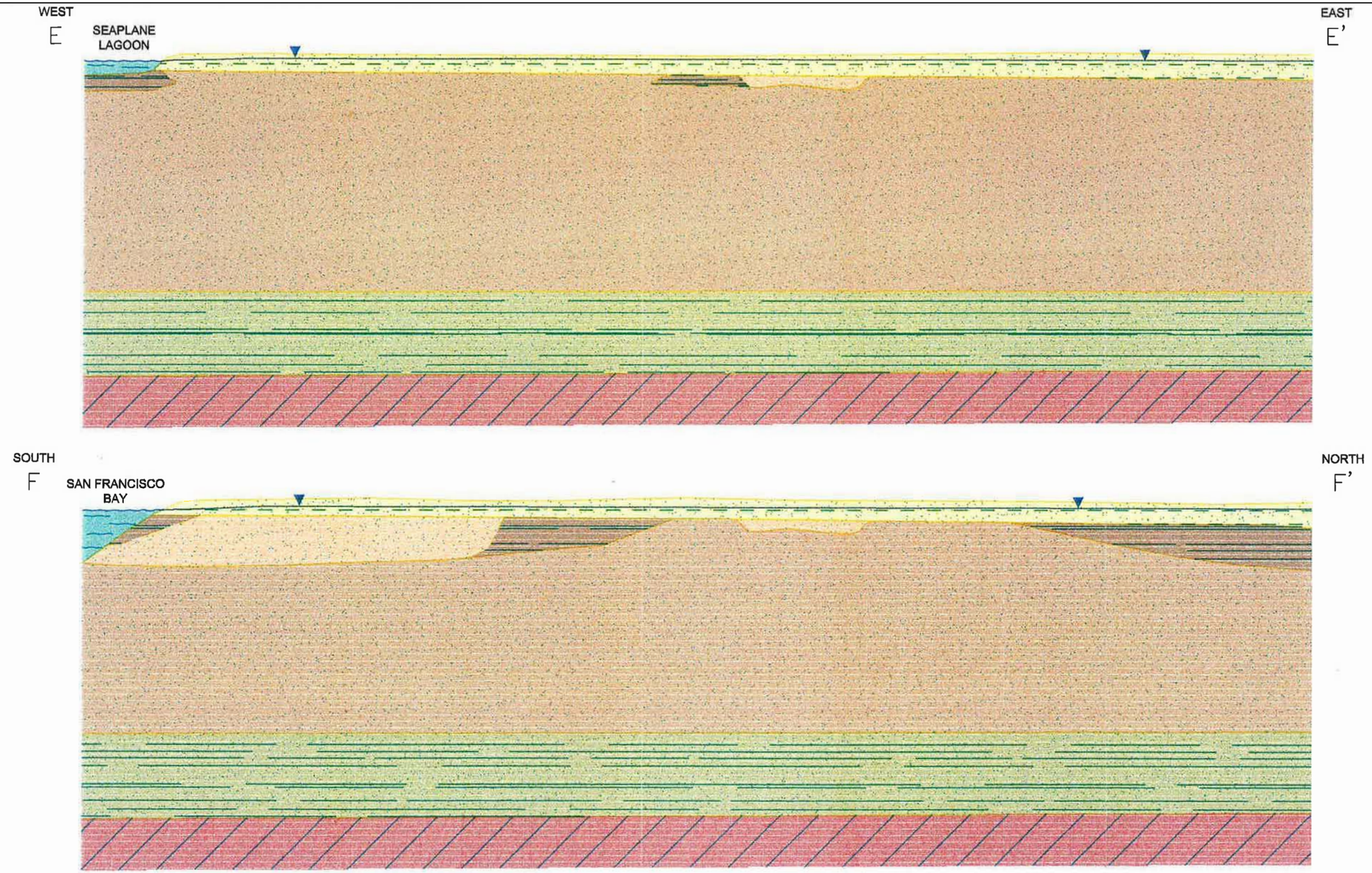

LEGEND

- WATER BODIES
- FILL
- BAY SEDIMENTS CLAY
- BAY SEDIMENTS SAND
- MERRITT SAND
- SAN ANTONIO INTERBEDDED SAND AND CLAY
- YERBA BUENA MUD
- CONTACT OF LITHOLOGIC UNITS
- CONTACT OF FINE AND COARSE MATERIAL WITHIN BAY SEDIMENTS
- FIRST WATER-BEARING ZONE WATER TABLE

NOT TO SCALE

FIGURE 4
Conceptual Geology – Southeastern Region
Cross Section E-E' and F-F'
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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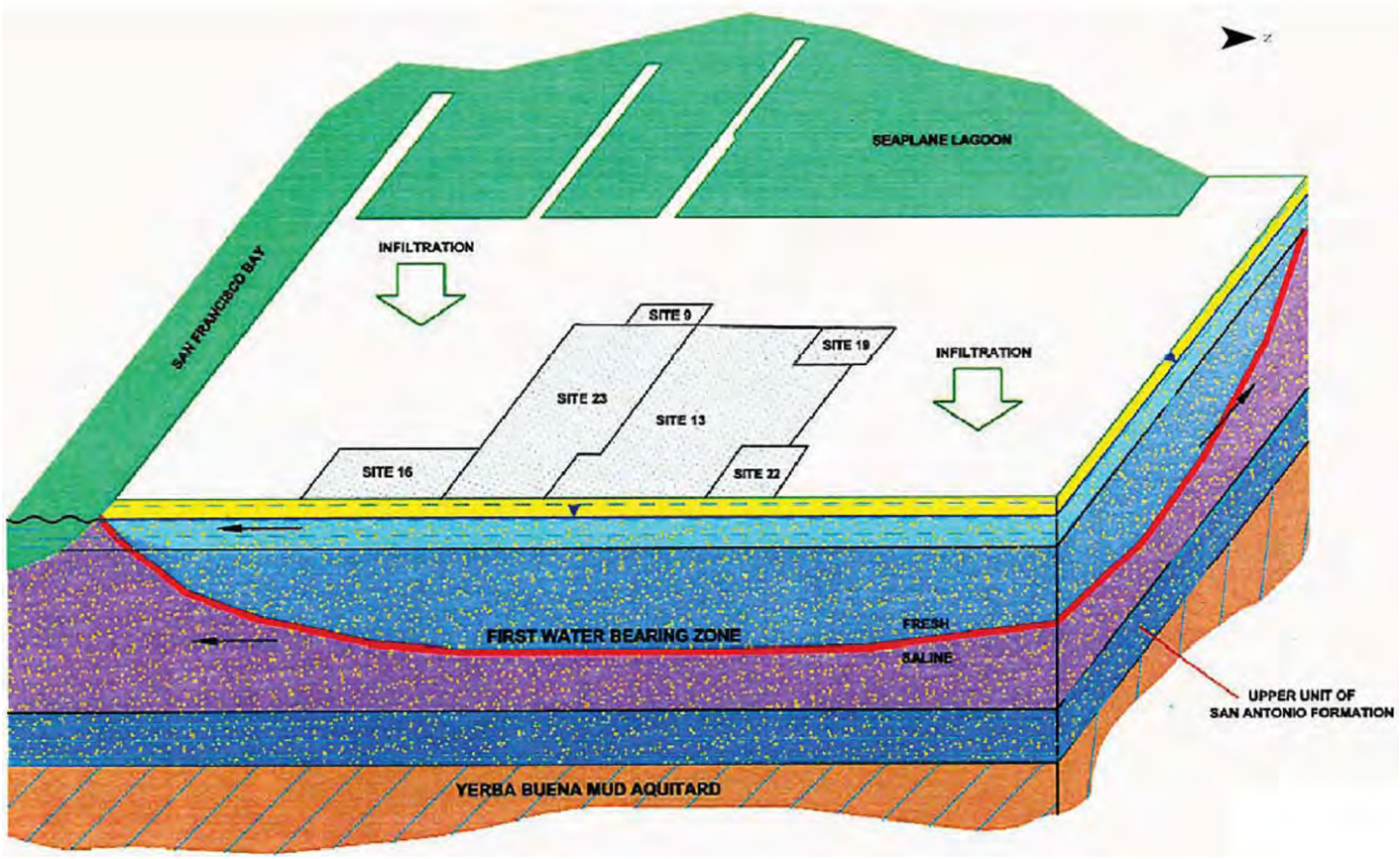

Source: SulTech 2005b

NOT TO SCALE

LEGEND

- INSTALLATION RESTORATION SITE
- SEAWATER
- ARTIFICIAL FILL WITH FRESH WATER
- MERRITT SAND WITH FRESH WATER
- MERRITT SAND WITH SALINE WATER
- UPPER UNIT OF SAN ANTONIO FORMATION WITH SALINE WATER
- YERBA BUENA MUD AQUITARD
- CONTACT OF LITHOLOGIC UNITS
- FIRST WATER-BEARING ZONE WATER TABLE
- GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS [TDS] >10,000 MILLIGRAMS PER LITER [mg\L])

FIGURE 5
Conceptual Hydrogeologic Model
for the Southeastern Region
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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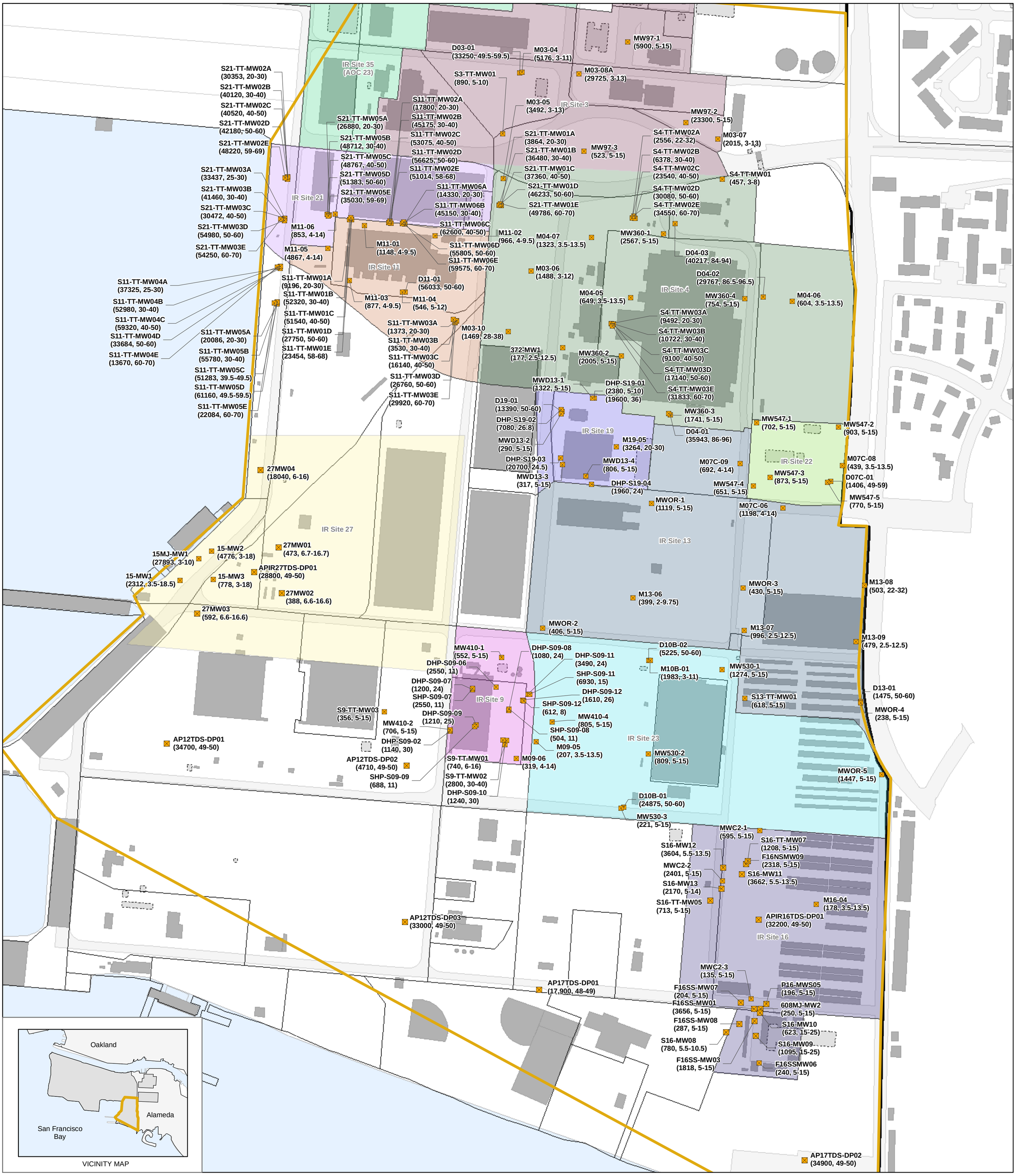

LEGEND

- Groundwater TDS Sample Locations
- Proposed Groundwater Exemption Area
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)

Notes:

MWC2-3 (135, 5-15) — Well ID (Concentration in mg/L, well screen interval in feet)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations

N

0 200 400
Feet

FIGURE 6
TDS SAMPLE VALUES
Alameda Point, Alameda, California

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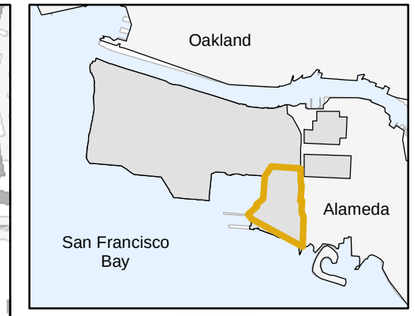

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 225 450
Feet

FIGURE 7
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 0-20 FEET

Alameda Point, Alameda, California

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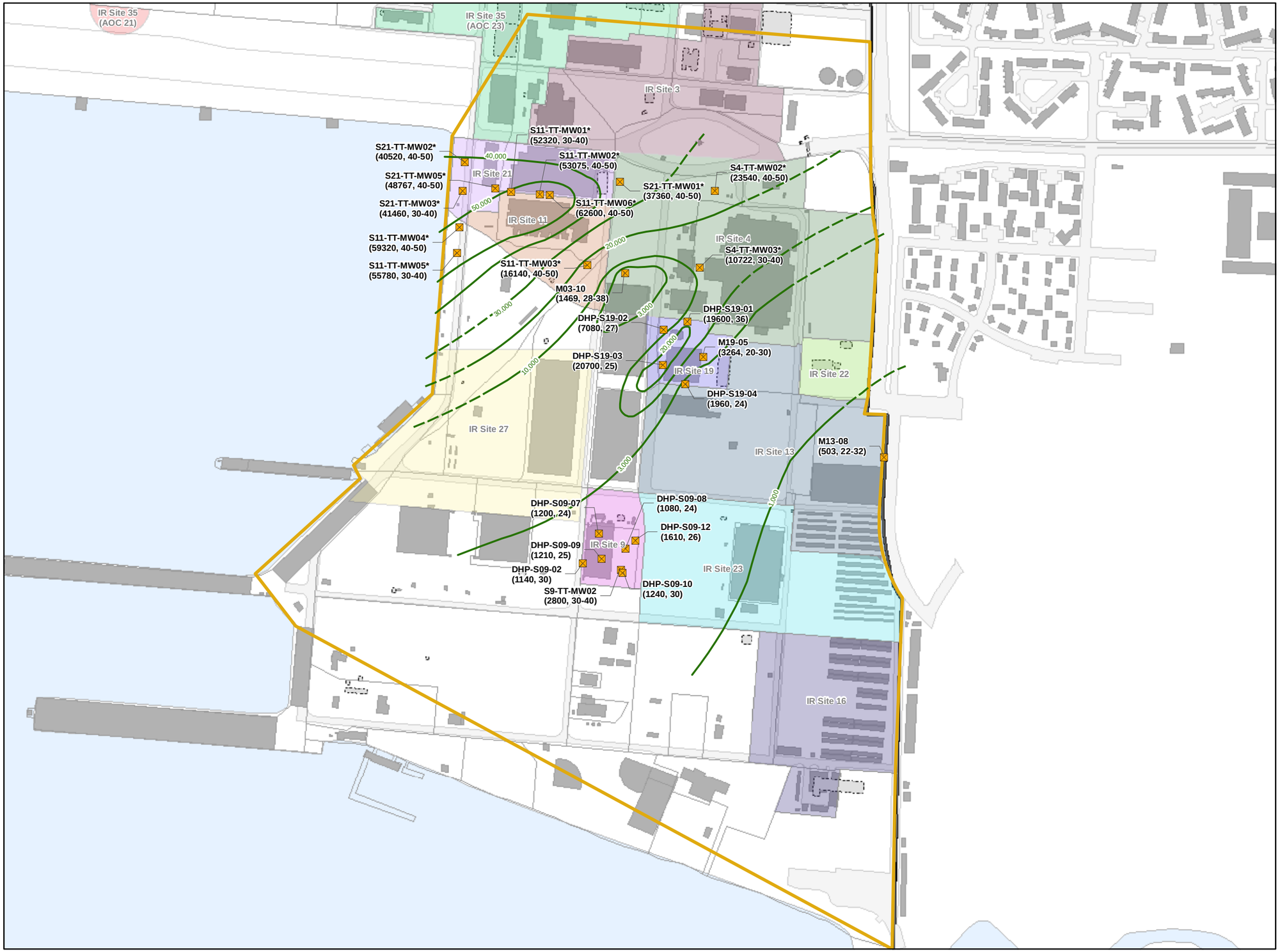

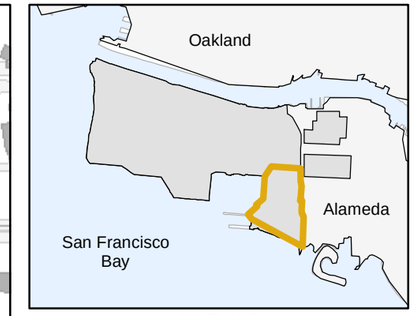

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 8
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 20-50 FEET
Alameda Point, Alameda, California

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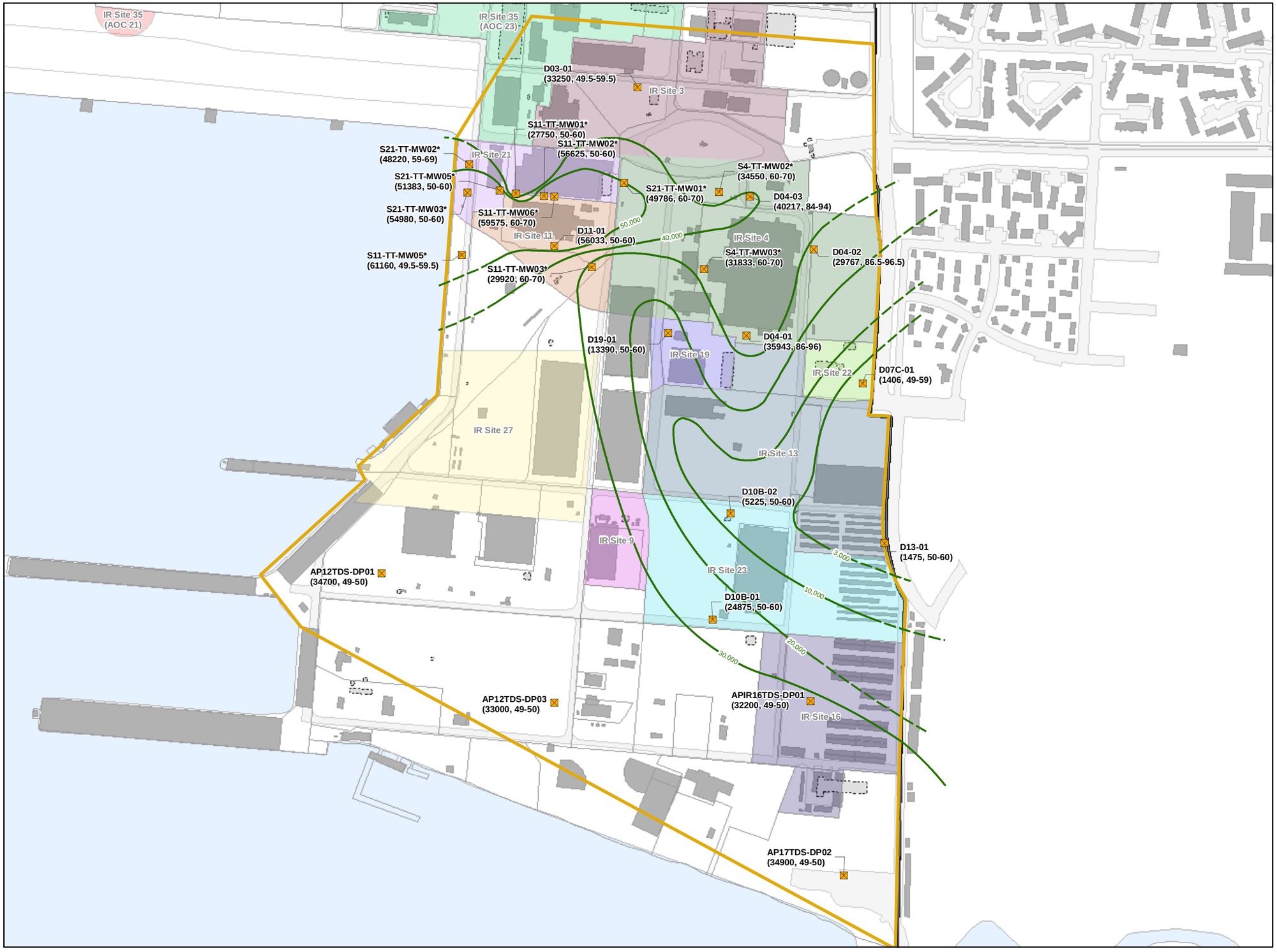

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 9
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS 50 FEET AND GREATER
Alameda Point, Alameda, California

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TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00003	M03-04	5176	3 to 11	Monitoring well	15-Dec-94	04-Aug-98	8
IR 00003	M03-07	2015	3 to 13	Monitoring well	15-Dec-94	04-Aug-98	8
IR 00003	M03-08A	29725	3 to 13	Monitoring well	09-Dec-94	04-Aug-95	4
IR 00003	MW97-1	5900	5 to 15	Monitoring well	14-Oct-94	31-Jul-95	5
IR 00003	MW97-2	23300	5 to 15	Monitoring well	18-Oct-94	01-Aug-95	4
IR 00003	MW97-3	523	5 to 15	Monitoring well	14-Oct-94	02-Aug-95	5
IR 00003	S3-TT-MW01	890	5 to 10	Monitoring well	09-Jun-10	12-May-11	5
IR 00004	372-MW1	177	2.5 to 12.5	Monitoring well	14-Oct-08	10-May-11	14
IR 00004	M03-05	3492	3 to 13	Monitoring well	08-Dec-94	04-Aug-98	9
IR 00004	M03-06	1488	3 to 12	Monitoring well	08-Dec-94	02-Aug-95	4
IR 00004	M04-05	649	3.5 to 13.5	Monitoring well	05-Jul-94	04-Aug-98	9
IR 00004	M04-06	604	3.5 to 13.5	Monitoring well	30-Jun-94	04-Aug-98	8
IR 00004	M04-07	1323	3.5 to 13.5	Monitoring well	06-Jul-94	04-Aug-98	8
IR 00004	MW360-1	2567	5 to 15	Monitoring well	06-Jul-94	04-Aug-98	9
IR 00004	MW360-2	2005	5 to 15	Monitoring well	05-Jul-94	30-Aug-06	11
IR 00004	MW360-3	1741	5 to 15	Monitoring well	01-Jul-94	05-Aug-98	9
IR 00004	MW360-4	754	5 to 15	Monitoring well	01-Jul-94	05-Aug-98	8
IR 00004	S4-TT-MW01	457	3 to 8	Monitoring well	08-Jun-10	10-May-11	7
IR 00009	M09-06	319	4 to 14	Monitoring well	30-Nov-94	07-Aug-98	8
IR 00009	MW410-1	552	5 to 15	Monitoring well	18-Oct-94	08-Aug-95	4
IR 00009	MW410-2	706	5 to 15	Monitoring well	18-Oct-94	04-Aug-95	4
IR 00009	S9-TT-MW01	740	6 to 16	Monitoring well	10-Jun-10	16-May-11	6
IR 00009	S9-TT-MW03	356	5 to 15	Monitoring well	10-Jun-10	13-May-11	5
IR 00009	SHP-S09-07	2550	11	Hydropunch	07-Sep-94	07-Sep-94	1
IR 00011	M11-01	1148	4 to 9.5	Monitoring well	26-Oct-94	07-Aug-98	8
IR 00011	M11-02	966	4 to 9.5	Monitoring well	26-Oct-94	07-Aug-98	9
IR 00011	M11-03	877	4 to 9.5	Monitoring well	01-Nov-94	28-Aug-95	4
IR 00011	M11-04	546	5 to 12	Monitoring well	04-Nov-94	25-Aug-95	4
IR 00011	M11-05	4867	4 to 14	Monitoring well	26-Oct-94	07-Aug-98	9
IR 00013	M07C-06	1198	4 to 14	Monitoring well	10-Nov-94	31-Aug-95	5
IR 00013	M07C-09	692	4 to 14	Monitoring well	10-Nov-94	30-Aug-95	4
IR 00013	M13-06	399	2 to 9.75	Monitoring well	21-Oct-94	07-Aug-98	9
IR 00013	M13-07	996	2.5 to 12.5	Monitoring well	01-Nov-94	16-Aug-95	4

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00013	M13-09	479	2.5 to 12.5	Monitoring well	09-Dec-94	07-Aug-98	8
IR 00013	MWOR-1	1119	5 to 15	Monitoring well	20-Oct-94	09-Aug-95	5
IR 00013	MWOR-2	406	5 to 15	Monitoring well	20-Oct-94	09-Aug-95	4
IR 00013	MWOR-3	430	5 to 15	Monitoring well	20-Oct-94	10-Aug-95	5
IR 00013	MWOR-4	238	5 to 15	Monitoring well	20-Oct-94	17-Aug-95	4
IR 00013	S13-TT-MW01	618	5 to 15	Monitoring well	10-Jun-10	12-May-11	5
IR 00016	608MJ-MW2	250	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16NSMW09	2318	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16SS-MW01	3656	5 to 15	Monitoring well	30-Apr-10	20-May-11	5
IR 00016	F16SS-MW03	1818	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16SSMW06	240	5 to 15	Monitoring well	02-May-06	02-May-06	1
IR 00016	F16SS-MW07	204	5 to 15	Monitoring well	30-Apr-10	19-May-11	5
IR 00016	F16SS-MW08	287	5 to 15	Monitoring well	30-Apr-10	19-May-11	5
IR 00016	M16-04	178	3.5 to 13.5	Monitoring well	01-Dec-94	06-Feb-98	7
IR 00016	MWC2-1	595	5 to 15	Monitoring well	21-Oct-94	17-Aug-95	5
IR 00016	MWC2-2	2401	5 to 15	Monitoring well	24-Oct-94	20-May-11	9
IR 00016	MWC2-3	135	5 to 15	Monitoring well	24-Oct-94	18-Aug-95	4
IR 00016	P-16-MWS05	196	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	S16-MW08	780	5.5 to 10.5	Monitoring well	28-Apr-10	28-Apr-10	1
IR 00016	S16-MW09	1095	15 to 25	Monitoring well	28-Apr-10	19-May-11	4
IR 00016	S16-MW10	623	15 to 25	Monitoring well	28-Apr-10	19-May-11	4
IR 00016	S16-MW11	3662	5.5 to 13.5	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	S16-MW12	3604	5.5 to 13.5	Monitoring well	30-Apr-10	20-May-11	5
IR 00016	S16-MW13	2170	5 to 14	Monitoring well	29-Apr-10	19-May-11	5
IR 00016	S16-TT-MW05	713	5 to 15	Monitoring well	28-Apr-10	18-May-11	4
IR 00016	S16-TT-MW07	1208	5 to 15	Monitoring well	28-Apr-10	18-May-11	4
IR 00019	MWD13-1	1322	5 to 15	Monitoring well	25-Oct-94	18-Aug-95	5
IR 00019	MWD13-2	290	5 to 15	Monitoring well	24-Oct-94	10-Aug-98	6
IR 00019	MWD13-3	317	5 to 15	Monitoring well	25-Oct-94	11-Aug-98	8
IR 00019	MWD13-4	806	5 to 15	Monitoring well	25-Oct-94	21-Aug-95	4
IR 00019	DHP-S19-01	2380	5 to 10	Hydropunch	01-Aug-94	01-Aug-94	1
IR 00021	M11-06	853	4 to 14	Monitoring well	29-Nov-94	07-Aug-98	8
IR 00022	M07C-08	439	3.5 to 13.5	Monitoring well	07-Nov-94	11-Aug-98	8

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00022	MW547-1	702	5 to 15	Monitoring well	08-Nov-94	31-Aug-95	4
IR 00022	MW547-2	903	5 to 15	Monitoring well	08-Nov-94	29-Aug-95	4
IR 00022	MW547-3	873	5 to 15	Monitoring well	07-Nov-94	31-Aug-95	4
IR 00022	MW547-4	651	5 to 15	Monitoring well	07-Nov-94	11-Aug-98	9
IR 00022	MW547-5	770	5 to 15	Monitoring well	10-Nov-94	29-Aug-95	4
IR 00009	DHP-S09-06	2550	11	Hydropunch	08-Sep-94	08-Sep-94	1
IR 00009	SHP-S09-08	504	11	Hydropunch	09-Sep-94	09-Sep-94	1
IR 00009	SHP-S09-09	688	11	Hydropunch	08-Sep-94	08-Sep-94	1
IR 00009	SHP-S09-11	6930	15	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	SHP-S09-12	612	8	Hydropunch	24-Aug-94	24-Aug-94	1
IR 00023	M09-05	207	3.5 to 13.5	Monitoring well	30-Nov-94	07-Aug-95	5
IR 00023	M10B-01	1983	3 to 11	Monitoring well	01-Dec-94	09-Aug-95	4
IR 00023	MW410-4	805	5 to 15	Monitoring well	19-Oct-94	07-Aug-95	4
IR 00023	MW530-1	1274	5 to 15	Monitoring well	19-Oct-94	09-Aug-95	5
IR 00023	MW530-2	809	5 to 15	Monitoring well	19-Oct-94	10-Aug-98	8
IR 00023	MW530-3	221	5 to 15	Monitoring well	19-Oct-94	09-Aug-95	4
IR 00023	MWOR-5	1447	5 to 15	Monitoring well	21-Oct-94	07-Aug-98	8
IR 00027	15MJ-MW1	27893	3 to 10	Monitoring well	19-Mar-02	10-Jul-02	3
IR 00027	15-MW1	2312	3.5 to 18.5	Monitoring well	20-Mar-02	09-Jul-02	5
IR 00027	15-MW2	4776	3 to 18	Monitoring well	19-Mar-02	02-Jul-02	5
IR 00027	15-MW3	778	3 to 18	Monitoring well	14-Mar-02	01-Jul-02	4
IR 00027	27MW01	473	6.7 to 16.7	Monitoring well	09-Jul-02	06-Mar-08	7
IR 00027	27MW02	388	6.6 to 16.6	Monitoring well	08-Jul-02	06-Mar-08	8
IR 00027	27MW03	592	6.6 to 16.6	Monitoring well	10-Jul-02	06-Mar-08	5
IR 00027	27MW04	18040	6 to 16	Monitoring well	05-Aug-03	06-Mar-08	3
IR 00004	S4-TT-MW02A	2556	22 to 32	Monitoring well	15-Jun-09	10-May-11	9
IR 00004	S4-TT-MW02B	6378	30 to 40	Monitoring well	12-Jun-08	10-May-11	12
IR 00004	S4-TT-MW02C	23540	40 to 50	Monitoring well	12-Jun-08	10-May-11	15
IR 00004	S4-TT-MW03A	9492	20 to 30	Monitoring well	18-Jun-09	10-May-11	10
IR 00004	S4-TT-MW03B	10722	30 to 40	Monitoring well	18-Jun-09	10-May-11	10
IR 00004	S4-TT-MW03C	9100	40 to 50	Monitoring well	08-Jun-10	10-May-11	5
IR 00004	M03-10	1469	28 to 38	Monitoring well	12-Jun-08	10-May-11	13
IR 00009	DHP-S09-02	1140	30	Hydropunch	28-Jul-94	28-Jul-94	1

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00009	DHP-S09-07	1200	24	Hydropunch	07-Sep-94	07-Sep-94	1
IR 00009	DHP-S09-08	1080	24	Hydropunch	06-Sep-94	06-Sep-94	1
IR 00009	DHP-S09-09	1210	25	Hydropunch	12-Sep-94	12-Sep-94	1
IR 00009	DHP-S09-10	1240	30	Hydropunch	09-Sep-94	09-Sep-94	1
IR 00009	DHP-S09-11	3490	24	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	DHP-S09-12	1610	26	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	S9-TT-MW02	2800	30 to 40	Monitoring well	10-Jun-10	16-May-11	5
IR 00011	S11-TT-MW01A	9196	20 to 30	Monitoring well	08-Jun-10	09-May-11	7
IR 00011	S11-TT-MW01B	52320	30 to 40	Monitoring well	10-Jun-10	09-May-11	5
IR 00011	S11-TT-MW01C	51540	40 to 50	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW02A	17800	20 to 30	Monitoring well	08-Jun-10	18-Feb-11	4
IR 00011	S11-TT-MW02B	45175	30 to 40	Monitoring well	09-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW02C	53075	40 to 50	Monitoring well	10-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW03A	1373	20 to 30	Monitoring well	08-Jun-10	09-May-11	7
IR 00011	S11-TT-MW03B	3530	30 to 40	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW03C	16140	40 to 50	Monitoring well	09-Jun-10	09-May-11	6
IR 00011	S11-TT-MW04A	37325	25 to 30	Monitoring well	16-Jun-08	11-May-11	12
IR 00011	S11-TT-MW04B	52980	30 to 40	Monitoring well	08-Jun-10	12-May-11	5
IR 00011	S11-TT-MW04C	59320	40 to 50	Monitoring well	09-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05A	20086	20 to 30	Monitoring well	10-Jun-10	11-May-11	7
IR 00011	S11-TT-MW05B	55780	30 to 40	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05C	51283	39.5 to 49.5	Monitoring well	10-Jun-10	11-May-11	6
IR 00011	S11-TT-MW06A	14330	20 to 30	Monitoring well	09-Jun-10	15-Feb-11	4
IR 00011	S11-TT-MW06B	45150	30 to 40	Monitoring well	16-Jun-08	14-Feb-11	12
IR 00011	S11-TT-MW06C	62600	40 to 50	Monitoring well	16-Jun-08	14-Feb-11	11
IR 00013	M13-08	503	22 to 32	Monitoring well	14-Dec-94	16-Aug-95	5
IR 00019	DHP-S19-01	19600	36	Hydropunch	27-Jul-94	27-Jul-94	1
IR 00019	DHP-S19-02	7080	26.8	Hydropunch	01-Aug-94	01-Aug-94	2
IR 00019	DHP-S19-03	20700	24.5	Hydropunch	01-Sep-94	01-Sep-94	1
IR 00019	DHP-S19-04	1960	24	Hydropunch	18-Aug-94	18-Aug-94	1
IR 00019	M19-05	3264	20 to 30	Monitoring well	13-Dec-94	21-Aug-95	5
IR 00021	S21-TT-MW01A	3864	20 to 30	Monitoring well	10-Jun-10	09-May-11	5
IR 00021	S21-TT-MW01B	36480	30 to 40	Monitoring well	10-Jun-10	09-May-11	5

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00021	S21-TT-MW01C	37360	40 to 50	Monitoring well	10-Jun-10	09-May-11	5
IR 00021	S21-TT-MW02A	30353	20 to 30	Monitoring well	11-Jun-08	11-May-11	15
IR 00021	S21-TT-MW02B	40120	30 to 40	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW02C	40520	40 to 50	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW03A	33437	25 to 30	Monitoring well	09-Jun-10	12-May-11	6
IR 00021	S21-TT-MW03B	41460	30 to 40	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03C	30472	40 to 50	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW05A	26880	20 to 30	Monitoring well	09-Jun-10	09-May-11	5
IR 00021	S21-TT-MW05B	48713	30 to 40	Monitoring well	16-Jun-08	09-May-11	16
IR 00021	S21-TT-MW05C	48767	40 to 50	Monitoring well	11-Jun-08	09-May-11	12
EDC 17	AP17TDS-DP01	17900	48 to 49	Hydropunch	19-Jul-12	19-Jul-12	1
IR 00003	D03-01	33250	49.5 to 59.5	Monitoring well	14-Dec-94	04-Aug-95	4
IR 00004	D04-01	35943	86 to 96	Monitoring well	01-Jul-94	05-Aug-98	7
IR 00004	D04-02	29767	86.5 to 96.5	Monitoring well	09-Mar-95	05-Aug-98	6
IR 00004	D04-03	40217	84 to 94	Monitoring well	09-Mar-95	05-Aug-98	6
IR 00004	S4-TT-MW02D	30080	50 to 60	Monitoring well	08-Jun-10	09-May-11	5
IR 00004	S4-TT-MW02E	34550	60 to 70	Monitoring well	08-Jun-10	09-May-11	6
IR 00004	S4-TT-MW03D	17140	50 to 60	Monitoring well	08-Jun-10	10-May-11	5
IR 00004	S4-TT-MW03E	31833	60 to 70	Monitoring well	08-Jun-10	10-May-11	6
IR 00011	D11-01	56033	50 to 60	Monitoring well	08-Mar-95	19-Sep-95	3
IR 00011	S11-TT-MW01D	27750	50 to 60	Monitoring well	10-Jun-10	09-May-11	6
IR 00011	S11-TT-MW01E	23454	58 to 68	Monitoring well	10-Jun-10	09-May-11	5
IR 00011	S11-TT-MW02D	56625	50 to 60	Monitoring well	09-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW02E	51014	58 to 68	Monitoring well	10-Jun-10	22-Feb-11	5
IR 00011	S11-TT-MW03D	26760	50 to 60	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW03E	29920	60 to 70	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW04D	33684	50 to 60	Monitoring well	09-Jun-10	12-May-11	5
IR 00011	S11-TT-MW04E	13670	60 to 70	Monitoring well	09-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05D	61160	49.5 to 59.5	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05E	22084	60 to 70	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW06D	55805	50 to 60	Monitoring well	16-Jun-08	14-Feb-11	11
IR 00011	S11-TT-MW06E	59575	60 to 70	Monitoring well	09-Jun-10	25-Feb-11	4
IR 00013	D13-01	1475	50 to 60	Monitoring well	16-Dec-94	19-Sep-95	4

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00019	D19-01	13390	50 to 60	Monitoring well	16-Dec-94	06-Aug-98	6
IR 00021	S21-TT-MW01D	46233	50 to 60	Monitoring well	10-Jun-10	09-May-11	6
IR 00021	S21-TT-MW01E	49786	60 to 70	Monitoring well	10-Jun-10	09-May-11	7
IR 00021	S21-TT-MW02D	42180	50 to 60	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW02E	48220	59 to 69	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03D	54980	50 to 60	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03E	54250	60 to 70	Monitoring well	09-Jun-10	11-May-11	6
IR 00021	S21-TT-MW05D	51383	50 to 60	Monitoring well	16-Jun-08	09-May-11	12
IR 00021	S21-TT-MW05E	35030	59 to 69	Monitoring well	10-Jun-10	09-May-11	5
IR 00022	D07C-01	1406	49 to 59	Hydropunch	16-Dec-94	07-Aug-98	8
IR 00023	D10B-01	24875	50 to 60	Monitoring well	15-Dec-94	14-Sep-95	4
IR 00023	D10B-02	5225	50 to 60	Monitoring well	15-Dec-94	07-Aug-98	8
EDC 12	AP12TDS-DP01	34700	49 to 50	Hydropunch	20-Jul-12	20-Jul-12	1
EDC 12	AP12TDS-DP02	4710	49 to 50	Hydropunch	18-Jul-12	18-Jul-12	1
EDC 12	AP12TDS-DP03	33000	49 to 50	Hydropunch	19-Jul-12	19-Jul-12	1
EDC 17	AP17TDS-DP02	34900	49 to 50	Hydropunch	20-Jul-12	20-Jul-12	1
IR 00016	APIR16TDS-DP01	32200	49 to 50	Hydropunch	19-Jul-12	19-Jul-12	1
IR 00027	APIR27TDS-DP01	28800	49 to 50	Hydropunch	18-Jul-12	18-Jul-12	1
Maximum Average Historical TDS value		62600					
Average Historical TDS value		15274					
Average Historical TDS value (Rounded)		15300					
Average (wells with screen interval < or = 20 feet bgs):		2337					
Number of wells with screen interval < or = 20 feet bgs:		91					
Average (wells with screen interval between 20 and 50 feet bgs):		23374					
Number of wells with screen interval between 20 and 50 feet bgs:		52					
Average (wells with screen interval > or = 50 feet bgs):		34176					
Number of wells with screen interval > or = 50 feet bgs:		40					

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
Weighted Average		15274					
Rounded Weighted Average		15300					

Note:

[a] TDS data collected from February 1994 through July 2012. For monitoring wells with multiple TDS results, the average TDS value is provided.

Double line denotes the boundary between wells with screen interval less than or equal to 20 feet bgs, 20-50 feet bgs, and greater than 50 feet bgs.

< equals less than

> equals greater than

Historical data excluded if screen interval is not available.

Average = Sum of TDS/Total No. of samples

Weighted Average = [(Avg x No. of samples)shallow + (Avg x No.of samples)intermediate + (Avg x No.of samples)deep]/(Total No.of samples)

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PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						ASPHALT CONCRETE PAVEMENT 0.4' thick.	Core pavement; hand auger to 5'
						AGGREGATE BASE / BROKEN CONCRETE 0.6' thick.	
		100	HA			**POORLY GRADED SAND (SP)** brown (10YR 5/3), damp, fine to medium grained, poorly graded, broken shell fragments.	
5	5.0			PID = 0		**POORLY GRADED SAND (SP)** brown (10YR 5/3), as above, without shell fragments after ~7 ft.	
		80	DP				Wet at ~8'
10	10.0			PID = 0		**POORLY GRADED SAND (SP)** brown (10YR 5/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
						CLAYEY SAND (SC) dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark grayish brown (2.5Y 4/2), wet, fine grained, poorly graded, 95% sand, 5% fines.	
15	15.0					**FAT CLAY (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 90% fines, 10% fine sand.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, medium grained, poorly graded, with 2- to 3-mm diameter bivalve shells.	
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, 95% sand, 5% fines.	
20	20.0	100	DP	PID = 0		**SILTY SAND (SM)** brown (10YR 4/3), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	22.5	100	DP				
25	25.0	100	DP	PID = 0		**CLAYEY SAND (SC)** strong brown (7.5YR 5/6), wet, fine grained, poorly graded, soft, 85% sand, 15% fines.	
						POORLY GRADED SAND (SP) brown (10YR 4/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
	27.5	100	DP			**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% sand, 25% fines.	
30	30.0					**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, medium grained, poorly graded.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
	32.5					**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 95% sand, 5% fines.	
		0	DP			**NO RECOVERY** very liquid, material flowed out of liner during retrieval.	
35	35.0						
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	37.5						
		100	DP				
40	40.0						
		100	DP	PID = 0		**CLAYEY SAND (SC)** yellowish brown (10YR 5/4), wet, fine grained, poorly graded, soft, 80% sand, 20% fines.	
	42.5						
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
		100	DP	PID = 0		**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	47.5	100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
50	50.0	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
				PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

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SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2109298.979, E 6042451.45
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 5.3 ft bgs
START : 7/18/12 09:00
END : 7/18/12 10:50
LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						CONCRETE 0.6' thick.	Core concrete; hand auger to 5.5'
						SILTY SAND (SM) olive (5Y 4/3), moist, fine to medium grained, very loose, predominately quartz with felsic minerals.	
				PID = 0		**SILTY SAND (SM)** olive (5Y 4/3), wet at 4.5'; saturated at 5.3'.	
		100	HA				
5							Wet at 5.3'
	5.5						
		60	DP				
10	10.0						
		50	DP				
						SANDY SILT (ML) very dark gray (5Y 3/1), wet, fine grained, very soft, with trace bivalve shells to 2mm diameter.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		50	DP			**SANDY SILT (ML)** very dark gray (5Y 3/1), wet, fine grained, very soft, with trace bivalve shells to 2mm diameter.	
20	20.0					**CLAYEY SAND (SC)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, loose to medium density, intermittent 0.5 layers of bivalve shells.	
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	22.5						
		100	DP				
25	25.0						
		100	DP				
	27.5						
		100	DP				
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	32.5	100	DP				
35	35.0	100	DP				
	37.5	100	DP				
40	40.0	100	DP				
	42.5	100	DP			**SANDY FAT CLAY (CH)** olive brown (2.5Y 4/4), wet, stiff, high plasticity.	
45	45.0					**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	

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PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	47.5						
		100	DP				
50	50.0					Boring terminated at 50 ft bgs.	
55							
60							

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SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 10:30 | END : 7/19/12 12:50 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.4' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** light olive brown (2.5Y 5/3), dry to damp, fine to medium grained, poorly graded, very loose.	
5	5.0			PID = 0		**NO RECOVERY**.	
		30	DP			**POORLY GRADED SAND (SP)** olive brown (2.5Y 4/3), wet, medium grained, poorly graded, loose, with shell fragments.	Wet at ~8'
10	10.0			PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine grained, poorly graded, loose, some shell fragments.	
		80	DP			**SANDY FAT CLAY (CH)** very dark greenish gray (10Y 3/1), wet, high plasticity, very soft, 60% fines, 40% fine sand.	
15	15.0					**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine to medium grained, poorly graded, loose, with shell fragments and 1- to 2-mm diameter bivalve shells.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 10:30 | END : 7/19/12 12:50 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		60	DP	PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine to medium grained, poorly graded, loose, with shell fragments and 1- to 2-mm diameter bivalve shells.	
20	20.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, loose, 95% sand, 5% fines.	
	22.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, loose, 90% sand, 10% fines.	
25	25.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, loose, 95% sand, 5% fines.	
	27.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
30	30.0					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108763.113, E 6042445.39
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/19/12 10:30
END : 7/19/12 12:50
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	32.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
35	35.0	100	DP	PID = 0		**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	37.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% sand, 25% fines.	
40	40.0	100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	42.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, 70% sand, 30% fines.	
45	45.0	100	DP			**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
						POORLY GRADED SAND WITH SILT (SP-SM) dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs START : 7/19/12 10:30 END : 7/19/12 12:50 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	47.5	100	DP				
						SILTY SAND (SM) dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108771.058, E 6043658.88
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 10.0 ft bgs
START : 7/19/12 08:10
END : 7/19/12 10:00
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						ASPHALT CONCRETE PAVEMENT 1' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** light olive brown (2.5Y 5/4), damp, fine to medium grained, very loose, 95% sand, 5% fines.	
						FAT CLAY (CH) dark greenish gray (10Y 4/1), damp, high plasticity, soft, 95% fines, 5% sand.	
						POORLY GRADED SAND (SP) light olive brown (2.5Y 5/4), damp, fine to medium grained, very loose, 95% sand, 5% fines.	
5	5.0			PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), damp, fine to medium grained, poorly graded, very loose, 95% sand, 5% fines, shell fragments, some thin 2" lenses of FAT CLAY (CH) of same color, occasional gravel to 0.5, wet at 10'.	
		90	DP				
10	10.0			PID = 0			Wet at ~10'
		90	DP				
						FAT CLAY (CH) dark greenish gray (10Y 4/1), wet, high plasticity, very soft.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs START : 7/19/12 08:10 END : 7/19/12 10:00 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
				PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, very loose, 95% sand, 5% fines, shell fragments.	
	17.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines, color change to strong brown (7.5YR 5/6) at 22.5'.	
20	20.0	100	DP	PID = 0			
	22.5	100	DP				
25	25.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, slightly stiff, 95% sand, 5% fines.	
	27.5	100	DP				
30	30.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs START : 7/19/12 08:10 END : 7/19/12 10:00 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, slightly stiff, 95% sand, 5% fines.	
	32.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
35	35.0			PID = 0			
		100	DP			**POORLY GRADED SAND (SP)** brown (10YR 5/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
	37.5						
		100	DP				
40	40.0			PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 95% sand, 5% fines, fine to medium grained beginning at 43'.	Flowing fine sand
	42.5						
		100	DP				
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs | START : 7/19/12 08:10 | END : 7/19/12 10:00 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** grayish brown (10YR 5/2), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
	47.5	100	DP				
						SILTY SAND (SM) brown (10YR 5/3), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs
START : 7/19/12 13:15 END : 7/19/12 15:30 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.5' thick.	Core pavement; hand auger to 5'
						POORLY GRADED SAND (SP) brown (10YR 5/3), damp, fine to medium grained, poorly graded, very loose, moist at 5', wet at 8', trace shell fragments at 5', many shell fragments at 8'.	
		100	HA				
5	5.0			PID = 0			
		70	DP				Wet at ~8'
10	10.0			PID = 0			
		60	DP				
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, loose.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108529.996, E 6042905.57
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/19/12 13:15
END : 7/19/12 15:30
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
				PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, loose.	
				PID = 0.2		**SANDY FAT CLAY (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 70% fines, 30% sand.	Broken liner; partial recovery
		60	DP				
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, medium grained, poorly graded.	
						SILTY SAND (SM) dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 80% sand, 20% fines.	
20	20.0			PID = 0			
		100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	22.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP				
25	25.0			PID = 0			
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	27.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP				
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 13:15 | END : 7/19/12 15:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	32.5					**CLAYEY SAND (SC)** brown (10YR 5/3), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
		100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** brown (10YR 5/3), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
35	35.0			PID = 0			
		100	DP				
	37.5						
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
						POORLY GRADED SAND (SP) brown (10YR 5/3), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
40	40.0			PID = 0			
		100	DP				
	42.5						
		0	DP			**NO RECOVERY**.	
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 13:15 | END : 7/19/12 15:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		0	DP	PID = 0		**NO RECOVERY**.	Broken liner stuck at 47.5'; no recovery
	47.5					Boring terminated at 47.5 ft bgs.	
50							
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.3' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** brown (10YR 4/3), damp to moist, fine to medium grained, poorly graded, 80% sand, 20% broken shell fragments.	
5	5.0			PID = 0		**FAT CLAY (CH)** dark greenish gray (10Y 4/1), moist to wet, high plasticity, soft, 90% fines, 10% fine sand.	
		85	DP			**POORLY GRADED SAND (SP)** dark grayish brown (10YR 4/2), moist to wet, fine grained, poorly graded, 95% sand, 5% fines.	Wet at ~8'
10	10.0			PID = 0			
		100	DP			**CLAYEY SAND (SC)** very dark greenish gray (10Y 3/1), wet, fine grained, poorly graded, 70% sand, 30% fines.	
15	15.0					**POORLY GRADED SAND WITH SILT (SP-SM)** very dark greenish gray (10Y 3/1), wet, medium grained, poorly graded, 90% sand, 10% fines.	3-inch lens colored black (PID = 0.0 ppm)

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2107945.691, E 6043816.85
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/20/12 10:20
END : 7/20/12 12:30
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**FAT CLAY WITH SAND (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 75% fines, 25% fine sand.	
20	20.0	100	DP	PID = 0		**CLAYEY SAND (SC)** dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, 85% sand, 15% fines.	
	22.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 90% sand, 10% fines.	
25	25.0	100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	27.5	100	DP				
30	30.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	32.5	100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
35	35.0	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
	37.5	100	DP	PID = 0		**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
40	40.0	100	DP	PID = 0		**POORLY GRADED, SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	42.5	100	DP			**CLAYEY SAND (SC)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 80% sand, 20% fines, at 47.5' color change to very dark greenish gray (5GY 3/1) with 25% fines.	
45	45.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 80% sand, 20% fines, at 47.5' color change to very dark greenish gray (5GY 3/1) with 25% fines.	
	47.5	100	DP				
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2109962.000, E 6041927.69
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 5.0 ft bgs
START : 7/18/12 13:00
END : 7/18/12 14:35
LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						CONCRETE 0.6' thick.	Core concrete; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** olive brown (2.5Y 4/4), moist to wet, loose to very loose, with felsic minerals, wet at 5'.	
5	5.0						Wet at ~5'
		60	DP			**POORLY GRADED SAND (SP)** greenish black (5GY 3/1), wet, loose to very loose, with felsic minerals.	
10	10.0						
		60	DP	PID = 0			
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**CLAYEY SAND (SC)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, medium density, trace bivalve shells.	
	17.5					**SILTY SAND (SM)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, medium density, trace shell fragments up to 0.5 diameter.	
		100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/3), wet, fine to medium grained, medium density.	
20	20.0						
		100	DP				
	22.5						
		100	DP				
25	25.0						
		100	DP				
	27.5						
		100	DP	PID = 0			
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
	32.5	100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/3), wet, fine to medium grained, medium density.	
	35.0	100	DP			**CLAYEY SAND (SC)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
35	37.5	100	DP				
	40.0	100	DP				
40	42.5	100	DP				
	45.0	100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
45							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
	47.5						
		100	DP				
50	50.0					Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

Attachment 1: Letter from Alameda Reuse and Redevelopment Authority to Navy, et al. regarding beneficial use of shallow groundwater in southeast portion of Alameda Point. Dated January 23, 2012.

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City of Alameda • California

January 23, 2012

Mr. Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Ms. Xuan-Mai Tran
US EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105-3901

Mr. Pankaj Arora
US EPA, Region 9
75 Hawthorne Street (SFD 8-3)
San Francisco, CA 94105-3901

Mr. James Fyfe
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710

Mr. John West
San Francisco Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Beneficial Use of Shallow Groundwater in Southeast Portion of Alameda Point

Dear Mr. Robinson, Mr. Arora, Mr. Fyfe, and Mr. West:

The Alameda Reuse and Redevelopment Authority (ARRA) appreciates the importance of remediating groundwater at Alameda Point so that its current and potential beneficial uses are preserved, thereby protecting human health and the environment. Current discussions among the environmental regulatory agencies and the Navy include whether shallow groundwater in the southeast portion of Alameda Point should be remediated according to standards applicable to potential drinking-water supplies.

Economic Development Department
2263 Santa Clara Avenue, Room 120
Alameda, California 94501-4477
510.747.6890 • Fax 510.523.1081 • TDD 510.522.7538

Printed on Recycled Paper

Furthermore, these issues were discussed with the ARRA governing board in November 2011.

The City of Alameda does not foresee ever using shallow groundwater at Alameda Point for a drinking-water supply. East Bay Municipal Utilities District supplies Alameda's potable water and is expected to continue to do so. Shallow groundwater at Alameda Point is undesirable as a municipal water supply for at least three reasons. First, shallow groundwater is prone to episodic and chronic contamination from overlying activities, such as, spills and leaks, excessive application of gardening chemicals, percolation of precipitation that has picked up contaminants on the ground surface, etc. Water-supply-well construction standards require well casings to exclude shallow groundwater for this reason. Second, most shallow groundwater at Alameda Point is too salty for domestic use. Although, limited areas of less salty shallow groundwater are present in some places, their small volumes preclude them from being reliable water supplies. Finally, except for seasonal precipitation and leakage from sewers and water mains, no freshwater sources of groundwater recharge are present at Alameda Point. Material groundwater pumping would induce saltwater intrusion from San Francisco Bay, Seaplane Lagoon, and Oakland Inner Harbor, quickly making shallow groundwater at Alameda Point even saltier.

The ARRA is vitally interested in remediation of Alameda Point to support its reuse in a manner that is protective of human health and the environment. However, funding for environmental clean-up activities is not limitless. Please direct remediation efforts to remediating contamination that significantly impacts reuse and redevelopment of the former base, rather than toward cleaning shallow groundwater in the southeast portion of Alameda Point to meet maximum contaminant levels for drinking-water supplies. Cleaning groundwater to protect ecological receptors and avoid vapor intrusion into buildings would be a much worthier effort.

Thank you for considering the ARRA's views in this matter.

Sincerely,

Jennifer Ott
Chief Operating Officer - Alameda Point

JO:rv

cc: Peter Russell, PhD, PE

Attachment 2: Letter from Water Board to Navy regarding concurrence with groundwater use exception September 13, 2012

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CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

September 13, 2012
ECM File No: 2199.9285 (JRW)

Department of the Navy
Base Realignment and Closure Program
Management Office West
Attn. Mr. Derek Robinson
1455 Frazee Road, Suite 900
San Diego, CA 92108
Via email: derek.j.robinson1@navy.mill

SUBJECT: Concurrence with Request for Beneficial Use Exception for Shallow Groundwater at Southeast Portion of the Former Naval Air Station, Alameda Point, Alameda County

Dear Mr. Robinson:

At the request of the Navy, Water Board staff reviewed groundwater and lithologic information, submitted in the Navy's February, August, and July, 2012, beneficial use exception request packages[1] to assess the potability and beneficial use of groundwater in the water-bearing zones from the surface to the Yerba Buena Mud Aquitard in the Southeast Portion at the former Alameda Naval Air Station. The Southeast Portion includes the following areas: operable units (OU) -2A (Installation Restoration Program (IR) Sites 9, 13, 19, 22, 23), OU-2B (IR Sites 3, 4, 11, and 21), OU-1 (IR Site 16), OU-6 (IR Site 27), and Transfer Parcels Economic Development Conveyance (EDC) -12 and EDC-17 (Figure 1). Based on the information for the southeast portion and adjacent areas provided by the Navy, including lithology, well location and screen interval, and total dissolved solids concentrations, Water Board staff believe groundwater in the

[1] Department of the Navy, Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California – Document Control Number (DCN): CH2M-1000-FZN0-0010, February 6, 2012.

Department of the Navy, Addendum to Expanded Site Inspection for Transfer Parcels EDC-12, EDC-17, FED-1A, FED-2B, and FED-2C, Alameda Point, Alameda, California, prepared by CH2MHill of Oakland, California, July 12, 2012

Department of the Navy, Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California – Document Control Number (DCN): CH2M-1000-FZN0-0010, August 6, 2012.

water bearing zones between the surface and the Yerba Buena Mud Aquitard within the Southeast Portion meets beneficial use exception (a) outlined below. Therefore, Water Board staff concur with the Navy's beneficial use exception request for the Southeast Portion.

BASIS FOR CONCURRENCE

Beneficial uses for groundwater and surface water are defined in the San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)[2]. The Basin Plan states that all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply and that, in making any exceptions, the Water Board will consider the criteria referenced in State Water Resource Control Board Resolution No. 88-63 and Regional Water Board Resolution No. 89-39, "Sources of Drinking Water," where the exceptions include:

a) The total dissolved solids (TDS) exceed 3,000 milligrams per liter (mg/L); 5,000 micro Siemens per centimeter electrical conductivity, and it is not reasonably expected by the Water Board that the groundwater could supply a public water system; or

b) There is contamination, either by natural processes or human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using best management practices or best economically achievable treatment practices; or

c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; or

d) The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR) Part 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR part 261.3.

In addition to the exceptions criteria above, the Navy also considered the following in evaluating the shallow groundwater's potential future Municipal and Domestic Supply (MUN) use:

a) The Southeast Portion's proximity to the saline San Francisco Bay would make the occurrence of elevated TDS in groundwater likely;

b) Most of the Southeast Portion of Alameda Point is reclaimed tideland or bay, and the high TDS values are likely representative of historical infilling of the San Francisco Bay.

c) The lack of an effective confining layer present with sufficient thickness and lateral extent to create two separate and distinct water-bearing zones was adequately characterized from the compilation of numerous investigation soil borings;

[2] California Regional Water Quality Control Board, San Francisco Bay Region, 2011, San Francisco Bay Basin (Region 2), Water Quality Control Plan (Basin Plan), December 31, 2011.

d) State of California production well construction requirements regarding the length of the sanitary seal for municipal, industrial, and domestic production wells would seal off any existing useable shallow groundwater; and

e) The current and anticipated future water supply to Alameda Point will be provided to the City from East Bay Municipal Utility District and there are no known plans to extract groundwater from the Southeast Portion.

SOUTHEAST PORTION AREA HYDROGEOLOGY

The hydrogeologic unit present in the Southeast Portion is a shallow unconfined water-bearing zone from the water table at approximately 3 to 6 feet bgs to the top of the Yerba Buena Mud at approximately 70 to 79 feet below ground surface (bgs). This zone includes artificial fill, where present, the Bay Sediment Unit (BSU) where present, and the Posey/Merritt/San Antonio Members. In the Southeast Portion, the clay within the BSU was not deposited in sufficient thickness or lateral continuity to create two separate and distinct water-bearing zones. This is the critical difference between the Alameda Point central region's hydrostratigraphy and the Southeast Portion and is described in the Determination of the Beneficial Uses of Groundwater Report[3]. In the central region of Alameda Point the BSU is present as a laterally continuous clay confining layer which separates two water-bearing zones. In the Southeast Portion, the BSU, where present, contains a higher percentage of sand and is not continuous. Clay is present only occasionally as narrow lenses of limited lateral extent. As a result, the BSU is an ineffective aquitard in the Southeast Portion resulting in density stratified freshwater in physical contact with saline water. Therefore, it is appropriate that the evaluations used to determine future potential beneficial uses (e.g., total dissolved solids (TDS) measurements) should be made throughout the shallow water-bearing zone in the Southeast Portion because the shallow non-saline groundwater would be rapidly depleted during extraction and subsequently the deeper saline groundwater would enter the groundwater extraction well.

SITE-SPECIFIC DATA

In support of its request, the Navy provided data focusing on TDS and/or electrical conductivity concentrations in groundwater samples from eleven IR Sites (3, 4, 9, 11, 13, 16, 19, 21, 22, 23, and 27) in addition to Parcel EDC-12 and EDC-17. In addition, TDS from 157 groundwater monitoring wells and 26 hydropunch/Geoprobe wells were used to support the beneficial use exception request. Figures 1 and 2 (Attachment A) show: Alameda Point, Operable CERCLA units; and the Southern Portion. Figures 5 and 6 show: the Conceptual Hydrogeological Model; Sample Locations and the TDS data in the Southeast Portion. Figures 7, 8, and 9 show the TDS

[3] Department of the Navy, Final Determination of the Beneficial Uses of Groundwater Alameda Point, prepared by Tetra Tech, EMI, July 2000,

concentration contours for shallow (0 to 20 feet bgs), intermediate (20 to 50 feet bgs), and deep (50 feet bgs to the Yerba Buena Mud Aquitard) depth intervals.

Based on historical groundwater data (February 1994 through July 20, 2012), TDS values of the Southeast Portion range from 135 mg/L to 62,600 mg/L with an average TDS concentration of approximately 15,274 mg/L. The average TDS sample concentrations taken from: 1) 77 samples in the shallow interval (well screen depths less than 20 feet bgs) were 2,527 mg/L; 2) 52 samples in the mid-interval (well screen depths between 20 and 50 feet bgs) were 23,146 mg/L; and 3) 34 samples in the deep interval (well screen depths greater than 50 feet bgs) were calculated at 35,257 mg/L. The average TDS weighted proportionally for measurements taken from the three intervals is 15,274 mg/L. These averages include monitoring well and Hydropunch data. Hydropunch TDS data are as accurate as monitoring well data because the EPA Method (160.1) and Standard Method (2540C) require filtration of the sample in the laboratory to ensure an accurate dissolved TDS measurement.

Water Board staff initially reviewed the Navy's February 6, 2012 Beneficial Use Exception request report and determined that the existing TDS data set was not sufficient to define the lateral extent of elevated TDS groundwater. Therefore, the Navy returned to the field and advanced seven additional borings to the Yerba Buena Mud Aquitard. The data from this sampling effort supported that elevated TDS groundwater exists at depth throughout the Southeast Portion. Specifically, in July 2012, the Navy collected seven additional hydropunch samples (AP12TDS-DP01 through AP12TDS-DP03; AP17TDS-DP01 and AP17TDS-DP02; APIR16TDS-DP01; APIR27TDS-DP01) within EDC-12, EDC-17, IR Site 16, and IR Site 27 to enhance the TDS data set for these areas. The hydropunch samples included one sample (AP17TDS-DP01) from 49 feet bgs and the remaining six hydropunch samples were collected at 50 feet bgs (see Figure 6 and 9).

The number of samples exceeding TDS criteria of 3,000 mg/l and 10,000 mg/l are tabulated and presented below, including the percentage that exceeded each criteria:

Water Bearing Depth	**# MWs/CPTs sampled**	**# MWs/CPTs with Average[1] [TDS] Exceeding:**	
		3,000 mg/l	**10,000 mg/l**
Shallow (<20 ft bgs)	91	13 (14%)	4 (4%)
Intermediate (~20-50 ft bgs)	52	40 (81%)	31 (60%)
Deep (>50ft bgs)	40	38 (95%)	36 (90%)

[1] Average TDS concentration is based on no fewer than one groundwater samples (and up to 15) for each location collected from MWs and Hydropunch/Geoprobe borings from 1994 to 2012.

Water Board staff also note that we have previously concurred with similar requests for water-bearing zones at Alameda Point in 1999 at Alameda ANNEX, and again in July of 2003 for Alameda Point areas west of Saratoga Road. In addition to elevated TDS, those prior concurrences have considered the low likelihood that groundwater within the fill could realistically serve as a future source of drinking water.

CLOSING

Based on the information presented above, Water Board staff concur that shallow groundwater in the Southeast Portion exceeds 3,000 mg/L on average and meets exception (a) outlined in Resolution Nos. 88-63 and 89-39. Therefore, Water Board staff concur with the Navy's request to provide a beneficial use exception for MUN at the Southeast Portion.

A beneficial use exception is not intended to allow for any ongoing groundwater degradation. Therefore, please note that State Water Resources Control Board (SWRCB) Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," requires attainment of background levels of water quality, or the highest level of water quality that is reasonable achievable if background levels cannot be restored. Furthermore, SWRCB Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Dischargers Under Water Code Section 13304," states that cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards. Where it is not possible to achieve background water quality, SWRCB Resolution No. 92-49 requires cleanup to the best level of water quality that is technologically and economically feasible.

If you have any questions, please contact John West of my staff at (510) 622-2438 or email at jwest@waterboards.ca.gov.

Sincerely,

Terry Seward

Digitally signed by Terry Seward
Date: 2012.09.13 13:24:01 -07'00'

Terry Seward, PE
Chief, Groundwater
Protection and Waste Containment
Division

E-Attachment A: Figures 1, 2, 5, 6, 7, 8, & 9
cc (via email)

Mr. William McGinnis, Department of the Navy, BRAC PMO West, william.mcginnis1@navy.mil
Mr. Cecily Sabedra, Department of the Navy, BRAC PMO West, cecily.sabedra@navy.mil
Ms. Curtis Moss, Department of the Navy, BRAC PMO West, curtis.m.moss.ctr@navy.mil
Ms. Xuan-Mai Tran, US EPA, Region 9, Tran.Xuan-Mai@epamail.epa.gov
Mr. James Fyfe, Department of Toxic Substances Control, JFyfe@dtsc.ca.gov
Mr. Peter Russell, Russell Resources, Inc. for the City of Alameda, peter@russellresources.com

Attachment A: Figures 1, 2, 5, 6, 7, 8, & 9

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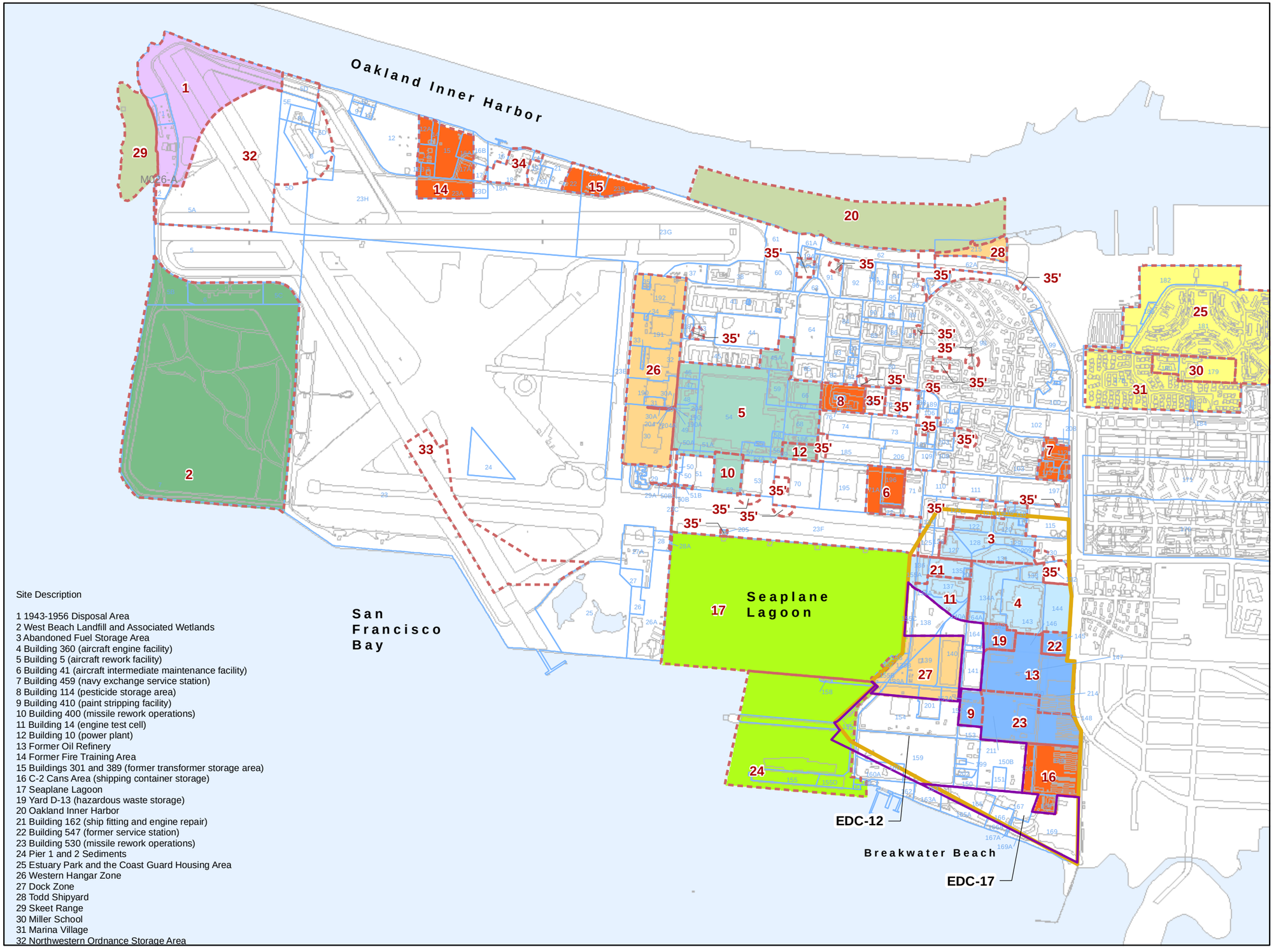

Site Description

1 1943-1956 Disposal Area
2 West Beach Landfill and Associated Wetlands
3 Abandoned Fuel Storage Area
4 Building 360 (aircraft engine facility)
5 Building 5 (aircraft rework facility)
6 Building 41 (aircraft intermediate maintenance facility)
7 Building 459 (navy exchange service station)
8 Building 114 (pesticide storage area)
9 Building 410 (paint stripping facility)
10 Building 400 (missile rework operations)
11 Building 14 (engine test cell)
12 Building 10 (power plant)
13 Former Oil Refinery
14 Former Fire Training Area
15 Buildings 301 and 389 (former transformer storage area)
16 C-2 Cans Area (shipping container storage)
17 Seaplane Lagoon
19 Yard D-13 (hazardous waste storage)
20 Oakland Inner Harbor
21 Building 162 (ship fitting and engine repair)
22 Building 547 (former service station)
23 Building 530 (missile rework operations)
24 Pier 1 and 2 Sediments
25 Estuary Park and the Coast Guard Housing Area
26 Western Hangar Zone
27 Dock Zone
28 Todd Shipyard
29 Skeet Range
30 Miller School
31 Marina Village
32 Northwestern Ordnance Storage Area

LEGEND
- Cercla Site
- Environmental Baseline Survey (EBS) Parcel
- Southeastern Region - Proposed Groundwater Exemption Area
- Transfer Parcel Boundaries
- OU-1
- OU-2A
- OU-2B
- OU-2c
- OU-3
- OU-4a
- OU-4b
- OU-4c
- OU-5
- OU-6
- Road/Runway/Building
- Water

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 1
OPERABLE UNITS AND CERCLA SITES
Alameda Point, Alameda, California

CH2MHILL

BAO \\ZINFANDEL\TEST\NAVYFAC\NAVYCLEAN\383512\GIS_FILES\MAPFILES\2012\CIRCA_OU.MXD RRATHNAY 5/2/2012 4:58:32 PM

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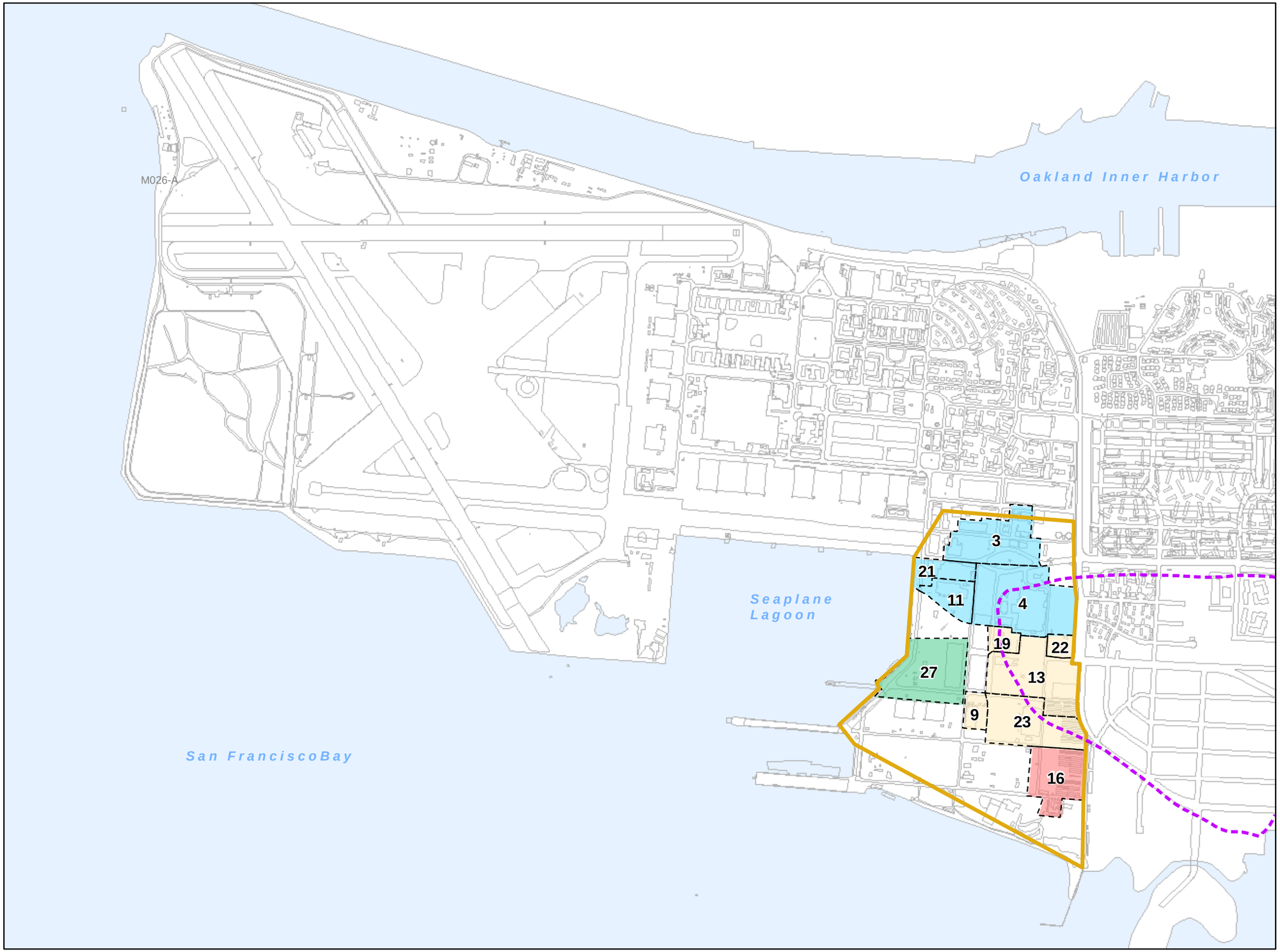

LEGEND

- Approximate Extent of Former Alameda Island Circa 1859 (United States Coast Survey, 1877)
- Proposed Groundwater Exemption Area
- Site and Site Number
- OU-1
- OU-2A
- OU-2B
- OU-6
- Road/Runway/Building
- Water

Notes:

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 2
EXTENT OF FORMER ALAMEDA ISLAND CIRCA 1859
Alameda Point, Alameda, California

CH2MHILL

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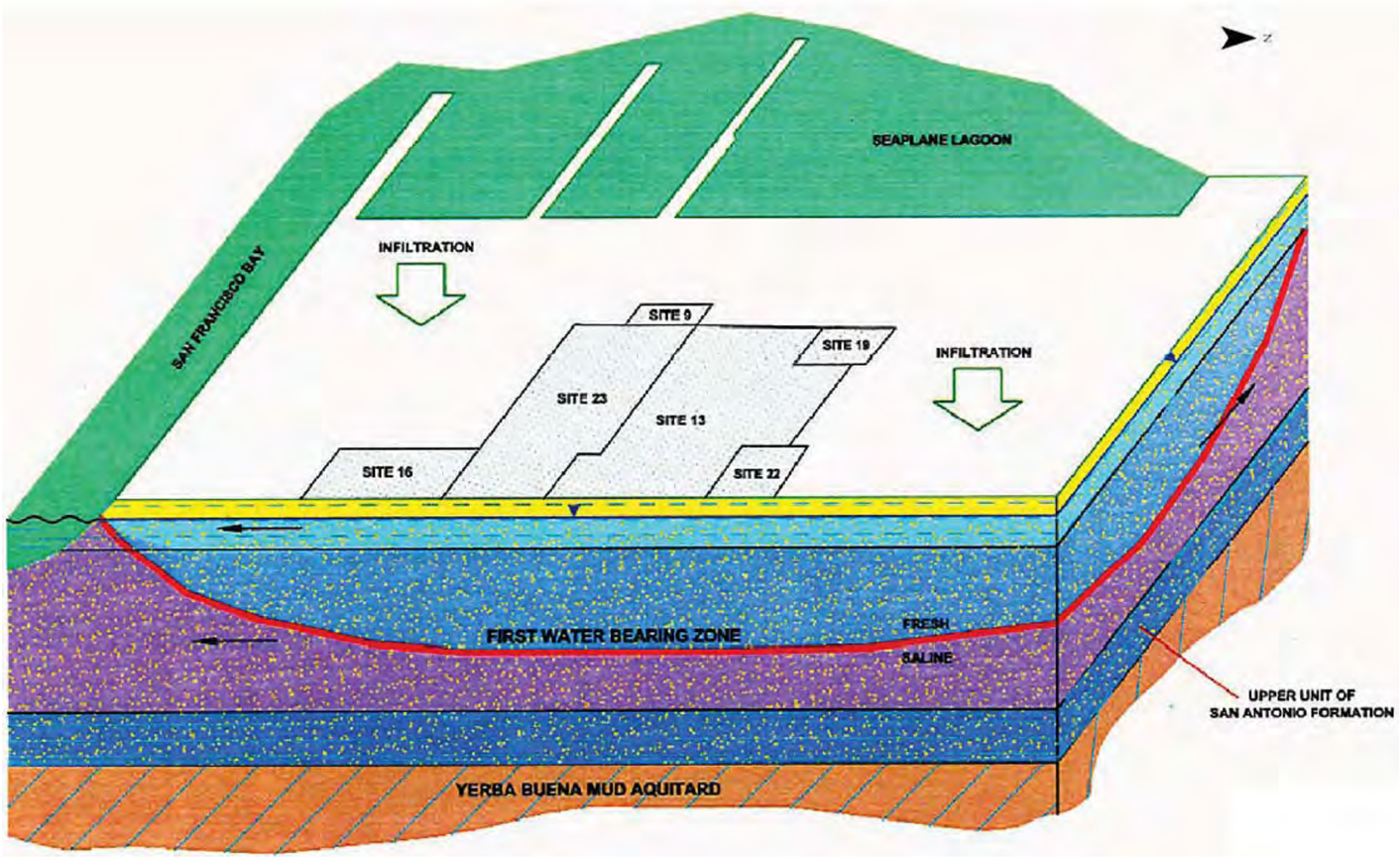

Source: SulTech 2005b

NOT TO SCALE

LEGEND

- INSTALLATION RESTORATION SITE
- SEAWATER
- ARTIFICIAL FILL WITH FRESH WATER
- MERRITT SAND WITH FRESH WATER
- MERRITT SAND WITH SALINE WATER
- UPPER UNIT OF SAN ANTONIO FORMATION WITH SALINE WATER
- YERBA BUENA MUD AQUITARD
- CONTACT OF LITHOLOGIC UNITS
- FIRST WATER-BEARING ZONE WATER TABLE
- GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS [TDS] >10,000 MILLIGRAMS PER LITER [mg\L])

FIGURE 5
Conceptual Hydrogeologic Model
for the Southeastern Region
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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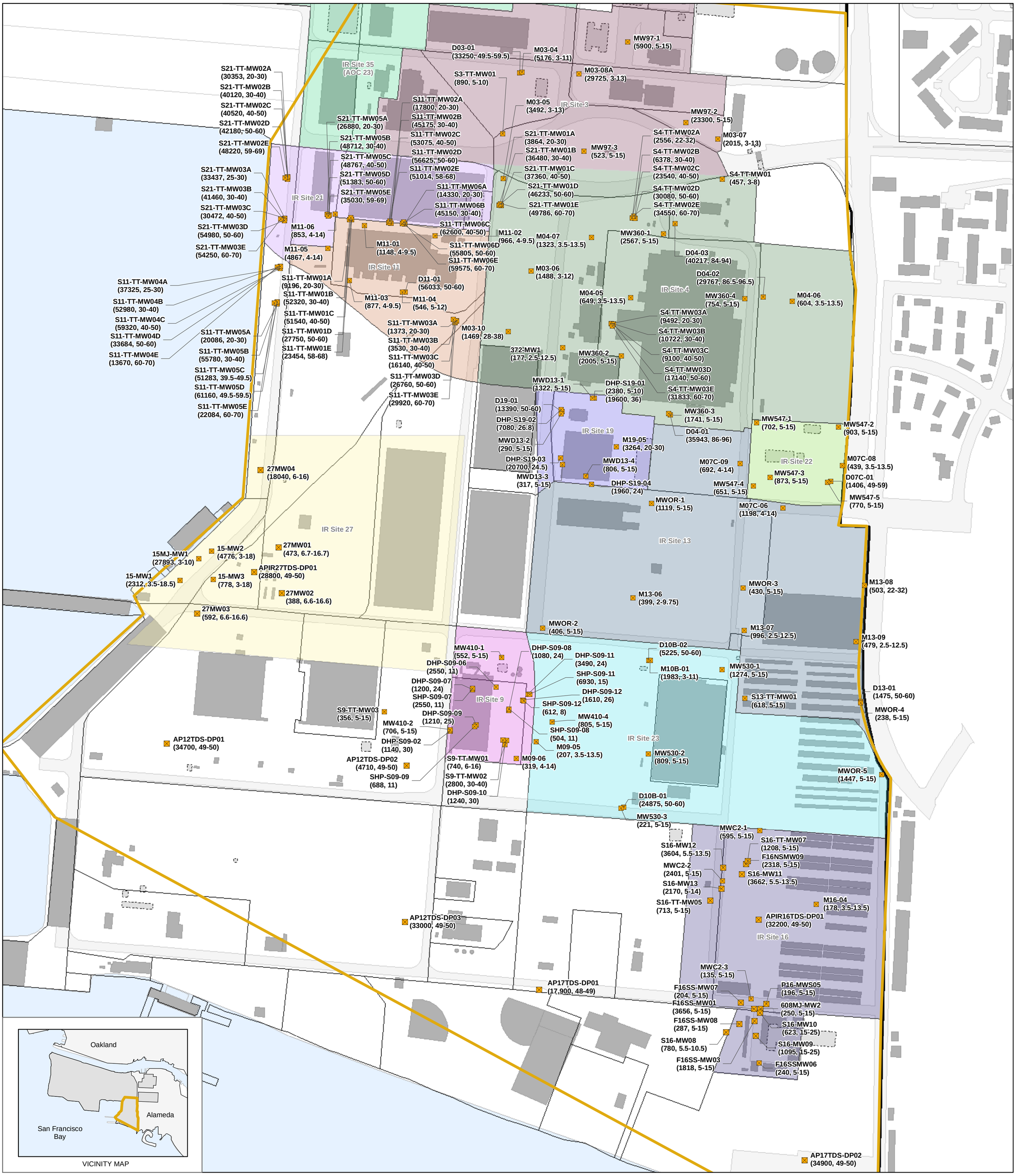

LEGEND

- Groundwater TDS Sample Locations
- Proposed Groundwater Exemption Area
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)

Notes:

MWC2-3 (135, 5-15) — Well ID (Concentration in mg/L, well screen interval in feet)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations

N

0 200 400
Feet

FIGURE 6
TDS SAMPLE VALUES
Alameda Point, Alameda, California

CH2MHILL

\\ZINFANDEL\PROJ\NAVYFAC\NAVYCLEAN\383512\GIS_FILES\MAPFILES\2012\TDS_HISTORICAL_CSIZE.MXD TDS_HISTORICAL_DSIZE.MXD RRATHNAY 7/31/2012 4:25:49 PM

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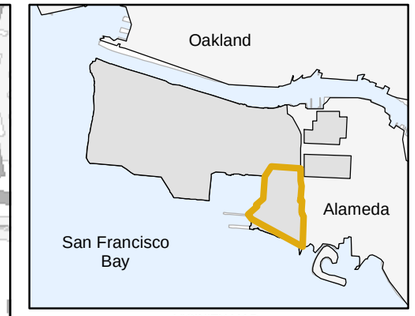

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 225 450
Feet

FIGURE 7
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 0-20 FEET

Alameda Point, Alameda, California

CH2MHILL

BAO \\ZINFANDEL\TEST\NAVYFAC\NAVYCLEAN\383512\GIS_FILES\MAPFILES\2012\TDS_0_20.MXD RRATHNAY 5/2/2012 5:43:27 PM

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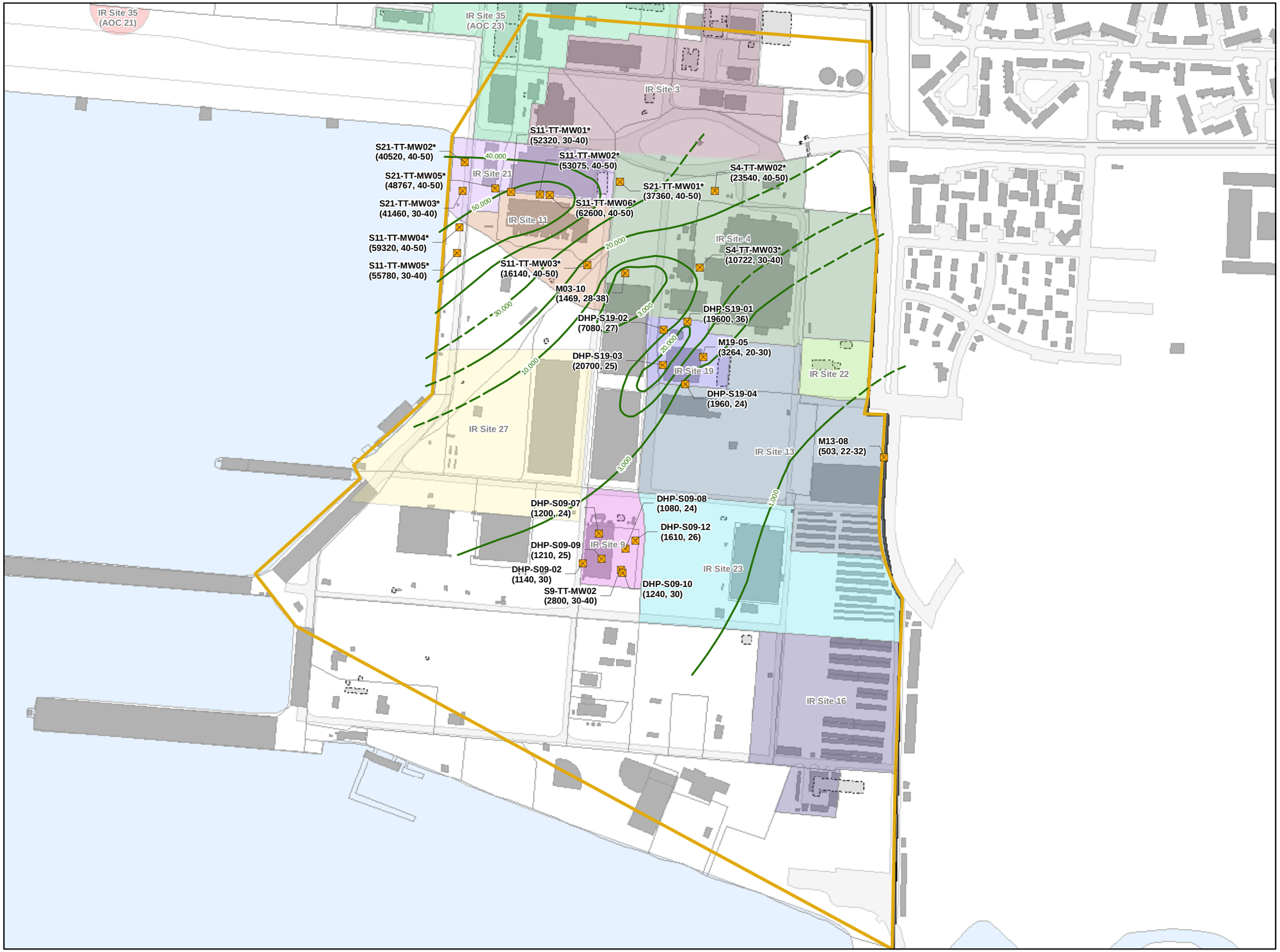

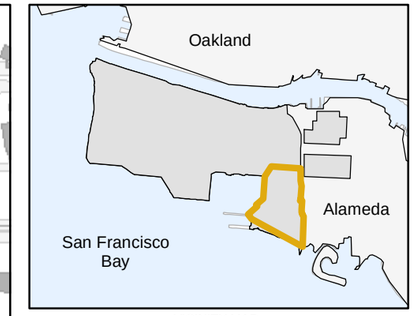

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 8
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 20-50 FEET
Alameda Point, Alameda, California

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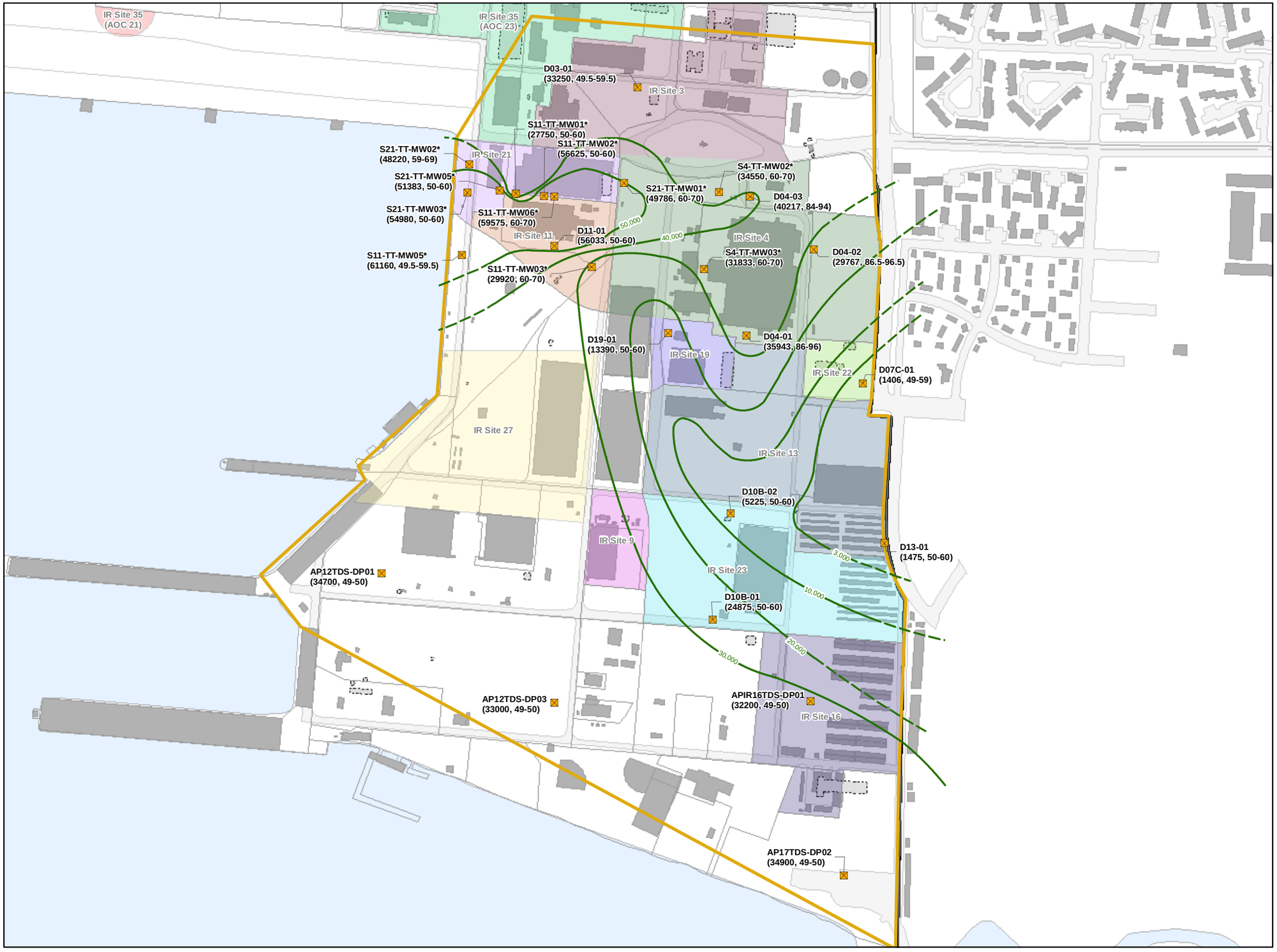

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
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- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 9
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS 50 FEET AND GREATER
Alameda Point, Alameda, California

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Attachment 3: Letter from U.S. EPA to Navy regarding concurrence with groundwater use exception September 28, 2012.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

September 28, 2012

Mr. Derek Robinson
Code BPMOW.DR
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Re: Navy's Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California, August 2012

Dear Mr. Robinson:

The U.S. Environmental Protection Agency (EPA) Region 9 has received a copy of the Navy's request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California, dated August 6, 2012. The requested groundwater use exception area includes Operable Units (OU)-2A (IR Sites 9, 13, 19, 22 and 23), OU-2B (IR Sites 3, 4, 11 and 21), OU-1 (IR Site 16), OU-6 (IR Site 27) and Transfer Parcels Economic Development Conveyance (EDC)-12 and EDC-17.

Based on the information provided in your request letter and the concurrence letter from the San Francisco Bay Regional Water Quality Control Board dated September 13, 2012, EPA concurs that the shallow groundwater in the southeast portion of Alameda Point does not meet the State or Federal criteria for municipal or domestic water supply. In addition, the City of Alameda has made the declaration in its January 23, 2012 letter to the Navy that the shallow groundwater at Alameda Point will not be used for drinking water supply. The drinking water supply at Alameda Point is being provided by the East Bay Municipal Utilities District.

If there are any questions concerning this matter, please contact Xuan-Mai Tran of my staff at (415) 972-3002.

Sincerely,

John Chesnutt

John D. Chesnutt
Chief, DoD and Pacific Islands Section
Superfund Division

cc: James Fyfe, DTSC
John West, SFRWQCB
Jennifer Ott, City of Alameda

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APPENDIX B
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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Table B1
Federal Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
		GROUNDWATER		
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste	Cal. Code Regs. tit. 22, § 66261.21, 66261 .22(a)(1), 66261.23, 66261 .24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste is hazardous.
Groundwater protection standards: Owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section that are designed to ensure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern set forth under Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area of concern at the POC.	A regulated unit that receives or has received hazardous waste before 26 July 1982 or regulated units that ceased receiving hazardous waste prior to 26 July 1982 where constituents in or derived from the waste may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	Relevant and Appropriate	Potentially relevant and appropriate for groundwater monitoring at OU-2A. The groundwater will be cleaned up to the lowest technologically and economically achievable concentrations which have been determined to be risk based levels for this OU.
		SOIL		
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991 [i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs tit. 22, § 66261.21, 66261 .22(a)(1), 66261.23, 66261 .24(a)(1), and 66261. 100	Applicable	Applicable for determining whether the soil cuttings generated as a result of well development at OU-2A is hazardous.

Notes:
[a] Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables
[b] Only the substantive provisions of the requirements cited in this table are potential ARARs
[c] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only pertinent substantive requirements of the specific citations are considered potential ARARs

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
ch. – chapter
OU – Operable Unit
POC – point of compliance
RCRA – Resource Conservation and Recovery Act
§ – section
TCLP – toxicity characteristic leaching procedure
tit. – title
U.S.C. – *United States Code*

Table B2
State Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation	ARAR Determination	Comments
		GROUNDWATER		
Cal/EPA Department of Toxic Substances Control [c]				
Definition of "non-RCRA hazardous waste."	Waste	Cal. Code Regs. tit. 22, § 66261 .3(a)(2)(C) or 66261 .3(a)(2)(F), 66261 .22(a)(3) and (4), 66261 .24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
State and Regional Water Quality Control Boards [c]				
Authorizes the SWRCB and RWQCB to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality.		Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	Applicable	The Navy accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirements, promulgated policies of the Basin Plan for the San Francisco Bay, as potential ARARs.
Describes the water basins in San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, establishes implementation plans to meet WQOs and protect beneficial uses, and incorporates statewide water quality control plans and policies.		Comprehensive Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) (Cal. Water Code § 13240)	Applicable	Substantive requirements pertaining to beneficial uses, WQOs, and certain statewide water quality control plans are potential state ARARs for the surface water and components of this response action.

Requirements	Prerequisite	Citation	ARAR Determination	Comments
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.		SWRCB Res. 88-63 (Sources of Drinking Water Policy)	Applicable (only for groundwater remedial action)	Substantive requirements are potential ARARs for determining whether groundwater at the site is a potential source of drinking water
Definitions of designated waste, nonhazardous waste, and inert waste.		Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	Potential ARARs for classifying waste and determining ARAR status of other requirements.

Notes:
[a] Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables
[b] Only the substantive provisions of the requirements cited in this table are potential ARARs
[c] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only pertinent substantive requirements of specific citations are considered potential ARARs

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement
Basin Plan – Water Quality Control Plan (RWQCB Region) Basin
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – *California Water Code*
div. – division
Navy – Department of the Navy
gpd – gallons per day
Porter-Cologne Act – Porter-Cologne Water Quality Control Act
ppm – parts per million
RCRA – Resource Conservation and Recovery Act
Res. – Resolution
RWQCB – (California) Regional Water Quality Control Board
§ – section
SWRCB – (California) State Water Resources Control Board
TDS – total dissolved solids
tit. – title
WQO – water quality objective

Table B3
Federal Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination	Comments
National Historic Preservation Act of 1966, as Amended (16 U.S.C. § 470-470x-6)[b]					
Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	Property included in or eligible for the National Register of Historic Places	16 U.S.C. § 470–470x-6 36 C.F.R. pt. 800	Relevant and Appropriate	The substantive provisions of the cited regulation would be relevant and appropriate federal ARARs if the Navy concludes that buildings at OU-2A are eligible for inclusion on the National Register of Historic Places.
Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)					
Migratory bird area	Protects almost all species of native migratory birds inthe U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds	16 U.S.C. § 703	Relevant and Appropriate	Because migratory birds are known to be present near Alameda Point that could stop at OU-2A, substantive provisions are potentially relevant and appropriate

Notes:
[a] Only the substantive provisions of the requirements cited in this table are potential ARARs
[b] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement
C.F.R. – *Code of Federal Regulations*
Navy – Department of the Navy
OU – operable unit
pt. – part
§ – section
U.S. – United States
U.S.C. – *United States Code*

Table B4
State Location-Specific ARARs

Location	Requirements	Prerequisite	Citation	ARAR Determination	Comments
There are no State Location Specific ARARs.					

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement

Table B5
Federal Action-Specific ARARs

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991 [i])*							
On-site waste generation	Person who generates waste shall determine if that waste is a hazardous waste.	Generator of waste	Cal. Code Regs. tit. 22,§ 66262.10(a), 66262.11	IR Sites 9 and 19; IR Site 13			Applicable for any operation where hazardous waste is generated. The determination of whether groundwater and/or wastes generated during remedial activities, such as soil cutting from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
On-site waste generation	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste	Cal. Code Regs tit. 22, § 66264.13(a) and (b)	IR Sites 9 and 19; IR Site 13			Applicable when analyzing waste generated during the groundwater remedial action activities at OU-2A.
Hazardous waste accumulation	Onsite hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.17 1–178 or in tanks, on drip pads, inside buildings, and is labeled and dated, etc.	Accumulate hazardous waste	Cal. Code Regs. tit. 22 § 66262.34	IR Sites 9 and 19; IR Site 13			Substantive requirements are potentially applicable for accumulation of waste for less than 90 days if the waste is hazardous waste and is stored on site. Wastes will not be stored on site for greater than 90 days.
Container storage	Containers of RCRA hazardous waste must be: ▪ maintained in good condition, ▪ compatible with hazardous waste to be stored, and ▪ closed during storage except to add or remove waste.	Storage of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere, in a container.	Cal. Code Regs. tit. 22, § 66264.171, .172, .173	IR Sites 9 and 19; IR Site 13			Substantive requirements are applicable for accumulation of waste for less than 90 days if the waste is RCRA hazardous waste and is stored on site.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Container storage (cont.)	Inspect container storage areas weekly for deterioration.		Cal. Code Regs. tit. 22, § 66264.174	IR Sites 9 and 19; IR Site 13			Substantive requirements are potentially applicable if hazardous wastes are generated and stored on site for less than 90 days.
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.	Storage in a container of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere.	Cal. Code Regs. tit. 22, § 66264.175(a) and (b)	IR Sites 9 and 19; IR Site 13			Potentially applicable if hazardous wastes are generated and stored on site less than 90 days.
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		Cal. Code Regs. tit. 22, § 66264.177	IR Sites 9 and 19; IR Site 13			Potentially applicable for temporary storage of incompatible materials
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners.		Cal. Code Regs. tit. 22, § 66264.178	IR Sites 9 and 19; IR Site 13			Potentially applicable if RCRA hazardous wastes are generated and stored for less than 90 days.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Use of tank systems	Requirements for the design and installation of new tank systems including strength, tightness testing, damage control, support, corrosion control, etc.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.192(a), (b), (c), (e), (f) and (g)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
	Requirements for secondary containment of tank systems.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.193 (b), (c), (d), and (e)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
	Requirements for secondary containment of ancillary equipment	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.193 (f)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
	Requirements for operation of tank systems including spill prevention and prohibitions of material that could cause failure.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.194(a) and (b)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
	Requirements for inspection of tank systems including inspection of overflow protection, corrosion, release, detection equipment, and cathodic protection.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, §66264.195(a), (b), and (c)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
	Requirements for response to leaks and spills from tank systems including removal of system from use if appropriate, containment, cleanup, emergency procedures, etc.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.196(b) except (b)(5) and (b)(7)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Use of tank system (cont.)	Requirements for closure and postclosure care of tank systems decontamination, clean closure and leaving waste in place at closure	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.197(a) and (b)	IR Site 13			If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs.
Monitoring	The RCRA monitoring regulations apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this article apply during the postclosure care period under Cal. Code Regs. tit. 22, § 66264.117 of article 7 of this chapter and during any compliance period under Cal. Code Regs. tit. 22, § 66264.96 unless: (1) the regulated unit has been in compliance with the water quality protection standard for a period of 3 consecutive years; and (2) all waste, waste residues, contaminated containment system components, contaminated subsoils, and all other contaminated geologic materials are removed or decontaminated at closure.	Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.90(c)	IR Sites 9 and 19; IR Site 13			Substantive provisions are relevant and appropriate for groundwater monitoring.
	Owners/operators of RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit.	Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.91(a)(4) and (c), except as it cross-references permit requirements	IR Sites 9 and 19; IR Site 13			Relevant and appropriate for groundwater monitoring.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Monitoring constituents of concern	Constituents of concern are the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste contained in the regulated unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.93		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate for the groundwater remediation.
	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97 (b)(1)(A), (b)(1)(D)(1) and (2), (b) (4-7), (e)(6), (12)(A) and (B), (13), and (15)		IR Sites 9 and 19; IR Site 13		Relevant and appropriate for groundwater monitoring.
	Requirements for a detection monitoring program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.98(e) (1-5), (i), (j), (k)(1-3), (4)(A) and (D),(5), (7)(C) and (D),(n)(1),(2) (B), and (C)		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate for the groundwater remediation.
Corrective action	An owner or operator required pursuant to section 66264.91 to establish a corrective action program for a regulated unit shall, at a minimum, comply with the requirements of this section for that unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(a)		IR Sites 9 and 19; IR Site 13		Relevant and appropriate for groundwater response alternatives.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Corrective action (continued)	The owner or operator shall establish and implement, in conjunction with the (corrective action measures, a water quality monitoring program that will demonstrate the effectiveness of the corrective action program and be effective in determining compliance with the water quality protection standard and in determining the success of the corrective action measures under subsection (c) of this section.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(d)		IR Sites 9 and 19; IR Site 13		Relevant and appropriate for groundwater response alternatives.
	The corrective action program is complete when compliance with the water quality standard is demonstrated based on the results of sampling and analysis for all constituents of concern for a period of 1 year.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(g)(1)		IR Sites 9 and 19; IR Site 13		Relevant and appropriate for groundwater response alternatives.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Safe Drinking Water Act (42 U.S.C. § 300[f]–300[j]-26)*							
Injection	Conduct appropriate geologic drilling logs and other tests during construction.		40 C.F.R. § 146.12 (d), excluding the reporting requirements		IR Site 13		Relevant and appropriate for drilling and construction of injection wells.
	Injection pressure may not exceed a maximum level designed to ensure that injection does not initiate new fractures or propagate existing ones and cause the movement of fluids into a USDW. Continuously monitor injection pressure, flow rate, and volume, and annual pressure, if required. Demonstration of mechanical integrity is required every 5 years. Groundwater monitoring may also be required.		40 C.F.R. § 146.13(a),(b), (d)		IR Site 13		Relevant and appropriate for groundwater reinjection.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	Wastes that no longer exhibit a hazardous characteristic are not prohibited if the wastes are disposed into a nonhazardous or hazardous injection well as defined under 40 C.F.R. § 146.6(a).	Characteristically hazardous wastewaters.	40 C.F.R. § 148.1(d)		IR Site 13		Potential ARAR for groundwater reinjection in Class V wells.

Note:
* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered potential ARARs

Acronyms/Abbreviations
A – applicable
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
C.F.R. – *Code of Federal Regulations*
ICs – intuitional controls
MNA – monitored natural attenuation
Navy – Department of the Navy
IR – Installation Restoration (Program)
OU – operable unit
RA – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
§ – section
TBC – to be considered
tit. – title
U.S.C. – *United States Code*
USDW – underground source of drinking water

Table B6
State Action-Specific ARARs

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
State Water Resources Control Board and Regional Water Quality Control Board*							
Discharges to high-quality waters	Incorporated into all Regional Board Basin Plans. Requires that quality of waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. Discharges to high quality waters must be treated using best practicable treatment or control necessary to prevent pollution or nuisance and to maintain the highest quality water. Requires cleanup to background water quality or to lowest concentrations technically and economically feasible to achieve. Beneficial uses must, at least, be protected.		SWRCB Res. 68-16 (Policy With Respect to Maintaining High Quality of Waters in California) (Cal. Water Code § 13140, CWA regulations 40 C.F.R. § 131.12)		IR Site 13		SWRCB Res. 68-16 is an ARAR for reinjection only. The Navy has determined that VOC migration in groundwater is not a discharge governed by the language in SWRCB Res. 68-16. Alternative 4, the selected remedy at IR Site 13 includes injection of treated groundwater to the shallow groundwater unit and the principal aquifer will comply by removing VOCs to below cleanup levels prior to injection and by injecting into areas with similar concentrations of total dissolved solids and nitrates. The state does not agree with the Navy position regarding the ARAR status.
Actions affecting water quality	Provides water quality criteria for classifying the beneficial use of groundwater as municipal/domestic. Criteria outlined as follows: total dissolved solids 3,000 mg/L or yielding 200 gallons per day or serving as a public water system.	Applies in determining beneficial uses for waters that may be affected by discharges of waste.	SWRCB Res. 88-63 (“Sources of Drinking Water Policy”) (as contained in the Basin Plans)	IR Sites 9 and 19; IR Site 13			Substantive provisions are potential ARARs for determining potential drinking-water sources.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Cal/EPA Department of Toxic Substances Control*							
Land Use Covenants	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when Facility closure, corrective action, remedial or removal action, or other response actions are undertaken and Hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by federal government to non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1(a), (d), and (e)(1)		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate because the Navy is transferring property to a nonfederal agency. Cal. Code Regs. tit. 22, § 67391.1 provides for a land-use covenant to be executed and recorded when remedial actions are taken and hazardous substances will remain at the property at concentrations that are unsuitable for unrestricted use of the land. The substantive provisions of this regulation have been determined to be “relevant and appropriate” state ARARs by the Navy.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
California Civil Code*							
Land-use controls	Provides conditions under which landuse restrictions will apply to l successive owners of land.	Transfer property from the Navy to a nonfederal agency	Cal. Civ. Code § 1471		IR Sites 9 and 19; IR Site 13		These requirements are ARARs in the event of the transfer of the OU-2A property to a non-federal entity. Generally, Cal. Civ. Code § 1471 allows an owner of land to make a covenant to restrict the use of land for the benefit of a covenantee. The covenant runs with the land to bind successive owners, and the restrictions must be reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in Cal. Health & Safety Code § 25260. Substantive provisions are the following general narrative standard: “to do or refrain from doing some act on his or her own (land . . . where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence of hazardous materials, as defined in Section 25260 of the California Health and Safety Code.” This narrative standard would be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer.

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
California Health and Safety Code*							
	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code § 25202.5.		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate since the DON is transferring property to a nonfederal agency. The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . ."
	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health & Safety Code § 25232(b)(1)(A)– (E).	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code § 25222.1 and 25355.5(a)(1)(C)		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate since the DON is transferring property to a nonfederal agency. Generally, Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C) provide the authority for the DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land restricting present and future uses of the land. The substantive requirements of the following Cal. Health & Safety Code § 25222.1 provisions are "relevant and appropriate": (1) the general narrative standard: "restricting specified uses of the property…" and (2) "…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination thereof, as appropriate, upon the present and future uses of the land." The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the land."

Impacted Groundwater at IR Sites 9 and 19: Alternative 2 ICs

Impacted Groundwater at IR Site 13: 4: In-Situ Bioremediation, MNA, and ICs

				ARAR Determination			
Action	**Requirements**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	Provides processes and criteria for obtaining written variances from a landuse restriction and for removal of the land use restrictions.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code §§ 25233(c) and 25234		IR Sites 9 and 19; IR Site 13		Substantive provisions are potentially relevant and appropriate since the DON is transferring property to a nonfederal agency. Cal. Health & Safety Code § 25233(c) sets forth "relevant and appropriate" substantive criteria for granting variances based upon specified environmental and health criteria. Cal. Health & Safety Code § 25234 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land-use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."
	Prohibits certain uses of land containing hazardous waste without a specific variance.	Hazardous waste property.	Cal. Health & Safety Code § 25232(b)(1)(A)–(E)				Substantive provisions are potentially relevant and appropriate since the DON is transferring property to a nonfederal agency. Land-use restrictions will be used to prohibit the following activities for impacted groundwater (IR Sites 9, 13, and 19: residential use of the sites, construction of hospitals for humans, schools for persons under 21 years of age, day care centers for children, or any permanently occupied human habitation on the sites.

Note:
* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific actions are considered potential ARARs.

Acronyms/Abbreviations:
A – applicable
ARAR – applicable or relevant and appropriate requirement
Cal. Civ. Code – *California Civil Code*
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency

Cal. Health & Safety Code – *California Health and Safety Code*
Cal. Water Code – *California Water Code*
C.F.R. – *Code of Federal Regulations*
CWA – Clean Water Act
ICs – institutional controls
IR – Installation Restoration (Program)
mg/L – milligrams per liter
MNA – monitored natural attenuation
Navy – Department of the Navy
OU – operable unit
RA – relevant and appropriate
Res. – resolution
RWQCB – Regional Water Quality Control Board, Santa Ana Region
§ – section
SWRCB – State Water Resources Control Board
TBC – to be considered
tit. – title
VOC – volatile organic compound

APPENDIX C
AUGUST 31, 2011 PUBLIC MEETING TRANSCRIPT

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NAVY'S PROPOSED PLAN FOR OPERABLE UNIT 2A

INSTALLATION RESTORATION PROGRAM

SITES 9, 13, 19, 22, 23

ALAMEDA POINT/FORMER NAVAL AIR STATION ALAMEDA

REPORTER'S TRANSCRIPT OF MEETING

AUGUST 31, 2011

Alameda City Hall West
950 West Mall Square
Building 1, Room 201
Alameda, California

Reported by Christine M. Niccoli, RPR, C.S.R. No. 4569

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ARBITRATIONS * DEPOSITIONS * HEARINGS * MEETINGS
~~~~~~

A T T E N D E E S

FACILITATOR/PRESENTER:

DEREK ROBINSON - United States Navy

CURTIS MOSS - United States Navy

---oOo---

UNITED STATES NAVY

DOUG DeLONG

TONY MEGLIOLA

---oOo---

REGULATOR'S & CONSULTANTS

JAMES R. FYFE - California Department of Toxic Substances Control (DTSC)

WAYNE HAGEN - DTSC

PETER RUSSELL - ARRA consultant

XUAN-MAI TRAN - U.S. Environmental Protection Agency (EPA)

TOMMIE JEAN VALMASSY - Tetra Tech EMI

JOHN WEST - San Francisco Bay Regional Water Quality Control Board

---oOo---

PUBLIC AUDIENCE

RICHARD BANGERT - RAB member

ALEX BOSKOVICH - County Supervisor Chan

ELIZABETH CHAN - Citizen

JOE CHAN - Citizen

CAROL GOTTSTEIN - RAB member

MICHAEL J. TORREY, RAB member

---oOo---

ALAMEDA, CALIFORNIA, WEDNESDAY, AUGUST 31, 2011

6:31 P.M.

---oOo---

MR. DEREK ROBINSON: Welcome, everybody, to the Proposed Plan for Operable Unit 2A. It includes the Sites 9, 13, 19, 22, and 23. If you haven't received a Proposed Plan, please pick one up at the table here as well as there's a sign-in sheet. You're welcome to do that.

This is -- this isn't really a question-and-answer -- or excuse me. It's not a presentation forum. It's kind of more of an open house. So we got Curtis and myself up here next to -- this is the information here on the Proposed Plan. We're happy for you to come up, review these, and ask questions if you have them when you're up here.

We also have a court reporter. So one of the important parts of the Proposed Plan is getting your -- getting your comments on the Navy's and the regulatory agencies' proposed action at these sites. And so the court reporter is here to officially record your comments as well as -- and those comments will then be included in the Record of Decision and officially responded to. So they will go on the record forever, really.

The only one -- The only other thing I was going to just really quick go over with everyone here is the CERCLA process. It's not a short process. At this point, we're at the Proposed Plan, like I just said.

The next stage is the Record of Decision. So depending on comments that we get, we may change what's in the Proposed Plan. But the next one is where it's officially the decision has been made on what to do, and it's recorded, and it's an enforceable document. That's the next step.

Getting up to this point, we have gone through many, many sampling events; and more -- kind of more significantly we have gone through a site inspection and a Remedial Investigation/Feasibility Study.

So those are places in the process where we take samples, evaluate the site, and then come up with alternatives that are then selected. And that's where we are right now is the selection process.

So please feel free. You guys come on up. You could look at these slides, ask any questions you like. And if you have comments, you can either write them down and send an E- -- and mail them to us, or you can give them directly to the court reporter, which is very easy way to do that. So . . .

MR. MOSS: There's no way you can see it from

back there. I apologize. I set up the chairs.

MR. ROBINSON: Yeah, it should have been set up more of an open-house forum. But please come up and take your time and look around, and it's not really a presentation. Yeah.

MR. WEST: I'll sit more up front.

MR. ROBINSON: Yeah, walk around.

MR. MOSS: Thank you all for coming.

Thanks, Derek.

I'm Curtis Moss. I'm the Navy's --

MR. ROBINSON: Oh, I'm sorry. I should have introduced you.

MR. MOSS: -- project manager for this environmental site called Operable Unit 2A, or OU-2A. So thank you for coming and showing your concern.

There's a couple of different ways of recording your comments. I'd just reiterate what Derek said. We do have a court reporter here. And then there's sheets here where you can submit in writing. And you also have 30 days until September 23rd to submit them in writing to Mr. Derek Robinson as well.

So just a quick summary of what we have here today, little background history of where we are at, where we're talking about where we are at on the point, this little section here [indicating]. This is Atlantic

coming in, Main [indicating].

And then we have looked at a summary of all the data that's been collected to evaluate these sites in the second slide in previous investigations.

You'll see we have five Installation Restoration sites, five environmental sites; the risk assessment, taking this data, assessing the hazards to our health and the environment, the preferred remedy that came out of this process, and you'll see the various criteria there that are evaluated in the preferred remedy. And then what you can do; what's the next step is the last slide, how to contact us and what's next.

So feel free to come up; take your time. Hopefully, you've received one in the mail. This is a condensed version.

MS. GOTTSTEIN: And if you didn't, there's a pile of them over there.

MR. MOSS: If you didn't, we brought more.

Yeah.

MR. CHAN: What is the potential impact of these sites on the proposed second site for the Lawrence Livermore Lab event?

MR. ROBINSON: Yeah. Well, I can't comment on that too much. They were here to talk about the

environmental and how we're moving forward on the environmental program.

I can tell you that they are having discussions with the City to make sure that the Navy's environmental program considers and will, if at all possible, make this site available for future development, whether it's Lawrence Livermore or anything else, and that is a concern of ours, and it's something we are always trying to work with the City.

MR. CHAN: But the site that was proposed in the briefings last month or whenever they were here at Alameda Point, does that site overlap with your environmental concern sites here?

MS. GOTTSTEIN: Can you point out where the Berkeley project is supposed to go in relation to what we are talking about tonight?

MR. ROBINSON: Yeah, yeah. Well, you know, that's not really my focus. My focus is environmental. It does slightly overlap. I think Site 9, the one that I did see --

Is it outside of Site 9?

MR. MEGLIOLA: I think it might touch 9.

MR. ROBINSON: Yeah, touch 9. So --

And I can also tell you that my management has had discussions with the City to make sure the site

would be, if at all possible, ready for future development, including Livermore Laboratories.

Please feel free to come up and read these.

We'll go off the record until they make formal comments and all the formal comment period later.

(Whereupon, off record 6:38 p.m.

7:45 p.m. whereupon the record is closed, having received no public comments.)

---oOo---

CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified Shorthand Reporter of the State of California, do hereby certify that this 10-page transcript of the foregoing meeting was reported by me stenographically to the best of my ability at the time and place aforementioned.

IN WITNESS WHEREOF, I have hereunto set my hand this _____ day of _____, _____.

_____
CHRISTINE M. NICCOLI, C.S.R. NO. 4569

APPENDIX D
RESPONSES TO BCT COMMENTS ON THE DRAFT OU-2A RECORD OF DECISION

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Document Title:
Draft Record of Decision for Operable Unit -2A, Former Naval Air Station, Alameda, California

Comments from Xuan-Mai Tran, Remedial Project Manager, Federal Facilities and Site Cleanup Branch, U.S. Environmental Protection Agency, May 24, 2012
General Comments

Comment No.	**Comment**	**Response**
1.	EPA's review of the Draft ROD for OU-2A is based on the expectation that issues relating to the beneficial use of groundwater will be resolved prior to the ROD signature and hopefully before the Draft Final ROD is presented to the regulatory agencies. As noted in the specific comment below the description of the process requires revision.	The Navy anticipates having the additional TDS analyses available for inclusion in the draft final ROD. The Navy will continue to coordinate closely with the regulatory agencies.
2.	The ROD needs to include a description of how the Navy will implement monitor and enforce the ICs including a reference to those elements which will be detailed in the remedial design.	Comment noted. Consistent with the "Navy Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and other Post-ROD Actions" the ROD will include information regarding monitoring and enforcement of the ICs along with a reference to those elements that will be addressed in the remedial design (RD). The ROD will briefly describe the ICs that will restrict use of the land until RGs are met. The specific ICs will be detailed in the Preliminary and Final RD Reports, which shall include a Land Use Control (LUC) RD Section to describe required IC implementation actions. The following text will be included within Section 2.9.1.2 of the ROD:

Comment No.	Comment	Response
2. (cont)		The LUC RD will include: • Requirements for CERCLA five-year remedy review; • Frequency and requirements for periodic monitoring or visual inspections; • Reporting results from monitoring and inspections; • Notification procedures to the regulators for planned property conveyance, corrective action required, and/or response to actions inconsistent with ICs for the remedy; • Consultation with U.S. EPA, DTSC, Water Board, and other government agencies regarding wording for land use restrictions and parties to be provided copies of the deed language once executed; • Identification of responsibilities for Navy, U.S. EPA, DTSC, Water Board, other government agencies, and new property owner for implementation, monitoring, reporting, and enforcement of ICs; • A list of ICs with their expected duration; and • Maps identifying where ICs are to be implemented. The Navy shall be responsible for implementing, monitoring, maintaining inspecting, reporting, and enforcing the necessary ICs described in this ROD in accordance with the approved RD reports. Although the Navy may later transfer these procedural

Comment No.	Comment	Response
2. (cont)		responsibilities to another party by contract, property transfer agreement, or other means, the Navy shall retain ultimate responsibility for remedy integrity. Should any of the ICs fail, the Navy shall ensure that appropriate actions are taken to reestablish protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the Navy's costs for mitigating any discovered IC violation(s). The ICs shall be maintained until such time as VOC concentrations have been reduced or remediated to levels that allow for unrestricted site use and exposure. The Navy and FFA signatories and their authorized agents, employees, contractors, and subcontractors shall have the right to enter upon OU-2A to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary.
3.	As the Draft Final ROD developed, the updated California lead standard should be evaluated to ensure that No Further Action for soil at OU-2A is still applicable.	The Navy has evaluated the updated California lead standard and has determined that no further action for soil at OU-2A is still protective of human health and the environment. As detailed in Appendix G of the OU-2A Feasibility Study Report, the calculated exposure point concentrations (EPC) for IR Sites 9, 13, 19, and 23 for lead were 9.28, 90.77, 38.99 and 17.36 milligrams per kilogram (mg/kg) respectively. Each site-specific EPC is below the updated California Human Health Screening Level (CHHSL) of 80 mg/kg plus background of 13.01 mg/kg at Alameda Point or

Comment No.	Comment	Response
3. (cont)		93 mg/kg. IR Site 22, however, does possess an EPC for lead in excess of the updated CHHSL plus background. The EPC for lead at IR Site 22 (Appendix G of the OU-2A Feasibility Study Report) was calculated as 830.4 mg/kg. As discussed in the FS, the elevated EPC was caused, principally, by one elevated lead detection at MW547-5. As part of the data gaps investigation conducted during the preparation of the Feasibility Study, three additional soil samples were collected at locations within 7.5 feet of MW547-7, and analyzed for lead concentrations. All lead sampling results were below the screening level. The Supplemental Data Gap Investigation concluded that the high lead concentration reported at MW547-5 was not consistent with results from adjacent sample locations, and likely an anomalous result. The Navy discussed theses results, along with the 64 remaining soil samples analyzed for lead at IR Site 22 that did not contain concentrations of lead in excess of 207 mg/kg with the BCT, and determined lead does not present unacceptable risk to human health at OU-2A and consequently, lead is not a COC at IR Site 22.
4.	The ROD needs to clearly state any restrictions associated with vapor intrusion during remediation (i.e., residential use, commercial/construction, etc.)	Comment noted. Please refer to the response to U.S. EPA comment 2, above. The ROD will include a description of restrictions applicable to residential use that will require vapor intrusion mitigation for residential buildings constructed over the plume until residential vapor intrusion risk-based criteria are met.

Comment No.	Comment	Response
5.	The ROD needs to include the findings of the updated toxicity assessments (i.e., TCE, PCE). Please provide the updated risk assessment based on revised toxicity values and discuss any changes in risk and their potential impact on protectiveness.	Section 2.5.1 of the ROD will be revised to state that Navy and U.S EPA both independently evaluated changes to toxicity criteria for TCE and PCE since the risk assessment was completed, and determined that the remedy at OU-2A remains protective of human health and the environment based on the updated toxicity criteria. Section 2.5.1 will also include text stating that the Navy also evaluated the change to the lead standard and that the remedy remains protective of human health and the environment.

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Comments from Xuan-Mai Tran, Remedial Project Manager, Federal Facilities and Site Cleanup Branch, U.S. Environmental Protection Agency, May 24, 2012
Specific Comments

Comment No.	**Comment**	**Response**
1.	**Section 1.2, Original Selected Remedies from the August 2011 Proposed Plan, Page 1:** Caption and text need to reflect the fact that the Proposed Plan did not select the remedies. Please change the caption for Section 1.2 from "Original Selected Remedies from the August 2011 Proposed Plan" to "Remedy Selection".	The text will be revised as suggested.
2.	**Section 1.2, Original Selected Remedies from the August 2011 Proposed Plan, Page 1:** The first paragraph of the text needs to be separated from the discussion of the Proposed Plan. Please include the first paragraph, "The Department of the Navy … , and the Water Board." under Section 1.2 Remedy Selection. Then, please start a new section as follows: **"1.2.1, Remedies Described in the August 2011 Proposed Plan** The following remedies, listed by IR site, were presented in the Proposed Plan:"	The text will be updated as suggested, and included in Section 1.2.1.
3.	**Section 1.2, Original Selected Remedies from the August 2011 Proposed Plan, Page 2:** The last paragraph, "This ROD is based on information … (Appendix A)." needs to move to the end of the Section 1.2 Remedy Selection.	The text will be revised as suggested.
4.	**Section 1.3, Groundwater Beneficial Use Evaluation, Page 2:** Please revise this section to read as follows: "Since the completion of the Proposed Plan in August 2011,	The text will be revised as requested.

Comment No.	Comment	Response
4. (cont)	the Navy and regulatory agencies have evaluated the potential of shallow groundwater adjacent to and beneath OU-2A to serve as future municipal water source. This evaluation used several lines of evidence and concluded that groundwater beneath OU-2A does not qualify as a potential source of drinking water under federal and state regulations/guidelines. Lines of evidence included proximity to San Francisco Bay and potential for salt water intrusion, high salinity, current county institutional restrictions on well installation in shallow groundwater, and potential for surface runoff to contaminate groundwater. The Navy sent this information to the California Water Board in a letter dated [insert final date of the letter]. Additionally, the City of Alameda has informed the Navy and regulatory agencies that the City does not intend to use shallow groundwater as a domestic or municipal source of water at Alameda Point in a letter dated January 23, 2012. The BCT evaluated this information and concluded on [insert the concurrence date] that the shallow groundwater does not meet the criteria for a potential drinking water aquifer."	
5.	**Section 1.4, Revised Selected Remedies, Page 2:** Please change the caption from "Revised Selected Remedies" to "Selected Remedies". The first sentence should be modified since the Proposed Plan remedies were never selected. In addition, the phrase "unlikely to be used" appears in a number of places throughout the document needs to be replaced. Please replace the "unlikely to be used" with the following text: " Because shallow groundwater has been demonstrated not to be a potential source of drinking water, MCLs are no longer applicable or relevant and appropriate requirements	The section title will be changed as suggested. The first sentence will be revised as below: "As a result of the groundwater beneficial use evaluation, the remedies proposed in the 2011 OU-2A Proposed Plan have been changed to adequately address the updated site model which now excludes site groundwater as a municipal water source. The following text was added to Section 2.5.1 (p. 22): "The exposure pathways under Group 2 represent the

Comment No.	Comment	Response
5. (cont)	(ARARs). As a result, the only remaining exposure pathway for volatile contaminants to reach on-site receptors is through vapor intrusion."	most reasonable residential exposure pathways, because shallow groundwater at OU-2A has been demonstrated not to be a potential future drinking-water source."
6.	**Section 1.4, Revised Selected Remedies, Page 3:** Second bullet, IR Site 13, please insert "vapor intrusion" to read as "In-situ Bioremediation (ISB), MNA, and ICs until vapor intrusion RGs are met."	The text will be revised as suggested.
7.	**Section 1.4, Revised Selected Remedies, Page 3:** The last paragraph, "ISB and MNA at IR Site 13 … the potential for exposure." needs to be revised. Please change the text in this paragraph to read as follows: "ISB and MNA at IR Site 13 will reduce concentrations of benzene and ethylbenzene to acceptable levels. ICs at IR Sites 9 and 19 will include non-engineered instruments such as administrative and/or legal controls that prevent municipal and domestic use of groundwater. The restrictions will prevent exposure to onsite receptors to the groundwater ingestion pathway. ICs would be implemented as described in Section [<u>insert section number for ICs description section</u>]." Please note that the ICs description section is missing from the ROD (see General Comment 2).	The text will be revised as follows: "ISB and MNA at IR Site 13 will reduce concentrations of benzene and ethylbenzene to acceptable levels. ICs at IR Sites 9 and 19 will include non-engineered instruments such as administrative and/or legal controls that prevent municipal and domestic use of groundwater. The restrictions will prevent exposure to onsite receptors to the groundwater ingestion pathway. The ICs will be legal and administrative mechanisms used to implement land use restrictions that are used to limit the exposure to groundwater and to vapors from groundwater of future landowners and users of the property to maintain the integrity of the selected remedies. A covenant to restrict the use of property (CRUP) will incorporate the ICs into environmental restrictive covenants that run with the land and are enforceable by DTSC and any other signatory state entity against future transferees. Routine monitoring of the ICs will be detailed in the remedial design documents.

Comment No.	Comment	Response
7. (cont)		The long-term LUCs applicable to future residential construction would require vapor intrusion mitigation for residential buildings constructed over the plume until the site's EPC is less than the residential vapor intrusion risk-based criteria, at which time long-term LUCs for vapor intrusion will be terminated.
8.	**Section 1.5, Assessment of the Sites, Page 3:** First sentence, please change "that no action is required …." to "that no further action is required …."	The text will be revised as suggested.
9.	**Section 1.5, Assessment of the Sites, Page 3:** Please insert the following text after the first sentence in the first paragraph: "However, the tarry refinery waste remains which are expected to be addressed under the petroleum program.	Please see Section 2.5.1.2 for a discussion of the risk due to refinery waste. Refinery waste was evaluated under CERCLA in the OU-2A risk assessment and found not to present unacceptable risk, therefore no further action is warranted. Refinery waste is not intended to be transferred to the petroleum program.
10.	**Section 1.5, Assessment of the Sites, Page 3:** Fourth bullet, please change "Previous removal actions" to "Previous response actions"	The text will be revised as suggested.
11.	**Section 1.5, Assessment of the Sites, Page 3:** Second paragraph, please revise the last sentence to read as "This determination is based on the conclusion of the beneficial use evaluation that site groundwater described above."	The text will be revised as follows: "This determination is based on the conclusion of the beneficial use evaluation that site groundwater does not meet the criteria for a potential drinking water source."

Comment No.	Comment	Response
12.	**Section 1.5, Assessment of the Sites, Page 3:** Last paragraph, the sentence "Site-wide risk …." needs to be clarified as to why the text refers to site-wide risk if something else is the driver?	The term "site-wide" will be deleted.
13.	**Section 1.5, Assessment of the Sites, Page 3:** Please add the following sentence to the end of the last paragraph "Risk associated with the Marsh Crust was addressed in the 2001 RAP/ROD which included the Subtidal Area where OU-2A is located."	The text will be added as suggested.
14.	**Section 1.6, Statutory Determination, Page 4:** The verb conducted goes with active remediation, please reverse the order of the sentence so that it starts with IR Site 13 then refer to implementing ICs at the other sites. Please revise the second sentence of this section to read as "Remedial action, consisting of ISB, MNA and ICs for IR Site 13 and ICs to restrict contact with or use of OU-2A groundwater at Sites 9 and 19."	The text will be revised as suggested.
15.	**Pages 2 thru 4:** Due to the revisions from the above comments, please re-number the sections as follows: 1.2 Remedy Selection 1.2.1 Remedies Described in the August 2011 Proposed Plan 1.2.2 Groundwater Beneficial Use Evaluation 1.2.3 Selected Remedies 1.3 Assessment of the Sites 1.4 Statutory Determinations 1.5 Data Certification Checklist 1.6 Authorizing Signatures	The text will be revised as suggested.

Comment No.	Comment	Response
16.	**Section 1.8, Authorizing Signatures:** Please revise the signature block for EPA as follows: Michael M. Montgomery Assistant Director Federal Facilities and Site Cleanup Branch, Region 9 United States Environmental Protection Agency	The text will be revised as suggested.
17.	**Section 2.1, Site Description and History, Page 7:** The Navy acquired the "land" not the "island" in 1936. Please revise.	The text will be revised as suggested.
18.	**Section 2.1, Site Description and History, Page 8:** First sentence, please change "OU-2A is located in the southwestern corner of .... " to "OU-2A is located in the southeastern portion of ...."	The text will be revised as suggested.
19.	**Section 2.1.1, IR Site 9 - Paint Stripping Facility, Page 9:** Second paragraph, was the IWTP clean closed in 1998? Please clarify.	The reference will be revised to link to the closure letter from DTSC dated March 9, 1998, which states: "1. The report [Closure Certification Report] certified that Building 410 Industrial Wastewater Treatment Plant (IWTP) has been closed in accordance with the approved closure plan. 2. The closure complied with the requirements in California Code of Regulations, Title 22, Chapter 15, Article 7 I (closure of ISD facilities). 3. Confirmation soil samples show metals, volatile organic compounds and semi-volatile organic compounds are all below residential preliminary

Comment No.	Comment	Response
19. (cont)		remediation goals (PRGs). This letter is to acknowledge that DTSC has reviewed this report and accepts this closure certification and considers Building 410 IWTP officially closed."
20.	**Section 2.1.2, IR Site 13 - Former Oil Refinery, Page 10:** In the second paragraph, please also reference the 2001 Marsh Crust RAP/ROD.	The text will be revised as follows: IR Site 13 includes areas where the Marsh Crust is known to exist. Based on the 2001 Marsh Crust RAP/ROD, the Marsh Crust Ordinance limits the extent of excavations to designated threshold depths.
21.	**Section 2.2, Site Characteristics, Page 13:** Below is the proposed text to address the Marsh Crust by reference to the prior 2001 RAP/ROD: "In 2001, prior to the listing of Alameda Point on the NPL, the Navy and the State regulators signed the Remedial Action Plan/Record of Decision for the Marsh Crust at the Fleet and Industrial Supply Center Oakland Alameda Facility/Alameda Annex and for the Marsh Crust and Former Subtidal Area at Alameda Point, which selected an institutional controls remedy for the Marsh Crust at Alameda Point, including portions of the sites that included in this ROD. The selected remedy requires a deed restriction and a CRUP for any property transferred from federal ownership. The deed restriction and the CRUP require compliance with the City of Alameda's Marsh Crust Ordinance. The IC provisions selected by this ROD will also be used to implement the restrictions selected by the 2001 RAP/ROD."	The Navy will include the text as recommended. However, the Navy recommends that the text be included in Section 2.1.1, where the Marsh Crust is first discussed rather than Section 2.2.

Comment No.	Comment	Response
22.	**Table 2-4, Residential and Commercial Vapor Intrusion Criteria for Groundwater - IR Sites 9, 13, and 19:** Please revise this table to make the table title consistent with its content. The content only includes the RGs for Site 13.	The Table title will be revised to "Table 2-4, Residential and Commercial Vapor Intrusion Criteria for Groundwater - IR Site 13". It will be further clarified that the commercial VI value is Site 13's Remedial Action RG, and the residential VI value is the long-term IC termination criteria for residential reuse restrictions.
23.	**Acronyms and Abbreviations, Page 61:** Please update the acronyms and abbreviations list to include the new ones that are being used (i.e., RAP/ROD, CRUP, etc).	The acronyms and abbreviations will be updated as suggested.
24.	**Appendix A, Administrative Record as of January 27, 2011:** Please remove the entire content of this Appendix from the hard copy and only include it on the CD.	The Administrative Record will be included on the CD only as reference 1, rather than as Appendix A.
25.	**Appendix C, ARARs:** Please eliminate the references to Cal. Health and Safety Code §25202.5, §25222.1, §25355.5, §25233, §25234, §25232. These are authorizing statues and do not relate to activities at Alameda Point. Citation to DTSC regulation and to §1471 are sufficient.	The references will not be eliminated as requested. In accordance with prior RODs at Alameda Point, the State of California maintains, and the Navy concurs that the identified citations are potential ARARs and should be referenced.

Comments from John West, Remedial Project Manager, Groundwater Protection Division, California Regional Water Quality Control Board, San Francisco Bay Region, May 25, 2012

Comment No.	**Comment**	**Response**
1.	**Groundwater Beneficial Use Exception**. Based upon the groundwater quality information found in the surrounding area Water Board staff concur with the Navy's conceptual model that the beneficial use of shallow groundwater in OU-2A probably will not meet the drinking water beneficial use criteria due to high Total Dissolved Solid (TDS) levels. However, until other lines of evidence like the current sampling data gaps activities reasonably substantiate that conceptual model, and, that the Water Board formally concurs with the Navy's January 23, 2012 request, we can not support the beneficial use exception for shallow groundwater as a municipal or domestic drinking water source at OU-2A. As the change of groundwater clean-up goals is directly tied to this beneficial use exception being accepted, it is very important that this issue be resolved before the final ROD and BCT signature stage. Otherwise, we will not be able to support and sign the final ROD package.	The Navy recognizes that it is important to resolve all issues relating to the groundwater beneficial use exception before the ROD is signed. The Navy is collecting the additional data requested by the Water Board and will provide the data to the BCT in early July 2012. The Navy will continue to coordinate closely with the regulatory agencies in this matter.
2.	**IR Site 13 – Former Oil Refinery**. The destiny and future management of the refinery wastes known as the Tarry Refinery Waste (TRW) at Site 13 have been discussed at some length during BCT meetings. However, we are still unclear of the regulatory program and institutional controls that will address it. It is my understanding that the last	Please see Section 2.5.1.2 for a discussion of the risk due to refinery waste. Refinery waste was evaluated under CERCLA in the OU-2A risk assessment and found not to present unacceptable risk, therefore no further action is warranted. Refinery waste is not intended to be

Comment No.	Comment	Response
2. (cont)	proposal made by the Navy was that TRW issues were to be transferred to the Petroleum Program because the TRW may not meet the requirements of being a CERCLA hazardous material. However the Petroleum Program manages fuel release related issues and not legacy waste issues. Please clarify what the Navy proposes for future steps in managing the TRW at Site 13.	transferred to the petroleum program.
3.	**Vapor Intrusion**. The ROD needs to clearly state any restrictions and associated land use controls associated with vapor intrusion concerns that might occur during remediation (i.e., residential use, commercial/construction, etc.).	The localized benzene plume at Site 13 is the only area in OU2A requiring vapor intrusion ICs. The long-term ICs applicable to future residential construction at Site 13 would require vapor intrusion mitigation for residential buildings constructed over the plume where there is a risk via vapor intrusion. Engineering controls may be used by the future landowner for residential construction until the long-term IC termination criteria (i.e., residential RGs) for groundwater are met.
4.	**Updated Risk Assessment Based on Revised Toxicity Values**. The ROD needs to include the findings of the updated toxicity assessments (i.e., TCE, PCE). Please provide the updated risk assessment based on revised toxicity values and discuss any changes in risk and their potential impact on protectiveness.	See Response to U.S. EPA General Comment Number 5 (Page 3).
5.	**Updated Lead Standard.** As the Draft Final ROD is being developed, the updated California lead standard should be evaluated to ensure that No Further Action for soil at OU-2A is still applicable.	See Response to U.S. EPA General Comment Number 3 (Page 2).

Comments from Peter Russell, consultant to the City of Alameda, April 20, 2012

Comment No.	Comment	Response
1.	Section 2.5.1.4, page 27: The text states a different human health risk and a different health hazard from Table 2-2 (page 23). According to Table 2-2, Exposure Group 2 risk is 3.E-04 and HI is 22 (for 0-8 feet bgs plus groundwater, but 2.E-04 and 6, respectively, for soil 0-2 feet bgs plus groundwater). The text on page 27 is "Under the Exposure Group 2 scenario...cancer risk is within the risk management range of 10^-4 to 10^-6 for carcinogens, and the HI is 4.0." Similar discrepancies between the text of Sections 2.5.1.1, 2.5.1.2, 2.5.1.3, and 2.5.1.5 and Table 2.2 occur. Please consider clarifying which risks and HIs are correct.	In Section 2.5.1.4, the HI value for shallow soil will be corrected to "6.0" and the text will be revised as follows. "Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total U.S. EPA cancer risk for CERCLA related contaminants is within the risk management range of 10^{-4} to 10^{-6} for carcinogens <u>in both surface and subsurface soil</u>. <u>The total U.S. EPA cancer risk (including both CERCLA and Petroleum related contaminants is slightly greater than the risk management range. The total HI is 6.0 in surface soil, and 22 in subsurface soil</u>. <u>The elevated cancer risk and HI are attributed to the presence of constituents related to the petroleum release that will be addressed separately by the Petroleum Program</u>." For clarification, a notation will be added to Table 2-2: "Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the cancer risk and HI, and are being addressed under the Petroleum Program. For groundwater, benzene is a major cancer and noncancer risk driver due to vapor intrusion into

Comment No.	Comment	Response
1. (cont)		indoor air. As a former gasoline service station, Site 22 is being addressed under the Petroleum Program. The carcinogenic risk at IR Site 22 from exposure to groundwater via vapor intrusion only is within the risk management range." In Sections 2.5.1.1, 2.5.1.2, 2.5.1.3 and 2.5.1.5, the cancer risk values for IR Sites 9, 13, 19, and 23 are all within the risk management range of 10^{-4} to 10^{-6} as stated in the text. The HI's reported for the sections in text were typographical errors. The values in Table 2-2 are correct, and the text will be revised to reflect the HI presented in Table 2-2.
2.	Table 2-4, page 32: This table lists residential and commercial vapor intrusion criteria (RGs) for groundwater at IR Site 13. Please note that the area to be remediated in IR Site 13 is planned for commercial mixed use, which includes residential use. Presumably the purpose of also listing the commercial RG is to aid in designing interim ICs. Please consider clarifying this point.	The Navy's RGs are based on current use at Site 13, commercial/industrial. Interim ICs will prevent commercial exposure/construction until commercial RGs are met. Long-term LUCs will either prevent residential construction or require vapor mitigation engineering controls until residential LUC termination criteria are met. The residential VI criteria (RGs) are provided as the long-term LUC termination criteria; this distinction will be clarified in the draft final ROD. The text will be revised as follows: Vapor intrusion risk- based RGs for groundwater at IR Site 13 are presented in Table 2-4 below. The commercial RGs are presented as the RG that will meet the criteria for the current site use,

Comment No.	Comment	Response
2. (cont)		commercial/industrial. The implementation of the interim IC which restricts but does not prohibit, the use of the property for residential use, will provide the requirement that residential uses incorporate appropriate vapor intrusion risk management requirements."
3.	Tables 2-6 and 2-7, page 35 and 36: These tables for comparison of groundwater Remedial Alternatives show Alternative 2 (MNA and ICs) scored as "Fair" for the NCP Criterion Reduction in Toxicity, Mobility, and Volume through Treatment [as a Principal Element], even though this alternative involves no treatment whatsoever. The error is propagated into the draft ROD after having appeared in OU-2A's Proposed Plan and Feasibility Study, despite comments that this is incorrect from the environmental regulatory agencies and the ARRA. The Navy's prior responses that toxicity, mobility, and volume are reduced through natural processes in the absence of treatment (heavily paraphrased) defeats the purpose of the criterion. Please indicate Alternative 2 is "Poor" for this criterion on these tables.	The Navy has previously responded that toxicity and volume will be reduced through the remedy of natural attenuation. Although natural attenuation is not an "engineered" treatment technology, it is a treatment "process" and a "fair" rating is warranted.
4.	Section 2.9.1.4, page 43: The entry for the statutory determination regarding Preference for Treatment as a Principal Element is: "ICs will restrict the municipal or domestic use of groundwater at the sites." This entry is irrelevant and fails to disclose that treatment is not a principal element of Alternative 2; it is not even a minor element. Please consider changing the entry to "Treatment is not an element of the remedy for IR Sites 9and 19." This admission should not thwart selection of Alternative 2 for IR Sites 9 and 19, because it is the best alternative otherwise.	The text will be revised as follows: "Active treatment is not an element of the remedy for IR Sites 9 and 19."

Comment No.	Comment	Response
5.	Section 2.9.1.2, page 44: The description of the selected remedy for IR Site 13 does not explicitly state what the RGs are for groundwater. The second paragraph of this section includes "...pre-design investigations will be conducted to optimize the target treatment zone at IR Site 13 to focus on areas with benzene concentrations above 11.26 micro-grams per liter (µg/L) and ethylbenzene concentrations above 31.46 µg/L (Table 2-4)." These concentrations are those listed on Table 2-4 for residential land use, however the text does not identify them as the ROD's RGs. Please consider clarifying that these two concentrations are the RGs for groundwater at IR Site 13.	The text will be revised as follows: “pre-design investigations will be conducted to optimize the target treatment zone at IR Site 13 to focus on areas with COC concentrations exceeding commercial RGs (Table 2-4). The pre-design investigations may include membrane interface probe advances, injection testing, and installation of monitoring wells and groundwater sampling and analyses for COCs. In addition, ICs will ensure that potential, future residential users are protected through requirements to install and maintain vapor barriers or venting systems in residential structures until residential LUC termination criteria are met."

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ALAMEDA POINT

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
1	Administrative Record	Section 1.2	Administrative Index for OU-2A, IR Sites 9, 13, 19, 22 and 23.

DRAFT ENVIRONMENTAL RESTORATION RECORD INDEX - UPDATE (SORTED BY RECORD NUMBER)

RECORDS RELATED TO OU 2A AND SITES 9, 19, 22 AND 23

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000007 TC.0202.10421 & EFAW SER 612.14/L0044 REPORT N62474-94-D-7609 113	**01-15-2001** 08-17-2000 5090.3.C. 00202	HUTCHISON, N. TETRA TECH EM, INC. G. CLARK NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL STORM SEWER STUDY REPORT, TOTAL PETROLEUM HYDROCARBON (TPH) ADDENDUM (INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK, RESPONSE TO COMMENTS ON THE DRAFT STORM SEWER STUDY REPORT DATED SEPTEMBER 1999) (*SEE COMMENTS)	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000005 SITE 00018	FRC - PERRIS IMAGED APNT_003	L181-03-0179 BX 0001 41074200
SF_N00236_000042 DS.0202.13653 REPORT N62474-94-D-7609 192	**12-04-2000** 12-18-2000 5090.3.C. 00202	HUTCHISON, N. TETRA TECH EM, INC. G. CLARK NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL STORM SEWER STUDY REPORT {SEE AR #7 - DRAFT FINAL STORM SEWER STUDY REPORT ADDENDUM & #240 - TECHNICAL MEMORANDUM ADDENDUM}	SENSITIVE SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000005	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0001 40095306 SAN
SF_N00236_000053 DS.0386.15580, 15580-01 AND 15580-02 REPORT N62474-94-D-7609 163	**01-05-2001** 01-05-2001 5090.3.C. CTO 0386	FENNESSY, C. TETRA TECH EM, INC. CLARK, G. NAVFAC - SOUTHWEST DIVISION	DRAFT REMOVAL ACTIONS FOR DISSOLVED-PHASE GROUNDWATER CONTAMINANTS, ENGINEERING EVALUATION AND COST ANALYSIS (EE/CA) - INCLUDES REVISION 2 REPLACEMENT PAGES ISSUED 17 APRIL 2001	SITE FILE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0001 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000058 SWDIV SER 06CA.GC/1044 CORRESPONDENCE NONE 3	**12-27-2000** 02-01-2001 5090.3.A. NONE	CLARK, G. NAVFAC - SOUTHWEST DIVISION M. CASSA DTSC, BERKELEY, CA	IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR REMOVAL ACTIONS	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00011 SITE 00016 SITE 00019 SITE 00021	FRC - PERRIS IMAGED APNT_003	L181-03-0179 BX 0002 41074200
AR_N00236_000091 2199.9285 (LBJ) CORRESPONDENCE NONE 4	**03-16-2001** 06-25-2001 5090.3.A. NONE	JOB, B. CRWQCB - OAKLAND, CA MCCLELLAND, M. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT REMOVAL ACTIONS FOR DISSOLVED - PHASE GROUNDWATER CONTAMINANTS, ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0003 41074200
AR_N00236_000092 NONE CORRESPONDENCE NONE 8	**04-09-2001** 06-25-2001 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA CLARK, G. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT REMOVAL ACTIONS FOR DISSOLVED - PHASE GROUNDWATER CONTAMINANTS, ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) [WITH ENCLOSURE]	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0003 41074200
AR_N00236_000093 NONE CORRESPONDENCE NONE 4	**04-12-2001** 06-25-2001 5090.3.A. NONE	CASSA, M. DTSC - BERKELEY, CA CLARK, G. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT REMOVAL ACTIONS FOR DISSOLVED - PHASE GROUNDWATER CONTAMINANTS, ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0003 41074200
AR_N00236_000190 1518.0, 1518.1 & SWDIV SER 06CA.GL/0617 & 0756 REPORT N62474-98-D-2076 422	**07-20-2001** 07-12-2001 5090.3.A. CTO 0037	MOISE, M. IT CORPORATION NAVFAC - SOUTHWEST DIVISION	FINAL CORRECTIVE ACTION WORK PLAN, HYDROCARBON PLUME DELINEATION, REMEDIATION, & SITE CLOSURE MEASURES, REVISION 1 (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT, DATED 11 JUNE 2001, TO FINAL)	ADMIN RECORD INFO REPOSITORY	CAA 000007 CAA 000011 CAA 000013 SITE 00007 SITE 00013 SITE 00023	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0009 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000198 NEESA 13-014 REPORT N62474-82-C-8272 176	**04-01-1983** 11-24-1999 5090.3.A. NONE	ECOLOGY AND ENVIRONMENT, INC. NAVFAC - EFA WEST	INITIAL ASSESSMENT STUDY (IAS)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED APNT_009	L181-03-0179 BX 0010 41074200
AR_N00236_000204 TC.0386.11025 & SWDIV SER 06CA.GC/0701 CORRESPONDENCE N62474-94-D-7609 22	**07-06-2001** 07-12-2001 5090.3.A. 00386	CLARK, G. NAVFAC - SOUTHWEST A. COOK US EPA - SAN FRANCISCO	RESPONSE TO COMMENTS ON THE DRAFT REMOVAL ACTIONS FOR DISSOLVED-PHASE GROUNDWATER CONTAMINANTS ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) {A PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0010 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000212 NONE REPORT NONE 215	**08-01-1988** 11-24-1999 5090.3.C. NONE	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT SAMPLING PLAN (SP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 1 OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0007 40095306 SAI

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000214 NONE REPORT NONE 66	**08-01-1988** 11-24-1999 5090.3.C. NONE	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT HEALTH AND SAFETY PLAN (HASP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 2 OF 8] {INCLUDES APPENDICES A THROUGH C} (***SEE COMMENTS)	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0011 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		
AR_N00236_000240 TC.0202.11178 OTHER N62474-94-D-7609 47	**08-30-2001** 09-25-2001 5090.3.A. 00202	HUTCHISON, N. TETRA TECH EM, INC. G. CLARK NAVFAC - SOUTHWEST DIVISION	STORM SEWER STUDY - TECHNICAL MEMORANDUM ADDENDUM AND RESPONSE TO CRWQCB, DTSC, & EPA COMMENTS {SEE AR #7 - DRAFT FINAL STORM SEWER STUDY REPORT ADDENDUM & #42 - DRAFT FINAL STORM SEWER STUDY REPORT} (MISSING FIGURES 3-4C AND 3-5C)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000005 SITE 00018	FRC - PERRIS IMAGED APNT_003	L181-03-0179 BX 0012 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000258 NONE REPORT N62474-85-D-5620 27	**09-01-1988** 11-24-1999 5090.3.C. DO 001 & DO 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT AIR SAMPLING PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 1B OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0012 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000259 NONE REPORT N62474-85-D-5620 38	**11-01-1988** 11-24-1999 5090.3.C. DO 0005	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT PROJECT MANAGEMENT PLAN/SCHEDULE, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 5 OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0012 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000260 NONE REPORT N62474-85-D-5620 85	**12-01-1988** 11-24-1999 5090.3.C. DO 0005	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT DATA MANAGEMENT PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 6 OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0012 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000261 NONE REPORT NONE 345	**12-01-1988** 11-24-1999 5090.3.C. NONE	CLEMENT ASSOCIATES NAVFAC - EFA WEST	FINAL DRAFT PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION PLAN (PHEE), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 7 OF 8] {MISSING SECTION 3} (***SEE COMMENTS)	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0013 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000262 NONE REPORT N62474-85-D-5620 78	**12-01-1988** 11-24-1999 5090.3.C. DO 0005	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT FEASIBILITY STUDY (FS) PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 8 OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0013 41074200

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					SITE 00020 YARD D-13		
SF_N00236_000267 DS.0386.15778 & SWDIV SER 06CA.GC/1090 REPORT N62474-94-D-7609 282	**10-15-2001** 11-02-2001 5090.3.C. 00386	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT DISSOLVED PHASE GROUNDWATER CONTAMINANTS, NON-TIME CRITICAL REMOVAL ACTION, ACTION MEMORANDUM (INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK) [MISSING TABLE 2-8 IN SECTION 2]	SITE FILE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_003	L181-03-0179 BX 0013 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000274 NONE REPORT N62474-85-D-5620 123	**12-01-1988** 11-24-1999 5090.3.A. DO 001 & DO 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL HEALTH AND SAFETY PLAN (HASP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 2 OF 8] {INCLUDES APPENDICES A THROUGH H} (***SEE COMMENTS)	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0013 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000275 NONE REPORT N62474-85-D-5620 34	**12-01-1988** 11-24-1999 5090.3.A. DO 001 & 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL AIR SAMPLING PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 1B OF 8] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0013 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000291 NONE REPORT N62474-85-D-5620 212	**01-01-1989** 11-24-1999 5090.3.A. DO 001 & DO 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	SAMPLING PLAN (SP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 1 OF 8] (REVISED VERSION) [***SEE COMMENTS]	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0013 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		
SF_N00236_000308 1249 & SWDIV SER 06CA.GC/0816 REPORT N62474-98-D-2076 279	**08-10-2001** 12-13-2001 5090.3.C. CTO 0059	IT CORPORATION NAVFAC - SOUTHWEST DIVISION	DRAFT PROJECT PLANS (WORK PLAN, QUALITY CONTROL PLAN, SAMPLING & ANALYSIS PLAN & SITE HEALTH & SAFETY PLAN) FOR THE AIR SPARGING/SOIL VAPOR EXTRACTION PILOT TEST REMOVAL ACTIONS, REVISION 1 [INCLUDES RESPONSE TO NAVY COMMENTS ON PRELIMINARY DRAFT]	SENSITIVE SITE FILE	"PERCHLORATE" SEARCH - ROUND 1 SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0007 40095306 SAN
AR_N00236_000309 NONE CORRESPONDENCE NONE 8	**10-12-2001** 12-13-2001 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA CLARK, G. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT PROJECT PLANS, AIR SPARGING/SOIL VAPOR EXTRACTION PILOT TEST FOR REMOVAL ACTIONS (W/ ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0007 40095306 SAN
SF_N00236_000313 2700.0 REPORT N62474-98-D-2076 501	**12-18-2001** 01-04-2002 5090.3.C. CTO 0078	MCGUIRE, J. IT CORPORATION WEISSENBORN, R. NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN FOR BASEWIDE GROUNDWATER MONITORING PROGRAM	SENSITIVE SITE FILE	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00021 SITE 00025 SITE 00026 SITE 00027	FRC - PERRIS IMAGED APNT_002	L181-08-0082 BX 0007 40095306 SAN

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000322 NONE REPORT NONE 45	**02-01-1989** 11-24-1999 5090.3.A. NONE	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL PROJECT MANAGEMENT PLAN/SCHEDULE, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 5 OF 8] (SEE AR #322 - EFAW TRANSMITTAL LETTER BY R. SERAYDARIAN) {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0014 41074200

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					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000351 NONE REPORT N62474-85-D-5620 154	**05-01-1989** 11-24-1999 5090.3.A. DO 001 & DO 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	REVISED FINAL HEALTH AND SAFETY PLAN (HASP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 2 OF 8] {INCLUDES APPENDICES A THROUGH J} (***SEE COMMENTS)	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0014 41074200

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					SITE 00020 YARD D-13		
AR_N00236_000354 2119.9285 (LMM) CORRESPONDENCE NONE 9	**01-28-2002** 04-10-2002 5090.3.A. NONE	MEILLIER, L. CRWQCB - OAKLAND, CA WEISSENBORN, R. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT WORK PLAN FOR BASEWIDE GROUNDWATER MONITORING PROGRAM (PORTION OF THE DISTRIBUTION LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 OU 0000001 SITE 00004 SITE 00005 SITE 00008 SITE 00009 SITE 00016 SITE 00025 SITE 00026 SITE 00027 UST 0000608-1	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0001 41031858

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AR_N00236_000361 NONE REPORT NONE 86	**05-01-1989** 11-24-1999 5090.3.A. NONE	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	DATA MANAGEMENT PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 6 OF 8] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0014 41074200

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					SITE 00020 YARD D-13		
SF_N00236_000364 TC.0386.11571 REPORT N62474-94-D-7609 277	**05-21-2002** 06-17-2002 5090.3.C. CTO 0386	HELGE, J. TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL WATER TOWER & ANTENNA SITES, LEAD REMOVAL ACTION ENGINEERING EVALUATION AND COST ANALYSIS (EE/CA)	SENSITIVE SITE FILE	BLDG 0000033 BLDG 0000036A BLDG 0000036B BLDG 0000061 BLDG 0000073B BLDG 0000088 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 PARCEL 0079 PARCEL 0098 PARCEL 0105 PARCEL 0106 PARCEL 0107 SITE 00008	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0002 41031858

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AR_N00236_000367 SWDIV SER 06CA.AD/0624 CORRESPONDENCE NONE 35	**06-14-2002** 06-18-2002 5090.3.A. NONE	DICK, A. NAVFAC - SOUTHWEST DIVISION A. COOK US EPA - SAN FRANCISCO	TRANSMITTAL OF DRAFT SITE MANAGEMENT PLAN AMENDMENT (W/ ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	AREA 00001 AREA 00002 AREA 00003 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0002 41031858

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SF_N00236_000369 TC.0386.11534 REPORT N62474-94-D-7609 352	**05-21-2002** 06-18-2002 5090.3.C. CTO 0386	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT ACTION MEMORANDUM, PARCELS 79, 98, 105, 106, AND 107, LEAD IN SOIL AND LEAD BASED PAINT, NON-TIME CRITICAL REMOVAL ACTION (NTCRA)	SENSITIVE SITE FILE	BLDG 0000073B OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 PARCEL 0079 PARCEL 0098 PARCEL 0105 PARCEL 0106 PARCEL 0107 SITE 00008	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0002 41031858

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SF_N00236_000370 3546 REPORT N62474-98-D-2076 348	**06-07-2002** 06-18-2002 5090.3.C. 00059	SHAFER, D. IT CORPORATION NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL WORK PLAN CHEMICAL OXIDATION PILOT TESTING FOR REMOVAL ACTIONS, REVISION 1 (INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK) [PORTION OF THE MAILING LIST IS SENSITIVE]	SENSITIVE SITE FILE	"PERCHLORATE " SEARCH - ROUND 1 AREA 00037 BLDG 0000014 BLDG 0000162 BLDG 0000351 BLDG 0000398 BLDG 0000402 BLDG 0000410 BLDG 0000586 BLDG 0000608 BLDG 0000620 OU 0000001 OU 0000002A SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0002 41031858

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AR_N00236_000371 NONE REPORT NONE 364	**06-01-1989** 11-24-1999 5090.3.A. NONE	CLEMENT ASSOCIATES NAVFAC - EFA WEST	FINAL PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION PLAN (PHEE), REMEDIAL INVESTIGATION FEASIBILITY STUDY (RI/FS) [VOLUME 7 OF 8] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0015 41074200

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					SITE 00020 YARD D-13		
SF_N00236_000376 TC.0386.11607 REPORT N62474-94-D-7609 293	**06-17-2002** 06-24-2002 5090.3.C. 00386	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT ACTION MEMORANDUM FOR SITES 9 AND 16, DISSOLVED-PHASE GROUNDWATER CONTAMINANTS, NON-TIME CRITICAL REMOVAL ACTION (NTCRA) [INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK)] {PORTION OF THE DOCUMENT RELATING TO COST IS SENSITIVE}	SENSITIVE SITE FILE	BLDG 0000351 BLDG 0000402 BLDG 0000410 BLDG 0000608 OU 0000001 OU 0000002A SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_003	L181-03-0188 BX 0003 41031858
AR_N00236_000405 TC.0386.11651 CORRESPONDENCE N62474-94-D-7609 20	**07-18-2002** 07-29-2002 5090.3.A. CTO 0386	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO COMMENTS ON THE DRAFT ACTION MEMORANDUM NON-TIME CRITICAL REMOVAL ACTION LEAD IN SOIL AND LEAD BASED PAINT [COMMENTS BY DTSC, ARC ECOLOGY - 06/24/02, ALAMEDA POINT COLLABORATIVE - 06/17/02, & THE SIERRA CLUB - 06/23/02] W/ENCLOSURES	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000023 BLDG 0000024 BLDG 0000073B OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 PARCEL 0079 PARCEL 0098 PARCEL 0105 PARCEL 0106 PARCEL 0107 SITE 00008	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0003 41031858

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AR_N00236_000406 DS.0385.15645 REPORT N62474-94-D-7609 2083	**07-25-2002** 08-06-2002 5090.3.A. CTO 0385	HUTCHISON, N. TETRA TECH EM, INC. LORTON, G. NAVFAC - SOUTHWEST DIVISION	DATA SUMMARY REPORT - SUPPLEMENTAL REMEDIAL INVESTIGATION DATA GAP SAMPLING FOR OPERABLE UNITS 1 & 2, VOLUMES 1-3 OF 3	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000005 BLDG 0000014 BLDG 0000041 BLDG 0000162 BLDG 0000397 BLDG 0000398 BLDG 0000400 BLDG 0000410 BLDG 0000497 BLDG 0000528 BLDG 0000608 OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0003 41031858 BX 0004
AR_N00236_000409 PROJECT NO. G477703 REPORT GS-10F-0275K 72	**08-14-2002** 08-28-2002 5090.3.A. NONE	LAU, V. BATTELLE NAVFAC - SOUTHWEST DIVISION	FINAL BREAKWATER BEACH/SEAPLANE LAGOON SUPPLEMENTAL AMPHIPOD TOXICITY STUDY SITE-SPECIFIC HEALTH AND SAFETY PLAN	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00013 SITE 00017	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0004 41031858

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AR_N00236_000410 SWDIV SER 06CA.MM/0847 CORRESPONDENCE NONE 36	**08-21-2002** 08-28-2002 5090.3.A. NONE	MCCLELLAND, M. NAVFAC - SOUTHWEST DIVISION A. COOK & DISTRIBUTION US EPA, SF & VARIOUS	TRANSMITTAL OF THE FINAL SITE MANAGEMENT PLAN AMENDMENT IN ACCORDANCE WITH THE FEDERAL FACILITIES AGREEMENT FOR ACTIVITY (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0004 41031858
AR_N00236_000411 TC.0386.11669 & SWDIV SER 06CA.GC\0860 CORRESPONDENCE N62474-94-D-7609 9	**08-23-2002** 08-29-2002 5090.3.A. CTO 0386	CLARK, G. NAVFAC - SOUTHWEST DIVISION COOK, A. U.S. EPA - SAN FRANCISCO, CA	TRANSMITTAL OF THE RESPONSES TO EPA COMMENTS ON THE DRAFT ACTION MEMORANDUM FOR SITES 9 AND 16, DISSOLVED-PHASE GROUNDWATER CONTAMINANTS, NON-TIME CRITICAL REMOVAL ACTION (W/ ENCLOSURES)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0004 41031858

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000412 TC.0190.11423 - MOD. 2 REPORT N62474-94-D-7609 417	**08-16-2002** 08-29-2002 5090.3.C. 00190	FOULK, G. TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT SUPPLEMENTAL ENVIRONMENTAL BASELINE SURVEY	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026	FRC - PERRIS IMAGED APNT_006	L181-03-0188 BX 0004 41031858

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					SITE 00027 SITE 00028 SITE 00029		
AR_N00236_000435 SWDIV SER 06CA.GC\0029 MEMO NONE 91	**10-07-2002** 10-31-2002 5090.3.A. NONE	IN-SITU OXIDATIVE TECHNOLOGIES NAVFAC - SOUTHWEST DIVISION	IN SITU CHEMICAL OXIDATION PILOT TEST TECHNICAL MEMORANDUM AND HEALTH AND SAFETY PLAN FOR IN SITU CHEMICAL OXIDATION PILOT TESTS ADDENDUM (INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK) [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00016N SITE 00016S SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0006 41031858

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SF_N00236_000436 DS.A033.10075 AND SWDIV SER 06CA.LO/0019 REPORT N68711-00-D-0005 237	**10-08-2002** 10-31-2002 5090.3.C. DO A033	KELLY, B. TETRA TECH EM, INC. L. OCAMPO NAVFAC - SOUTHWEST DIVISION	DRAFT TECHNICAL MEMORANDUM: EVALUATION OF ISSUES RELATED TO THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA); FACILITY PERMIT EPA ID CA 2170023236, TIERED PERMITS, AND THE NONPERMITTED AREAS (INCLUDES SWDIV TRANSMITTAL LETTER BY L. OCAMPO)	SENSITIVE SITE FILE	BLDG 0000013 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00023 SITE 00026 SITE 00027 SITE 00028	FRC - PERRIS IMAGED APNT_003	L181-03-0188 BX 0006 41031858

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AR_N00236_000437 SWDIV SER 06CA.GC/0040 CORRESPONDENCE NONE 32	**10-11-2002** 11-01-2002 5090.3.A. NONE	CLARK, G. NAVFAC - SOUTHWEST DIVISION A. COOK US EPA - SAN FRANCISCO	SWDIV TRANSMITTAL OF RESPONSES TO COMMENTS ON THE DRAFT WORK PLAN CHEMICAL OXIDATION PILOT TESTING REMOVAL ACTIONS AT INSTALLATION RESTORATION SITES 9, 11/21, AND 16 (W/ ENCLOSURE) [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0006 41031858
AR_N00236_000456 NONE CORRESPONDENCE NONE 7	**12-16-2002** 01-29-2003 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA OCAMPO, L. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM: EVALUATION OF ISSUES RELATED TO THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY PERMIT EPA ID CA 217002323G TIERED PERMITS AND THE NONPERMITTED AREAS	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00023 SITE 00027 SITE 00028	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0010 41031858

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AR_N00236_000470 SWDIV SER 06CA.AD/0357 CORRESPONDENCE NONE 31	**01-16-2003** 02-06-2003 5090.3.A. NONE	DICK, A. NAVFAC - SOUTHWEST DIVISION COOK, A. U.S. EPA - SAN FRANCISCO, CA	TRANSMITTAL OF SITE MANAGEMENT PLAN UPDATE (W/ ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00017 SITE 00020 SITE 00024 SITE 00025 SITE 00029	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0010 41031858
AR_N00236_000474 5425 & SWDIV SER 06CA.GC/0409 REPORT N62474-98-D-2076 751	**02-03-2003** 02-19-2003 5090.3.A. 00059	SCIACCA, J. IT CORPORATION NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN CHEMICAL OXIDATION PILOT TESTING FOR REMOVAL ACTIONS AT INSTALLATION RESTORATION SITES 9, 11/21, AND 16, REVISION 0 [INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH - ROUND 1 SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0010 41031858

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SF_N00236_000502 CTO-0059/0010 & SWDIV 06CA.GC/0840 REPORT N68711-95-D-7526 285	**05-19-2003** 06-03-2003 5090.3.C. CTO 0059	JOHANSEN, E. BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN FOR ASSESSMENT OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) CONTAMINATIONAT SELECTED CERCLA SITES AND EBS PARCELS [INLCUDES SWDIV TRANSMITTAL LETTER]	SENSITIVE SITE FILE	PARCEL 0028 PARCEL 0051 PARCEL 0205 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00030 SITE 00031 SITE 00032	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0012 41031858
AR_N00236_000568 TC.A021.10074 MINUTES N68711-00-D-0005 12	**07-11-2000** 06-11-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	11 JULY 2000 RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY	ADMIN RECORD INFO REPOSITORY	OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004 OU 0000005 SITE 00015 SITE 00023 SITE 00025	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000590 TC.A021.10074 MINUTES N68711-00-D-0005 19	**10-03-2000** 06-11-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	03 OCTOBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MISSING ATTENDANCE LIST)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004 OU 0000005 OU 0000007 SITE 00001 SITE 00002 SITE 00005 SITE 00007 SITE 00013 SITE 00025	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858

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AR_N00236_000594 NONE MM NONE 12	**02-06-2001** 06-11-2003 5090.3.A. NONE	NAVFAC - EFA WEST MULTIPLE AGENCIES	06 FEBRUARY 2001 RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0013 41031858
AR_N00236_000608 TC.A021.10074 MINUTES N68711-00-D-0005 14	**09-04-2001** 06-11-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	04 SEPTEMBER 2001 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES MEETING AGENDA AND SIGN-IN SHEETS)	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00007 SITE 00009 SITE 00011 SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00024 SITE 00028 SITE 00029	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858

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AR_N00236_000610 TC.A021.10074 MINUTES N68711-00-D-0005 50	**11-06-2001** 06-11-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	06 NOVEMBER 2001 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES MEETING AGENDA, SIGN-IN SHEETS, AND VARIOUS HANDOUTS)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00004 SITE 00005 SITE 00009 SITE 00011 SITE 00016	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858
SF_N00236_000646 TC.A021.10075 MM N68711-00-D-0005 4	**04-02-1993** 06-13-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	02 APRIL 1993 MONTHLY PROGRESS REVIEW MEETING MINUTES FOR THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	SITE FILE	SITE 00001 SITE 00002 SITE 00004 SITE 00007A SITE 00007B SITE 00009 SITE 00011 SITE 00017	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858
AR_N00236_000673 TC.A021.10075 MINUTES N68711-00-D-0005 9	**06-25-1996** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - EFA WEST	25 JUNE 1996 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA) [MISSING ATTACHMENT C]	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00007 SITE 00007A SITE 00007C SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858

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AR_N00236_000674 TC.A021.10075 MINUTES N68711-00-D-0005 11	**08-20-1996** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - EFA WEST	20 AUGUST 1996 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA) [MISSING ATTACHMENT C]	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00005 SITE 00007 SITE 00007A SITE 00007C SITE 00010 SITE 00010A SITE 00014 SITE 00015 SITE 00016 SITE 00018 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858
AR_N00236_000679 TC.A021.10075 MINUTES N68711-00-D-0005 10	**09-17-1996** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	17 SEPTEMBER 1996 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA) [MISSING ATTACHMENT C]	ADMIN RECORD INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00010 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0013 41031858
AR_N00236_000681 TC.A021.10075 MINUTES N68711-00-D-0005 16	**12-17-1996** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	17 DECEMBER 1996 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST, AGENDA AND PROJECT STATUS AND UPDATE SHEETS)	ADMIN RECORD INFO REPOSITORY	OU 0000004 SITE 00001 SITE 00003 SITE 00005 SITE 00007 SITE 00012 SITE 00014 SITE 00016 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858

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AR_N00236_000682 TC.A021.10075 MINUTES N68711-00-D-0005 11	**02-18-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	18 FEBRUARY 1997 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA)	ADMIN RECORD INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00017 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858
AR_N00236_000683 TC.A021.10075 MINUTES N68711-00-D-0005 7	**02-26-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	26 FEBRUARY 1997 BACKGROUND ASSESSMENT MEETING MINUTES	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00011 SITE 00012 SITE 00018 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858
AR_N00236_000685 TC.A021.10075 MM N68711-00-D-0005 12	**04-29-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	29 APRIL 1997 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST) [MISSING ATTACHMENT C] {SEE AR #684 - ATTACHMENT D}	ADMIN RECORD INFO REPOSITORY	OU 0000001 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00010 SITE 00012 SITE 00022	FRC - PERRIS IMAGED APNT_004	L181-03-0188 BX 0014 41031858
AR_N00236_000686 TC.A021.10075 MINUTES N68711-00-D-0005 11	**06-23-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	23 JUNE 1997 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA) [MISSING ATTACHMENT C]	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00011 SITE 00012 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858

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AR_N00236_000689 TC.A021.10075 MINUTES N68711-00-D-0005 13	**09-16-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	16 SEPTEMBER 1997 MONTHLY TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES AGENDA) [MISSING ATTACHMENT B]	ADMIN RECORD INFO REPOSITORY	OU 0000002 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858
AR_N00236_000690 TC.A021.10075 MINUTES N68711-00-D-0005 12	**10-28-1997** 06-16-2003 5090.3.A. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	28 OCTOBER 1997 TRACKING MEETING MINUTES FOR ENVIRONMENTAL ACTIONS (INCLUDES ATTENDANCE LIST AND AGENDA) [MISSING ATTACHMENT B]	ADMIN RECORD INFO REPOSITORY	OU 0000001 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858
SF_N00236_000692 TC.A021.10075 MINUTES N68711-00-D-0005 8	**01-16-2001** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	16 JANUARY 2001 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING MINUTES FOR THE AFTER ACTION REPORT (INCLUDES AGENDA)	SITE FILE	SITE 00004 SITE 00009 SITE 00011 SITE 00015 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0014 41031858

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SF_N00236_000730 TC.A021.10075 MINUTES N68711-00-D-0005 11	**02-20-2001** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	20 FEBRUARY 2001 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA)	SITE FILE	OU 0000004A OU 0000005 SITE 00002 SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
SF_N00236_000731 TC.A021.10075 MINUTES N68711-00-D-0005 12	**03-20-2001** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	20 MARCH 2001 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA)	SITE FILE	OU 0000006 SITE 00005 SITE 00009 SITE 00011 SITE 00016 SITE 00018 SITE 00021	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
SF_N00236_000737 TC.A021.10075 MINUTES N68711-00-D-0005 15	**07-17-2001** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	17 JULY 2001 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA AND SIGN-IN SHEET)	SITE FILE	SITE 00015 SITE 00023 SITE 00025 SITE 00026 SITE 00027 SITE 00028	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
SF_N00236_000738 TC.A021.10075 MINUTES N68711-00-D-0005 14	**08-21-2001** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	21 AUGUST 2001 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA AND SIGN-IN SHEET)	SITE FILE	SITE 00009 SITE 00011 SITE 00016 SITE 00021 SITE 00026	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000747 TC.A021.10075 MINUTES N68711-00-D-0005 87	**04-16-2002** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	16 APRIL 2002 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS) [PORTION OF THE SIGN-IN SHEET IS SENSITIVE]	SENSITIVE SITE FILE	OU 0000001 OU 0000002 SITE 00001 SITE 00002 SITE 00004 SITE 00009 SITE 00011 SITE 00014 SITE 00015 SITE 00016 SITE 00021 SITE 00026	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
SF_N00236_000750 TC.A021.10075 MINUTES N68711-00-D-0005 52	**07-16-2002** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	16 JULY 2002 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS) [PORTION OF THE SIGN-IN SHEET IS SENSITIVE]	SENSITIVE SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000005 SITE 00001 SITE 00002 SITE 00013	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
SF_N00236_000751 NONE MINUTES NONE 61	**08-20-2002** 06-17-2003 5090.3.C. NONE	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	20 AUGUST 2002 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS)	SITE FILE	OU 0000005 SITE 00009 SITE 00011 SITE 00014 SITE 00015 SITE 00016 SITE 00020 SITE 00021 SITE 00028	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858

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SF_N00236_000752 TC.A021.10075 MINUTES N68711-00-D-0005 28	**10-15-2002** 06-17-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	15 OCTOBER 2002 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS)	SITE FILE	OU 0000001 OU 0000002A SITE 00005 SITE 00006 SITE 00007 SITE 00011 SITE 00013 SITE 00014 SITE 00015 SITE 00025	FRC - PERRIS IMAGED APNT_001	L181-03-0188 BX 0014 41031858
AR_N00236_000763 6321 REPORT N62474-98-D-2076 281	**07-04-2003** 07-22-2003 5090.3.A. 00107	SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	FIELD SUMMARY REPORT FOR THE IN-SITU CHEMICAL OXIDATION PILOT TESTS (CD COPY OF APPENDIX A IS ENCLOSED)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0015 41031858

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AR_N00236_000772 NONE PUB NOTICE NONE 16	**07-01-2003** 08-04-2003 5090.3.A. NONE	MCCLELLAND, M. NAVFAC - SOUTHWEST DIVISION PUBLIC	JULY 2003 ALAMEDA POINT FOCUS ENVIRONMENTAL NEWSLETTER	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032	FRC - PERRIS IMAGED APNT_002	L181-03-0188 BX 0016 41031858

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AR_N00236_000780 NONE REPORT N62474-85-D-5620 178	**11-01-1989** 11-24-1999 5090.3.A. DO 0008	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	REVISED FINAL HEALTH AND SAFETY PLAN (HASP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 2 OF 8] {INCLUDES APPENDICES A THROUGH K} (***SEE COMMENTS)	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0018 41074200

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					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000783 NONE REPORT N62474-85-D-5620 93	**01-01-1990** 11-24-1999 5090.3.A. DO 0005	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL FEASIBILITY STUDY PLAN (FS), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 8 OF 8] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0018 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000785 NONE REPORT N62474-85-D-5620 283	**02-01-1990** 11-24-1999 5090.3.A. DO 0008	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL SAMPLING PLAN (SP), REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) [VOLUME 1 OF 8] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0018 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_000787 NONE REPORT N62474-85-D-5620 27	**08-01-1988** 11-24-1999 5090.3.A. DO 001 & DO 002	CANONIE ENVIRONMENTAL NAVFAC - EFA WEST	FINAL DRAFT AIR SAMPLING PLAN, REMEDIAL INVESTIGASTION/FEASIBILITY STUDY (RI/FS) [VOLUME 1B OF 8] {***SEE COMMENTS}	SITE FILE	AREA 00097 BLDG 0000005 BLDG 0000010 BLDG 0000014 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000459 BLDG 0000530 BLDG 0000547 CANS C-2 AREA SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0018 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00020 YARD D-13		
AR_N00236_000796 NONE REPORT NONE 32	**12-01-1990** 11-24-1999 5090.3.A. NONE	CANONIE	PHASE 2A ANALYTICAL RESULTS FOR SITE 9, BUILDING 410 RI/FS (ENCLOSURE 6)	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0019 41074200
AR_N00236_000801 NONE REPORT NONE 44	**12-01-1990** 11-24-1999 5090.3.A. NONE	CANONIE	PHASE 2A ANALYTICAL RESULTS FOR SITE 19, YARD D-13 RI/FS VOLUME 1 (ENCLOSURE 11)	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0021 41074200
AR_N00236_000802 NONE REPORT NONE 4	**12-01-1990** 11-24-1999 5090.3.A. NONE	CANONIE	PHASE 2A ANALYTICAL RESULTS FOR SITE 19, YARD D-13 RI/FS VOLUME 2 (ENCLOSURE 12)	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0021 41074200
AR_N00236_000831 NONE REPORT NONE 32	**06-01-1992** 11-24-1999 5090.3.A. NONE	CANONIE	REVISED PHASE 1 AND 2A ANALYTICAL RESULTS FOR SITE 9, BUILDING 410 RI/FS	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0023 41074200
AR_N00236_000836 NONE REPORT NONE 43	**06-01-1992** 11-24-1999 5090.3.A. NONE	CANONIE	REVISED PHASE 1 AND 2A ANALYTICAL RESULTS FOR SITE 19, YARD D-13 RI/FS - VOLUME 1	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0024 41074200
AR_N00236_000837 NONE REPORT NONE 4	**06-01-1992** 11-24-1999 5090.3.A. NONE	CANONIE	REVISED PHASE 1 AND 2A ANALYTICAL RESULTS FOR SITE 19, YARD D-13 RI/FS - VOLUME 2	ADMIN RECORD INFO REPOSITORY REFERENCE	SITE 00019	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0024 41074200

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AR_N00236_000839 8843 & BRAC SER BPMOW.CD/0238 REPORT N62474-98-D-2076 472	**12-22-2004** 08-04-2003 5090.3.A. 0078 & 0103	MCGUIRE, J. SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	GROUNDWATER MONITORING REPORT FOR INSTALLATION RESTORATION SITE 9 GROUP, SUMMER 2002 TO SPRING 2003 (CD COPY OF APPENDICES A AND B ENCLOSED) [INCLUDES REPLACEMENT PAGES ISSUED ON DIFFERENT DATES WITH DIFFERENT DOCUMENT CONTROL NUMBERS] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0017 41031858
SF_N00236_000858 NONE REPORT N62474-88-D-5086 303	**09-29-1993** 11-24-1999 5090.3.C. 00107	PRC ENVIRONMENTAL MANAGEMENT, INC. NAVFAC - EFA WEST	DRAFT FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) WORK PLAN ADDENDUM (INCLUDES COMMENTS ON DRAFT RI/FS WORK PLAN ADDENDUM BY R. HOUGH {COMMUNITY ADVISOR COMMITTEE}) [MISSING APPENDIX F] {PORTION OF THE COMMENTS IS SENSITIVE} (***SEE COMMENTS)	SENSITIVE SITE FILE	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007A SITE 00007B SITE 00007C SITE 00008 SITE 00009 SITE 00010A SITE 00010B SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0027 41074200

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SF_N00236_000888 6483 & SWDIV SER 06CA.GC/1146 REPORT N62474-98-D-2076 171	**08-08-2003** 08-08-2003 5090.3.C. 00107	SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN ADDENDUM FOR THE IN-SITU CHEMICAL OXIDATION PILOT TESTING, REV 0 (INCLUDES RESPONSE TO COMMENTS ON THE INTERNAL DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM, IN-SITU CHEMICAL OXIDATION PILOT TESTING AND SWDIV TRANSMITTAL LETTER BY G. CLARK)	SITE FILE	"PERCHLORATE" SEARCH - ROUND 1 SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-03-0188 BX 0017 41031858
SF_N00236_000889 6482 & SWDIV SER 06CA.GC/1147 REPORT N62474-98-D-2076 292	**08-08-2003** 08-08-2003 5090.3.C. 00107	SHAFER, D. SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN FOR THE FULL-SCALE IN-SITU CHEMICAL OXIDATION TESTING, REVISION 0 (INCLUDES RESPONSE TO COMMENTS ON THE INTERNAL DRAFT SAMPLING AND ANALYSIS PLAN, FULL SCALE IN-SITU CHEMICAL OXIDATION TESTING AND SWDIV TRANSMITTAL LETTER BY G. CLARK)	SENSITIVE SITE FILE	"PERCHLORATE" SEARCH - ROUND 1 SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0008 40095306 SAI

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SF_N00236_000897 BEI-7526-0093-0295 REPORT N68711-95-D-7526 1222	**04-01-2008** 07-24-2008 5090.3.C. CTO 0093	FATTAHIPOUR, M. BECHTEL ENVIRONMENTAL, INC. BRAC PMO WEST	DRAFT REMEDIAL INVESTIGATION, REVISION 1, VOLUMES I, II, AND III OF III (CD COPY ENCLOSED) [SEE AR # 826 - BRAC PMO WEST TRANSMITTAL LETTER, AND # 2064 - DRAFT REMEDIAL INVESTIGATION REPORT]	SITE FILE	"PERCHLORATE " SEARCH - ROUND 1 AOC 000005 AST 000002 AST 000005G AST 000005H AST 000010A AST 000010B AST 000010C AST 000010D AST 000010E AST 000010F AST 000010G AST 000010H AST 000010I AST 000010J AST 000010K AST 000032 AST 000405A AST 000405B BLDG 0000002 BLDG 0000005 BLDG 0000006 BLDG 0000010 BLDG 0000011 BLDG 0000012 BLDG 0000032 BLDG 0000034 BLDG 0000034-1 BLDG 0000043 BLDG 0000044 BLDG 0000062 BLDG 0000102 BLDG 0000261 BLDG 0000281	FRC - PERRIS IMAGED APNT_007	L181-09-0008 30099217 SAN BX 0001 BX 0002 BX 0003 BX 0004 BX 0005 BX 0006 BX 0007 BX 0008 BX 0009 BX 0010 BX 0011 BX 0012 BX 0013 BX 0014 BX 0015 BX 0016 BX 0017 BX 0018 BX 0019 BX 0020 BX 0021 BX 0022 BX 0023 BX 0024

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							BLDG 0000614		
							BLDG 0000615		
							CAA 000005A		
							CAA 000005B		
							CAA 000005C		
							CAA 000010		
							CAA B		
							OU 0000001		
							OU 0000002		
							OU 0000002C		
							OWS 000005		
							OWS 000006A		
							OWS 000006B		
							OWS 000010		
							PARCEL 0023C		
							PARCEL 0028A		
							PARCEL 0029A		
							PARCEL 0030A		
							PARCEL 0045A		
							PARCEL 0046		
							PARCEL 0047		
							PARCEL 0048		
							PARCEL 0049		
							PARCEL 0050A		
							PARCEL 0050B		
							PARCEL 0051A		
							PARCEL 0051B		

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							PARCEL 0053		
							PARCEL 0053A		
							PARCEL 0054		
							PARCEL 0055		
							PARCEL 0056		
							PARCEL 0057		
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							PARCEL 0059		
							PARCEL 0066		
							PARCEL 0067		
							PARCEL 0068		
							PARCEL 0186		
							PARCEL 0190A		
							PARCEL 0204A		
							SITE 00003		
							SITE 00004		
							SITE 00005		
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							SITE 00009		
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							SITE 00019		
							SITE 00021		
							SITE 00022		
							SITE 00023		
							SITE 00025		
							SITE 00026		
							SWMU AOC 0002		
							SWMU AST 614-1		
							SWMU NADEP GAP 11		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							SWMU NADEP GAP 28		
							SWMU NAS GAP05		
							SWMU OM-08		
							UST 0000002-1		
							UST 0000005-1		
							UST 0000005-2		
							UST 0000005-3		
							UST 0000006-1		
							UST 0000006-2		
							UST 0000010-1		
							UST 0000010-2		
							UST 0000010-3		
							UST 0000010-4		
							UST 0000010-5		
							UST 0000010-6		
							UST 0000062-1		
							UST 0000261-1		
							UST 0000261-2		
							UST 0000261-3		
							UST 0000282-1		
							UST 0000282-2		
							UST 0000400-1		
							UST 0000614-1		
							UST 0000615-1		
							UST 0000615-2		
							UST 0000615-3		
							UST 0000615-4		
							UST R-12		
							UST R-2		
							WELL 1MW65		
							WELL 2MW85		
							WELL 400MJ-MW1		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL 400MJ-MW2		
							WELL 400MJ-MW3		
							WELL D05-01		
							WELL D05-02		
							WELL D05-03		
							WELL D05-11		
							WELL D05-12		
							WELL D05-13		
							WELL D05BS-01		
							WELL D05HW-01		
							WELL D12-01		
							WELL DIOA-01		
							WELL L05-01		
							WELL L05-02		
							WELL L05-03		
							WELL M05-01		
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							WELL M05-18		
							WELL M05-20		
							WELL M08-07		
							WELL M10-01		
							WELL M10-02		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					WELL M10-03 WELL M117-E WELL M12-01 WELL M12-02 WELL M12-03 WELL M12-04 WELL MLS-1 WELL MLS-6 WELL MLS-7 WELL MW05-06 WELL MW75 WELL P-5-1-MWS3 WELL P-5-I-MWI1		
SF_N00236_000995 TC.A021.10125 MINUTES N68711-00-D-0005 47	**01-21-2003** 08-20-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	21 JANUARY 2003 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEET, AND HANDOUT MATERIALS) [PORTION OF THE SIGN-IN SHEET IS SENSITIVE]	SENSITIVE SITE FILE	OU 0000005 SITE 00001 SITE 00005 SITE 00007 SITE 00009 SITE 00011 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00027 SITE 00028 SITE 00029	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0008 40095306 SAN

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_000999 TC.A021.10125 MINUTES N68711-00-D-0005 23	**02-18-2003** 08-20-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING MINUTES AFTER ACTION REPORT FOR THE 18 FEBRUARY 2003 - INCLUDES AGENDA, SIGN-IN SHEET, AND HANDOUT MATERIALS	SENSITIVE SITE FILE	OU 0000001 OU 0000002A OU 0000002B SITE 00009 SITE 00011 SITE 00014 SITE 00015 SITE 00016 SITE 00021 SITE 00027 SITE 00028	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0008 40095306 SAN
SF_N00236_001000 TC.A021.10125 MINUTES N68711-00-D-0005 33	**04-15-2003** 08-20-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING MINUTES AFTER ACTION REPORT FOR THE 15 APRIL 2003 - INCLUDES AGENDA, SIGN-IN SHEET, AND HANDOUT MATERIALS	SENSITIVE SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000005 SITE 00004 SITE 00005 SITE 00014 SITE 00015	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0008 40095306 SAN
SF_N00236_001021 TC.A021.10125 MINUTES N68711-00-D-0005 84	**05-20-2003** 08-20-2003 5090.3.C. DO 0021	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING MINUTES AFTER ACTION REPORT FOR THE 20 MAY 2003 - INCLUDES AGENDA, SIGN-IN SHEET, AND HANDOUT MATERIALS	SITE FILE	BLDG 0000397 BLDG 0000530 SITE 00013 SITE 00022	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0008 40095306 SAN

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001129 EFAW SER T4NAS/001 CORRESPONDENCE NONE 3	**10-24-1994** 11-24-1999 5090.3.A. NONE	PETOUHOFF, M. NAVFAC - EFA WEST LANPHAR, T. DTSC - BERKELEY, CA	IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 OU 0000004 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007A SITE 00007B SITE 00007C SITE 00008 SITE 00009 SITE 00010A SITE 00010B SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0031 41074200
AR_N00236_001207 EFAW SER 1831.2/5158 CORRESPONDENCE NONE 5	**06-28-1995** 11-24-1999 5090.3.A. NONE	KIKUGAWA, G. NAVFAC - EFA WEST MULTIPLE AGENCIES	TRANSMITTAL OF DRAFT FIELD INVESTIGATION WORK PLAN (WP), QUALITY ASSURANCE PROJECT PLAN (QAPP), HEALTH AND SAFETY PLAN (HASP) [LETTER RECEIVED IN THE ADMINISTRATIVE RECORDS W/OUT ENCLOSURE]	ADMIN RECORD INFO REPOSITORY	SITE 00007C SITE 00022	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0032 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001213 EFAW SER 1831.2/5160 CORRESPONDENCE NONE 5	**07-11-1995** 11-24-1999 5090.3.A. NONE	KIKUGAWA, G. NAVFAC - EFA WEST MULTIPLE AGENCIES	SUBMISSION OF DOCUMENT SUMMARY FOR DRAFT DATA TRANSMITTAL MEMORANDUM FOR INSTALLATION RESTORATION SITES 1, 2, 3, RUNWAY AREA, 6 , 7A, 7B, 7C, 10B, 11, 13, 15, 16, AND 19 (W/ ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00010 SITE 00011 SITE 00013 SITE 00015 SITE 00016 SITE 00019	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0032 41074200
AR_N00236_001214 NONE REPORT N62474-88-D-5086 398	**05-01-1996** 11-24-1999 5090.3.A. 00280	BALCH, D. PRC ENVIRONMENTAL MANAGEMENT, INC. G. MUNEKAWA NAVFAC - EFA WEST	FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS); DATA TRANSMITTAL MEMORANDUM, VOL 1 OF 2 (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT DATED 7/11/95 TO FINAL)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00010 SITE 00011 SITE 00013 SITE 00015 SITE 00016 SITE 00019	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0033 41074200
AR_N00236_001215 NONE REPORT N62474-88-D-5086 849	**05-01-1996** 11-24-1999 5090.3.A. 00280	BALCH, D. PRC ENVIRONMENTAL MANAGEMENT, INC. G. MUNEKAWA NAVFAC - EFA WEST	FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS); DATA TRANSMITTAL MEMORANDUM, VOL 2 OF 2 (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT DATED 7/11/95 TO FINAL)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00010 SITE 00011 SITE 00013 SITE 00015 SITE 00016 SITE 00019	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0033 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001216 EFAW SER NO. 1831.2/5159 CORRESPONDENCE NONE 6	**07-14-1995** 11-24-1999 5090.3.A. NONE	KIKUGAWA, G. NAVFAC - EFA WEST MULTIPLE AGENCIES	TRANSMITTAL OF 1) DOCUMENT SUMMARY FOR DRAFT DATA TRANSMITTAL MEMORANDUM, AND 2) DRAFT DATA TRANSMITTAL MEMORANDUM (W/ ENCLOSURE 1) [SEE AR #1214 AND AR #1215 - FINAL DATA TRANSMITTAL MEMORANDUM, VOLUMES 1 AND 2 OF 2]	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007A SITE 00007B SITE 00007C SITE 00010B SITE 00011 SITE 00013 SITE 00015 SITE 00016 SITE 00019	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0033 41074200
AR_N00236_001218 NONE CORRESPONDENCE NONE 7	**07-26-1995** 11-24-1999 5090.3.A. NONE	LAMPHAR, T. DTSC - BERKELEY, CA C. GARIBALDI NAVFAC - EFA WEST	COMMENTS ON THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) DATA TRANSMITTAL MEMORANDUM {PORTION OF THE MAILING LIST IS SENSITIVE} (INCLUDES CRWQCB COMMENTS DATED 07/05/95 ON THE DRAFT RI/FS DATA TRANSMITTAL MEMORANDUM)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00004 SITE 00005 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00014	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0033 41074200
AR_N00236_001255 EFAW SER 1831.2GK/L6087 CORRESPONDENCE NONE 5	**01-24-1996** 11-24-1999 5090.3.A. NONE	KIKUGAWA, G. NAVFAC - EFA WEST DISTRIBUTION	SUBMISSION OF (1) DRAFT FINAL FIELD INVESTIGATION WORK PLAN, SUPPLEMENTARY SOIL INVESTIGATION, (2) DRAFT FINAL HEALTH AND SAFETY PLAN FOR SUPPLEMENTARY SOIL INVESTIGATION, (3) RESPONSE TO REVIEW COMMENTS ON THE DRAFT FIELD INVESTIGATION (**SEE COMMENTS)	ADMIN RECORD INFO REPOSITORY	SITE 00022	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0034 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001284 EFAW SER 18312GK/L6153 CORRESPONDENCE N62474-88-D-5086 3	**04-24-1996** 11-24-1999 5090.3.A. 00280	KIKUGAWA, G. NAVFAC - EFA WEST MULTIPLE AGENCIES	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING DRAFT DATED 11 JULY 1995 TO FINAL REMEDIAL INVETIGATION/FEASIBILITY STUDY DATA TRANSMITTAL MEMORANDUM (W/OUT ENCLOUSURE) {REPLACEMENT PAGES INSERTED IN THE DOCUMENT}	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00013 SITE 00015 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0034 41074200
AR_N00236_001316 NONE REPORT N62474-88-D-5086 23	**05-24-1996** 11-24-1999 5090.3.A. 00082	CHALOUPKA, K. PRC ENVIRONMENTAL MANAGEMENT, INC. T. BERNHARD NAVFAC - EFA WEST	SUMMARY OF THE SCREENING EVALUATION METHODOLOGY AND RESULTS OF THE HUMAN HEALTH RISK-BASED SCREENING FOR PETROLEUM AT SITES 3, 7A, 7C, 14, AND 16 TIER 1 (MISSING TABLES A-2 AND A-3)	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00007A SITE 00007C SITE 00014 SITE 00016 SITE 00022	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0035 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_001408 SULT-5104-0012-0002 REPORT N68711-03-D-5104 694	**06-22-2007** 08-29-2008 5090.3.C. CTO 0012	HUNTER, C. SULTECH BRAC PMO WEST	INFORMATIONAL DRAFT - COMPENDIUM OF SOLID WASTE MANAGEMENT UNIT (SWMU) EVALUATION REPORTS, HAZARDOUS WASTE PERMIT 2170023236 (CD COPY ENCLOSED)	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000006 PARCEL 0001A PARCEL 0003 PARCEL 0005 PARCEL 0009 PARCEL 0012 PARCEL 0017 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00026 SITE 00027 SITE 00032 SITE 00034	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0004

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001418 NONE CORRESPONDENCE NONE 3	**07-15-2004** 09-09-2008 5090.3.A. NONE	LOIZOS, L. ARC ECOLOGY MACCHIARELLA, T. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT SITE MANAGEMENT PLAN (SMP) FOR FISCAL YEAR 2005	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000003 OU 0000005 SITE 00001 SITE 00014 SITE 00025	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0005
AR_N00236_001428 EFAW SER 18311TB/7033 CORRESPONDENCE NONE 1	**06-24-1997** 11-24-1999 5090.3.A. NONE	BERNHARD, T. NAVFAC - EFA WEST MULTIPLE AGENCIES	NAVY REQUEST TO 1) EXTEND THE REVIEW OF DRAFT RISK BASED CORRECTIVE ACTION REPORT FOR IR SITES 03, 07, 11, 11 AND 22, AND 2)RE-SCHEDULE THE PROJECT TRACKING MEETING TO 26 AUGUST 1997	ADMIN RECORD INFO REPOSITORY	SITE 00003 SITE 00007 SITE 00011 SITE 00012 SITE 00022	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0037 41074200
AR_N00236_001429 EFAW SER 18311TB/7032 CORRESPONDENCE NONE 5	**07-24-1997** 11-24-1999 5090.3.A. NONE	BERNHARD, T. NAVFAC - EFA WEST MULTIPLE AGENCIES	MEMORANDUM FOR SEDIMENT SAMPLING AT SITE 024 (LETTER RECEIVED IN THE ADMINISTRATIVE RECORDS W/OUT ENCLOSURES)	ADMIN RECORD INFO REPOSITORY	SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0037 41074200
AR_N00236_001573 NONE REPORT N62474-94-D-7609 838	**12-07-1998** 11-24-1999 5090.3.A. 00108	UDELL, M. TETRA TECH EM, INC. P. MCFADDEN NAVFAC - EFA WEST	DATA SUMMARY REPORT FOR QUARTERLY GROUNDWATER MONITORING, NOVEMBER 1997 - AUGUST 1998 [SEE AR #1533 - EFAW TRANSMITTAL LETTER BY P. MCFADDEN] {***SEE COMMENTS}	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0040 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001678 NONE MINUTES NONE 85	**09-07-1999** 01-21-2000 5090.3.A. NONE	NAVFAC - WESTERN DIVISION RAB MEMBERS	07 SEPTEMBER 1999 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, SIGN-IN SHEETS AND VARIOUS HANDOUT MATERIALS) [PORTION OF ATTACHMENT C IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000005 BLDG 0000014 BLDG 0000400 BLDG 0000410 BLDG 0000530 OU 0000002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00025	FRC - PERRIS IMAGED APNT_009	L181-03-0179 BX 0045 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001679 NONE MM NONE 29	**08-03-1999** 01-21-2000 5090.3.A. NONE	NAVFAC - WESTERN DIVISION NAVFAC - WESTERN DIVISION	3 AUGUST 1999 RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, HANDOUTS AND SIGN-IN SHEETS) [PORTION OF THE SIGN-IN SHEET IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000005 BLDG 0000014 BLDG 0000162 BLDG 0000360 BLDG 0000400 BLDG 0000410 OU 0000001 OU 0000002 OU 0000003 OU 0000004 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0045 41074200

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_001719 6794 CORRESPONDENCE N62474-98-D-2076 7	**10-08-2003** 10-30-2003 5090.3.A. 00107	SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	U.S. EPA COMMENTS ON THE DRAFT WORK PLAN ADDENDUM FOR THE IN-SITU CHEMICAL OXIDATION PILOT TESTING	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0010 40095306 SAN
SF_N00236_001738 CHAD-3213-0048-0041 MINUTES N62473-07-D-3213 41	**11-17-2009** 04-22-2010 5090.3.C. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE ROBINSON, D. BRAC PMO WEST	17 NOVEMBER 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	BLDG 0000459 OU 0000002A SITE 00005 SITE 00007 SITE 00009 SITE 00013 SITE 00017 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_001742 6850 & SWDIV SER 06CA.GC/1410 REPORT N68711-98-D-5713 169	**10-24-2003** 12-01-2003 5090.3.A. 00107	BRANSFORD, D. SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN ADDENDUM FOR THE IN-SITU CHEMICAL OXIDATION PILOT TESTING, REVISION 0 (INCLUDES SWDIV TRANSMITTAL LETTER BY G. CLARK) [SEE AR #474 - FINAL WORK PLAN; AR #888 - DRAFT WORK PLAN ADDENDUM AND AR #2032 - FINAL SAP ADDENDUM NO. 2]	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0010 40095306 SAN
AR_N00236_001749 7001 REPORT N62474-98-D-2076 344	**12-22-2003** 01-14-2004 5090.3.A. 00107	BRANSFORD, D. SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN, FULL-SCALE IN-SITU CHEMICAL OXIDATION TESTING, REVISION 0 (INCLUDES SAMPLING AND ANALYSIS PLAN, SITE HEALTH AND SAFETY PLAN, QUALITY CONTROL PLAN, ENVIRONMENTAL PROTECTION PLAN, IDWMP, AND RESPONSE TO COMMENTS ON THE DRAFT VERSION)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0011 40095306 SAN

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AR_N00236_001757 SWDIV SER 06CA.AD/1416 REPORT NONE 33	**11-05-2003** 01-15-2004 5090.3.A. NONE	MCCLELLAND, M. NAVFAC - SOUTHWEST DIVISION COOK, A. US EPA - SAN FRANCISCO	SITE MANAGEMENT PLAN UPDATE - [INCLUDES SWDIV TRANSMITTAL LETTER] [SEE RECORD # 1710 - FEDERAL FACILITIES AGREEMENT]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0012 40095306 SAN

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_001786 DS.A028.10401 & SWDIV SER 06CA.GL/0229 REPORT N68711-00-D-0005 3439	**02-26-2004** 03-02-2004 5090.3.C. DO 0028	HELGE, J. TETRA TECH EM, INC. G. LORTON NAVFAC - SOUTHWEST DIVISION	DRAFT REMEDIAL INVESTIGATION REPORT (VOLUME I-III OF III IN 2 FOLDERS: VOLUME I - REPORT SECTION 1-11, VOLUME II - APPENDICES A-E, AND VOLUME III - APPENDICES F-I) [INCLUDES SWDIV TRANSMITTAL LETTER BY G. LORTON]	SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0015 40095306 SAN
AR_N00236_001789 TC.A028.10184 & SWDIV SER 06CA.GL/0264 REPORT N68711-00-D-0005 53	**03-05-2004** 03-16-2004 5090.3.A. DO 0028	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM, RESULTS OF A PILOT TEST FOR TERRAIN CONDUCTIVITY MAPPING (INCLUDES SWDIV TRANSMITTAL LETTER BY G. LORTON) [PORTION OF MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00013	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0016 40095306 SAN
SF_N00236_001799 TC.B010.10186 MINUTES N68711-03-D-5104 25	**09-16-2003** 04-22-2004 5090.3.C. 00010	SULTECH NAVFAC - SOUTHWEST DIVISION	16 SEPTEMBER 2003 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, SIGN-IN SHEETS AND VARIOUS HANDOUTS) [PORTION OF THE SIGN-IN SHEET IS SENSITIVE]	SENSITIVE SITE FILE	SITE 00007 SITE 00014 SITE 00015 SITE 00022 SITE 00023 SITE 00035	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0017 40095306 SAN

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AR_N00236_001803 TC.B010.10187 MM N68711-03-D-5104 34	**08-05-2003** 04-22-2004 5090.3.A. 00010	SULTECH NAVFAC - SOUTHWEST DIVISION	05 AUGUST 2003 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES MEETING AGENDA, SIGN-IN SHEETS AND VARIOUS HANDOUTS) [ATTENDANCE LIST IS MISSING]	ADMIN RECORD INFO REPOSITORY	BLDG 0000195 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00011 SITE 00014 SITE 00016 SITE 00021 SITE 00025 SITE 00026 SITE 00027	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0017 40095306 SAN
SF_N00236_001808 3834 REPORT N62474-98-D-2076 436	**05-03-2002** 04-22-2004 5090.3.C. CTO 0078	MCGUIRE, J. IT CORPORATION NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN FOR BASEWIDE GROUNDWATER MONITORING PROGRAM	SITE FILE	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00025 SITE 00026 SITE 00027	FRC - PERRIS IMAGED APNT_002	L181-08-0082 BX 0017 40095306 SAN

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AR_N00236_001812 CTO-0059/0127 OR SWDIV SER 06CA.DN/0379 REPORT N68711-95-D-7526 127	**03-30-2004** 04-22-2004 5090.3.A. CTO 0059	JOHANSEN, E. BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	FIELD ACTIVITY REPORT ASSESSMENT OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) CONTAMINATION AT SELECTED CERCLA SITES AND EBS PARCELS (CD COPY OF APPENDICES B THROUGH D AND ATTACHMENT E-1 IS ENCLSOED) [INCLUDES SWDIV TRANSMITTAL LETTER]	ADMIN RECORD INFO REPOSITORY SENSITIVE	PARCEL 0028 PARCEL 0051 PARCEL 0205 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00030 SITE 00031 SITE 00032	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0017 40095306 SAN
AR_N00236_001818 8830, 6980 & SWDIV SER 06CA.CD/0438 REPORT N62474-98-D-2076 200	**12-17-2004** 04-29-2004 5090.3.A. 00103	MCGUIRE, J. SHAW ENVIRONMENTAL, INC. BRAC - SAN DIEGO	GROUNDWATER MONITORING REPORT FOR SUMMER 2003 TO SPRING 2004 [INCLUDES REPLACEMENT PAGES AND SWDIV TRANSMITTAL LETTER] {PORTION OF MAILING LIST IS SENSITIVE; CD COPY APPENDICES ENCLOSED}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009	NAVFAC - SOUTHWEST	

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AR_N00236_001830 7788.0, 7789 & SWDIV SER 06CA.CD/0507 MISC N62474-98-D-2076 7	**05-07-2004** 05-11-2004 5090.3.A. 00103	MACCHIARELLA, T. NAVFAC - SOUTHWEST DIVISION A. COOK U.S. EPA - SAN FRANCISCO	WINTER AND FALL 2003 QUARTERLY GROUNDWATER MONITORING DATA REPORTS (COMPACT DISC (CD) FORMAT ONLY) {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00025	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0019 40095306 SAN
AR_N00236_001841 NONE FACT SHEET NONE 4	**03-01-2004** 06-15-2004 5090.3.A. NONE	NAS ALAMEDA - ALAMEDA, CA PUBLIC	NEWSLETTER REGARDING CLEANUP OPTIONS BEING EVALUATED	ADMIN RECORD INFO REPOSITORY	SITE 00005 SITE 00009 SITE 00014 SITE 00015 SITE 00016 SITE 00025 SITE 00026	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0019 40095306 SAN
SF_N00236_001857 8058 & SWDIV SER. 06CA.GC/0822 REPORT N62474-98-D-2076 65	**08-12-2004** 08-13-2004 5090.3.C. 00107	SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT ACTION MEMORANDUM TIME-CRITICAL REMOVAL ACTION AT COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT [INCLUDES SWDIV TRANSMITTAL LETTER BY T. MACCHIARELLA] {PORTION OF MAILING LIST IS SENSITIVE}	SENSITIVE SITE FILE	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0021 40095306 SAN

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AR_N00236_001872 TC.B010.10254 MM N68711-03-D-5104 38	**07-01-2004** 09-27-2004 5090.3.A. 00010	SULTECH NAVFAC - SOUTHWEST DIVISION	1 JULY 2004 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00009 SITE 00011 SITE 00013 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00025	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0022 40095306 SAN
AR_N00236_001876 SWDIV SER. 06CA.GL/0942 REPORT NONE 43	**09-14-2004** 09-27-2004 5090.3.A. NONE	MACCHIARELLA, T. NAVFAC - SOUTHWEST DIVISION U.S. EPA - SAN FRANCISCO, CA	FINAL SITE MANAGEMENT PLAN FOR FISCAL YEAR 2005 [INCLUDES SWDIV TRANSMITTAL]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0022 40095306 SAN
SF_N00236_001878 8484 & SWDIV SER 06CA.GC/1018 REPORT N62474-98-D-2076 68	**10-01-2004** 10-04-2004 5090.3.C. 00107	SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL ACTION MEMORANDUM TIME CRITICAL REMOVAL ACTION AT SHALLOW [INCLUDES SWDIV TRANSMITTAL LETTER]	SENSITIVE SITE FILE	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0022 40095306 SAN
AR_N00236_001879 8819, 8820 & BRAC SER BPMOW.GC\0198 REPORT N62474-98-D-2076 127	**12-10-2004** 10-13-2004 5090.3.A. 00107	SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FIELD SUMMARY REPORT FOR THE IN-SITU CHEMICAL OXIDATION PILOT TEST AT INSTALLATION RESTORATION SITE INTERMEDIATE, REVISION 0 (INCLUDES SWDIV TRANSMITTAL LETTER BY T. MACCHIARELLA) [PORTION OF MAILING LIST IS SENSITIVE; CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0022 40095306 SAN

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AR_N00236_001880 SWDIV SER. 06CA.CD/1492 CORRESPONDENCE NONE 15	**11-24-2003** 10-18-2004 5090.3.A. NONE	MACCHIARELLA, T. NAVFAC - SOUTHWEST RIPPERDA, M. US EPA - SAN FRANCISCO	TRANSMITTAL OF GROUNDWATER MONITORING REPORTS, SUMMER 2002 TO SPRING 2003 (W/OUT ENCLOSURES) [SEE AR # 774 THROUGH AR # 778, AR # 823, AR # 824, AR # 839, AR # 840, AR # 861, AR # 873, AND AR # 880 - GROUNDWATER MONITORING REPORTS]	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00025 GROUP SITE 00027	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0022 40095306 SAN
AR_N00236_001891 TC.B010.10256 MINUTES N68711-03-D-5104 43	**09-02-2004** 11-22-2004 5090.3.A. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	02 SEPTEMBER 2004 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED] {PORTION OF THE MAILING LIST FOR ATTACHMENT B-1 IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002 OU 0000002A	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0025 40095306 SAN
SF_N00236_001892 TC.B010.10261 MINUTES N68711-03-D-5104 26	**08-17-2004** 11-22-2004 5090.3.C. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	17 AUGUST 2004 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, 07/20/04 MEETING MINUTES AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	SITE FILE	BLDG 0000020 BLDG 0000023 OU 0000001 OU 0000002A OU 0000002B SITE 00026 SITE 00030	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0025 40095306 SAN
SF_N00236_001893 TC.B010.10262 MINUTES N68711-03-D-5104 52	**09-21-2004** 11-22-2004 5090.3.C. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	21 SEPTEMBER 2004 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	SITE FILE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B SITE 00001 SITE 00007 SITE 00015 SITE 00022 SITE 00032	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0025 40095306 SAN

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AR_N00236_001894 TC.B010.10255 MINUTES N68711-03-D-5104 68	**08-05-2004** 11-22-2004 5090.3.A. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	05 AUGUST 2004 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000001 OU 0000001 OU 0000002A OU 0000002B SITE 00025 SITE 00030	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0025 40095306 SAN
AR_N00236_001902 8554 & SWDIV BPMOW.CXD/0076 CORRESPONDENCE N62474-98-D-2076 21	**11-10-2004** 12-06-2004 5090.3.A. NONE	PLASEIED, R. NAVFAC - SOUTHWEST DIVISION COOK, A. US EPA - SAN FRANCISCO	TRANSMITTAL OF GROUNDWATER MONITORING REPORTS FOR SUMMER 2003 TO SPRING 2004 [INCLUDES SUMMARY OF SIGNIFICANT CHANGES TO ANNUAL 2003 TO 2004 ALAMEDA BASEWIDE GROUNDWATER MONITORING PROGRAM] (W/OUT ENCLOSURES) {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00027 SITE 00032	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0025 40095306 SAN
AR_N00236_001911 SWDIV SER BPMOW.CG\0194 CORRESPONDENCE NONE 3	**12-09-2004** 12-29-2004 5090.3.A. NONE	MACCHIARELLA, T. BRAC - SAN DIEGO A. COOK U.S. EPA - SAN FRANCISCO	REQUEST FOR A 45 DAY EXTENSION ON RESPONSES TO COMMENTS AND DRAFT FINAL REMEDIAL INVESTIGATION REPORT	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0026 40095306 SAN
AR_N00236_001913 TC.B010.10257 MINUTES N68711-03-D-5104 35	**10-07-2004** 01-03-2005 5090.3.A. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	07 OCTOBER 2004 FINAL RESTORTION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, 21 SEPTEMBER 2004 MONTHLY BCT MEETING MINUTES AND VARIOUS HANDOUTS)	SENSITIVE SITE FILE	OU 0000001 OU 0000002A OU 0000002B SITE 00032	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0026 40095306 SAN

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AR_N00236_001929 NONE CORRESPONDENCE NONE 12	**10-08-2003** 01-10-2005 5090.3.A. NONE	VARIOUS AGENCIES CLARK, G. NAVFAC - SOUTHWEST DIVISION	COMPILATION OF COMMENTS ON THE DRAFT WORKPLAN FOR THE FULL-SCALE IN-SITU CHEMICAL OXIDATION	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0026 40095306 SAN
AR_N00236_001930 NONE CORRESPONDENCE NONE 5	**10-31-2003** 01-10-2005 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA G. CLARK NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT WORKPLAN, FULL-SCALE IN-SITU CHEMICAL OXIDATION	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0026 40095306 SAN
AR_N00236_001962 8767 & SWDIV SER BPMOW.GMC/0418 REPORT N62474-98-D-2076 69	**02-18-2005** 02-28-2005 5090.3.A. 00107	SHAW ENVIRONMENTAL, INC. BRAC - SAN DIEGO	FINAL ACTION MEMORANDUM FOR THE TIME-CRITICAL REMOVAL ACTION, REVISION 0 [INCLUDES SWDIV TRANSMITTAL LETTER BY T. MACCHIARELLA] {PORTION OF MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0028 40095306 SAN
AR_N00236_001984 NONE CORRESPONDENCE NONE 6	**07-10-2002** 03-10-2005 5090.3.A. NONE	MEILLIER, L. CRWQCB - SAN FRANCISCO, CA G. CLARK NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT WORK PLAN (WP) FOR THE CHEMICAL OXIDATION PILOT TEST (MISSING PAGES 2 AND 4) [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0028 40095306 SAN
AR_N00236_001985 NONE CORRESPONDENCE NONE 11	**08-15-2002** 03-10-2005 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA G. CLARK NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT FINAL WORK PLAN (WP) FOR THE CHEMICAL OXIDATION PILOT TESTING FOR REMOVAL ACTIONS (INCLUDES HAZARDOUS SUBSTANCES UNIT COMMENTS DATED 8/7/02)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0028 40095306 SAN

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AR_N00236_001986 NONE CORRESPONDENCE NONE 3	**08-01-2002** 03-10-2005 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA CLARK, G. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT ACTION MEMORANDUM (AM) DISSOLVED-PHASE GROUNDWATER CONTAMINANTS NON-TIME CRITICAL REMOVAL ACTION (TCRA)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00016	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0028 40095306 SAN
AR_N00236_001987 NONE CORRESPONDENCE NONE 10	**08-21-2002** 03-10-2005 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA G. CLARK NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT FINAL WORK PLAN (WP) FOR THE CHEMICAL OXIDATION PILOT TESTING FOR REMOVAL ACTIONS	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00011 SITE 00016 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0028 40095306 SAN

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AR_N00236_001988 NONE CORRESPONDENCE NONE 6	**07-15-2003** 03-10-2005 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA CLARK, G. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN (WP) FOR THE ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBON (PAH) CONTAMINATION AT SELECTED CERCLA SITES AND ENVIRONMENTAL BASELINE STUDY (EBS) PARCELS (INCLUDES COMMENTS BY HERD DATED 08 JULY 2003)	ADMIN RECORD INFO REPOSITORY	PARCEL 0028 PARCEL 0051 PARCEL 0205 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00030 SITE 00031 SITE 00032	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0028 40095306 SAN
AR_N00236_001990 NONE PUBLIC NOTICE NONE 1	**10-14-2004** 03-10-2005 5090.3.A. NONE	OAKLAND TRIBUNE PUBLIC	PUBLIC NOTICE OF AVAILABILITY AND PUBLIC COMMENT PERIOD FOR THE ACTION MEMORANDUM (AM) FOR THE TIME CRITICAL REMOVAL ACTION (TCRA) TO REMOVE PETROLEUM PRODUCT	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0028 40095306 SAN
AR_N00236_001991 NONE PUBLIC NOTICE NONE 2	**10-08-2004** 03-10-2005 5090.3.A. NONE	ALAMEDA TIMES-STAR PUBLIC	PUBLIC NOTICE OF AVAILABILITY AND PUBLIC COMMENT PERIOD FOR THE ACTION MEMORANDUM (AM) FOR THE TIME CRITICAL REMOVAL ACTION (TCRA) TO REMOVE PETROLEUM PRODUCT	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0028 40095306 SAN

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AR_N00236_001992 NONE PUBLIC NOTICE NONE 2	**10-08-2004** 03-10-2005 5090.3.A. NONE	ALAMEDA JOURNAL PUBLIC	PUBLIC NOTICE OF AVAILABILITY AND PUBLIC COMMENT PERIOD FOR THE ACTION MEMORANDUM (AM) FOR THE TIME CRITICAL REMOVAL ACTION (TCRA) TO REMOVE PETROLEUM PRODUCT	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0028 40095306 SAN
SF_N00236_002006 TC.B010.10264 MINUTES N68711-03-D-5104 57	**11-16-2004** 04-12-2005 5090.3.C. CTO 0010	SULTECH BRAC PMO WEST	16 NOVEMBER 2004 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA AND VARIOUS HANDOUT MATERIALS)	SITE FILE	OU 0000002A OU 0000002B OU 0000005 SITE 00025 SITE 00028 SITE 00030	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0030 40095306 SAN
AR_N00236_002008 TC.B010.10259 MINUTES N68711-03-D-5104 15	**12-02-2004** 04-12-2005 5090.3.A. CTO 0010	SULTECH NAVFAC - SOUTHWEST DIVISION	2 DECEMBER 2005 FINAL RESTORATION ADVISORY BOARD (RAB) MONTHLY MEETING SUMMARY (INCLUDES AGENDA, ATTENDANCE LIST AND VARIOUS HANDOUT MATERIALS]	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B SITE 00002 SITE 00030	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0030 40095306 SAN
AR_N00236_002017 DS.A028.10402 & DS.B010.20039 REPORT N68711-00-D-0005 4172	**04-01-2005** 04-29-2005 5090.3.A. DO 0028	DAVENPORT, D. TETRA TECH EM, INC. BRAC -SAN DIEGO	FINAL REMEDIAL INVESTIGATION REPORT - VOLUMES I-III OF III, FOLDERS 1-3 OF 3 (INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 3/3/05 TO FINAL) [INCLUDES SWDIV TRANSMITTAL LETTER BY T. MACCHIARELLA {BRAC SER BPMOW.CD/0478}]	ADMIN RECORD INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH - ROUND 1 OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0031 40095306 SAN
AR_N00236_002022 NONE CORRESPONDENCE NONE 1	**09-14-2004** 05-03-2005 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA T. MACCHIARELLA NAVFAC - SOUTHWEST DIVISION	REVIEW AND CONCURRENCE ON THE DRAFT TIME-CRITICAL REMOVAL ACTION (TCRA) MEMORANDUM	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_003	L181-08-0082 BX 0032 40095306 SAN

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AR_N00236_002026 NONE CORRESPONDENCE NONE 11	**04-08-2005** 05-03-2005 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA T. MACCHIARELLA NAVFAC - SOUTHWEST DIVISION	DTSC - REVIEW OF AND CONCURRENCE ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0032 40095306 SAN
AR_N00236_002028 NONE CORRESPONDENCE NONE 2	**03-31-2005** 05-03-2005 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA T. MACCHIARELLA BRAC - SAN DIEGO	EPA - HAS REVIEWED AND AGREES TO FINALIZE DRAFT FINAL REMEDIAL INVESTIGATION REPORT	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0032 40095306 SAN
AR_N00236_002032 9177 REPORT N62474-98-D-2076 32	**03-31-2005** 05-11-2005 5090.3.A. 00107	SHAFER, D. SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL SAMPLING AND ANALYSIS PLAN ADDENDUM NO. 2 FULL-SCALE IN-SITU CHEMICAL OXIDATION ACTIVITIES AT INSTALLATION RESTORATION SITE INTERMEDIATE	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0032 40095306 SAN
SF_N00236_002134 DS.B101.20010 AND BRAC SER BPMOW.CD/1159 REPORT N68711-03-D-5104 461	**09-30-2005** 10-13-2005 5090.3.C. 00101	SULTECH BRAC PMO WEST	DRAFT FEASIBILITY STUDY REPORT (INCLUDES BRAC PMO WEST TRANSMITTAL LETTER)	SENSITIVE SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0039 40095306 SAN

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AR_N00236_002196 TC.B012.12263 REPORT N68711-03-D-5104 449	**12-23-2005** 01-26-2006 5090.3.A. 00012	FOULK, G. SULTECH L. OCAMPO BRAC PMO WEST	COMPILATION OF SOLID WASTE MANAGEMENT UNIT EVALUATION REPORTS PREVIOUSLY SUBMITTED WITH CERCLA DOCUMENTS, HAZARDOUS WASTE PERMIT EPA ID NUMBER CA 2170023236	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C PARCEL EDC-3 PARCEL EDC-5 PARCEL PBC-1A SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-08-0082 BX 0048 40095306 SAN
AR_N00236_002269 NONE CORRESPONDENCE NONE 9	**03-29-2006** 04-11-2006 5090.3.A. NONE	HUANG, J. CRWQCB - OAKLAND, CA T. MACCHIARELLA BRAC PMO WEST	GENERAL COMMENTS AND REQUEST FOR ADDITIONAL INFORMATION PERTAINING TO THE DRAFT FEASIBILITY STUDY (FS) REPORT (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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AR_N00236_002270 NONE CORRESPONDENCE NONE 20	**03-28-2006** 04-11-2006 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA T. MACCHIARELLA BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY(FS) REPORT	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_002286 NONE CORRESPONDENCE NONE 23	**03-30-2006** 05-03-2006 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY (FS) STUDY REPORT (INCLUDES GSU COMMENTS DATED 3/27/06 AND HERD COMMENTS DATED 3/29/06) [INCLUDES DTSC LEADSPREAD OUTPUT SHEETS (2)]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00003 SITE 00009 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_001	L181-08-0082 BX 0052 40095306 SAN
AR_N00236_002309 NONE CORRESPONDENCE NONE 1	**09-22-2005** 05-19-2006 5090.3.A. NONE	JOHNSON, K. U.S. EPA - SAN FRANCISCO, CA T. MACCHIARELLA BRAC PMO WEST	REVIEW AND CONCURRENCE ON FINAL ACTION MEMORANDUM, TIME CRITICAL REMOVAL ACTION (TCRA), SITE 9 (BUILDING 410)	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0052 40095306 SAN
AR_N00236_002364 BRAC SER BPMOW.MLH/0550 CORRESPONDENCE NONE 4	**06-22-2006** 07-14-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST J. HUANG RWQCB - OAKLAND	TRANSMITTAL OF QUARTERLY TECHNICAL MEMORANDUM FOR CORRECTIVE ACTION AT BUILDING 410 (SITE 9 SHALLOW) FOR THE PERIOD JULY THROUGH SEPTEMBER 2005 (W/OUT ENCLOSURE) [SEE AR #2363 - TECHNICAL MEMORANDUM] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 CAA 000009 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0059 40095306 SAN
SF_N00236_002365 9948 REPORT N62474-98-D-2076 8	**06-29-2006** 07-14-2006 5090.3.C. 00101	SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	4TH QUARTER TECHNICAL MEMORANDUM, REPORTING PERIOD OCTOBER THROUGH DECEMBER 2005	SITE FILE	BLDG 0000410 CAA 000009 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0059 40095306 SAN

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AR_N00236_002366 BRAC SER BPMOW.MLH/0548 CORRESPONDENCE NONE 4	**06-29-2006** 07-14-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST J. HUANG RWQCB - OAKLAND	TRANSMITTAL OF QUARTERLY TECHNICAL MEMORANDUM FOR CORRECTIVE ACTION AT BUILDING 410 (SITE 9 SHALLOW) FOR THE PERIOD OCTOBER THROUGH DECEMBER 2005 (W/OUT ENCLOSURE) [SEE AR #2365 - TECHNICAL MEMORANDUM] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 CAA 000009 SITE 00009	FRC - PERRIS IMAGED APNT_004	L181-08-0082 BX 0059 40095306 SAN
AR_N00236_002410 NONE CORRESPONDENCE NONE 19	**03-28-2006** 08-21-2006 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON DRAFT FEASIBILITY STUDY (FS) REPORT (W/ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_001	L181-03-0179 BX 0025 41074200
AR_N00236_002472 SWDIV SER 06CA.GC/0080 CORRESPONDENCE NONE 4	**01-20-2001** 08-28-2006 5090.3.A. NONE	CLARK, G. NAVFAC - SOUTHWEST DIVISION A. COOK USEPA - SAN FRANCISCO	REQUEST FOR REGULATORY AGENCIES TO STOP REVIEW OF ENGINEERING EVALUATION/COST ANALYSIS PENDING SUBMITTAL OF REVISIONS (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009 SITE 00011 SITE 00016 SITE 00019 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0004 41074200
AR_N00236_002473 BRAC SER BPMOW.GL\0214 CORRESPONDENCE NONE 2	**03-08-2006** 08-28-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	REQUEST FOR 120-DAY EXTENSION ON SUBMITTAL OF DRAFT FINAL FEASIBILITY STUDY (FS) FOR OPERABLE UNIT (OU) 2A AND DRAFT FINAL FS FOR OPERABLE UNIT (OU) 2B	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0004 41074200
AR_N00236_002475 NONE CORRESPONDENCE NONE 42	**07-02-2004** 08-28-2006 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA T. MACCHIARELLA NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON DRAFT REMEDIAL INVESTIGATION (RI) REPORT (INCLUDES GSU COMMENTS BY M. FINCH DATED 11 JUNE 2004) [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0004 41074200

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AR_N00236_002476 FILE NO. 2199.9285(JCH) CORRESPONDENCE NONE 4	**06-10-2004** 08-28-2006 5090.3.A. NONE	HUANG, J. CRWQCB - OAKLAND, CA T. MACCHIARELLA NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON DRAFT REMEDIAL INVESTIGATION (RI) REPORT (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_004	L181-03-0179 BX 0004 41074200
AR_N00236_002509 BRAC SER BPMOW.MLH/1426 CORRESPONDENCE NONE 4	**11-30-2005** 09-06-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST J. HUANG CRWQCB - OAKLAND	TRANSMITTAL OF QUARTERLY TECHNICAL MEMORANDUM, FOR BUILDING 410 (SITE 9 SHALLOW) [JANUARY - JUNE 2005] {W/OUT ENCLOSURE} (PORTION OF THE MAILING LIST IS SENSITIVE) [SEE AR #2510 - MEMORANDUM]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0004 41074200
SF_N00236_002510 9512 REPORT NONE 6	**11-30-2005** 09-06-2006 5090.3.C. NONE	SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	QUARTERLY TECHNICAL MEMORANDUM, JANUARY - JUNE 2005	SITE FILE	BLDG 0000410 SITE 00009	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0004 41074200
AR_N00236_002522 NONE CORRESPONDENCE NONE 6	**09-13-2004** 09-12-2006 5090.3.A. NONE	LIAO, M. DTSC - BERKELEY, CA T. MACCHIARELLA NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON DRAFT ACTION MEMORANDUM, TIME CRITICAL REMOVAL ACTION (TCRA) [INCLUDES GSU COMMENTS BY M. VEST DATED 13 SEPTEMBER 2004]	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_002	L181-03-0179 BX 0005 41074200
AR_N00236_002527 SWDIV SER 06CA.GL/0377 CORRESPONDENCE NONE 2	**04-07-2004** 09-12-2006 5090.3.A. NONE	LORTON, G. NAVFAC - SOUTHWEST DIVISION M. LIAO DTSC - BERKELEY	REQUEST OF IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0005 41074200

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AR_N00236_002539 NONE CORRESPONDENCE NONE 3	**02-08-2001** 09-19-2006 5090.3.A. NONE	CASSA, M. DTSC - BERKELEY, CA G. CLARK NAVFAC - SOUTHWEST DIVISION	RESPONSE TO REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR REMOVAL ACTIONS (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00011 SITE 00016 SITE 00019 SITE 00021	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0005 41074200
AR_N00236_002569 BRAC SER BPMOW.SAP\0005 CORRESPONDENCE NONE 3	**10-03-2006** 10-19-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	REQUEST FOR EXTENSION ON SUBMITTAL OF DRAFT DATA GAP SAMPLING WORK PLAN (WP) FOR OU-1, OU-2A, AND OU-2B	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0007 41074200
AR_N00236_002571 BRAC SER BPMOW.DJR\0054 CORRESPONDENCE NONE 5	**10-19-2006** 10-25-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL FIELD SUMMARY REPORT FOR THE FULL-SCALE IN SITU CHEMICAL OXIDATION REMOVAL ACTION AT 1) SITE SHALLOW AND 2) INTERMEDIATE (W/OUT ENCLOSURES) [SEE AR # 2572 - ENCLOSURE 1, AND AR # 2573 - ENCLOSURE 2] {SEE ***COMMENTS}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00009	FRC - PERRIS IMAGED APNT_007	L181-09-0008 BX 0025 30099217 SAI
AR_N00236_002572 10080 REPORT N62474-98-D-2076 228	**09-29-2006** 10-25-2006 5090.3.A. 00107	SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FIELD SUMMARY REPORT FOR THE FULL-SCALE IN SITU CHEMICAL OXIDATION REMOVAL ACTION - SHALLOW (SEE AR #2571 - BRAC PMO WEST TRANSMITTAL LETTER) [CD COPY OF APPENDICES A & B ENCLOSED]	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_007	L181-09-0008 BX 0025 30099217 SAI
AR_N00236_002573 10079 REPORT N62474-98-D-2076 1110	**09-29-2006** 10-25-2006 5090.3.A. CTO 0107	SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FIELD SUMMARY REPORT FOR THE FULL-SCALE IN SITU CHEMICAL OXIDATION REMOVAL ACTION - INTERMEDIATE (CD COPY OF APPENDICES A & B ENCLOSED) [INCLUDES ANALYTICAL DATA] {SEE COMMENTS.}	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_007	PT-181-2010-0235 BX 0008

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AR_N00236_002596 BRAC SER BPMOW.SAP\0112 CORRESPONDENCE NONE 4	**11-03-2006** 11-07-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF DRAFT WORK PLAN (WP) FOR DATA GAP SAMPLING (W/OUT ENCLOSURE) [SEE AR #2597 - DRAFT WP] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0061 40095306 SAN
SF_N00236_002597 ECSD-RACIV-06-0611 REPORT N62473-06-D-2201 979	**11-03-2006** 11-07-2006 5090.3.C. CTO 0012	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	DRAFT DATA GAP SAMPLING WORK PLAN (WP) [PORTIONS OF DOCUMENT ARE SENSITIVE]	SENSITIVE SITE FILE	"PERCHLORATE" SEARCH - ROUND 1 OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_006	PT-181-2010-0235 BX 0008
AR_N00236_002639 BRAC SER BPMOW.MH\004 CORRESPONDENCE NONE 5	**10-04-2006** 12-27-2006 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF MISSING PAGES FROM FINAL REMEDIAL INVESTIGATION (RI) REPORT DATED 01 APRIL 2005, AND DRAFT FEASIBILITY STUDY (FS) REPORT DATED 30 SEPTEMBER 2005 (W/OUT ENCLOSURES) [***SEE COMMENTS]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_005	L181-03-0179 BX 0007 41074200
AR_N00236_002715 NONE CORRESPONDENCE NONE 2	**06-29-2004** 03-22-2007 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA MACCHIARELLA, T. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT [SEE AR # 1786 - DRAFT REPORT]	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0071 40095306 SAN
SF_N00236_002741 TC.B130.12389 MINUTES N68711-03-D-5104 100	**01-23-2007** 04-25-2007 5090.3.C. 00130	SULTECH NAVFAC - SOUTHWEST DIVISION	23 JANUARY 2007 BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) FINAL MONTHLY TRACKING MEETING MINUTES AFTER ACTION REPORT (INCLUDES AGENDA, HANDOUT MATERIALS, AND VARIOUS ATTACHMENTS)	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000005 SITE 00001 SITE 00002 SITE 00004 SITE 00005 SITE 00032	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0079 40095306 SAN

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AR_N00236_002742 TC.B130.12391 MINUTES N68711-03-D-5104 64	**02-01-2007** 04-25-2007 5090.3.A. 00130	SULTECH NAVFAC - SOUTHWEST DIVISION	01 FEBRUARY 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, HANDOUT MATERIALS, AND VARIOUS ATTACHMENTS)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B PARCEL EDC-17 SITE 00004 SITE 00005	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0079 40095306 SAN
AR_N00236_002753 TC.B130.12385 MINUTES N68711-03-D-5104 59	**01-04-2007** 05-14-2007 5090.3.A. 00130	PEARSON, L. SULTECH MACCHIARELLA, T. NAVFAC - SOUTHWEST DIVISION	04 JANUARY 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, HANDOUT MATERIALS, AND VARIOUS ATTACHMENTS)	ADMIN RECORD INFO REPOSITORY	CAA 000003B CAA 000003C CAA 000004C CAA 000006 CAA 000007 CAA 000011 CAA 000013 OU 0000005 SITE 00002 SITE 00009	FRC - PERRIS IMAGED APNT_009	L181-08-0082 BX 0080 40095306 SAN
SF_N00236_002808 SULT.5104.0130.004 0 MINUTES N68711-03-D-5104 41	**04-25-2007** 08-15-2007 5090.3.C. 00130	BRAC PMO WEST MULTIPLE AGENCIES	25 APRIL 2007 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (CD COPY IS ENCLOSED) [INCLUDES AGENDA AND VARIOUS HANDOUT MATERIALS]	SITE FILE	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_009	L181-08-0082 BX 0082 40095306 SAN
AR_N00236_002828 BRAC SER BPMOW.SAP/0814 CORRESPONDENCE NONE 4	**09-05-2007** 09-11-2007 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT FINAL DATA GAP SAMPLING WORK PLAN (W/OUT ENCLOSURE) {PORTION OF THE MAILING LIST IS SENSITIVE} [SEE AR # 2829 - FINAL DATA GAP SAMPLING WORK PLAN] (***SEE COMMENTS)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0086 40095306 SAN
AR_N00236_002829 ECSD-2201-0012- 0002 REPORT N62473-06-D-2201 813	**10-11-2007** 09-11-2007 5090.3.A. 00012	EVERDS, P. TETRA TECH EM, INC. BRAC PMO WEST	FINAL DATA GAP SAMPLING WORK PLAN (CD COPY ENCLOSED) [SEE RECORD # 2910 - BRAC PMO WEST TRANSMITTAL LETTER] {INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 27 AUGUST 2007 TO FINAL)	ADMIN RECORD INFO REPOSITORY	"PERCHLORATE" SEARCH - ROUND 1 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0086 40095306 SAN

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AR_N00236_002848 NONE CORRESPONDENCE NONE 27	**02-15-2007** 09-17-2007 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT DATA GAP SAMPLING WORK PLAN [SEE AR # 2597 - DRAFT DATA GAP SAMPLING WP]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0086 40095306 SAN
AR_N00236_002849 FILE: 2199.9285(EWS) CORRESPONDENCE NONE 1	**02-02-2007** 09-17-2007 5090.3.A. NONE	SIMON, E. CRWQCB - OAKLAND, CA MACCHIARELLA, T. BRAC PMO WEST	DEFERRAL TO COMMENTS ON THE DRAFT DATA GAP SAMPLING WORK PLAN [SEE AR # 2597 - DRAFT DATA GAP SAMPLING WP]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_009	L181-08-0082 BX 0086 40095306 SAN
AR_N00236_002910 BRAC SER BPMOW.ALB/0805 CORRESPONDENCE NONE 4	**10-11-2007** 10-31-2007 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 27 SEPTEMBER 2007 TO FINAL DATA GAP SAMPLING WORK PLAN (W/OUT ENCLOSURE) [SEE AR # 2829 - FINAL DATA GAP SAMPLING WORK PLAN] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_006	L181-08-0082 BX 0088 40095306 SAN
AR_N00236_002918 NONE CORRESPONDENCE NONE 28	**01-29-2007** 11-05-2007 5090.3.A. NONE	DALRYMPLE, M. DTSC - BERKELEY, CA - VERIFY AFFILIATION LOFSTROM, D. DTSC - BERKELEY	REVIEW AND COMMENTS ON THE DRAFT DATA GAP SAMPLING WORK PLAN [SEE AR # 2597 - DRAFT DATA GAP SAMPLING WP]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0088 40095306 SAN
AR_N00236_002919 NONE CORRESPONDENCE NONE 3	**02-08-2007** 11-05-2007 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON DRAFT DATA GAP SAMPLING WORK PLAN [SEE AR # 2918 - HERD AND GSU COMMENTS, AND AR # 2597 - DRAFT DATA GAP SAMPLING WP]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0088 40095306 SAN
AR_N00236_002920 NONE CORRESPONDENCE NONE 1	**01-16-2007** 11-05-2007 5090.3.A. NONE	COOK, A. U.S. EPA - SAN FRANCISCO, CA MACCHIARELLA, T. BRAC PMO WEST	REQUEST FOR A 30-DAY EXTENSION FOR REVIEW OF DRAFT DATA GAP SAMPLING WORK PLAN [SEE AR # 2597 - DRAFT DATA GAP SAMPLING WP]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0088 40095306 SAN

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AR_N00236_002957 SULT.5104.0130.005 0 MINUTES N68711-03-D-5104 51	**09-06-2007** 12-26-2007 5090.3.A. 00130	BRAC PMO WEST RAB MEMBERS	06 SEPTEMBER 2007 FINAL RESTORATION ADVISORY BOARD MEETING SUMMARY (INCLUDES CD COPY, LIST OF ATTENDEES, AGENDA, AND VARIOUS HANDOUT MATERIALS)	ADMIN RECORD INFO REPOSITORY	SITE 00005 SITE 00009 SITE 00010 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00022 SITE 00023 SITE 00025 SITE 00030 SITE 00031 SITE 00032	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0089 40095306 SAI
AR_N00236_002963 PROJECT NO. 02- 125.11 REPORT N68711-02-D-8213 17502	**03-01-2006** 01-07-2008 5090.3.A. 00016	INNOVATIVE TECHNICAL SOLUTIONS, INC. BRAC PMO WEST	SUMMER 2005 QUARTERLY GROUNDWATER MONITORING DATA REPORT (INCLUDES ANALYTICAL DATA)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00025 SITE 00027 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0090 40095306 SAI BX 0091 BX 0092 BX 0093 BX 0094 BX 0095 BX 0096 BX 0097

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AR_N00236_002965 NO. 02-125.11.06 REPORT N68711-02-D-8213 1493	**02-01-2007** 01-07-2008 5090.3.A. 00016	LEONARD, K. INNOVATIVE TECHNICAL SOLUTIONS, INC. BRAC PMO WEST	FINAL SPRING 2006 BASEWIDE ANNUAL GROUNDWATER MONITORING REPORT, VOLUMES 1 AND 2 OF 2 (INCLUDES ANALYTICAL DATA, CD COPY, AND RESPONSE TO COMMENTS ON THE DRAFT) {***SEE COMMENTS***}	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00027 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_007	L181-08-0082 40095306 SAN	BX 0097 BX 0098 BX 0099 BX 0100 BX 0101 BX 0102

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SF_N00236_002968 SULT.5104.0130.005 2 MINUTES N68711-03-D-5104 61	**09-18-2007** 01-09-2008 5090.3.C. 00130	SULTECH BRAC PMO WEST	18 SEPTEMBER 2007 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT), MONTHLY TRACKING MEETING, AFTER ACTION REPORT (CD COPY ENCLOSED)	SITE FILE	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00034 SITE 00035	FRC - PERRIS IMAGED APNT_007	L181-08-0082 BX 0103 40095306 SAN

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AR_N00236_002974 BRAC SER BPMOW.MLH/O661 CORRESPONDENCE NONE 5	**07-05-2007** 01-14-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF DRAFT WORK PLAN, SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION, FORMER OIL REFINERY (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009
SF_N00236_002975 RBAE-4302-7018-0006 REPORT N68711-03-D-4302 240	**07-05-2007** 01-14-2008 5090.3.C. CTO 0066	RICHARD BRADY & ASSOCIATES NAVFAC - SOUTHWEST	DRAFT WORK PLAN, SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION, FORMER OIL REFINERY (CD COPY ENCLOSED)	SITE FILE	AST 000324 AST 000325 AST 000326 AST 000327 AST 000328 BLDG 0000372 BLDG 0000397 BLDG 0000530 OU 0000002A SITE 00003 SITE 00005 SITE 00007B SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009
AR_N00236_002976 BRAC SER BPMOW.MLH/0087 CORRESPONDENCE NONE 4	**11-14-2007** 01-14-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF FINAL WORK PLAN, SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION, FORMER OIL REFINERY (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009

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AR_N00236_002977 RBAE-4302-7018-0011 REPORT N68711-03-D-4302 238	**10-17-2007** 01-14-2008 5090.3.A. CTO 0066	HEIDT, A. RICHARD BRADY & ASSOCIATES NAVFAC - SOUTHWEST	FINAL WORK PLAN, SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION, FORMER OIL REFINERY (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY	AST 000324 AST 000325 AST 000326 AST 000327 AST 000328 BLDG 0000372 BLDG 0000397 BLDG 0000530 BLDG MS-01 BLDG MS-02 BLDG MS-03 BLDG MS-04 BLDG MS-05 BLDG MS-06 BLDG MS-07 BLDG MS-08 BLDG MS-09 BLDG MS-10 OU 0000002A SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009

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AR_N00236_002979 NONE CORRESPONDENCE NONE 4	**12-27-2006** 01-24-2008 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	COMMENTS ON THE DRAFT SPRING 2006, ALAMEDA BASEWIDE, ANNUAL GROUNDWATER MONITORING REPORT	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00027 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009
AR_N00236_002987 NONE CORRESPONDENCE NONE 5	**02-27-2007** 01-28-2008 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT SPRING 2006, ANNUAL GROUNDWATER MONITORING REPORT	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00027 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009
AR_N00236_002998 BRAC SER BPMOW.MLH/0210 CORRESPONDENCE NONE 2	**12-20-2006** 02-06-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST SIMON, E. CRWQCB - OAKLAND, CA	TRANSMITTAL OF FINAL FIELD ACTIVITY REPORT, FREE PETROLEUM PRODUCT REMOVAL, SHALLOW (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0009

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AR_N00236_002999 9985 REPORT N62474-98-D-2076 996	**12-19-2006** 02-06-2008 5090.3.A. CTO 0101	MCMILLAN, J. SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FIELD ACTIVITY REPORT, FREE PETROLEUM PRODUCT REMOVAL, SHALLOW (INCLUDES ANALYTICAL DATA)	ADMIN RECORD INFO REPOSITORY	SITE 00009	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235	BX 0009
AR_N00236_003004 PROJECT NO. 02-125.11 REPORT N68711-02-D-8213 513	**03-01-2005** 02-13-2008 5090.3.A. 00016	INNOVATIVE TECHNICAL SOLUTIONS, INC. BRAC PMO WEST	FINAL FALL/WINTER 2004 QUARTERLY GROUNDWATER MONITORING DATA REPORT (INCLUDES ANALYTICAL DATA)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00025 SITE 00027 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_008	L181-09-0008 30099217 SAN	BX 0044 BX 0045 BX 0046 BX 0047 BX 0048 BX 0049 BX 0050 BX 0051

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AR_N00236_003054 SULT-5104-0130-0059 MINUTES N68711-03-D-5104 40	**03-14-2008** 04-10-2008 5090.3.A. CTO 0130	PEARSON, L. SULTECH MACCHIARELLA, T. BRAC PMO WEST	06 DECEMBER 2007 FINAL RESTORATION ADVISORY BOARD MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUT MATERIALS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	AOC 000023G BLDG 0000071 CAA 000003A CAA 000003B CAA 000003C CAA 000004C CAA A OU 0000001 OU 0000002A OU 0000004 OU 0000005 PARCEL 0012 SITE 00001 SITE 00002 SITE 00004 SITE 00005 SITE 00010 SITE 00014 SITE 00017 SITE 00020 SITE 00026 SITE 00027 SITE 00028 SITE 00031 SITE 00032 SITE 00033 SITE 00035	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0012

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AR_N00236_003081 BEI-7526-0088-0032 & BEI-7526-0088-0032-1 REPORT N68711-95-D-7526 627	**01-01-2008** 04-21-2008 5090.3.A. CTO 0088	HARRIS, V. BECHTEL ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FEASIBILITY STUDY (FS) REPORT, NORTHWESTERN ORDINANCE STORAGE AREA (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT FINAL DATED 01 DECEMBER 2007 TO FINAL AND CD COPY) {REPLACEMENT PAGES ISSUED ON 01 JANUARY 2008}	ADMIN RECORD INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH - ROUND 1 BLDG 0000082 BLDG 0000497 BLDG 0000594 OU 0000001 OU 0000002 PARCEL 0005D PARCEL 0005E PARCEL 0008A PARCEL C SITE 00001 SITE 00002 SITE 00009 SITE 00011 SITE 00014 SITE 00016 SITE 00021 SITE 00032 UST 0000594-1 UST 0000594-2 WELL IR32-MW-01 WELL IR32-MW-02 WELL IR32-MW-03 WELL IR32-MW-04 WELL IR32-MW-05 WELL M003-A WELL M003-B WELL M005-A WELL M030-A WELL M030-C	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0012

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					WELL M032-A		
AR_N00236_003105 SULT-5104-0130-0065 MINUTES N68711-03-D-5104 74	**03-06-2008** 05-01-2008 5090.3.A. DO 0130	PEARSON, L. SULTECH BROOKS, P. BRAC PMO WEST	06 MARCH 2008 FINAL RESTORATION ADVISORY BOARD MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUT MATERIALS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	OU 0000002A PARCEL 0182 SITE 00009 SITE 00013 SITE 00020 SITE 00022 SITE 00023 SITE 00031	FRC - PERRIS IMAGED APNT_007	PT-181-2010-0235 BX 0013
SF_N00236_003113 RBAE-4302-0066-0015 REPORT N68711-03-D-4302 611	**05-01-2008** 05-06-2008 5090.3.C. CTO 0066	MCHUGH, D. RICHARD BRADY & ASSOCIATES BRAC PMO WEST	DRAFT SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION REPORT (CD COPY ENCLOSED)	SITE FILE	OU 0000002A SITE 00013	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0013
AR_N00236_003128 NONE CORRESPONDENCE NONE 4	**07-20-2006** 05-21-2008 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT 2007 SITE MANAGEMENT PLAN (SMP) SCHEDULE	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000004B OU 0000004C SITE 00020 SITE 00024 SITE 00030 SITE 00031	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014

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AR_N00236_003129 BRAC SER BPMOW.GL/0703 CORRESPONDENCE NONE 6	**08-14-2006** 05-21-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT FINAL AMENDMENT TO THE SITE MANAGEMENT PLAN (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000004B OU 0000004C PARCEL EDC-12 PARCEL EDC-17 SITE 00001 SITE 00002 SITE 00014 SITE 00015 SITE 00024 SITE 00026 SITE 00030 SITE 00031 SITE 00034 SITE 00035	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014
AR_N00236_003145 BRAC SER BPMOW.JW/0259 CORRESPONDENCE NONE 3	**02-12-2008** 05-29-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST FOR THE DRAFT REVISED FEASIBILITY STUDY REPORT	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014
AR_N00236_003153 BRAC SER BPMOW.ASK/0135 CORRESPONDENCE NONE 4	**12-03-2007** 05-30-2008 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST RAMSEY, P. U.S. EPA - SAN FRANCISCO, CA	FEDERAL FACILITY AGREEMENT (FFA) EXTENSION REQUEST FOR PRIMARY DOCUMENTS, DRAFT FEASIBILITY STUDY REPORT AND DRAFT REMEDIAL INVESTIGATION REPORT	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00022 SITE 00022A	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014
AR_N00236_003158 NONE CORRESPONDENCE NONE 13	**09-13-2007** 06-03-2008 5090.3.A. NONE	LOFSTROM, D. DTSC - SACRAMENTO, CA MACCHIARELLA, T. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, SCAPS LASER INDUCED FLUORESCENCE, TARRY REFINERY WASTE INVESTIGATION, FORMER OIL REFINERY [SEE COMMENTS]	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00013 SITE 00019 SITE 00023	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014

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AR_N00236_003162 ECSD-2201-0012-0002.A1 REPORT N62473-06-D-2201 7	**10-17-2007** 06-03-2008 5090.3.A. CTO 0012	JOYCE, G. TETRA TECH EC, INC. BRAC PMO WEST	FINAL ADDENDUM 1 TO THE DRAFT FINAL SAMPLING AND ANALYSIS PLAN (SAP) (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) DATA GAP SAMPLING (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY	BLDG 0000360 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014
AR_N00236_003163 BRAC SER BPMOW.SAP/0112 CORRESPONDENCE NONE 4	**11-03-2006** 06-03-2008 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE SAMPLING AND ANALYSIS PLAN, APPENDIX A OF DRAFT WORK PLAN FOR DATA GAP SAMPLING (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0014
AR_N00236_003181 BRAC SER BPMOW.MLH/0496 CORRESPONDENCE NONE 4	**06-10-2008** 06-20-2008 5090.3.A. NONE	BROOKS, G. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL SCAPS LASER INDUCED FLORESCENCE TARRY REFINERY WASTE INVESTIGATION REPORT (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0015
AR_N00236_003182 RBAE-4302-0066-0016 REPORT N68711-03-D-4302 3605	**06-01-2008** 06-20-2008 5090.3.A. CTO 0066	RICHARD BRADY & ASSOCIATES BRAC PMO WEST	FINAL SCAPS LASER INDUCED FLORESCENCE TARRY REFINERY WASTE INVESTIGATION REPORT (CD COPY ENCLOSED) {INCLUDES ANALYTICAL DATA}	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00023	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0015
SF_N00236_003190 SULT-5104-0130-0069 MINUTES N68711-03-D-5104 45	**04-15-2008** 07-01-2008 5090.3.C. CTO 0130	SULTECH BRAC PMO WEST	15 APRIL 2008 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING ACTION REPORT (AAR) [INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	SITE FILE	BLDG 0000163 OU 0000002A OU 0000002B SITE 00001 SITE 00004 SITE 00009 SITE 00013 SITE 00019 SITE 00033 SITE 00034	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0017

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AR_N00236_003191 SULT-5104-0130-0071 MINUTES N68711-03-D-5104 38	**05-01-2008** 07-01-2008 5090.3.A. CTO 0130	SULTECH BRAC PMO WEST	01 MAY 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	BLDG 0000001 BLDG 0000163 BLDG 0000163A BLDG 0000360 OU 0000002A OU 0000002B SITE 00001 SITE 00002	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0017
AR_N00236_003193 BRAC SER BPMOW.JCK/0543 CORRESPONDENCE NONE 5	**06-26-2008** 07-02-2008 5090.3.A. NONE	BROOKS, G. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT 2009 AMENDMENT TO THE SITE MANAGEMENT PLAN (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B SITE 00001 SITE 00027 SITE 00028 SITE 00032 SITE 00034	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0017

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SF_N00236_003194 NONE REPORT NONE 19	**06-26-2008** 07-02-2008 5090.3.C. NONE	BRAC PMO WEST NAVFAC - SOUTHWEST	DRAFT 2009 AMENDMENT TO THE SITE MANAGEMENT PLAN	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 PARCEL FED-1A PARCEL FED-2B PARCEL FED-2C SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0017

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					SITE 00026		
					SITE 00027		
					SITE 00028		
					SITE 00030		
					SITE 00031		
					SITE 00032		
					SITE 00033		
					SITE 00034		
					SITE 00035		

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SF_N00236_003208 NONE REPORT NONE 24	**09-15-2008** 10-01-2008 5090.3.C. NONE	BRAC PMO WEST NAVFAC - SOUTHWEST	DRAFT FINAL 2009 AMENDMENT TO THE SITE MANAGEMENT PLAN (SMP) [INCLUDES RESPONSES TO COMMENTS ON THE DRAFT]	SITE FILE	AREA 00001 AREA 00001A BASEWIDE BLDG 0000005 BLDG 0000010 BLDG 0000041 BLDG 0000114 BLDG 0000162 BLDG 0000301 BLDG 0000360 BLDG 0000389 BLDG 0000400 BLDG 0000410 BLDG 0000530 BLDG 0000547 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 PARCEL 0001A PARCEL 0002B PARCEL 0002C PIER 1 PIER 2 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0020

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					SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033 SITE 00034 SITE 00035		
AR_N00236_003222 BRAC SER BPMOW.CM\0850 CORRESPONDENCE NONE 4	**09-19-2008** 10-14-2008 5090.3.A. NONE	BROOKS, G. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT TECHNICAL MEMORANDUM FOR DATA GAP SAMPLING (PORTION OF THE MAILING LIST IS SENSITIVE) [W/OUT ENCLOSURE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0020

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SF_N00236_003223 ECSD-2201-0012-0008 REPORT N62473-06-D-2201 17225	**09-19-2008** 10-14-2008 5090.3.C. CTO 0012	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	DRAFT TECHNICAL MEMORANDUM FOR DATA GAP SAMPLING (INCLUDES ANALYTICAL DATA AND CD COPY)	SITE FILE	AOC 000009 AST 000360E BLDG 0000112 BLDG 0000113 BLDG 0000118 BLDG 0000162 BLDG 0000163 BLDG 0000222 BLDG 0000265 BLDG 0000360 BLDG 0000372 BLDG 0000398 BLDG 0000517 OU 0000002A OU 0000002B OWS 000014A OWS 000014B OWS 000014C OWS 000014D OWS 000014E OWS 000163 OWS 000360 OWS 000372 OWS 000410A OWS 000410B OWS 000547 SITE 00003 SITE 00004 SITE 00009 SITE 00011 SITE 00013 SITE 00019 SITE 00021 SITE 00022 UST 0000014-4	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0020 BX 0021 BX 0022 BX 0023

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					UST R-6 WELL 126-002-003 WELL 14 SG08 WELL M11-03		
AR_N00236_003226 ECSD-2201-0012-0002.A2 REPORT N62473-06-D-2201 7	**05-05-2008** 10-14-2008 5090.3.A. CTO 0012	JOYCE, G. TETRA TECH EC, INC. BRAC PMO WEST	ADDENDUM 2 TO THE FINAL SAMPLING AND ANALYSIS PLAN (SAP) {FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP)) DATA GAP SAMPLING [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_008	PT-181-2010-0235 BX 0023

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AR_N00236_003237 SULT-5104-0130-0077 MINUTES N68711-03-D-5104 78	**08-14-2008** 10-28-2008 5090.3.A. CTO 0130	PEARSON, L. SULTECH BROOKS, P. BRAC PMO WEST	14 AUGUST 2008 FINAL RESTORATION ADVISORY BOARD MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED] {PORTION OF DOCUMENT IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004B OU 0000004C OU 0000005 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00011 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00026 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00034 SITE 00035	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0030

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Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.	_____	Subject	_____	Distribution	Sites	CD No.	FRC Box No(s)

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AR_N00236_003260 BRAC SER BPMOW.JCK/1126 CORRESPONDENCE NONE 22	**12-05-2008** 12-09-2008 5090.3.A. NONE	BROOKS, G. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL 2009 AMENDMENT TO THE SITE MANAGEMENT PLAN (SMP) [PORTION OF THE MAILING LIST IS SENSITIVE] {W/ENCLOSURE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0030

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					SITE 00030 SITE 00031 SITE 00032 SITE 00034 SITE 00035		
SF_N00236_003274 CHAD-3213-0048-0006 MINUTES N62473-07-D-3213 51	**11-18-2008** 01-15-2009 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	18 NOVEMBER 2008 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) (INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	SITE FILE	BLDG 0000020 CAA 000006 OU 0000002A OU 0000002B SITE 00005 SITE 00010 SITE 00014 SITE 00017 SITE 00026	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0031
AR_N00236_003276 CHAD-3213-0048-0003 MINUTES N62473-07-D-3213 91	**10-02-2008** 01-15-2009 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RAB MEMBERS	02 OCTOBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	CAA C OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00014 SITE 00015 SITE 00017 SITE 00024 SITE 00026 SITE 00033	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0031

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AR_N00236_003277 CHAD-3213-0048-0005 MINUTES N62473-07-D-3213 34	**11-06-2008** 01-15-2009 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RAB MEMBERS	06 NOVEMBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA AND VARIOUS HANDOUTS) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00005 SITE 00026 SITE 00030	FRC - PERRIS IMAGED APNT_009	PT-181-2010-0235 BX 0031
SF_N00236_003363 CHAD-3213-0048-0010 MINUTES N62473-07-D-3213 30	**01-21-2009** 06-30-2009 5090.3.C. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE BROOKS, G. BRAC PMO WEST	21 JANUARY 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) [INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	SITE FILE	BLDG 0000360 OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00010 SITE 00014 SITE 00017 SITE 00026 SITE 00028	NAVFAC - SOUTHWEST	

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AR_N00236_003365 CHAD-3213-0048-0007 MINUTES N62473-07-D-3213 40	**12-04-2008** 06-30-2009 5090.3.A. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE BROOKS, G. BRAC PMO WEST	04 DECEMBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY [INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	ADMIN RECORD INFO REPOSITORY	AOC 000003 AOC 000010 AOC 000012 BLDG 0000410 CAA 000003 CAA 000005B CAA C OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00014 SITE 00017 SITE 00024 SITE 00026 SITE 00027 SITE 00028 SITE 00030 SITE 00032 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	

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AR_N00236_003366 CHAD-3213-0048-0009 MINUTES N62473-07-D-3213 50	**01-08-2009** 06-30-2009 5090.3.A. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE BROOKS, G. BRAC PMO WEST	8 JANUARY 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY [INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	ADMIN RECORD INFO REPOSITORY	AST 000360E BLDG 0000014 BLDG 0000112 BLDG 0000113 BLDG 0000118 BLDG 0000162 BLDG 0000163 BLDG 0000265 BLDG 0000360 BLDG 0000372 BLDG 0000398 OU 0000002A OU 0000002B OU 0000002C OU 0000005 OWS 000014A OWS 000014B OWS 000014C OWS 000014D OWS 000014E OWS 000163 OWS 000360 OWS 000372A SITE 00001 SITE 00002 SITE 00002A SITE 00002B SITE 00003 SITE 00003B SITE 00004 SITE 00009 SITE 00011 SITE 00013 SITE 00014 SITE 00019	NAVFAC - SOUTHWEST	

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					SITE 00021 SITE 00022 SITE 00026 SITE 00032 SWMU 00372		
AR_N00236_003367 CHAD-3213-0048-0011 MINUTES N62473-07-D-3213 50	**02-05-2009** 06-30-2009 5090.3.A. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE BROOKS, G. BRAC PMO WEST	05 FEBRUARY 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY [INCLUDES AGENDA AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00014 SITE 00026 SITE 00027	NAVFAC - SOUTHWEST	
SF_N00236_003373 CHAD-3213-0048-0014 MAP N62473-07-D-3213 53	**03-17-2009** 07-09-2009 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	17 MARCH 2009 BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	OU 0000002A OU 0000002B SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00010 SITE 00016 SITE 00017 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00035	NAVFAC - SOUTHWEST	

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AR_N00236_003374 CHAD-3213-0048-0015 MAP N62473-07-D-3213 33	**04-02-2009** 07-09-2009 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RAB MEMBERS	02 APRIL 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00002 SITE 00024 SITE 00025 SITE 00026 SITE 00028	NAVFAC - SOUTHWEST	
SF_N00236_003375 CHAD-3213-0048-0016 MINUTES N62473-07-D-3213 70	**04-21-2009** 07-09-2009 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	21 APRIL 2009 BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	BLDG 0000012 OU 0000002A OU 0000002B SITE 00002 SITE 00005 SITE 00010 SITE 00024 SITE 00025	NAVFAC - SOUTHWEST	
AR_N00236_003408 ECSD-2201-0020-0006 REPORT N62473-06-D-2201 891	**07-09-2009** 09-08-2009 5090.3.A. CTO 0020	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	FINAL WORK PLAN FOR REMOVING OIL / WATER SEPARATOR (OWS) AND CONDUCTING A ZERO-VALENT IRON TREATABILITY STUDY (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B OWS 000163 SITE 00003 SITE 00004 SITE 00009 SITE 00011 SITE 00019 SITE 00021 SITE 00022	NAVFAC - SOUTHWEST	

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AR_N00236_003411 CHAD-3213-0048-0017 MINUTES N62473-07-D-3213 51	**05-07-2009** 09-09-2009 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RAB MEMBERS	07 MAY 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00017 SITE 00025 SITE 00026 SITE 00032 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
SF_N00236_003413 CHAD-3213-0048-0020 MINUTES N62473-07-D-3213 43	**06-16-2009** 09-09-2009 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	16 JUNE 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	AOC 000023 BASEWIDE OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00002 SITE 00004 SITE 00005 SITE 00006 SITE 00011 SITE 00027 SITE 00028 SITE 00030 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003423 ECSD-2201-0012-0002.A3/F REPORT N62473-06-D-2201 238	**08-14-2009** 09-17-2009 5090.3.A. CTO 0012	JOYCE, G. TETRA TECH EC, INC. BRAC PMO WEST	ADDENDUM 3 TO THE FINAL SAMPLING AND ANALYSIS PLAN (SAP) {FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP)) DATA GAP SAMPLING [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	NAVFAC - SOUTHWEST	

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SF_N00236_003470 CHAD-3213-0048-0026 MINUTES N62473-07-D-3213 61	**09-15-2009** 12-18-2009 5090.3.C. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE ROBINSON, D. BRAC PMO WEST	15 SEPTEMBER 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (AAR) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000004A OU 0000004B OU 0000005 OU 0000006 SITE 00001 SITE 00027 SITE 00028 SITE 00030 SITE 00032 SITE 00033 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003472 CHAD-3213-0048-0025 MINUTES N62473-07-D-3213 24	**09-03-2009** 12-18-2009 5090.3.A. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE ROBINSON, D. BRAC PMO WEST	FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B SITE 00001 SITE 00005 SITE 00024 SITE 00027 SITE 00030 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003479 BRAC SER BPMOW.MLH/0437 CORRESPONDENCE NONE 2	**02-25-2005** 12-29-2009 5090.3.A. NONE	MACCHIARELLA, T. BRAC PMO WEST HUANG, J. CRWQCB - OAKLAND, CA	TRANSMITTAL OF THE FINAL WORK PLAN FREE PETROLEUM PRODUCT REMOVAL (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 SITE 00009	NAVFAC - SOUTHWEST	

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SF_N00236_003480 9037 REPORT N62474-98-D-2076 60	**02-25-2005** 12-29-2009 5090.3.C. CTO 0101	MCMILLAN, J. SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL WORK PLAN FREE PETROLEUM PRODUCT REMOVAL	SENSITIVE SITE FILE	BLDG 0000351 BLDG 0000410 BLDG 0000530 BLDG 0000588 OU 0000002A SITE 00009	NAVFAC - SOUTHWEST	

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AR_N00236_003542 CHAD-3213-0048-0032 & CHAD-3213-0048-0032.R1 REPORT N62473-07-D-3213 143	**03-01-2010** 02-11-2010 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	FINAL COMMUNITY INVOLVEMENT PLAN UPDATE (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT FINAL, DATED 28 JANUARY 2010, TO FINAL AND CD COPY) [INCLUDES REPLACEMENT PAGES, DATED 01 MARCH 2010]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026	NAVFAC - SOUTHWEST	

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					SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033 SITE 00034 SITE 00035		
SF_N00236_003559 CHAD-3213-0048-0039 MINUTES N62473-07-D-3213 24	**10-20-2009** 03-01-2010 5090.3.C. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE ROBINSON, D. BRAC PMO WEST	20 OCTOBER 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	OU 0000002A OU 0000002B SITE 00001 SITE 00027 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003560 CHAD-3213-0048-0043 MINUTES N62473-07-D-3213 63	**12-15-2009** 03-01-2010 5090.3.A. DO 0048	PEARSON, L. CHADUX TT, JOINT VENTURE ROBINSON, D. BRAC PMO WEST	15 DECEMBER 2009 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	OU 0000002A OU 0000002C SITE 00002 SITE 00005 SITE 00010 SITE 00024 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003570 BRAC SER BPMOW.CM/0133 CORRESPONDENCE NONE 2	**12-07-2009** 03-11-2010 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE REVISED DRAFT FEASIBILITY STUDY REPORT (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A	NAVFAC - SOUTHWEST	

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SF_N00236_003571 OTIE-8814-0004-0001.R1 REPORT N62473-08-D-8814 552	**12-01-2009** 03-11-2010 5090.3.C. CTO 0002	ONEIDA TOTAL INTEGRATED ENTERPRISES LLC BRAC PMO WEST	REVISED DRAFT FEASIBILITY STUDY REPORT (CD COPY ENCLOSED)	SENSITIVE SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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PF_N00236_003576 ITSI-6403-0015-0050 REPORT N68711-05-D-6403 7514	**07-01-2009** 06-08-2010 5090.3.B. CTO 0015	INNOVATIVE TECHNICAL SOLUTIONS, INC. BRAC PMO WEST	FINAL ALAMEDA BASEWIDE 2008 ANNUAL GROUNDWATER MONITORING REPORT, VOLUMES 1 AND 2 OF 2 (CD COPY ENCLOSED)	POST DECISION FILE SENSITIVE	"PERCHLORATE " SEARCH - ROUND 2 BLDG 0000014 BLDG 0000162 BLDG 0000351 BLDG 0000360 BLDG 0000372 BLDG 0000410 BLDG 0000530 BLDG 0000547 BLDG 0000588 OU 0000002A OU 0000002B OU 0000002C OU 0000004A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00007 SITE 00008 SITE 00011 SITE 00019 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00032 WELL M117-E WELL MLS-6	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559	BX 0063 BX 0064 BX 0065

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SF_N00236_003620 AMEC-8816-0003-0023 REPORT N62473-08-D-8816 6060	**03-01-2010** 09-08-2010 5090.3.C. CTO 0003	SCHOTTLE, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	DRAFT 2009 ANNUAL GROUNDWATER MONITORING REPORT, BASEWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	SENSITIVE SITE FILE	BASEWIDE OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559	BX 0081 BX 0082

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AR_N00236_003622 ITSI-6403-0015-0036 REPORT N68711-05-D-6403 525	**07-01-2009** 09-13-2010 5090.3.A. DO 0015	LEONARD, K. INNOVATIVE TECHNICAL SOLUTIONS, INC. BRAC PMO WEST	FINAL BASEWIDE 2008 SEMIANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	AOC 000023 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00032 SITE 00035	NAVFAC - SOUTHWEST	

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AR_N00236_003627 BRAC SER BPMOW.CM/0623 CORRESPONDENCE NONE 3	**07-06-2010** 09-21-2010 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF 1) SUMMARY OF CHANGES MADE TO DRAFT FINAL FEASIBILITY STUDY REPORT, AND 2) DRAFT FINAL FEASIBILITY STUDY REPORT	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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SF_N00236_003628 OTIE-8814-0004-0002 REPORT N62473-08-D-8814 1094	**07-01-2010** 09-21-2010 5090.3.C. CTO 0004	MULDER, T. ONEIDA TOTAL INTEGRATED ENTERPRISES BRAC PMO WEST	DRAFT FINAL FEASIBILITY STUDY REPORT (CD COPY ENCLOSED) [INCLUDES THE SUMMARY OF CHANGES MADE TO THE DRAFT FINAL REPORT IN RESPONSE TO REGULATORY AGENCY COMMENTS ON THE REVISED DRAFT FEASIBILITY STUDY REPORT]	SENSITIVE SITE FILE	CAA 000001 CAA 000002 CAA 000003A CAA 000003B CAA 000003C CAA 000004A CAA 000004B CAA 000004C CAA 000005A CAA 000005B CAA 000005C CAA 000006 CAA 000007 CAA 000008 CAA 000009A CAA 000009B CAA 000010 CAA 000011A CAA 000011B CAA 000012 CAA 000013 CAA A CAA B CAA C OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023 WELL MW410-1 WELL MW410-2 WELL MW410-3 WELL MW410-4	NAVFAC - SOUTHWEST	

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					WELL P-9-MWI-01 WELL P-9-MWI-02 WELL P-9-MWI-03 WELL P-9-MWI-04 WELL P-9-MWI-05 WELL P-9-MWI-06 WELL P-9-MWI-08 WELL P-9-MWI-09 WELL P-9-MWI-10 WELL P-9-MWS-01 WELL P-9-MWS-02 WELL P-9-MWS-03 WELL P-9-MWS-04		
AR_N00236_003631 BRAC SER BPMOW.CMM/0555 CORRESPONDENCE NONE 5	**06-04-2010** 10-04-2010 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT SUPPLEMENTAL DATA GAPS INVESTIGATION	ADMIN RECORD SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559 BX 0082

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AR_N00236_003632 ECSD-3211-0022-0001 AND ECSD-3211-0022-0001.R1 REPORT N62473-07-D-3211 13068	**08-16-2010** 10-04-2010 5090.3.A. CTO 0022	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	FINAL SUPPLEMENTAL DATA GAPS INVESTIGATION (CD COPY ENCLOSED) [INCLUDES ANALYTICAL DATA - PAPER ONLY]	ADMIN RECORD INFO REPOSITORY SENSITIVE	AST 000360E OU 0000002A OU 0000002B SITE 00009 SITE 00013 SITE 00022 WELL S13-TT-MW01	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559	BX 0083 BX 0084 BX 0085 BX 0086 BX 0087
AR_N00236_003644 BRAC SER BPMOW.CM/0472 CORRESPONDENCE NONE 4	**07-15-2009** 10-25-2010 5090.3.A. NONE	BROOKS, G. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL TECHNICAL MEMORANDUM FOR DATA GAP SAMPLING	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559	BX 0087

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AR_N00236_003645 ECSD-2201-0012-0009 REPORT N62473-06-D-2201 70685	**07-17-2009** 10-25-2010 5090.3.A. CTO 0012	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	FINAL TECHNICAL MEMORANDUM FOR DATA GAP SAMPLING (INCLUDES ANALYTICAL DATA - PAPER ONLY, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	AOC 000372 AST 000324 AST 000325 AST 000326 AST 000327 AST 000328 AST 000360E BLDG 0000014 BLDG 0000112 BLDG 0000113 BLDG 0000119 BLDG 0000162 BLDG 0000163 BLDG 0000164 BLDG 0000169 BLDG 0000170 BLDG 0000222 BLDG 0000287 BLDG 0000337 BLDG 0000351 BLDG 0000360 BLDG 0000372 BLDG 0000397 BLDG 0000398 BLDG 0000410 BLDG 0000414 BLDG 0000517 BLDG 0000527 BLDG 0000530 BLDG 0000547 BLDG 0000547-1 BLDG 0000547A BLDG 0000552 BLDG 0000555 BLDG 0000588	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559	BX 0087 BX 0088 BX 0089 BX 0090 BX 0091 BX 0092 BX 0093 BX 0094 BX 0095 BX 0096 BX 0097 BX 0098 BX 0099 BX 0100 BX 0101 BX 0102 BX 0103 BX 0104 BX 0105 BX 0106 BX 0107 BX 0108 BX 0109 BX 0110

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Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							BLDG 0000600		
							BLDG 0000610		
							BLDG 0000616		
							BLDG 0000627		
							BLDG D-13		
							OU 0000002A		
							OU 0000002B		
							OWS 000163		
							OWS 000360		
							OWS 000372		
							OWS 000547		
							SITE 00003		
							SITE 00004		
							SITE 00009		
							SITE 00011		
							SITE 00013		
							SITE 00019		
							SITE 00021		
							SITE 00022		
							SITE 00023		
							SWMU 00163		
							SWMU 00360		
							SWMU 00372		
							SWMU 00372A		
							SWMU 00547		
							SWMU OWS 014A		
							SWMU OWS 014B		
							SWMU OWS 014C		
							SWMU OWS 014D		
							SWMU OWS 014E		
							SWMU OWS 410A		

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Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							SWMU OWS 410B		
							UST 0000006		
							UST 0000014-4		
							WELL M07C-06		
							WELL M09-06		
							WELL M13-06		
							WELL M13-07		
							WELL M13-09		
							WELL M13-P		
							WELL MW360-1		
							WELL MW360-2		
							WELL MW360-3		
							WELL MW360-4		
							WELL MW410-2		
							WELL MW410-3		
							WELL MWD13-3		
							WELL MWD13-4		
							WELL MWOR-3		
							WELL MWOR-4		
							WELL P-4-1-MWS6		
							WELL P-9-MWI-02		
							WELL P-9-MWI-04		
							WELL P-9-MWI-05		
							WELL PP41MW01		
							WELL S11-TT-MW01E		
							WELL S11-TT-MW02E		
							WELL S11-TT-MW03E		
							WELL S11-TT-MW04E		

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					WELL S11-TT-MW05E WELL S11-TT-MW06E WELL S21-TT-MW01E WELL S21-TT-MW02E WELL S21-TT-MW03E WELL S21-TT-MW05E WELL S4-TT-MW02E WELL S4-TT-MW03E WELL S9-TT-MW01 WELL S9-TT-MW02 WELL S9-TT-MW03		
AR_N00236_003648 CHAD-3213-0048-0068 MINUTES N62473-07-D-3213 43	**08-05-2010** 10-29-2010 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RESTORATION ADVISORY BOARD	05 AUGUST 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000163 OU 0000002A OU 0000002B OU 0000002C SITE 00035	NAVFAC - SOUTHWEST	
SF_N00236_003649 CHAD-3213-0048-0067 MINUTES N62473-07-D-3213 44	**07-20-2010** 10-29-2010 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	20 JULY 2010 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	OU 0000002A OU 0000002B SITE 00002 SITE 00013 SITE 00032 SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	

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AR_N00236_003656 AMEC-8816-0004-0019 REPORT N62473-08-D-8816 592	**07-01-2010** 11-16-2010 5090.3.A. CTO 0004	BUNKER, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL ACCIDENT PREVENTION PLAN CORRECTIVE ACTION (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 SITE 00009	NAVFAC - SOUTHWEST	
AR_N00236_003665 BRAC SER BPMOW.CM/0707 CORRESPONDENCE NONE 3	**08-16-2010** 12-07-2010 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE REPLACEMENT PAGES CONVERTING THE DRAFT SUPPLEMENTAL DATA GAPS INVESTIGATION DATED 4 JUNE 2010 TO FINAL SUPPLEMENTAL DATA GAPS INVESTIGATION	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	FRC - PERRIS IMAGED APNT_010	PT-181-2011-0559 BX 0111
AR_N00236_003687 NONE CORRESPONDENCE NONE 1	**08-12-2010** 01-03-2011 5090.3.A. NONE	SMITH, D. NAS ALAMEDA RESTORATION ADVISORY BOARD - BERKELEY, CA ROBINSON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B SITE 00034 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003693 CHAD-3213-0048-0070 MINUTES N62473-07-D-3213 37	**09-02-2010** 01-11-2011 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RESTORATION ADVISORY BOARD	02 SEPTEMBER 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000005 BLDG 0000162 BLDG 0000346 BLDG 0000360 OU 0000002A OU 0000002B SITE 00007 SITE 00026 SITE 00030	NAVFAC - SOUTHWEST	

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SF_N00236_003694 CHAD-3213-0048-0069 MINUTES N62473-07-D-3213 22	**08-17-2010** 01-11-2011 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	17 AUGUST 2010 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	OU 0000002A OU 0000002B SITE 00001 SITE 00002 SITE 00005 SITE 00007 SITE 00010 SITE 00017 SITE 00028 SITE 00034	NAVFAC - SOUTHWEST	
AR_N00236_003695 BRAC SER BPMOW.DD/0040 CORRESPONDENCE NONE 2	**10-19-2010** 01-11-2011 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST WEST, J. CRWQCB - OAKLAND, CA	TRANSMITTAL OF THE DRAFT WORK PLAN CORRECTIVE ACTION	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	NAVFAC - SOUTHWEST	

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SF_N00236_003696 AMEC-8816-0004-0014 REPORT N62473-08-D-8816 44	**10-01-2010** 01-11-2011 5090.3.C. CTO 0004	BUNKER, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	DRAFT WORK PLAN CORRECTIVE ACTION (CD COPY ENCLOSED)	SENSITIVE SITE FILE	BLDG 0000410 SITE 00009 WELL DVE-14 WELL DVE-15 WELL DVE-16 WELL DVE-18 WELL DVE-9-1 WELL DVE-9-10 WELL DVE-9-11 WELL DVE-9-12 WELL DVE-9-2 WELL DVE-9-3 WELL DVE-9-4 WELL DVE-9-5 WELL DVE-9-7 WELL DVE-9-8 WELL DVE-9-9 WELL PEZ-S09-10 WELL S9-TT-MW04	NAVFAC - SOUTHWEST	

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AR_N00236_003700 AMEC-8816-0003-0031 REPORT N62473-08-D-8816 86	**11-01-2010** 01-12-2011 5090.3.A. CTO 0003	BERNHARDT, A. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL FALL 2009/2010 DATA SUBMISSION, BASEWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	AOC 000023 BASEWIDE OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00032 SITE 00035 WELL 000001-MW-6S WELL 000002-MW-8S WELL 000005-3-MW-1S WELL 000005-3-MW-6S WELL 000005-3-MW-7S WELL 00372-MW1 WELL 00398-MW1	NAVFAC - SOUTHWEST	

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Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL 00398-MW4		
							WELL 00442-MW1		
							WELL D03-01		
							WELL D03-02		
							WELL D03-03		
							WELL D03-04		
							WELL D04-03		
							WELL D05-03		
							WELL D05-04		
							WELL D05-05		
							WELL D05-06		
							WELL D09-01		
							WELL D11-01		
							WELL L05-01		
							WELL L05-02		
							WELL L05-03		
							WELL L05-04		
							WELL L05-05		
							WELL L05-06		
							WELL M001-A		
							WELL M001-B		
							WELL M001-E		
							WELL M002-A		
							WELL M003-A		
							WELL M003-B		
							WELL M004-A		
							WELL M005-A		
							WELL M006-A		
							WELL M007-A		
							WELL M010-A		
							WELL M010-B		
							WELL M011-A		
							WELL M012-A		
							WELL M012-B		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL M013-A		
							WELL M014-A		
							WELL M014-B		
							WELL M016-A		
							WELL M016-B		
							WELL M016-E		
							WELL M017-A		
							WELL M018-A		
							WELL M018-E		
							WELL M019-A		
							WELL M019-E		
							WELL M020-A		
							WELL M020-B		
							WELL M020-E		
							WELL M021-A		
							WELL M021-C		
							WELL M021-E		
							WELL M022-A		
							WELL M022-E		
							WELL M023-A		
							WELL M023-B		
							WELL M023-C		
							WELL M023-E		
							WELL M024-A		
							WELL M024-E		
							WELL M025-A		
							WELL M025-C		
							WELL M026-A		
							WELL M027-A		
							WELL M027-B		
							WELL M027-C		
							WELL M028-A		
							WELL M028-C		
							WELL M028-E		
							WELL M029-A		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL M03-04		
							WELL M03-05		
							WELL M03-06		
							WELL M03-07		
							WELL M03-09		
							WELL M030-A		
							WELL M030-C		
							WELL M03-10		
							WELL M03-11		
							WELL M03-12		
							WELL M03-13		
							WELL M03-14		
							WELL M03-15		
							WELL M03-16		
							WELL M031-A		
							WELL M031-C		
							WELL M032-A		
							WELL M033-A		
							WELL M034-A		
							WELL M035-A		
							WELL M036-A		
							WELL M036-B		
							WELL M036-E		
							WELL M037-A		
							WELL M037-B		
							WELL M037-E		
							WELL M038-A		
							WELL M038-B		
							WELL M038-E		
							WELL M039-A		
							WELL M039-B		
							WELL M04-05		
							WELL M04-06		
							WELL M05-02		
							WELL M05-04		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
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							WELL M05-06		
							WELL M05-08		
							WELL M05-09		
							WELL M05-11		
							WELL M05-12		
							WELL M05-13		
							WELL M05-14		
							WELL M05-15		
							WELL M05-16		
							WELL M05-17		
							WELL M05-18		
							WELL M05-19		
							WELL M05-20		
							WELL M05HW-01		
							WELL M07B-01		
							WELL M07C-08		
							WELL M10-01		
							WELL M10-02		
							WELL M10-03		
							WELL M11-01		
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							WELL M11-06		
							WELL M13-06		
							WELL M13-07		
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							WELL M13-09		
							WELL MLS-6		
							WELL MW360-1		
							WELL MW360-2		
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							WELL MW360-4		
							WELL MW41-1		
							WELL MW41-2		

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Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
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							WELL MW41-4		
							WELL MW4-2-1		
							WELL MW4-2-12		
							WELL MW4-2-4		
							WELL MW4-2-6		
							WELL MW97-3		
							WELL MWD13-1		
							WELL MWD13-3		
							WELL MWD13-4		
							WELL MWOR-4		
							WELL MWOR-5		
							WELL OU2B-MW01		
							WELL OU2B-MW02		
							WELL OU2B-MW03		
							WELL OU2B-MW04		
							WELL OU2B-MW05		
							WELL P-5-1-MW13		
							WELL S11-TT-MW04A		
							WELL S11-TT-MW06B		
							WELL S11-TT-MW06C		
							WELL S11-TT-MW06D		
							WELL S21-TT-MW02A		
							WELL S21-TT-MW05B		
							WELL S21-TT-MW05C		

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					WELL S21-TT-MW05D WELL S4-TT-MW02A WELL S4-TT-MW02B WELL S4-TT-MW02C WELL S4-TT-MW03A WELL S4-TT-MW03B		
AR_N00236_003706 CHAD-3213-0048-0073 MINUTES N62473-07-D-3213 36	**10-07-2010** 01-20-2011 5090.3.A. CTO 0048	CHADUX TT, JOINT VENTURE RESTORATION ADVISORY BOARD	07 OCTOBER 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00002 SITE 00026 SITE 00032 SITE 00035	NAVFAC - SOUTHWEST	
SF_N00236_003707 CHAD-3213-0048-0072 MINUTES N62473-07-D-3213 44	**09-21-2010** 01-20-2011 5090.3.C. CTO 0048	CHADUX TT, JOINT VENTURE BRAC PMO WEST	21 SEPTEMBER 2010 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	BLDG 0000005 BLDG 0000346 OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00002 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00016 SITE 00017 SITE 00027 SITE 00028 SITE 00032 SITE 00034	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003711 AMEC-8816-0003-0022 REPORT N62473-08-D-8816 2115	**06-01-2010** 01-20-2011 5090.3.C. CTO 0003	BERNHARDT, A. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	DRAFT FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLAN), BASEWIDE GROUNDWATER MONITORING PROGRAM [CD COPY ENCLOSED]	SENSITIVE SITE FILE	AOC 000023 BASEWIDE OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000004B OU 0000004C OU 0000005 OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033 SITE 00034 SITE 00035		
AR_N00236_003726 AMEC-8816-0003-0029 REPORT N62473-08-D-8816 2117	**08-01-2010** 02-10-2011 5090.3.A. CTO 0003	BERNHARDT, A. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLAN) BASEWIDE GROUNDWATER MONITORING PROGRAM [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY SENSITIVE	AOC 000023 BASEWIDE OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00032 SITE 00035	NAVFAC - SOUTHWEST	

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PF_N00236_003731 AMEC-8816-0003-0027 REPORT N62473-08-D-8816 58506	**08-01-2010** 02-16-2011 5090.3.B. CTO 0003	SCHOTTLE, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL 2009 ANNUAL GROUNDWATER MONITORING REPORT BASEWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	POST DECISION FILE SENSITIVE	"AEROJET" SEARCH "IGNITE" SEARCH "OXIDIZE" SEARCH "PERCHLORATE" SEARCH - ROUND 2 "REACTIVE" SEARCH BASEWIDE OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A OU 0000006 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00028 SITE 00032	FRC - PERRIS IMAGED APNT_011	PT-181-2011-0559	BX 0115 BX 0116 BX 0117 BX 0118 BX 0119 BX 0120 BX 0121 BX 0122 BX 0123 BX 0124 BX 0125 BX 0126	

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Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
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							WELL D05-09		
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							WELL M003-B		
							WELL M010-A		
							WELL M010-B		
							WELL M012-A		
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							WELL M020-B		
							WELL M020-E		
							WELL M021-A		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL M021-C		
							WELL M021-E		
							WELL M022-A		
							WELL M022-E		
							WELL M023-A		
							WELL M023-B		
							WELL M023-C		
							WELL M023-E		
							WELL M024-A		
							WELL M024-E		
							WELL M025-A		
							WELL M025-C		
							WELL M027-A		
							WELL M027-B		
							WELL M027-C		
							WELL M028-A		
							WELL M028-C		
							WELL M028-E		
							WELL M03-04		
							WELL M030-A		
							WELL M030-C		
							WELL M031-A		
							WELL M031-C		
							WELL M036-A		
							WELL M036-B		
							WELL M036-E		
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							WELL M037-B		
							WELL M037-E		
							WELL M038-A		
							WELL M038-B		
							WELL M038-E		
							WELL M039-A		
							WELL M039-B		
							WELL M05-05		

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					WELL M05-06 WELL M05-13 WELL M05-14 WELL M05-15 WELL M05-16 WELL M11-04 WELL MW410-2 WELL S211-TT-MW05B WELL S211-TT-MW05C WELL S211-TT-MW05D WELL S211-TT-MW06B WELL S211-TT-MW06C WELL S211-TT-MW06D WELL S4-TT-MW02A WELL S4-TT-MW02B WELL S4-TT-MW02C WELL S4-TT-MW03A WELL S4-TT-MW03B		
AR_N00236_003733 BRAC SER BPMOW.DD/0215 CORRESPONDENCE NONE 2	**01-19-2011** 02-25-2011 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST WEST, J. CRWQCB - OAKLAND, CA	TRANSMITTAL OF THE FINAL WORK PLAN CORRECTIVE ACTION	ADMIN RECORD INFO REPOSITORY	BLDG 0000410 SITE 00009	NAVFAC - SOUTHWEST	

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AR_N00236_003734 AMEC-8816-0004-0035 REPORT N62473-08-D-8816 52	**01-01-2011** 02-25-2011 5090.3.A. CTO 0004	BUNKER, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL WORK PLAN CORRECTIVE ACTION (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000410 SITE 00009 WELL F9SMW02 WELL F9SMW04 WELL F9SMW05 WELL F9SMW06 WELL M09-05 WELL M09-06 WELL MW410-1 WELL MW410-3 WELL MW410-4 WELL P-9-MWS03 WELL P-9-MWS04 WELL S9-TT-MW01 WELL S9-TT-MW04	NAVFAC - SOUTHWEST	

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SF_N00236_003794 AMEC-8816-0003-0033 REPORT N62473-08-D-8816 196	**03-01-2011** 04-19-2011 5090.3.C. CTO 0003	SCHOTTLE, R. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	DRAFT 2010 ANNUAL GROUNDWATER MONITORING REPORT, BASEWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	SENSITIVE SITE FILE	AOC 000023 BASEWIDE OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00032 SITE 00035 WELL 00398-MW4 WELL D09-01 WELL M03-07 WELL M13-06 WELL M13-07 WELL M13-08 WELL M13-09 WELL MW410-2 WELL MW410-3 WELL MW97-3 WELL MWD13-4	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					WELL S13-TT-MW01 WELL S19-TT-MW01 WELL S3-TT-MW01 WELL S9-TT-MW01 WELL S9-TT-MW02 WELL S9-TT-MW03		
SF_N00236_003800 TRVT-4408-0000-0006 MINUTES N62473-10-C-4408 31	**12-14-2010** 04-29-2011 5090.3.C. NONE	TREVET BRAC PMO WEST	14 DECEMBER 2010 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	SENSITIVE SITE FILE	OU 0000002A OU 0000002B SITE 00001 SITE 00002 SITE 00016 SITE 00017	NAVFAC - SOUTHWEST	
AR_N00236_003808 ECSD-3211-0022-0002.A4/F REPORT N62473-07-D-3211 230	**02-01-2011** 05-12-2011 5090.3.A. CTO 0022	JOYCE, G. TETRA TECH EC, INC. BRAC PMO WEST	FINAL ADDENDUM 4 TO THE FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) DATA GAP SAMPLING (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B	NAVFAC - SOUTHWEST	

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SF_N00236_003820 TRVT-4408-0000-0012 MINUTES N62473-10-C-4408 37	**01-18-2011** 06-15-2011 5090.3.C. NONE	TREVET BRAC PMO WEST	18 JANUARY 2011 FINAL BASE REALIGNMENT AND CLOSURE CLEANUP TEAM MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	BLDG 0000005 BLDG 0000005A BLDG 0000459 CAA 000013 OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00005 SITE 00010 SITE 00012 SITE 00014 SITE 00017 SITE 00021 SITE 00024 SITE 00027 SITE 00033 SITE 00035	NAVFAC - SOUTHWEST	

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SF_N00236_003821 TRVT-4408-0000-0013 MINUTES N62473-10-C-4408 23	**02-15-2011** 06-15-2011 5090.3.C. NONE	TREVET BRAC PMO WEST	15 FEBRUARY 2011 FINAL BASE REALIGNMENT AND CLOSURE CLEANUP TEAM MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	BLDG 0000005 BLDG 0000005A BLDG 0000010 BLDG 0000035 BLDG 0000064 BLDG 0000400 CAA 000013 OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00013 SITE 00017 SITE 00021 SITE 00024 SITE 00033	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003822 TRVT-4408-0000-0014 MINUTES N62473-10-C-4408 21	**03-15-2011** 06-15-2011 5090.3.C. NONE	TREVET BRAC PMO WEST	15 MARCH 2011 FINAL BASE REALIGNMENT AND CLOSURE CLEANUP TEAM MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000066 BLDG 0000608 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000005 SITE 00001 SITE 00002 SITE 00009 SITE 00013 SITE 00014 SITE 00017 SITE 00019 SITE 00021 SITE 00022 SITE 00024 SITE 00028 SITE 00032 SITE 00033 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003824 TRVT-4408-0000-0016 MINUTES N62473-10-C-4408 32	**04-07-2011** 06-23-2011 5090.3.A. NONE	TREVET RESTORATION ADVISORY BOARD	07 APRIL 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000005 BLDG 0000005A BLDG 0000041 BLDG 0000400 OU 0000002A OU 0000002C SITE 00001 SITE 00002 SITE 00006 SITE 00017 SITE 00025	NAVFAC - SOUTHWEST	

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AR_N00236_003830 TRVT-4408-0000-0015 MINUTES N62473-10-C-4408 41	**03-03-2011** 07-07-2011 5090.3.A. NONE	TREVET RESTORATION ADVISORY BOARD	03 MARCH 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00001 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00014 SITE 00016 SITE 00019 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00032	NAVFAC - SOUTHWEST	
AR_N00236_003831 BRAC SER BPMOW.CM/660 CORRESPONDENCE NONE 2	**06-16-2011** 07-11-2011 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT PROPOSED PLAN	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
SF_N00236_003832 OTIE-8814-0004-0004 REPORT N62473-08-D-8814 21	**06-01-2011** 07-11-2011 5090.3.C. CTO 0004	LESHER, R. ONEIDA TOTAL INTEGRATED ENTERPRISES BRAC PMO WEST	DRAFT PROPOSED PLAN (CD COPY ENCLOSED)	SENSITIVE SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_003834 BRAC SER BPMOW.CM/0853 CORRESPONDENCE NONE 2	**06-15-2011** 07-15-2011 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL FEASIBILITY STUDY REPORT	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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AR_N00236_003835 OTIE-8814-0004-0003 REPORT N62473-08-D-8814 1038	**06-01-2011** 07-15-2011 5090.3.A. CTO 0004	MULDER, T. ONEIDA TOTAL INTEGRATED ENTERPRISES BRAC PMO WEST	FINAL FEASIBILITY STUDY REPORT (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	CAA 000013 OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023 WELL M07C-06 WELL M13-07 WELL M13-P WELL MW-001 WELL MW410-2 WELL MW410-3 WELL MW410-4 WELL MW-530-2 WELL MW530-3 WELL MW547-3 WELL MWD13-4 WELL MWOR-4	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003842 TRVT-4408-0000-0019 MINUTES N62473-10-C-4408 22	**05-17-2011** 07-28-2011 5090.3.C. NONE	SCHMUCKER, B. TREVET BRAC PMO WEST	17 MAY 2011 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	AOC 000003 AOC 000010 AOC 000012 BLDG 0000044 BLDG 0000066 BLDG 0000114 BLDG 0000608 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000005 PARCEL 0012 PARCEL 0017 SITE 00001 SITE 00002 SITE 00007 SITE 00014 SITE 00016 SITE 00017 SITE 00024 SITE 00026 SITE 00027 SITE 00032 SITE 00033 SITE 00034 SITE 00035 UST 0000357	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003849 TRVT-4408-0000-0020 MINUTES N62473-10-C-4408 32	**06-21-2011** 08-10-2011 5090.3.C. NONE	SCHMUCKER, B. TREVET BRAC PMO WEST	21 JUNE 2011 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000005 BLDG 0000044 BLDG 0000114 BLDG 0000346 BLDG 0000353 BLDG 0000497 BLDG 0000608 OU 0000002A OU 0000002B OU 0000003 OU 0000006 SITE 00001 SITE 00002 SITE 00016 SITE 00017 SITE 00027 SITE 00032 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_003854 OTIE-8814-0004-0005 REPORT N62473-08-D-8814 22	**08-01-2011** 08-24-2011 5090.3.A. CTO 0004	ONEIDA TOTAL INTEGRATED ENTERPRISES NAVFAC - SOUTHWEST	PROPOSED PLAN FOR GROUNDWATER RESPONSE ACTIONS (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_003858 OTIE-8814-0004-0006 MINUTES N62473-08-D-8814 15	**08-31-2011** 09-30-2011 5090.3.A. CTO 0004	ONEIDA TOTAL INTEGRATED ENTERPRISES PUBLIC	31 AUGUST 2011 REPORTER'S TRANSCRIPT OF MEETING FOR THE PROPOSED PLAN (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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AR_N00236_003859 NONE PUBLIC NOTICE NONE 2	**08-26-2011** 09-30-2011 5090.3.A. NONE	BAY AREA NEWS GROUP - SAN FRANCISCO, CA PUBLIC	PUBLIC NOTICE OF THE PUBLIC COMMENT PERIOD ON THE PROPOSED PLAN	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_003860 NONE PUBLIC NOTICE NONE 1	**08-24-2011** 09-30-2011 5090.3.A. NONE	BAY AREA NEWS GROUP - SAN FRANCISCO, CA PUBLIC	PUBLIC NOTICE OF THE PUBLIC COMMENT PERIOD ON THE PROPOSED PLAN (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_003861 TRVT-4408-0000-0023 MINUTES N62473-10-C-4408 27	**08-04-2011** 09-30-2011 5090.3.A. NONE	TREVET RESTORATION ADVISORY BOARD	FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	AREA B BLDG 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00002 SITE 00017 SITE 00024 WELL MW0-28 WELL MW0-28B	NAVFAC - SOUTHWEST	
AR_N00236_003862 BRAC SER BPMOW.JL/0451 CORRESPONDENCE NONE 2	**03-18-2011** 09-30-2011 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT BASEWIDE GROUNDWATER MONITORING PROGRAM WORK PLAN	ADMIN RECORD INFO REPOSITORY	BASEWIDE SITE 00009 SITE 00014 SITE 00027	NAVFAC - SOUTHWEST	

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PF_N00236_003865 AMEC-8816-0003-0035 REPORT N62473-08-D-8816 75303	**06-01-2011** 10-06-2011 5090.3.B. CTO 0003	BAHDE, J. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL 2010 ANNUAL GROUNDWATER MONITORING REPORT, BASEWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	POST DECISION FILE SENSITIVE	"IGNITE" SEARCH "OXIDIZE" SEARCH "PERCHLORATE" SEARCH - ROUND 2 "REACTIVE" SEARCH AOC 000023 BASEWIDE OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000004A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00032 SITE 00035 WELL MW360-1 WELL MW360-2 WELL MW410-2 WELL MW410-3 WELL MW97-3	FRC - PERRIS IMAGED APNT_011	PT-181-2012-0594	BX 0006 BX 0007 BX 0008 BX 0009 BX 0010 BX 0011 BX 0012 BX 0013 BX 0014 BX 0015 BX 0016 BX 0017 BX 0018 BX 0019 BX 0020 BX 0021 BX 0022 BX 0023 BX 0024 BX 0025

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Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL S11-TT-MW01A		
							WELL S11-TT-MW01B		
							WELL S11-TT-MW01C		
							WELL S11-TT-MW01D		
							WELL S11-TT-MW01E		
							WELL S11-TT-MW02A		
							WELL S11-TT-MW02B		
							WELL S11-TT-MW02C		
							WELL S11-TT-MW02D		
							WELL S11-TT-MW02E		
							WELL S11-TT-MW03A		
							WELL S11-TT-MW03B		
							WELL S11-TT-MW03C		
							WELL S11-TT-MW03D		
							WELL S11-TT-MW03E		
							WELL S11-TT-MW04A		
							WELL S11-TT-MW04B		
							WELL S11-TT-MW04C		
							WELL S11-TT-MW04D		
							WELL S11-TT-MW04E		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL S11-TT-MW05A		
							WELL S11-TT-MW05B		
							WELL S11-TT-MW05C		
							WELL S11-TT-MW05D		
							WELL S11-TT-MW05E		
							WELL S11-TT-MW06A		
							WELL S11-TT-MW06B		
							WELL S11-TT-MW06C		
							WELL S11-TT-MW06D		
							WELL S11-TT-MW06E		
							WELL S13-TT-MW01		
							WELL S19-TT-MW01		
							WELL S21-TT-MW01A		
							WELL S21-TT-MW01B		
							WELL S21-TT-MW01C		
							WELL S21-TT-MW01D		
							WELL S21-TT-MW01E		
							WELL S21-TT-MW02A		
							WELL S21-TT-MW02B		
							WELL S21-TT-MW02C		

UIC No. _ Rec. No.	Record Date								
Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL S21-TT-MW02D		
							WELL S21-TT-MW02E		
							WELL S21-TT-MW03A		
							WELL S21-TT-MW03B		
							WELL S21-TT-MW03C		
							WELL S21-TT-MW03D		
							WELL S21-TT-MW03E		
							WELL S21-TT-MW05A		
							WELL S21-TT-MW05B		
							WELL S21-TT-MW05C		
							WELL S21-TT-MW05D		
							WELL S21-TT-MW05E		
							WELL S3-TT-MW01		
							WELL S4-TT-MW02A		
							WELL S4-TT-MW02B		
							WELL S4-TT-MW02C		
							WELL S4-TT-MW02D		
							WELL S4-TT-MW02E		
							WELL S4-TT-MW03A		
							WELL S4-TT-MW03B		

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					WELL S4-TT-MW03C WELL S4-TT-MW03D WELL S4-TT-MW03E WELL S9-TT-MW01 WELL S9-TT-MW02 WELL S9-TT-MW03		
AR_N00236_003899 AMEC-8816-0004-0053 REPORT N62473-08-D-8816 151	**08-11-2011** 11-21-2011 5090.3.A. CTO 0004	BERNHARDT, A. AMEC EARTH AND ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLAN) CORRECTIVE ACTION (CD COPY ENCLOSED) [SEE RECORD # 3898 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD INFO REPOSITORY	CAA 000003 CAA 000003A CAA 000003B CAA 000003C CAA 000005B WEST CAA 000013 WEST CAA C OU 0000002A OU 0000002B	NAVFAC - SOUTHWEST	
AR_N00236_003900 ECSD-3211-0022-0003 REPORT N62473-07-D-3211 5706	**09-19-2011** 11-21-2011 5090.3.A. CTO 0022	EVERDS, P. TETRA TECH EC, INC. BRAC PMO WEST	FINAL SUPPLEMENTAL DATA GAPS SAMPLING (INCLUDES RAW ANALYTICAL DATA AND CD COPY)	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B OWS 000410A SITE 00003 SITE 00004 SITE 00009 SITE 00013 SITE 00021 WELL MW547-5	NAVFAC - SOUTHWEST	

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AR_N00236_003910 TRVT-4408-0000-0025 MINUTES N62473-10-C-4408 22	**09-01-2011** 12-06-2011 5090.3.A. NONE	SCHMUCKER, B. TREVET RESTORATION ADVISORY BOARD	01 SEPTEMBER 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002C SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023 SITE 00024	NAVFAC - SOUTHWEST	
SF_N00236_003913 TRVT-4408-0000-0027 MINUTES N62473-10-C-4408 43	**10-18-2011** 12-12-2011 5090.3.C. NONE	SCHMUCKER, B. TREVET BRAC PMO WEST	18 OCTOBER 2011 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION-REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	OU 0000002A OU 0000002B OU 0000005 SITE 00002 SITE 00004	NAVFAC - SOUTHWEST	
AR_N00236_003935 BRAC SER BPMOW.CM/0118 CORRESPONDENCE NONE 2	**12-14-2011** 01-27-2012 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) EXTENSION REQUEST FOR THE DRAFT RECORD OF DECISION	ADMIN RECORD INFO REPOSITORY	OU 0000002A	NAVFAC - SOUTHWEST	
SF_N00236_003949 TRVT-4408-0000-0028 MINUTES N62473-10-C-4408 35	**11-15-2011** 03-01-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	15 NOVEMBER 2011 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION-REPORT (INCLUDES AGENDA; VARIOUS HANDOUTS; AND CD COPY)	SITE FILE	OU 0000002A OU 0000002B SITE 00004 SITE 00009 SITE 00013 SITE 00019	NAVFAC - SOUTHWEST	
SF_N00236_003953 TRVT-4408-0000-0029 MINUTES N62473-10-C-4408 25	**12-15-2011** 03-20-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	15 DECEMBER 2011 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION-REPORT (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	AOC 000003 OU 0000002A OU 0000002B SITE 00035	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_003955 BRAC SER BPMOW.CMM/0172 CORRESPONDENCE NONE 2	**03-29-2012** 04-03-2012 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT RECORD OF DECISION (ENCLOSURE IS RECORD # 3956)	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
SF_N00236_003956 TRVT-5004-0000-0006 REPORT N62473-11-C-5004 208	**03-01-2012** 04-03-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	DRAFT RECORD OF DECISION (CD COPY ENCLOSED) [SEE RECORD # 3955 - BRAC PMO WEST TRANSMITTAL LETTER]	SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
AR_N00236_003958 BRAC SER BPMOW.CMM/0094 CORRESPONDENCE NONE 3	**02-27-2012** 04-12-2012 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT EXTENSION REQUEST FOR THE DRAFT RECORD OF DECISION	ADMIN RECORD INFO REPOSITORY	OU 0000002A	NAVFAC - SOUTHWEST	
AR_N00236_003960 CH2M-1000-FZN0-0010 AND BRAC SER BPMOW.CS/0057 CORRESPONDENCE N62470-08-D-1000 17	**02-06-2012** 04-12-2012 5090.3.A. CTO FZN0	ROBINSON, D. BRAC PMO WEST WEST, J. CRWQCB - OAKLAND, CA	LETTER REQUEST FOR GROUNDWATER USE EXCEPTION FROM CONSIDERATION AS A MUNICIPAL OR DOMESTIC WATER SUPPLY IN THE SOUTHEAST PORTION (W/ ENCLOSURES) [CD COPY ENCLOSED]	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000006 SITE 00003 SITE 00004 SITE 00009 SITE 00011 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_003962 TRVT-4408-0000-0031 MINUTES N62473-10-C-4408 26	**12-01-2011** 04-19-2012 5090.3.A. NONE	TREVET RESTORATION ADVISORY BOARD	01 DECEMBER 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00017 SITE 00024 SITE 00028	NAVFAC - SOUTHWEST	
AR_N00236_003967 CH2M-1000-FZN0-0010 AND BRAC SER BPMOW.CS/0057 CORRESPONDENCE N62470-08-D-1000 16	**02-06-2012** 05-22-2012 5090.3.A. CTO FZN0	ROBINSON, D. BRAC PMO WEST WEST, J. CRWQCB - OAKLAND, CA	LETTER REQUEST FOR GROUNDWATER USE EXCEPTION FROM CONSIDERATION AS A MUNICIPAL OR DOMESTIC WATER SUPPLY IN THE SOUTHEAST PORTION (W/ ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000006 PARCEL EDC-12 PARCEL EDC-17 SITE 00003 SITE 00004 SITE 00009 SITE 00011 SITE 00013 SITE 00016 SITE 00019 SITE 00021 SITE 00022 SITE 00023 SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003976 TRVT-4408-0000-0032 MINUTES N62473-10-C-4408 20	**02-29-2012** 06-12-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	29 FEBRUARY 2012 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION-REPORT (INCLUDES AGENDA; VARIOUS HANDOUTS; AND CD COPY)	SITE FILE	BLDG 0000005 BLDG 0000044 BLDG 0000066 BLDG 0000113 BLDG 0000346 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000005 OU 0000006 PARCEL 0012 PARCEL 0017 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00022 SITE 00023 SITE 00026 SITE 00027 SITE 00028 SITE 00035	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N00236_003985 TRVT-4408-0000-0033 MINUTES N62473-10-C-4408 22	**03-20-2012** 06-27-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	20 MARCH 2012 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING MEETING AFTER ACTION-REPORT (INCLUDES AGENDA; VARIOUS HANDOUTS; AND CD COPY)	SITE FILE	BLDG 0000004 BLDG 0000066 BLDG 0000400 OU 0000002A OU 0000004A SITE 00001 SITE 00002 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00022 SITE 00023 SITE 00026 SITE 00035 WELL 00016 WELL 00017 WELL 00018 WELL 00019 WELL 00020 WELL 00021 WELL 00022 WELL 00023 WELL 00024 WELL 00036 WELL 00037 WELL 00038 WELL 00039	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N00236_003986 TRVT-4408-0000-0035 MINUTES N62473-10-C-4408 57	**03-08-2012** 06-27-2012 5090.3.A. NONE	TREVET RESTORATION ADVISORY BOARD	08 MARCH 2012 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA; VARIOUS HANDOUTS; AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	OU 0000002A OU 0000002B OU 0000002C SITE 00004 SITE 00017 SITE 00024	NAVFAC - SOUTHWEST	
SF_N00236_003997 TRVT-4408-0000-0037 AND TRVT-4408-0000-0037.R1 MINUTES N62473-10-C-4408 51	**05-08-2012** 07-25-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	08 MAY 2012 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY TRACKING, MEETING AFTER-ACTION REPORT (INCLUDES REPLACEMENT PAGES, AGENDA, VARIOUS HANDOUTS, AND CD COPY)	SENSITIVE SITE FILE	BLDG 0000066 OU 0000002A OU 0000002B OU 0000005 SITE 00001 SITE 00002 SITE 00027 SITE 00035	NAVFAC - SOUTHWEST	
AR_N00236_004002 BRAC SER BPMOW.CMM/0447 CORRESPONDENCE NONE 2	**07-27-2012** 08-27-2012 5090.3.A. NONE	ROBINSON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT FINAL RECORD OF DECISION (ENCLOSURE IS RECORD # 4003)	ADMIN RECORD INFO REPOSITORY	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	
SF_N00236_004003 TRVT-5004-0000-0008 REPORT N62473-11-C-5004 1610	**07-27-2012** 08-27-2012 5090.3.C. NONE	TREVET BRAC PMO WEST	DRAFT FINAL RECORD OF DECISION (CD COPY ENCLOSED) [SEE RECORD # 4002 - BRAC PMO WEST TRANSMITTAL LETTER]	SITE FILE	OU 0000002A SITE 00009 SITE 00013 SITE 00019 SITE 00022 SITE 00023	NAVFAC - SOUTHWEST	

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Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
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Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)

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No Classification

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
2	Feasibility Study	Section 1.2.3	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Sections 5.5 and 5.6, Pages 5-10 through 5-39. Oneida Total Integrated Enterprises LLC 2011.

In the third step, the technically implementable process options were evaluated based on effectiveness, implementability, and cost, to select representative process options for alternative development.

The effectiveness evaluation focused on ability of the process option to handle estimated areas and volumes of groundwater (i.e., to reduce volume, toxicity, and mobility of COCs in groundwater), potential impacts to human-health and the environmental during implementation of the process option, and whether the process is reliable and proven for remediation of COCs.

The implementability evaluation focused on technical as well as institutional aspects of implementability, such as the ability to obtain necessary regulatory approvals, availability of equipment and skilled workers, extensiveness of knowledge required to implement the process option, and the need for treatment or disposal of process waste.

The cost evaluation included semi-quantitative analysis based on engineering judgment. Relative capital and operation and maintenance (O&M) costs were used rather than detailed estimates.

Due to the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) as compared to IR Site 13 (petroleum hydrocarbon VOCs), identification and screening of technology types and process options was carried out separately for IR Sites 9 and 19, and IR Site 13. Tables 5-3 and 5-4 present identification and screening of technology types and process options for the impacted groundwater at IR Sites 9 and 19, and IR Site 13, respectively. Process options selected during the screening process were carried forward in the FS in the development and evaluation of remedial alternatives in later sections; those process options that are screened out were not carried forward.

5.5 Development of Remedial Alternatives

5.5.1 IR Sites 9 and 19

The remedial action alternatives for impacted groundwater at IR Sites 9 and 19 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process ensured the development of a range of alternatives from those involving active restoration of the plumes to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

Alternative G-1: No Action

Alternative G-2: Monitored Natural Attenuation (MNA) and ICs

Alternative G-3: ISCO, MNA, and ICs

Alternative G-4: In-Situ Bioremediation, MNA, and ICs

5.5.1.1 Alternative G-1: No Action

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Sites 9 and 19. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.1.2 ALTERNATIVE G-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G-2 would rely on natural attenuation processes and monitoring for remediation of COC-impacted groundwater at IR Sites 9 and 19. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

Based on the analysis of concentration trends of VOCs from Summer 2002 to Spring 2008, the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) concluded that chlorinated hydrocarbons (COCs) have been reported consistently in groundwater at OU-2A since monitoring was initiated in Summer 2002. The report further concludes that general overall trends of the time-series plots indicate a general decrease in concentrations over time for the analytes and plume boundaries appear to be generally stable. The time-series plots presented in the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) show a general decrease in VC concentrations in monitoring well, MW410-2 at Site 9 (see Appendix F). At Site 19, the concentrations of PCE appear to show a stable to decreasing trend based on the time-series plots for monitoring well, MWD13-4. These observations are based primarily on monitoring results for shallow/FWBZ wells near the leading edges of groundwater plumes. However, it should be noted that the decreases in VOC concentrations at IR Site 9 may also be due to pilot studies and removal actions conducted using ISCO in 2006 that led to decreases in concentrations of VC.

The concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. In addition, groundwater geochemistry parameters indicate reducing conditions in most wells that are likely to favor anaerobic biodegradation of chlorinated COCs such as PCE, TCE, cis-1,2-DCE, and VC (see Section 3.4 for details). Therefore, natural attenuation appears to be occurring in groundwater at IR Sites 9 and 19.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Sites 9 and 19. This estimate was based on groundwater flow and transport modeling for representative COCs (VC; 1,1-DCA; and 1,2,3-TCP). The groundwater flow (MODFLOW 2000) and transport models (MT3D Version 4b) developed as part of OU-2B FS were used for performing simulations. The model hydraulic parameters were left unchanged. The dispersivity values were adjusted based on the plume lengths of COCs modeled. The initial concentrations of COCs were based on the plume maps presented in Figures 3-9 through 3-13, and no biodegradation was assumed.

The predicted remediation time frames for VC, 1,1-DCA, and 1,2,3-TCP were estimated to be 21 years, 22.5 years, and 22 years, respectively.

With the exception of VC, the EPC (95 percent upper confidence limit [UCL] of the reported concentrations based on the data from 2002 to 2008) of all the COCs are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs

Protect site security features such as fences, and signs

Preserve access to the areas requiring institutional controls (ARICs) for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plumes at IR Sites 9 and 19:

The prohibition on domestic use of groundwater.

The prohibition on drilling wells of any kind.

The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.3 Alternative G-3: In-Situ Chemical Oxidation, MNA, and ICs

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Sites 9 and 19. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of plumes shown on Figures 3-9 through 3-13. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 50 feet bgs. An alternative strategy for emplacement of oxidant is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO such as Fenton's reagent, activated persulfate or ozone. The removal actions conducted at IR Site 9 in 2006 used modified Fenton's

reagent-based oxidation chemistry. The removal action results indicate that several oxidant injection events may be required to treat the COCs in FWBZ and SWBZ. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

To ensure protection of human-health and attainment of RAOs, Alternative G-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-3 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.4 Alternative G-4: In-Situ Bioremediation, MNA, and ICs

Alternative G-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Sites 9 and 19. The details of the implementation of in-situ bioremediation at IR Sites 9 and 19 are presented in the following sections. Bioremediation would be implemented to treat COCs present in groundwater at IR Sites 9 and 19 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

Similar to Alternatives G-2 and G-3, Alternative G-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-4 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-4 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

BIOREMEDIATION AT IR SITE 9

The COCs at IR Site 9 include VC, 1,1-DCA, cis-1,2-DCE, benzene, methyl tert-butyl ether, 1,1-DCE, and 1,2,3-TCP. Based on this, aerobic bioremediation may be implemented for the FWBZ and SWBZ at IR Site 9 because of the following reasons:

The major COCs at IR Site 9 include VC and 1,1-DCA, which are amenable to aerobic biodegradation (USEPA 2000).

Cis-1,2-DCE has been shown to biodegrade under aerobic conditions in the presence of VC.

Benzene and methyl tert-butyl ether are amenable to aerobic biodegradation.

Although 1,1-DCE is more amenable to degradation under anaerobic conditions, it was reported at only one isolated location at a low concentration (12 µg/L) during the Data Gap Study (Tetra Tech EC 2009).

Aerobic bioremediation would include emplacement of the source of molecular oxygen into the subsurface. Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figures 3-9 through 3-12). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 40 feet bgs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

The bioremediation design including bioremediation strategy, anaerobic versus aerobic, and injection strategy, direct injection versus groundwater recirculation loop would be finalized during the remediation design stage.

BIOREMEDIATION AT IR SITE 19

The primary COCs at IR Site 19 include PCE and TCE. These COCs are readily amenable to anaerobic reductive dechlorination. VC is also amenable to anaerobic bioremediation. Therefore, bioremediation at IR Site 19 would include emplacement of an electron donor into the subsurface to promote more strongly reducing conditions in the aquifer and to serve as a source of electron donor for the microorganisms that degrade PCE and TCE. Some common electron donors include molasses, vegetable oil, methanol, and lactate. These electron donors can also serve as a source of carbon for the microorganisms.

The emplacement strategies for an electron donor are the same as those for an oxygen release compound and are discussed in Section 5.5.4.1.

5.5.2 IR Site 13

The remedial action alternatives for impacted groundwater at IR Site 13 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process

ensured the development of a range of alternatives from those involving active restoration of the plume to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

Alternative G13-1: No Action

Alternative G13-2: MNA and ICs

Alternative G13-3: ISCO, MNA, and ICs

Alternative G13-4: In-Situ Bioremediation, MNA, and ICs

5.5.2.1 ALTERNATIVE G13-1: NO ACTION

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Site 13. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.2.2 ALTERNATIVE G13-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G13-2 would rely on natural attenuation processes and monitoring for remediation of COCs (i.e. benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G13-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

The results of groundwater sampling conducted from May 2000 through September 2009, indicate that COCs in IR Site 13 groundwater (benzene, ethylbenzene, toluene, and xylene) are localized in extent and plume boundaries are relatively stable. The comparison of May/June 2000 benzene concentrations with concentrations observed during September 2009 does not indicate significant reduction in concentrations or migration. Benzene, ethylbenzene, toluene, and xylene are readily biodegraded under aerobic conditions, however as summarized in Section 3.4, groundwater at most locations within OU-2A is indicative of reducing conditions. The reducing conditions in groundwater may be responsible for relatively slow biodegradation of COCs in IR Site 13 groundwater. Therefore, although MNA may be effective in reducing potential migration of COCs in IR Site 13 groundwater, natural attenuation processes may take relatively long time to reduce COC concentrations below their respective TCGs.

As part of implementation of MNA, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs including benzene, ethylbenzene, and toluene in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analysis.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Site 13. This estimate was based on assuming the first-order decay and using the following equation:

$$\log C - \log C_o = - kt$$

where:

C = Final COC concentration at time t

C_o = Initial COC concentration at time zero

k = First-order decay rate constant for the COC

T = Time for COC concentration to decrease from C_o to C.

To ensure development of a representative estimate for natural attenuation time-frames, the following methodology was used:

Benzene was used as a representative COC.

The minimum value of anaerobic biodegradation rate constant (0.0015 per day) for benzene presented in the USEPA document "Anaerobic Biodegradation Rates of Organic Chemicals in Groundwater: A Summary of Field and Laboratory Studies" (U.S. EPA 1999b) was used.

The maximum concentration of benzene of 1,500 µg/L reported the Supplemental DGI was used as the initial concentration value.

Based on the above methodology, the total time required for COCs in groundwater at IR Site 13 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 14 years.

With the exception of benzene, the EPC (95 percent UCL of the reported concentrations based on the data from 2002 to 2008) of all the COCs at IR Site 13 are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs

Protect site security features such as fences, and signs

Preserve access to the ARICs for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plume at IR Site 13:

The prohibition on domestic use of groundwater.

The prohibition on drilling wells of any kind.

The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G13-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.3 ALTERNATIVE G13-3: IN-SITU CHEMICAL OXIDATION, MNA AND ICS

Alternative G13-3 would include implementation of ISCO to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extent of plume shown on Figure 3-14. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. The lateral and vertical extents of COCs in IR Site 13 groundwater would be refined as part of pre-design investigations. These investigations would include installation of monitoring wells and groundwater sampling and analyses for the COCs.

An alternative strategy for emplacement of oxidant in the subsurface that uses groundwater recirculation could also be used at IR Site 13 for the implementation of ISCO. This strategy uses groundwater extraction and injection wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO of COCs at IR Site 13 such as Fenton's reagent, activated persulfate or ozone. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

To ensure protection of human-health and attainment of RAOs, Alternative G13-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA.

The ICs and access restrictions implemented for Alternative G13-3 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

If Alternative G13-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.4 ALTERNATIVE G13-4: IN-SITU BIOREMEDIATION, MNA, AND ICS

Alternative G13-4 would include implementation of in-situ bioremediation to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The COCs at IR Site 13 are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. The 1998 Intrinsic Bioremediation Treatability Study indicates that oxygen is a limiting factor in biodegradation of COCs at IR Site 13. Therefore, implementation of bioremediation at IR Site 13 would include delivery of the source of molecular oxygen into the subsurface.

As part of implementation of Alternative G13-4, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analyses for COCs.

Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plume with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figure 3-13). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

Oxygen may also be delivered into the subsurface at IR Site 13 using biosparging. Biosparging would include injection of air or oxygen into the subsurface using wells. The pilot studies and petroleum corrective action conducted west of Building 530 would provide useful data to design biosparging at IR Site 13. Although, the VOC mass removal due to biosparging was not established during the pilot studies and petroleum corrective action, an effective radius of influence of 20 feet was recommended based on these studies.

Bioremediation would be implemented to treat COCs present in groundwater at IR Site 13 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

Similar to Alternatives G13-2 and G13-3, Alternative G13-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of in-situ bioremediation and MNA. The ICs and access restrictions implemented for Alternative G13-4 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

5.6 DETAILED ANALYSIS OF ALTERNATIVES

The NCP (40 C.F.R. § 300.430 [e][9][i] and [ii]) requires that a detailed analysis of remedial alternatives be conducted during the FS based on the nine evaluation criteria identified in 40 C.F.R. § 300.430 (e)(9)(iii). The results of the detailed analysis provide the basis for identifying a preferred alternative and preparing the proposed plan.

Because of the difference in the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) compared to IR Site 13 (petroleum hydrocarbon VOCs), the detailed analysis of remedial alternatives was carried out separately for IR Sites 9 and 19, and for IR Site 13 Section 5.6.1 provides a brief description of each of the nine evaluation criteria. Sections 5.6.2 and 5.6.3 provide an assessment and a summary profile of each alternative against the evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively. Sections 5.6.3 and 5.6.4 present comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively.

5.6.1 Evaluation Criteria

The nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied by each alternative and relate directly to statutory findings that must ultimately be made in the ROD. The two threshold criteria include:

Overall protection of human-health and the environment, and

Compliance with ARARs

The primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

Long-term effectiveness and permanence

Reduction of toxicity, mobility, or volume through treatment

Short-term effectiveness

Implementability

Cost

The modifying criteria are taken into account following comment on the FS Report and proposed plan, and are addressed once a final decision is being made and the ROD is being prepared. The modifying criteria include:

State acceptance, and

Community acceptance

Each of the nine evaluation criteria is summarized in the following sections.

5.6.1.1 Overall Protection of Human-Health and the Environment

Under this criterion, the alternatives are assessed to determine whether they can adequately protect human-health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of remediation goals. Overall protection of human-health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.6.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Under this criterion, the alternatives are assessed to determine whether they attain ARARs under Federal environmental laws and State environmental or facility siting laws or provide grounds for invoking a waiver.

5.6.1.3 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. Factors that are considered, as appropriate, include the following:

Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities.

Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste.

5.6.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion evaluates alternatives based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. This includes how treatment is used to address the principal threats posed by the site. Factors that are considered include the following:

The treatment or recycling processes the alternatives employ and materials they will treat

The amount of constituents that will be destroyed, treated, or recycled

The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reductions are occurring

The degree to which the treatment is irreversible

The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their constituents

The degree to which treatment reduces the inherent hazards posed by principal threats at the site

5.6.1.5 Short-Term Effectiveness

Under this criterion, alternatives are evaluated with respect to their effects on human-health and the environment during implementation of the remedial action. The short-term impacts of alternatives are assessed considering the following:

Short-term risks that might be posed to the community during implementation of an alternative

Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures

Potential environmental impacts with respect to sustainability metrics (i.e., emission of pollutants and greenhouse gases) of the remedial action and the effectiveness and reliability of mitigative measures during implementation

Time until protection is achieved

5.6.1.6 IMPLEMENTABILITY

The assessment for implementability of the alternatives is based on the following factors:

Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).

Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

5.6.1.7 COST

The types of costs that are assessed include the following:

Capital costs, including both direct and indirect costs

Annual O&M costs

Net present value of capital and O&M costs

Cost estimates for remedial alternatives for impacted groundwater at IR Sites 9, 13 and 19 were generated using RACER™ 2010 (version 10.3.0). The cost backup including underlying assumptions and quantities for cost estimates, and an individual cost summary for each remedial action alternative considered for detailed analysis in this FS are presented in Appendix D. The cost estimates were generated for remedial action alternatives based on the conceptual design conducted using the available site characterization, pilot studies, and removal action data, as appropriate. The cost estimates generated in this FS are for comparison purposes only and are of sufficient level of accuracy to conduct comparative analysis of remedial alternatives based on costs.

5.6.1.8 STATE ACCEPTANCE

This criterion assesses the State acceptance by considering the following:

The State's position and key concerns related to the preferred alternative and other alternatives

State comments on ARARs or the proposed use of waivers

5.6.1.9 COMMUNITY ACCEPTANCE

This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

5.6.2 Individual Analysis of Alternatives – IR Sites 9 and 19

5.6.2.1 ALTERNATIVE G-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IR Sites 9 and 19. Natural attenuation processes such as dilution, dispersion, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater In addition, under the No Action Alternative there would be no way to assess the fate of COCs in groundwater. Alternative G-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G-1 would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-1 would have no short-term impact on risks at IR Sites 9 and 19. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G-1 includes no remedial action, sustainable environmental remediation (SER) analysis was not conducted for this alternative.

Implementability

Alternative G-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.

Cost

There are no direct costs associated with Alternative G-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-1 will be assessed following the public review process.

5.6.2.2 ALTERNATIVE G-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G-2 consists of natural attenuation monitoring and land/groundwater use restrictions to ensure that the RAOs for groundwater at IR Sites 9 and 19 are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce COC concentrations in groundwater.

ICs under Alternative G-2 would include non-engineered controls to limit human exposure to impacted groundwater. Restrictions on future land and groundwater use would be to ensure protection of potential receptors, and protect the MNA system components. A complete description of Alternative G-2 is presented in Section 5.5.2.

Overall Protection of Human-Health and the Environment

Alternative G-2 provides protection of human-health and the environment. This alternative restricts use of groundwater, thereby protecting human-health by minimizing the potential for exposure to impacted groundwater. In addition, to ensure protection against potential unacceptable risks due to vapor intrusion pathway, ICs may include a requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs, as presented in Section 5.1.5. Effective implementation of ICs would be necessary for Alternative G-2 to be protective of human-health. ICs would have to be implemented until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

Compliance with ARARs

Alternative G-2 complies with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

Alternative G-2 would provide long-term effectiveness in minimizing the potential for exposure to impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for impacted groundwater can be accomplished relatively easily.

ICs may have to be implemented for a relatively long period of time for groundwater at IR Sites 9 and 19 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are

not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. At IR Site 19, higher chlorinated alkenes (TCE and PCE) may get anaerobically biodegraded to VC which is more toxic than the parent compounds. However, other natural attenuation processes such as dilution and dispersion would eventually reduce concentrations of VC (if formed). The groundwater monitoring results to date have shown that concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. Therefore natural attenuation appears to be occurring to reduce mobility of COCs.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-2 would have short-term impact on risks at IR Sites 9 and 19 if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G-2 would require longer time-frames for remediation of COCs in groundwater to concentrations less than their TCGs compared to alternatives involving active remediation. However, Alternative G-2 would rely on ICs that require land/groundwater use restrictions to minimize the potential for exposure to COC concentrations posing unacceptable risk.

Alternative G-2 would have a low degree of environmental impact as evaluated through the SER analysis (see Appendix C). The impacts to the environment for Alternative G-2 are primarily due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and green house gas (GHG) emissions, and energy use are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

The total time required for VOCs in groundwater at IR Sites 9 and 19 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 15 years. The detailed methodology for estimation of remediation time frame for Alternative G-2 is presented in Section 5.5.1.2.

Implementability

MNA is relatively easily implementable. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-2. The detailed costs for implementation of Alternative G-2 are presented in Appendix D. The estimated net present-worth of Alternative G-2 is $2,789,000. The present-worth analysis assumed the construction and O&M period of 15 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-2 will be assessed following the public review process.

5.6.2.3 Alternative G-3: In-Situ Chemical Oxidation, MNA, and ICs

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Sites 9 and 19. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than their respective TCGs. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

To ensure protection of human-health and attainment of RAOs, Alternative G-3 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landownwer(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs.

Overall Protection of Human-Health and the Environment

Alternative G-3 would be protective of human-health and the environment. ISCO would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G-3 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19. Therefore, Alternative G-3 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G-3 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

ISCO is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of ISCO treatments would be required to reduce concentrations of COCs across the entire lateral and vertical extents of VOC plumes.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

ISCO implemented as part of Alternative G-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water (ITRC 2005). Therefore, Alternative G-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-3 would have a short-term impact on risks at IR Sites 9 and 19 since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G-3 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G-3 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Sites 9 and 19 to concentrations less than their respective target cleanup goals using Alternative G-3.

Implementability

Injection of reagents using direct push and or injection wells as part of ISCO is a mature, well-known technology. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19. These tests have shown that injection of reagents in the FWBZ is relatively easy compared to injection into deeper groundwater/SWBZ.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the ISCO performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-3. The detailed costs for implementation of Alternative G-3 are presented in Appendix D. The estimated net present-worth of Alternative G-3 is $4,611,000. The present-worth analysis assumed an O&M period of five years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-3 will be assessed following the public review process.

5.6.2.4 ALTERNATIVE G-4: IN-SITU BIOREMEDIATION, MNA, AND ICS

Alternative G-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Sites 9 and 19. Based on the nature of COCs present in groundwater, aerobic bioremediation may be implemented at IR Site 9 and anaerobic bioremediation may be implemented at IR Site 19 (see Section 5.5.4 for details). Both aerobic and anaerobic bioremediation would require injection of amendments to the subsurface to stimulate bacteria capable of biodegrading the COCs.

To ensure protection of human-health and attainment of RAOs, Alternative G-4 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below their respective TCGs.

Overall Protection of Human-Health and the Environment

Alternative G-4 would be protective of human-health and the environment. In-situ bioremediation would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G-4 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19. Therefore, Alternative G-4 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G-4 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

In-situ bioremediation is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of bioremediation amendment injections would be required to reduce concentrations of COCs across the entire lateral and vertical extents of the VOC plumes.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Bioremediation implemented as part of Alternative G-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. The anaerobic degradation of TCE and PCE at IR Site 19 may lead to generation of VC which is more toxic than the parent compounds. However, VC may eventually degrade to ethene under anaerobic conditions. If further anaerobic biodegradation of VC does not occur, the geochemical conditions may be changed to aerobic by injection of oxygen releasing compounds or oxygen gas since VC biodegrades more readily under aerobic conditions. Therefore, Alternative G-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-4 would have a short-term impact on risks at IR Sites 9 and 19 since subsurface injection of amendments such as emulsified vegetable oil or oxygen releasing chemical compounds would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G-4 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Sites 9 and 19 to concentrations less than their respective target cleanup goals using Alternative G-4.

Implementability

Injection of reagents using direct push and or injection wells as part of bioremediation is a mature, well-known technology. Materials and vendors for implementation of bioremediation are readily available. However, bench/pilot tests may be required to assess the feasibility of bioremediation for treatment of COCs at IR Site 9 and 19. These tests would evaluate the feasibility of complete dechlorination of TCE and PCE or if implementation of anaerobic and aerobic bioremediation in sequential fashion would be required at IR Site 19.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-4. The detailed costs for implementation of Alternative G-4 are presented in Appendix D. The estimated net present-worth of Alternative G-4 is $7,014,000. The present-worth analysis assumed an O&M period of 5 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-4 will be assessed following the public review process.

5.6.3 IR Site 13 - Analysis of Alternatives

5.6.3.1 ALTERNATIVE G13-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IR Site 13. Natural attenuation processes such as dilution, dispersion, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater In addition, under the No Action Alternative there would be no way to assess the fate of COCs in groundwater. Alternative G13-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G13-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G13-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution, dispersion, and biodegradation would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G13-1 would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-1 would have no short-term impact on risks at IR Site 13. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G13-1 includes no remedial action, SER analysis was not conducted for this alternative.

Implementability

Alternative G13-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.

Cost

There are no direct costs associated with Alternative G13-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-1 will be assessed following the public review process.

5.6.3.2 ALTERNATIVE G13-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G13-2 consists of natural attenuation monitoring and land/groundwater use restrictions to ensure that the RAOs for groundwater at IR Site 13 are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce COC concentrations in groundwater.

ICs under Alternative G13-2 would include non-engineered controls to limit human exposure to impacted groundwater. Restrictions on future land and groundwater use would be to ensure protection of potential receptors, and protect the MNA system components. A complete description of Alternative G-2 is presented in Section 5.5.2.

Overall Protection of Human-Health and the Environment

Alternative G13-2 provides protection of human-health and the environment. This alternative restricts use of groundwater, thereby protecting human-health by minimizing the potential for exposure to impacted groundwater. In addition, to ensure protection against potential unacceptable risks due to vapor intrusion pathway, ICs may include a requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs, as presented in Section 5.1.5. Effective implementation of ICs would be necessary for Alternative G13-2 to be protective of human-health. ICs would have to be implemented until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

Compliance with ARARs

Alternative G13-2 complies with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

Alternative G13-2 would provide long-term effectiveness in minimizing the potential for exposure to impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for impacted groundwater can be accomplished relatively easily.

ICs may have to be implemented for a relatively long period of time for groundwater at IR Site 13 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results and the 1998 Intrinsic Bioremediation Study indicate that hydrocarbon biodegradation rates at IR Site 13 are slow presumably

due to reducing conditions in groundwater. However, monitoring results also indicate relatively stable plume boundaries for benzene (primary COC). Therefore, natural attenuation processes appear to be occurring to reduce mobility of COCs at IR Site 13.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-2 would have short-term impact on risks at IR Site 13 if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G13-2 would require longer time-frames for remediation of COCs in groundwater to concentrations less than their TCGs compared to alternatives involving active remediation. However, Alternative G13-2 would rely on ICs that require land/groundwater use restrictions to minimize the potential for exposure to COC concentrations posing unacceptable risk.

Alternative G13-2 would have a low degree of environmental impact as evaluated through the SER analysis (see Appendix C). The impacts to the environment for Alternative G13-2 are primarily due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant emissions are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The GHG emissions and energy use are estimated to be the highest for disposal of groundwater generated during sampling of wells. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

The total time required for VOCs in groundwater at IR Site 13 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 14 years. The detailed methodology for estimation of remediation time frame for Alternative G13-2 is presented in Section 5.5.2.2.

Implementability

MNA is relatively easily implementable. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-2. The detailed costs for implementation of Alternative G13-2 are presented in Appendix D. The estimated net present-worth of Alternative G13-2 is $2,435,000. The present-worth analysis assumed a construction and O&M period of 14 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-2 will be assessed following the public review process.

5.6.3.3 ALTERNATIVE G13-3: IN-SITU CHEMICAL OXIDATION, MNA, AND ICS

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Site 13. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than their respective TCGs. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

To ensure protection of human-health and attainment of RAOs, Alternative G13-3 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landownwer(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs.

Overall Protection of Human-Health and the Environment

Alternative G13-3 would be protective of human-health and the environment. ISCO would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G13-3 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13. Therefore, Alternative G13-3 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G13-3 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

ISCO is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of ISCO treatments would be required to reduce concentrations of COCs across the entire lateral and vertical extents of impacted groundwater.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

ISCO implemented as part of Alternative G13-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water (ITRC 2005). Therefore, Alternative G13-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-3 would have a short-term impact on risks at IR Site 13 since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to

work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G13-3 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G13-3 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Site 13 to concentrations less than their respective target cleanup goals using Alternative G13-3.

Implementability

Injection of reagents using direct push and or injection wells as part of ISCO is a mature, well-known technology. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide data to optimize the design of the full-scale ISCO implementation at IR Site 13. These tests have shown that injection of reagents in shallow groundwater is relatively easy. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the ISCO performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-3. The detailed costs for implementation of Alternative G13-3 are presented in Appendix D. The estimated net present-worth of Alternative G13-3 is $2,103,000. The present-worth analysis assumed an O&M period of five years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-3 will be assessed following the public review process.

5.6.3.4 Alternative G13-4: In-Situ Bioremediation, MNA, and ICs

Alternative G13-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Site 13. Based on the nature of COCs present in groundwater, aerobic bioremediation may be implemented at IR Site 13 using direct injection, groundwater recirculation or biosparging.

To ensure protection of human-health and attainment of RAOs, Alternative G13-4 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of

future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below their respective TCGs.

Overall Protection of Human-Health and the Environment

Alternative G13-4 would be protective of human-health and the environment. In-situ bioremediation would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G13-4 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13. Therefore, Alternative G13-4 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G13-4 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

In-situ bioremediation is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of bioremediation amendment injections would be required to reduce concentrations of COCs across the entire lateral and vertical extents of impacted groundwater.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The COCs at IR Site 13 including benzene, ethylbenzene, and toluene are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-4 would have a short-term impact on risks at IR Site 13 since subsurface injection of amendments such as oxygen releasing chemical compounds would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G13-4 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Site 13 to concentrations less than their respective target cleanup goals using Alternative G13-4.

Implementability

Injection of reagents using direct push and or injection wells as part of bioremediation is a mature, well-known technology. Materials and vendors for implementation of bioremediation are readily available. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-4. The detailed costs for implementation of Alternative G13-4 are presented in Appendix D. The estimated net present-worth of Alternative G13-4 is $2,364,000. The present-worth analysis assumed an O&M period of 5 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-4 will be assessed following the public review process.

5.6.4 Comparative Analysis of Alternatives – IR Sites 9 and 19

The comparative analysis of alternatives constitutes evaluation of alternatives in relation to one another for each of the nine NCP evaluation criteria. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

The comparative analysis of remedial alternatives developed for VOCs-impacted groundwater at IR Sites 9 and 19 is presented in the following sections. A ranking of poor, fair, or good is assigned to each alternative as a result of the evaluation. Table 5-5 presents a summary of individual and comparative analysis.

5.6.4.1 Overall Protection of Human-Health and the Environment

All alternatives, except Alternative G-1 (No Action) provide adequate protection of human-health and the environment. Under Alternative G-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective TCGs. Alternative G-2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative G-2 provides protection by implementation of land/groundwater use restrictions to minimize the potential for exposure to COCs above their respective TCGs.

Alternatives G-3 and G-4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives G-3 and G-4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective TCGs.

5.6.4.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Since Alternative G-1 entails no remedial action, ARARs would not be triggered. Alternatives G-2 through G-4 would comply with all identified ARARs.

5.6.4.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Under Alternative G-2, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. The natural attenuation is also expected to reduce further migration of COCs.

Under Alternatives G-3 and G-4, concentrations of COCs in groundwater would be permanently reduced through active in-situ treatment methods such as ISCO and bioremediation.

ICs would be required under Alternatives G-2, G-3, and G-4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective TCGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

5.6.4.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative G-2 relies on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Alternatives G-3 and G-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternatives G-3 includes implementation of ISCO and Alternative G-4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective TCGs.

5.6.4.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness includes risks to workers/community or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative G-1 since no remedial action would be implemented. Alternative G-2 would include limited remedial construction operations including installation of additional monitoring wells. Alternatives G-3 and G-4 would include handling and injection of reagents into the subsurface and drilling. The reagents involved under Alternative G-3 may include hazardous oxidants. Therefore, risks to site workers under Alternatives G-3 and G-4 are greater compared to Alternative G-2.

Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are higher for Alternatives G-3 and G-4 compared to Alternative G-2. This is due to higher estimated pollutant and GHG emissions, energy use, and injury and fatality risks for workers during implementation of Alternative G-2 compared to Alternatives G-3 and G-4.

Alternative G-2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long time to achieve TCGs compared to Alternatives G-3 and G-4.

5.6.4.6 IMPLEMENTABILITY

There are no implementability concerns associated with Alternative G-1 since no action will be taken. Alternative G-2 would be the simplest to construct and operate. The implementation of Alternative G-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well

drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.

Alternative G-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19.

The implementation of bioremediation under Alternative G-4 may require bench/pilot tests to assess the feasibility of bioremediation for treatment of COCs at IR Site 9 and 19. Therefore, technical implementation of bioremediation at IR Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.

5.6.4.7 COST

There are no costs associated with Alternative G-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G-2 is least expensive and Alternative G-4 is most expensive.

5.6.4.8 STATE ACCEPTANCE

The State comments will be formally presented in the Proposed Plan and documented in the ROD..

5.6.4.9 COMMUNITY ACCEPTANCE

Community acceptance of one or more of the remedial alternatives proposed for impacted groundwater would be assessed following the public review process.

5.6.5 Comparative Analysis of Alternatives – IR Site 13

The comparative analysis of remedial alternatives developed for VOCs-impacted groundwater at IR Site 13 is presented in the following sections. A ranking of poor, fair, or good is assigned to each alternative as a result of the evaluation. Table 5-6 presents a summary of individual and comparative analysis.

5.6.5.1 OVERALL PROTECTION OF HUMAN-HEALTH AND THE ENVIRONMENT

All alternatives, except Alternative G13-1 (No Action) provide adequate protection of human-health and the environment. Under Alternative G13-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective TCGs. Alternative G13-2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative G13-2 provides protection by implementation of land/groundwater use restrictions to minimize the potential for exposure to COCs above their respective TCGs.

Alternatives G13-3 and G13-4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives G13-3 and G13-4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective TCGs.

5.6.5.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Since Alternative G13-1 entails no remedial action, ARARs would not be triggered. Alternatives G13-2 through G13-4 would comply with all identified ARARs.

5.6.5.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Under Alternative G13-2, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. The natural attenuation is also expected to reduce further migration of COCs.

Under Alternatives G13-3 and G13-4, concentrations of COCs in groundwater would be permanently reduced through active in-situ treatment methods such as ISCO and bioremediation.

ICs would be required under Alternatives G13-2, G13-3, and G13-4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective TCGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

5.6.5.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative G13-2 relies on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Alternatives G13-3 and G13-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternatives G13-3 includes implementation of ISCO and Alternative G13-4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective TCGs.

5.6.5.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness includes risks to workers/community or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative G13-1 since no remedial action would be implemented. Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are estimated to be higher for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The estimated pollutant emissions for Alternative G13-2 are comparable to Alternatives G13-3 and G13-4. The estimated dust and GHG emissions, energy use, water use, and injury/fatality risks for Alternative G13-2 are higher compared to Alternatives G13-3 and G13-4.

Alternative G13-2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long time to achieve TCGs compared to Alternatives G13-3 and G13-4.

5.6.5.6 IMPLEMENTABILITY

There are no implementability concerns associated with Alternative G13-1 since no action will be taken. Alternative G13-2 would be the simplest to construct and operate. The implementation of Alternative G13-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.

Alternative G13-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to design the full-scale ISCO implementation at IR Site 13. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.

Alternative G13-4 would include implementation of in-situ bioremediation. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective

action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.

5.6.5.7 COST

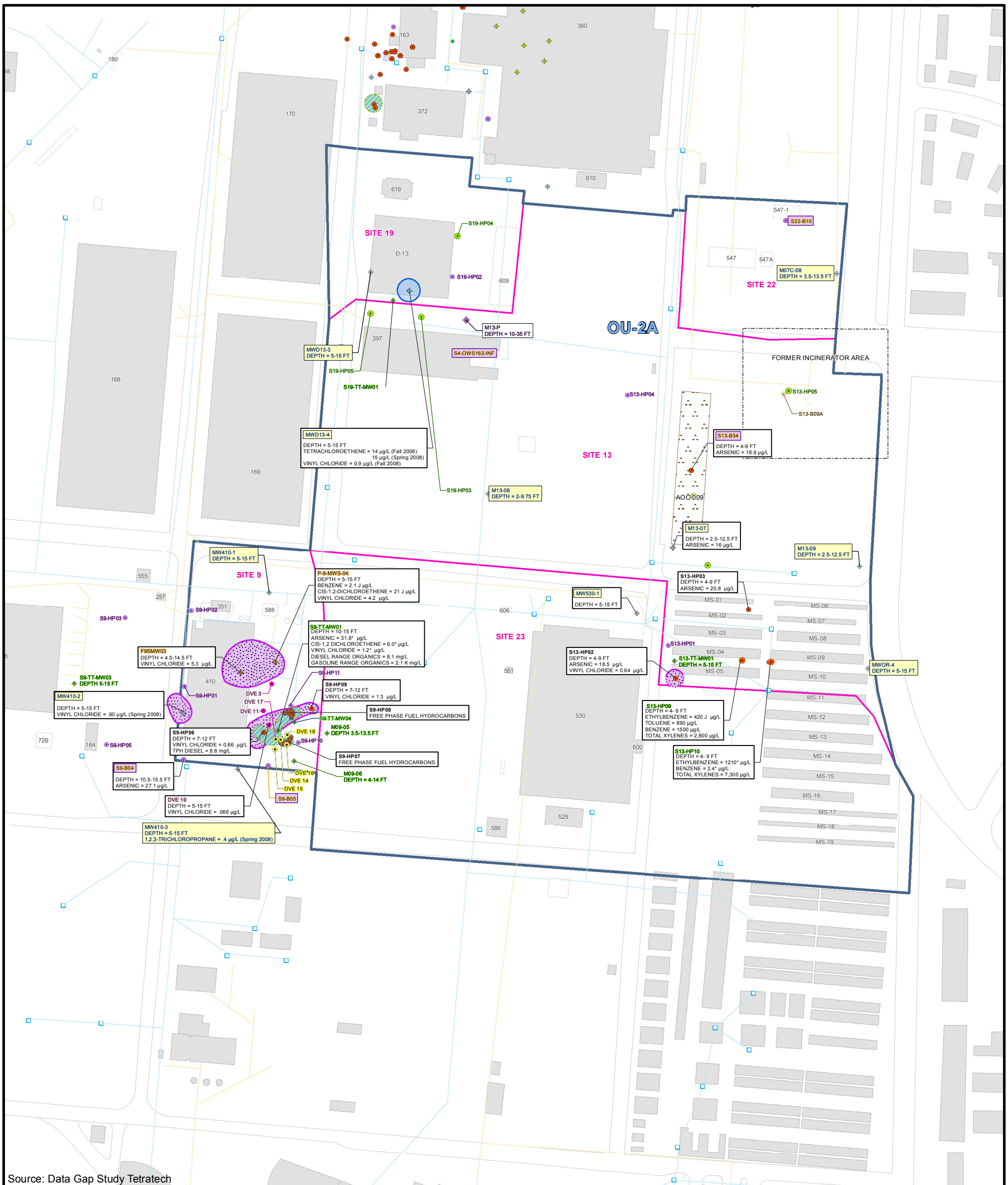
There are no costs associated with Alternative G13-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G13-3 is least expensive and Alternative G13-4 is most expensive.

5.6.5.8 STATE ACCEPTANCE

The State comments will be formally presented in the Proposed Plan and documented in the ROD..

5.6.5.9 COMMUNITY ACCEPTANCE

Community acceptance of one or more of the remedial alternatives proposed for impacted groundwater would be assessed following the public review process.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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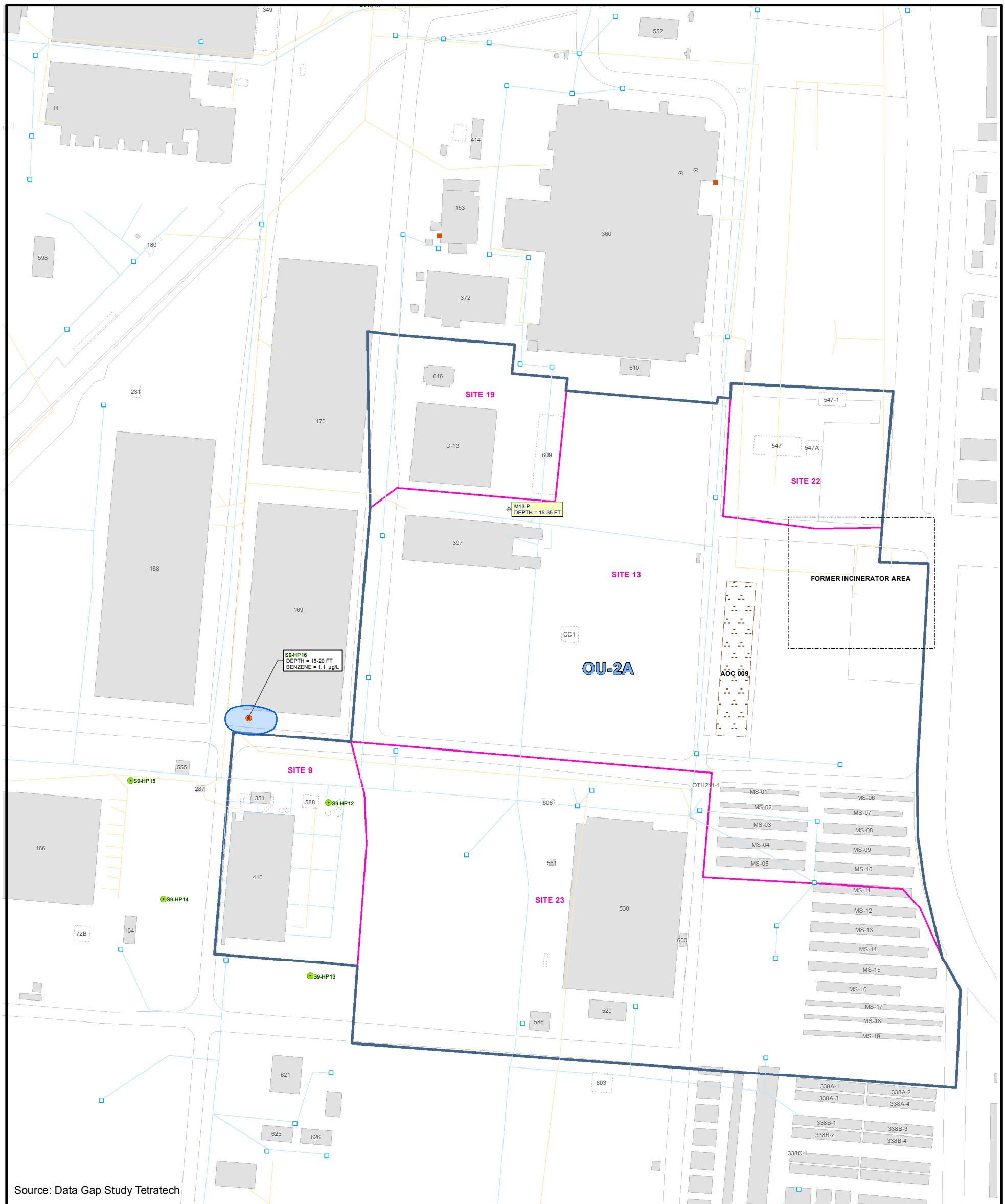

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (15 - 20 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-10

OTIE Oneida Total Integrated Enterprises

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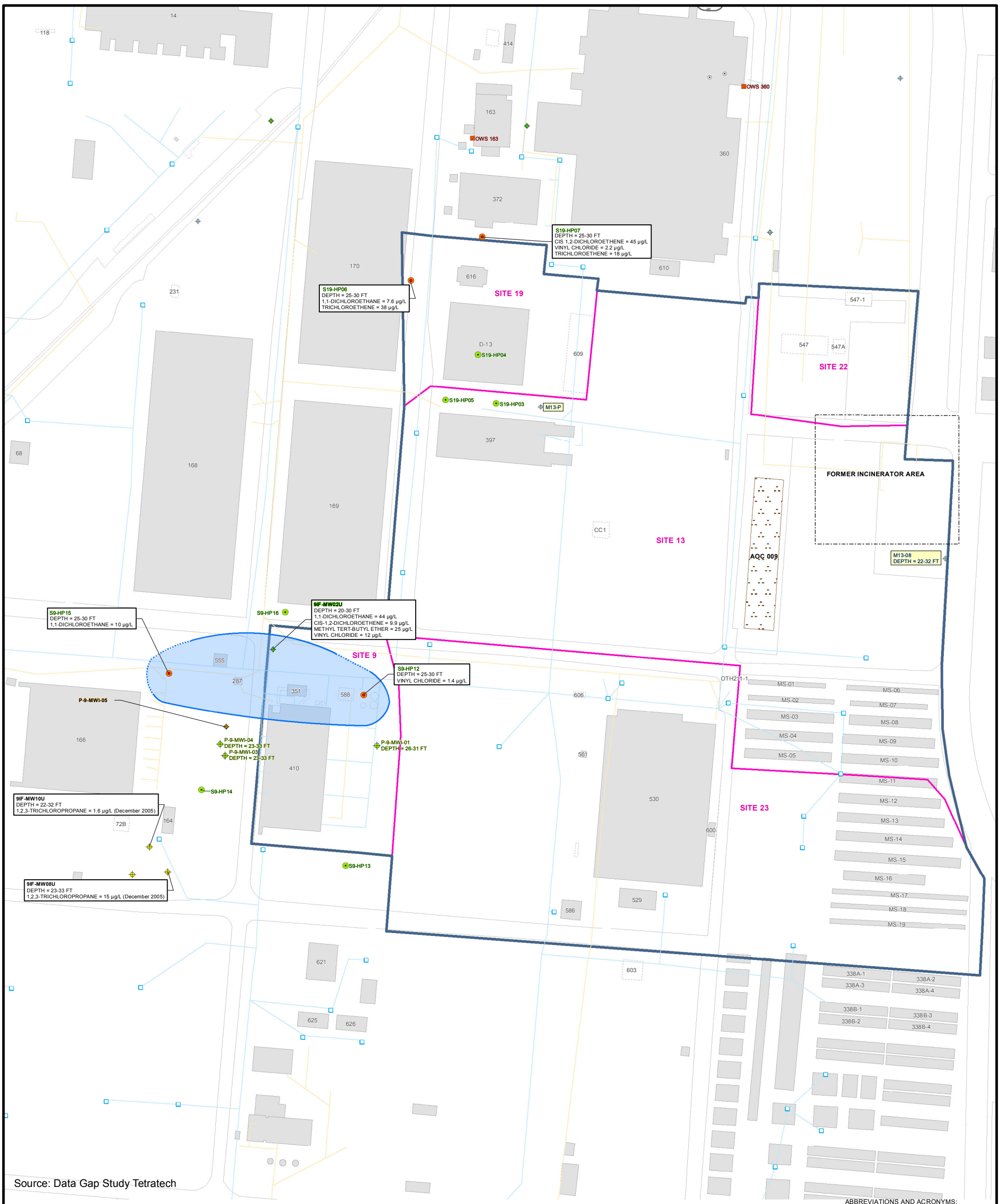

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-08 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (20 - 30 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-11

OTIE Oneida Total Integrated Enterprises

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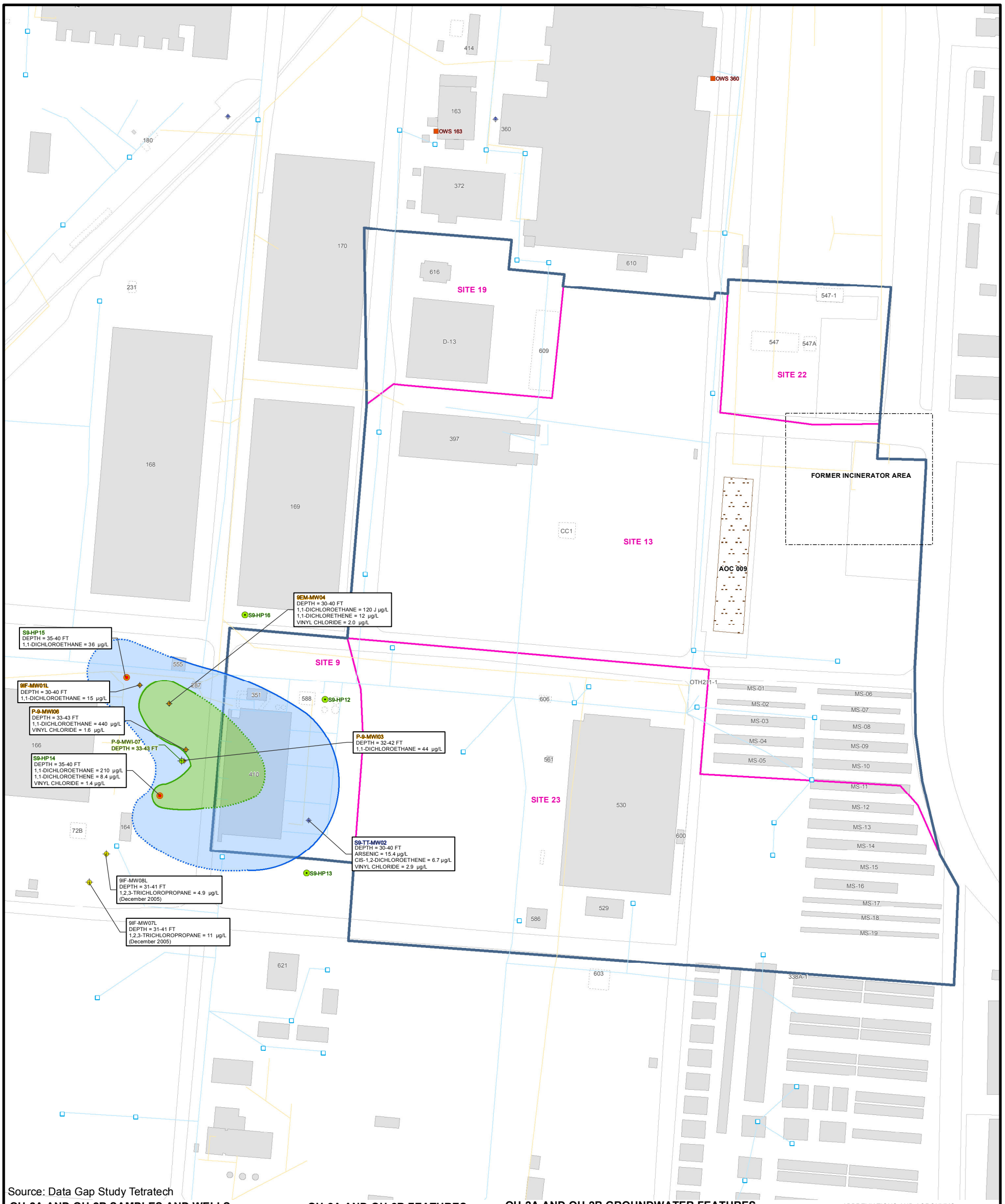

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (30 - 40 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-12

OTIE Oneida Total Integrated Enterprises

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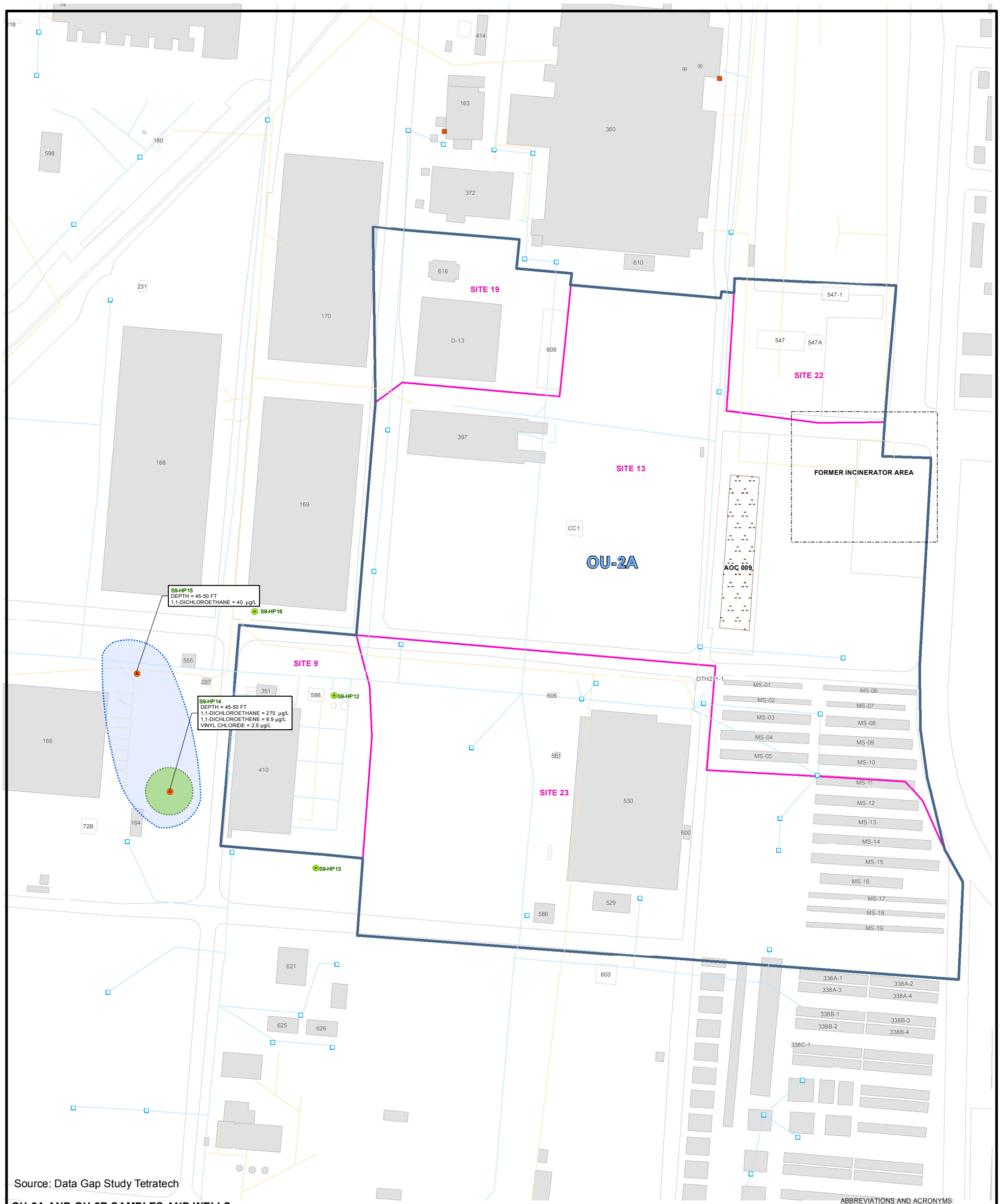

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (40 - 50 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-13

OTIE Oneida Total Integrated Enterprises

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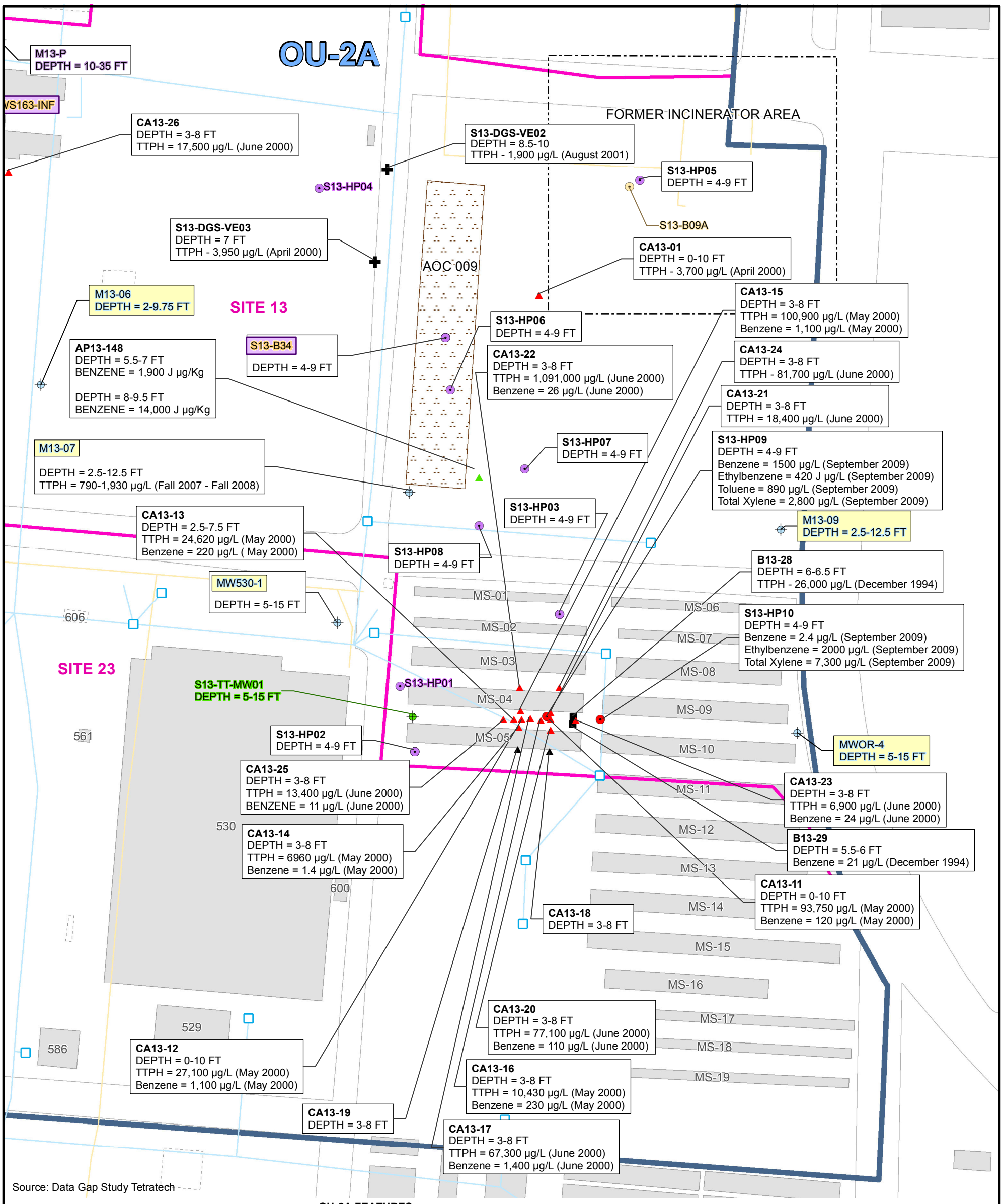

Source: Data Gap Study Tetratech

OU-2A SAMPLES AND WELLS

- S9-HP09 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2010)
- S3-HP04 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2010)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE LESS THAN MCL AND TTPH LESS THAN 1400 µG/L (SULTECH 2005B)
- VACCUM EXTRACTION - APRIL 2000 THROUGH AUGUST 2001
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE GREATER THAN MCL AND/OR TTPH GREATER THAN 1400 µG/L (SULTECH 2005B)
- BORINGS - DECEMBER 1994
- SOIL SAMPLE LOCATIONS - TRW INVESTIGATION (RBA 2008)

OU-2A FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF BENZENE ABOVE MCL (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF TTPH (SUM OF TPH-g, TPH-d, and TPH-mo) PLUME GREATER THAN 1,400 µg/L AS PRESENTED IN THE RI (DASHED WHERE INFERRED) (SULTECH 2005b)

N

0 100 200 Feet

1 inch = 100 feet

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
TPH-d - TPH AS DIESEL
TPH-g - TPH AS GASOLINE
TPH-mo - TPH AS MOTOR OIL
TRW - TARRY REFINERY WASTE
TTPH - Sum OF TPH-g, TPH-d, and TPH-mo
VOC - VOLATILE ORGANIC COMPOUND

OU-2A FS — Final

Benzene and TPH Results
IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-14

OTIE Oneida Total Integrated Enterprises — AECOM

Table 5-1: List of COCs – IRP Sites 9, 13, and 19 Groundwater

IR Site 9 Groundwater	IR Site 13 Groundwater	IR Site 19 Groundwater
∉ VC ∉ 1,1-DCA ∉ cis-1,2-DCE ∉ Benzene ∉ Methyl tert-butyl ether ∉ 1,1-DCE ∉ 1,2,3-Trichloropropane (1,2,3-TCP)	∉ Benzene ∉ Ethylbenzene ∉ Toluene ∉ Total Xylene	∉ TCE ∉ PCE ∉ VC

Table 5-2: Target Cleanup Goals – IR Sites 9, 13, and 19 Groundwater

Analyte	RBCs – Residential Use	Potential Chemical-Specific ARARs			
	Inhalation - Indoor Air (σg/L)	Federal MCL (σg/L)	Federal MCLG (σg/L)	California MCL (σg/L)	**Selected Target Cleanup Goal[a] (σg/L)**
IR Site 9					
VC	3.19	2	0	0.5	**0.5**
1,1-DCA	61.41	--	--	5	**5**
cis-1,2-DCE	2011.17	70	70	6	**6**
Benzene	11.26	5	0	1	**1**
Methyl tert-butyl Ether[b]	--	--	--	13	13
1,1-DCE	1526.96	7	7	6	**6**
1,2,3-TCP[b]	--	--	--	--	**0.5[c]**
IR Site 13					
Benzene	11.26	5	0	1	**1**
Ethylbenzene	33702.76	700	700	300	**300**
Toluene[b]	--	1,000	1,000	150	**150**
Total Xylene[b]	--	10,000	10,000	1,750	**1,750**
1IR Site 19			0		
TCE	27.15	5	0	5	**5**
PCE	5.91	5	0	5	**5**
VC	3.19		0	0.5	**0.5**

Notes:
[a]Least of the following values: RBCs, Federal MCL, non-zero Federal MCLG, and California MCL.
[b]Not a vapor intrusion COPC.
[C]RBC based on the level that can be reliably detected and quantified.

Table 5-5: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Sites 9 and 19

Criterion	Alternative G-1 – No Action	Alternative G-2 – MNA and ICs	Alternative G-3: ISCO, MNA, and ICs	Alternative G-4: In-situ Bioremediation, MNA, and ICs
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion Under this alternative, no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater. In addition, there would be no way to assess fate of COCs in groundwater. This alternative does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.	Meets the Criterion This alternative would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. In addition, ICs including land and groundwater use restrictions would be implemented as part of this alternative to minimize the potential for exposure to COCs above their respective TCGs. Effective implementation of ICs would be necessary for Alternative G-2 to be protective of human-health.	Meets the Criterion ISCO would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19.	Meets the Criterion In-situ bioremediation would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19.
Compliance with ARARs	Criterion does not Apply Since Alternative G-1 entails no remedial action, a discussion of compliance with ARARs is not appropriate for this alternative.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.
Long-Term Effectiveness	Poor This alternative affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.	Fair Under this alternative, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. ICs may have to be implemented for a relatively long period of time for groundwater at IR Sites 9 and 19 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through ISCO. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through in-situ bioremediation. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	Poor This alternative would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.	Fair Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results till date have shown that concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. Therefore natural attenuation appears to be occurring to reduce mobility of COCs	Good ISCO implemented as part of Alternative G-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.	Good Bioremediation implemented as part of Alternative G-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced
Short-Term Effectiveness	Good No construction/implementation activity will be conducted to generate additional site risk. Therefore, no work crews would be exposed to risks, and there would be no sources of additional environmental impact. Since Alternative G-2 includes no remedial action, SER analysis was not conducted for this alternative.	Good This alternative would have short-term impact on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. Alternative G-2 would have a low degree of environmental impact as evaluated through the SER analysis compared to Alternatives G-3 and G-4 (see Appendix C). The pollutant and green house GHG emissions, and energy use are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-2 is 15 years (see Section 5.5.1.2 for details).	Fair Alternative G-3 would have a short-term impact on site risks since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. The environmental impacts associated with Alternative G-3 including emission of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-3 is less than 5 years.	Fair Alternative G-4 would have a short-term impact on site risks since subsurface injection of bioremediation amendments would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. The environmental impacts associated with Alternative G-4 including emission of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-4 is less than 5 years.

Table 5-5: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Sites 9 and 19

Criterion	Alternative G-1 – No Action	Alternative G-2 – MNA and ICs	Alternative G-3: ISCO, MNA, and ICs	Alternative G-4: In-situ Bioremediation, MNA, and ICs
Implementability	Good Alternative G-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.	Good Alternative G-2 would be the simplest to construct and operate. The implementation of Alternative G-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.	Fair Alternative G-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at Sites 9 and 19.	Poor The implementation of bioremediation under Alternative G-4 may require bench/pilot tests to assess the feasibility of bioremediation for treatment of COCs at Site 9 and 19. Therefore, technical implementation of bioremediation at Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.
Community Acceptance	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.
Cost[a]	No Costs	Good $3,513,000[b]	Fair $4,611,000[c]	Poor $7,014,000[c]

Notes:
[a] Alternative that costs the least was rated as good.
[b] The present worth analysis was performed assuming an O&M period of 30 years and a discount rate of 2.8 percent.
[c] The present worth analysis was performed assuming an O&M period of 5 years and a discount rate of 2.8 percent.

Table 5-6: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Site 13

Criterion	Alternative G13-1 – No Action	Alternative G13-2 – MNA and ICs	Alternative G13-3: ISCO, MNA, and ICs	Alternative G13-4: In-situ Bioremediation, MNA, and ICs
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion Under this alternative, no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater. In addition, there would be no way to assess fate of COCs in groundwater. This alternative does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.	Meets the Criterion This alternative would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. In addition, ICs including land and groundwater use restrictions would be implemented as part of this alternative to minimize the potential for exposure to COCs above their respective TCGs. Effective implementation of ICs would be necessary for Alternative G13-2 to be protective of human-health.	Meets the Criterion ISCO would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13.	Meets the Criterion In-situ bioremediation would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13.
Compliance with ARARs	Criterion does not Apply Since Alternative G13-1 entails no remedial action, a discussion of compliance with ARARs is not appropriate for this alternative.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.
Long-Term Effectiveness	Poor This alternative affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.	Fair Under this alternative, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. ICs may have to be implemented for a relatively long period of time for groundwater at IR Site 13 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through ISCO. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through in-situ bioremediation. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	Poor This alternative would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.	Fair Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results and the 1998 Intrinsic Bioremediation Study indicate that hydrocarbon biodegradation rates at IR Site 13 are slow presumably due to reducing conditions in groundwater. However, monitoring results also indicate relatively stable plume boundaries for benzene (primary COC). Therefore, natural attenuation processes appear to be occurring to reduce mobility of COCs at IR Site 13.	Good ISCO implemented as part of Alternative G13-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.	Good Bioremediation implemented as part of Alternative G13-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced
Short-Term Effectiveness	Good No construction/implementation activity will be conducted to generate additional site risk. Therefore, no work crews would be exposed to risks, and there would be no sources of additional environmental impact. Since Alternative G13-2 includes no remedial action, SER analysis was not conducted for this alternative.	Fair This alternative would have short-term impact on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are estimated to be higher for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The GHG emissions, energy use, water use, and injury and fatality risks for workers during implementation of Alternative G13-2 are higher compared to Alternatives G13-3 and G13-4. This is due to longer time frames and greater scope of hollow-stem drilling (due to requirement for well replacement) for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The estimated time to achieve RAOs using Alternative G13-2 is 14 years (see Section 5.5.2.2 for details).	Good Alternative G13-3 would have a short-term impact on site risks since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells (see Appendix C). The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G13-3 is less than 5 years.	Good Alternative G13-4 would have a short-term impact on site risks since subsurface injection of bioremediation amendments would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells (see Appendix C). The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G13-4 is less than 5 years.

Table 5-6: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Site 13

Criterion	Alternative G13-1 – No Action	Alternative G13-2 – MNA and ICs	Alternative G13-3: ISCO, MNA, and ICs	Alternative G13-4: In-situ Bioremediation, MNA, and ICs
Implementability	Good Alternative G13-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.	Good Alternative G13-2 would be the simplest to construct and operate. The implementation of Alternative G13-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.	Poor Alternative G13-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to design of the full-scale ISCO implementation at IR Site 13. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.	Fair Alternative G13-4 would include implementation of in-situ bioremediation. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.
Community Acceptance	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.
Cost[a]	No Costs	Fair $2,435,000[b]	Good $2,103,000[c]	Fair $2,364,000[c]

Notes:
[a] Alternative that costs the least was rated as good.
[b] The present worth analysis was performed assuming an O&M period of 30 years and a discount rate of 2.8 percent.
[c] The present worth analysis was performed assuming an O&M period of 5 years and a discount rate of 2.8 percent.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
3	Proposed Plan	Section 1.2.3	Proposed Plan for Operable Unit 2A Installation Restoration Program Sites 9, 13, 19, 22, and 23, Former NAS Alameda, Alameda California. August 2011.

PROPOSED PLAN for Operable Unit 2A Installation Restoration Program Sites 9, 13, 19, 22, and 23, Former NAS Alameda, Alameda, California

Alameda, California

August 2011

THE DEPARTMENT OF THE NAVY ANNOUNCES PROPOSED PLAN

The Department of the Navy encourages the public to comment on this ***Proposed Plan**** for groundwater response actions associated with ***Installation Restoration (IR)*** Sites 9, 13, and 19 located within Operable Unit-2A (OU-2A) at former Naval Air Station (NAS) Alameda, known as Alameda Point, in Alameda, California. No further action is required for soil and groundwater at IR Sites 22 and 23, and for soil at IR Sites 9, 13, and 19, based on the evaluation of human health risks. The Navy is making this request in cooperation with the ***U.S. Environmental Protection Agency, Region 9 (EPA)***, the ***San Francisco Bay Regional Water Quality Control Board (Water Board)***, and the ***California Department of Toxic Substances Control (DTSC)***.

This Proposed Plan summarizes and compares the possible remedies and identifies the Navy's ***preferred remedial alternatives*** for groundwater at IR Sites 9, 13, and 19 (Figure 1). The Navy proposes the following to remediate groundwater at IR Sites 9, 13, and 19:

- ***Monitored natural attenuation (MNA)*** of ***chemicals of concern (COCs)*** to meet the ***remedial action objectives (RAOs)*** at IR Sites 9 and 19.
- Remediate groundwater contaminated with COCs using ***in-situ biological treatment/ bioremediation*** to meet the RAOs at IR Site 13.

Further discussion of COCs and RAOs is presented on page 7. Further discussion of the proposed remedies is presented on page 12.

Based on the evaluation of human health risks, no further action is required for soil at IR Sites 9, 13, and 19. In addition, no further action is required for soil and groundwater at IR Sites 22 and 23 (see risk assessment summary on pages 6 and 7).

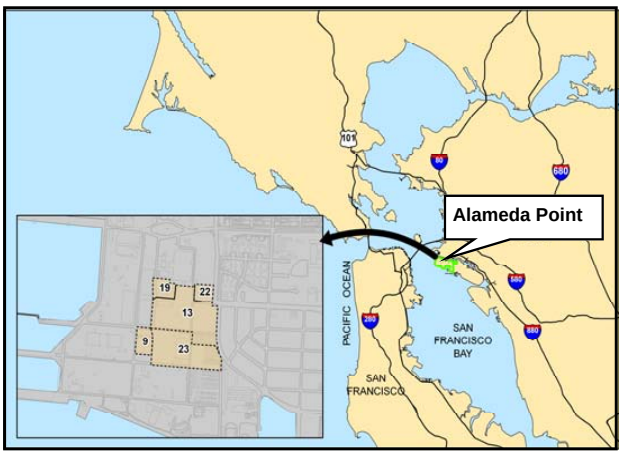

Figure 1: Location of Alameda Point

This Proposed Plan summarizes the site history, the environmental investigations, and the response action alternatives evaluated in accordance with the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)***, as amended by the ***Superfund Amendments and***

-NOTICE-

Public Comment Period

August 24 through September 24, 2011

Public Meeting

August 31, 2011
Alameda Point Main Office Bldg 1, Room 201
950 West Mall Square, Alameda, California
6:30 p.m. to 8:00 p.m.

* Words in bold and italic type are defined in the Glossary of Terms beginning on page 15.

Reauthorization Act (SARA), and explains the basis for choosing the preferred remedial alternative. The Navy will consider and respond to public comments on this Proposed Plan in a responsiveness summary when the ***Record of Decision (ROD)*** is prepared for OU-2A.

THE CERCLA PROCESS

CERCLA requires that the Navy involve the community in the decision-making process for the cleanup of IR Sites 9, 13, 19, 22, and 23. The Proposed Plan is the stage of the CERCLA process where the public has the opportunity to provide comments to the Navy about the proposed cleanup plan for the sites.

Figure 2 illustrates the current status of IR Sites 9, 13, 19, 22, and 23 in the CERCLA process.

This Proposed Plan summarizes information detailed in the ***Remedial Investigation (RI)*** and ***Feasibility Study (FS)***, along with other documents contained in the administrative record file for IR Sites 9, 13, 19, 22, and 23. The administrative record contains the reports and historical documents that will be used to support selection of remedial alternatives. The Navy encourages the public to review these documents to gain an understanding of the environmental assessments and investigations that have been conducted at IR Sites 9, 13, 19, 22, and 23. The documents are available for public review at the locations listed on page 14.

SITE BACKGROUND

Former NAS Alameda, now called Alameda Point, is located on the western tip of Alameda Island, on the eastern side of the San Francisco Bay. The Navy acquired Alameda Point from the Army in 1936 and began building the air station called NAS Alameda. Its original primary mission was to provide facilities and support for fleet aviation. After World War II, NAS Alameda served as a critical component to support Navy activities during the Korean War, the Vietnam War, and Operation Desert Storm. Alameda Point was identified for closure in 1993 and naval operations ceased in 1997.

As a management tool to accelerate investigation, cleanup, and reuse, the Navy has divided 35

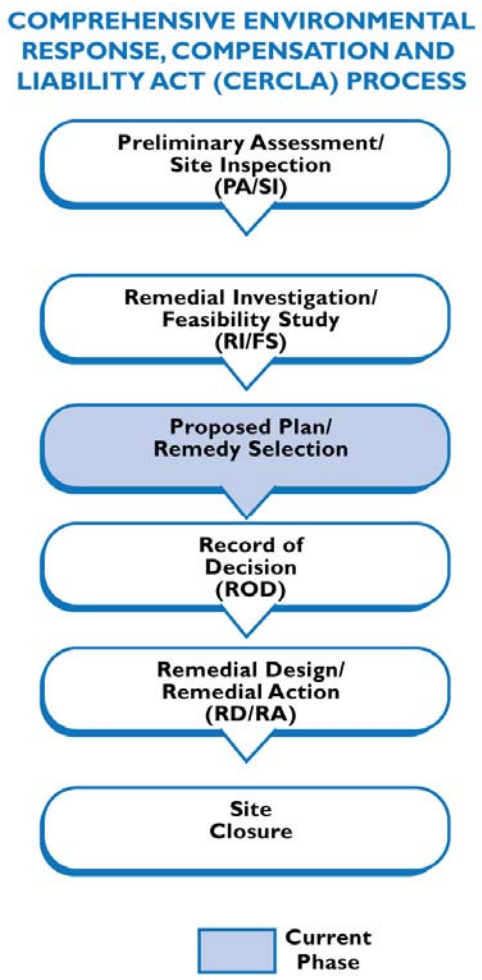

Figure 2. CERCLA Process

CERCLA sites at Alameda Point into ten OUs. This proposed plan addresses OU-2A, which includes IR Site 9 (Paint Stripping Facility), IR Site 13 (Former Oil Refinery), IR Site 19 (Hazardous Waste Storage), IR Site 22 (Former Service Station), and IR Site 23 (Missile Rework Operations/Former Plane Defueling Area).

IR SITE 9

IR Site 9 covers approximately 2.9 acres in the southwestern corner of OU-2A (Figure 3). Two buildings (Buildings 410 and 351) covering approximately 37,000 square feet are still present at IR Site 9 (Figure 4). Building 410 was constructed in 1958 as an aircraft paint stripping facility and was used for storage since the early 1990s.

IR SITE 13

IR Site 13 covers approximately 17.5 acres in the northern half of OU-2A (Figure 3). IR Site 13 includes Building 397, a 17,400 square foot aircraft overhaul plant and engine test facility constructed in

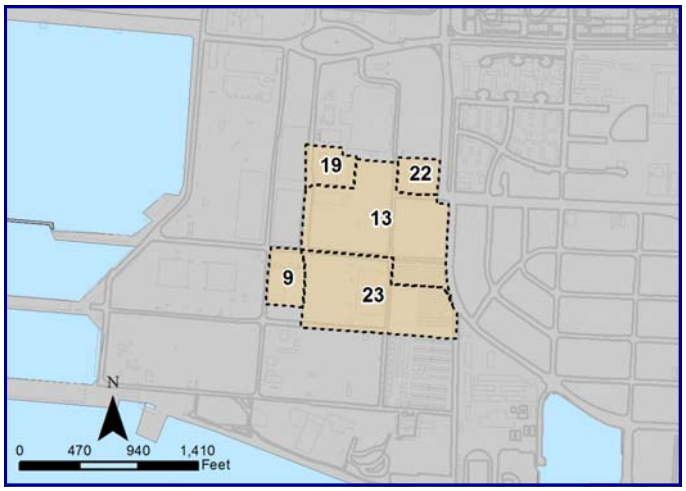

Figure 3: Location of OU-2A Sites

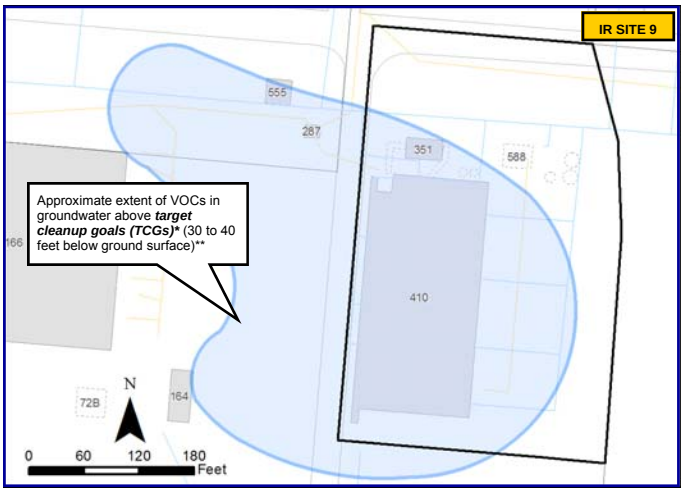

Figure 4: IR Site 9 Layout and Features

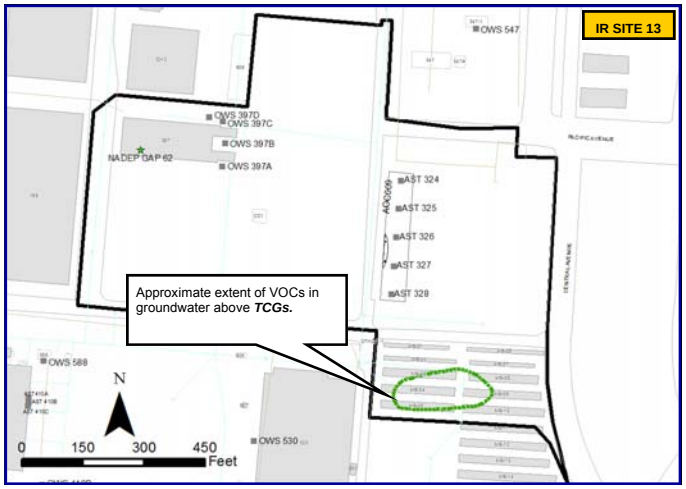

Figure 5: IR Site 13 Layout and Features

Figure 6: IR Site 19 Layout and Features

Figure 7: IR Site 22 Layout and Features

Figure 8: IR Site 23 Layout and Features

Notes:

* ***Target Cleanup Goal*** (TCG) is defined in the Glossary of Terms beginning on Page 15.

** Extents of VOCs in groundwater vary with depth.

1958 (Figure 5). Materials stored during Building 397 operations included petroleum products, solvents, and aircraft fuel.

A petroleum refinery operated by Pacific Coast Oil Works Company existed at IR Site 13 from 1879 to 1903. It is assumed that petroleum refinery wastes were disposed at IR Site 13 during refinery operations. Releases of petroleum hydrocarbons at IR Site 13 are being addressed under the Petroleum Program, and are not discussed in this Proposed Plan.

IR Site 19

IR Site 19 covers approximately 2.3 acres in the northwestern corner of OU-2A (Figure 3). There are two structures on the site, Building 616 and Yard D-13 (Figure 6). Building 616 is a materials storage unit. Yard D-13 encompasses 30,000 square feet and was a ***Resource Conservation and Recovery Act (RCRA)***-permitted hazardous waste storage area with a steel roof and secondary containment berms. The facility ceased accepting hazardous waste as a permitted storage facility in 1996, and was formally closed by the DTSC in 1999. Two underground storage tanks (USTs) are located at IR Site 19. These USTs were constructed for spill control but were never used.

IR Site 22

IR Site 22 covers approximately 2.1 acres in the northeastern corner of OU-2A (Figure 3). This site was formerly a gasoline distribution and service station from 1971 to 1980.

Three USTs (547-1 through 547-3) associated with the service station were removed (Figure 7). These tanks each held a 12,000-gallon capacity of gasoline. One oil-water separator (OWS) is located south of the car wash pad.

Numerous releases of petroleum fuels from leaking USTs or fuel lines were reported during gas station operations as documented in the OU-2A RI Report. Impacted groundwater beneath IR Site 22 is being remediated under the Petroleum Program and is not discussed in this Proposed Plan.

IR Site 23

IR Site 23 covers approximately 14.3 acres at the southern half of OU-2A (Figure 3). This area was used for plane defueling between 1953 and the early 1970s. The main structure located at IR Site 23 is Building 530 (Figure 8). Building 530 was constructed in 1973 for missile rework operations. Two smaller buildings on the site, Buildings 529 and 600, provided operational support for Building 530. Currently IR Site 23 is being addressed under the Petroleum Program.

PREVIOUS SITE INVESTIGATIONS

Various environmental investigations have been performed for soil and groundwater at OU-2A sites in conformance with CERCLA, the Petroleum Program, and the RCRA. Primary investigations performed at OU-2A sites included the following:

- Phases I and 2A investigations (1992)
- Phases 2B and 3 investigations (1992)
- Follow-on investigations (1994, 1995, and 1996)
- Supplemental RI data gap sampling (2002)
- Basewide polycyclic aromatic hydrocarbon (PAH) investigation (2003)
- Terrain conductivity mapping to delineate the location of the tarry refined waste (TRW) at IR Site 13 due to former refinery operations (2003)
- TRW investigation (2008)
- Data gap sampling at OU-2A and OU-2B (2009)
- Supplemental data gap investigation (2010)
- Routine basewide groundwater monitoring (ongoing on regular basis)

Investigations Results Summary — Soil

The investigations for soil at IR Sites 9, 13, 19, 22, and 23 included collection of soil samples for various analytes including ***volatile organic compounds (VOCs)***, ***semi-volatile organic compounds (SVOCs)***, pesticides, ***polychlorinated biphenyls (PCBs)***, metals, **polycyclic aromatic *hydrocarbons (PAHs)***, and/or ***total petroleum hydrocarbons (TPH).***

IR Site 9

None of the reported concentrations of VOCs, SVOCs, pesticides, PCBs, PAHs, and metals in IR Site 9 soil samples exceeded the ***comparison criteria*** (see glossary of technical terms on pages 15 and 16).

IR Site 13

None of the reported SVOCs, pesticides, and PCBs in IR Site 13 soil exceeded the comparison criteria. Metals (arsenic, chromium, cobalt, iron, vanadium, and lead) exceeded the comparison criteria at few isolated locations and in less than 3 percent of the total number of samples. PAHs exceeded the ***comparison criteria*** of 0.62 mg/kg at a few isolated locations. These exceedances mainly occur at depths greater than 4 feet below ground surface and may be associated with fill material used to construct the island. Based on the overall distribution of PAHs, these exceedances did not indicate widespread impact or unacceptable exposure.

IR Site 19

None of the reported VOCs, SVOCs, and metals in IR Site 19 soil exceeded the comparison criteria. PAHs concentrations were generally less than the ***comparison criteria***, except at two isolated locations. The two isolated PAH exceedances, south-west of Yard D-13 (at 4.5 feet to 5 feet bgs) and in the north-east portion of IR site 19 (at 0.5-foot to 2 feet bgs) may be associated with fill material used to construct the base and did not indicate widespread impact or unacceptable exposure.

IR Site 22

None of the reported pesticides or SVOCs in IR Site 22 soil exceeded the comparison criteria. Benzene, ethylbenzene, and xylenes were reported at maximum concentrations of 3.3 mg/kg, 570 mg/kg, and 2,600 mg/kg at a depth of 5 feet to 6 feet bgs. These locations were related to the fuel and sanitary sewer lines and are being addressed under the Petroleum Program.

Arsenic and PAHs exceeded their respective ***comparison criteria*** at few isolated locations (less than 5 percent of the total number of samples) These exceedances did not indicate widespread impact or unacceptable exposure.

Lead was reported at a maximum concentration of 9,890 mg/kg at one location (MW547-5) in a shallow soil sample (0.5 feet to 1 foot bgs) collected from an open area southeast of the site with clean deeper samples. However, subsequent sampling adjacent to this location reported lead below the comparison criteria of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. Therefore, no further action is recommended at IR Site 22.

IR Site 23

None of the reported concentrations of VOCs, SVOCs, PCBs, and metals in IR Site 23 soil exceeded the comparison criteria. Toxaphene was reported above the laboratory reporting limit and the comparison criteria in only one sample. PAHs exceeded the ***comparison criteria*** of 0.62 mg/kg at localized regions west of Building 530 and east of Building 530. These exceedances mainly occur at depths greater than 4 feet which may be associated with fill material used to construct the island. Based on the overall distribution of PAHs, these exceedances did not indicate widespread impact or unacceptable exposure.

INVESTIGATIONS RESULTS SUMMARY — GROUNDWATER

The investigations for groundwater at IR Sites 9, 13, 19, 22, and 23 included collection of groundwater samples from monitoring wells and hydropunch locations, and analyses for VOCs, SVOCs, dissolved and total metals, general chemistry, TPH and/or PAHs.

IR Site 9

Data collected following the ISCO treatment shows VOCs exceeding their TCGs in IR Site 9 groundwater from 5 to 60 feet bgs. The VOCs exceeding the TCGs included vinyl chloride (VC), benzene, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), and methyl tert-butyl ether. The nature and horizontal extents of VOCs vary with depth. Figure 4 presents extents of VOCs in IR Site 9 groundwater from 30 to 40 feet bgs. The horizontal extent of VOCs are estimated to be the largest at the depth range of 30-40 feet bgs.

Metals including arsenic, chromium, copper, iron, lead, manganese, selenium, thallium, vanadium, and zinc exceeded their respective background values in IR Site 9 groundwater. An analysis of metals in groundwater indicated that metals present above

background levels are related to temporary chemical changes in groundwater associated with the degradation of VOCs. Therefore, these elevated levels do not indicate an ongoing source of groundwater contamination.

IR Site 13

Previous investigations have reported benzene, toluene, ethylbenzene and xylene (total) at concentrations exceeding their TCGs in shallow groundwater (5 to 15 feet bgs) at IR Site 13 (Figure 5).

Metals including arsenic, copper, iron, lead, manganese, and selenium exceeded their respective background values in IR Site 13 groundwater. An analysis of metals in groundwater indicated that metals present above background levels are related to temporary chemical changes in groundwater associated with the degradation of VOCs. Therefore, these elevated levels do not indicate an ongoing source of groundwater contamination.

IR Site 19

Previous investigations have reported PCE, TCE, and VC at concentrations exceeding their TCGs in shallow groundwater (5 to 15 feet bgs) at IR Site 19 (Figure 6).

Metals including vanadium and zinc exceeded their respective background values in IR Site 19 groundwater. An analysis of metals in groundwater indicated that metals present above background levels are related to temporary chemical changes in groundwater associated with the degradation of VOCs. Therefore, these elevated levels do not indicate an ongoing source of groundwater contamination.

IR Site 22

Previous investigations have reported few VOCs (1,2-dichloroethane, benzene, ethylbenzene, toluene, xylenes), and metals (arsenic, iron, manganese, and thallium) in groundwater exceeding their respective ***maximum contaminant levels (MCLs)***.

The VOCs reported represent petroleum hydrocarbon constituents and are likely a result of releases of petroleum fuels based on the historic site activities. The impacted groundwater beneath IR Site 22 is being remediated under the Petroleum Program.

IR Site 23

Previous investigations have reported a few VOCs (1,2-dibromo-3-chloropropane, 1,2-dibromoethane, cis-1,2-DCE, and methylene chloride), and metals (arsenic, iron, and manganese) exceeded their respective MCLs. The evaluation of the data indicated sporadic/isolated detections of VOCs as evident from the very low detection frequencies (less than or equal to 10 percent for analytes with total number of samples of greater than 100). In addition, all reported concentrations of arsenic, iron, and manganese were less than their naturally-occurring background values established for OU-2A.

SUMMARY OF PREVIOUS GROUNDWATER RESPONSE ACTIONS/PILOT STUDIES

In November 2002, field studies were conducted to evaluate the feasibility of ***in-situ chemical oxidation*** (ISCO) for remediation of VOCs in IR Site 9 groundwater. This was followed by a larger scale implementation of ISCO at IR Site 9 as part of a CERCLA Removal Action between January and May 2006. After six oxidant injection events in shallow and deep groundwater, decreases in VOC concentrations were observed, although VOCs remain above TCGs.

RISK ASSESSMENT PROCESS

As part of the FS, a ***baseline human health risk assessment (BHHRA)*** was conducted to assess risks at IR Sites 9, 13, 19, 22, and 23 from the detected contaminants. “Risk” is the likelihood or probability that a hazardous chemical, when released to the environment, will cause adverse effects on exposed humans or other biological receptors. The HHRA evaluated the potential risks to humans based on potential future use of the OU-2A area.

Under the current reuse plan for Alameda Point, the OU-2A area is planned to be used for residential use, commercial mixed use, and commercial/employment centers. Based on this, the residential use was evaluated in the risk assessment, since it represents the worst-case scenario in terms of potential exposure to contamination. In addition, potential risks as a result of VOC vapor intrusion into indoor air due to impacted groundwater were evaluated for

commercial use scenario.

The hypothetical resident was assumed to be exposed to contamination in soil and groundwater by the following pathways: ingestion of soil and homegrown produce, inhalation of particulates from soil in outdoor air, inhalation of vapors in indoor and outdoor air, and dermal contact with soil. These exposure pathways represent the most reasonable exposure pathways under current and future use because it is highly unlikely that shallow groundwater at OU-2A would be used as the primary source of drinking water.

BHHRA Results

Based on the evaluation of risk assessment results, no chemicals were selected for further evaluation in the FS for soil at IR Sites 9, 13, 19, 22, and 23; and for groundwater at IR Sites 22 and 23. The majority of the risk due to groundwater at IR Site 22 is attributed to petroleum hydrocarbon constituents like benzene, which are being handled under Petroleum Program.

For groundwater, COCs identified in the risk assessment for further evaluation in the FS for IR Sites 9, 13, and 19 are presented in Table 1 on page 8.

ECOLOGICAL RISK ASSESSMENT

Currently, ecological habitat capable of supporting significant wildlife is not present at OU-2A sites. However, ecological risk evaluation was performed as part of the RI for terrestrial receptors to provide conservative estimate of risk. Exposure pathways for aquatic receptors were considered incomplete because groundwater plumes were not discharging to the Seaplane Lagoon or San Francisco Bay.

Based on the risk calculations and qualitative evaluations and the planned future use of the IR Sites 9, 13, 19, 22, and 23, no risks to ecological receptors were identified that require further evaluation or mitigation.

FEASIBILITY STUDY

The FS demonstrated that no further CERCLA response action is required for soil at all of the OU-2A sites. In addition, the FS identified RAOs and remedial alternatives for groundwater at IR Sites 9, 13, and 19. The remedial alternatives identified in the FS were evaluated against seven of the nine criteria required by CERCLA and as specified in the ***National Oil and Hazardous Substances Pollution Contingency Plan (NCP)*** and summarized in Figure 9. The two final criteria are State acceptance and community acceptance. The State acceptance is documented in this Proposed Plan. Community acceptance is evaluated based on either written and oral comments on this Proposed Plan as outlined on page 13.

Remedial Action Objectives

The RAOs are the final cleanup objectives for the site, and provide the foundation for the alternatives presented in the Proposed Plan. The anticipated future use of the site is an important consideration in selecting the RAOs. RAOs have been established for groundwater at IR Sites 9, 13, and 19 to be protective of human health and the environment.

The following RAOs were developed for remediation of impacted groundwater and to address the potential risks to human health at IR Sites 9, 13, and 19:

- Minimize the potential for domestic use of groundwater at IR Sites 9, 13, and 19 with concentrations of COCs exceeding the established TCGs.
- Protect future receptors from unacceptable risks associated with inhalation of VOCs in groundwater.

The COCs for groundwater were selected based on the regulatory requirements considered ***applicable or relevant and appropriate requirements (ARARs)*** and to be protective of human health. Numerical concentrations were developed as TCGs from the RAOs to guide groundwater remedial actions. These goals were based on the COCs, potential exposure pathways and receptors, ***risk-based concentrations (RBCs)***, and ARARs. The list of groundwater COCs and their TCGs are presented in Table 1. For the majority of COCs, the TCGs are Federal or more stringent State drinking water MCLs.

Remedial Alternatives

Four remedial alternatives were developed for remediation of groundwater at IR Sites 9, 13, and 19:

- Alternative G-1: No Action

- Alternative G-2: MNA and Institutional Controls (ICs)
- Alternative G-3: ISCO, MNA, and ICs
- Alternative G-4: In-situ Bioremediation, MNA, and ICs

Each alternative is discussed in more detail in Table 2.

EVALUTION OF REMEDIAL ALTERNATIVES

Table 3 summarizes the comparison of groundwater remedial Alternatives G-1 through G-4. The alternatives were compared using the NCP criteria (Figure 9). The nature of constituents at IR Sites 9 and 19 is different from those present at IR Site 13; therefore, where appropriate, comparison on alternatives with respect to the NCP criterion was carried out separately for IR Sites 9 and 19, and IR Site 13. A detailed comparison of the alternatives can be found in the FS, which is available at the Information Repositories listed on page 14 of this Proposed Plan.

The following is a summary of the comparisons that were made for the groundwater remedial alternatives for IR Sites 9, 19, and 13.

1. Overall Protection of Human-Health and the Environment

All alternatives, except Alternative G-1 (No Action) satisfy the threshold criterion of overall protection of human health and the environment. Under Alternative G-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective TCGs. In addition, Alternative G-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use. Since Alternative G-1 does not meet the threshold criteria of overall protection of human health and the environment, it cannot be selected as a remedy and will not be discussed further in the nine criteria analysis.

Alternative G-2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative G-2 provides protection by implementation of land/groundwater use restrictions to minimize the potential for exposure to COCs above their respective TCGs. Alternatives G-3 and G-4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives G-3 and G-4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective TCGs.

2. Compliance with Applicable or Relevant and Appropriate Requirements

ARARs are Federal and State laws and regulations that are identified for each remedial alternative. The Alternatives G-2, G-3, and G-4 would meet the project ARARs. The key ARARs are presented in Attachment 1.

3. Long-Term Effectiveness and Permanence

Under Alternative G-2, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. Under Alternatives G-3 and G-4, concentrations of COCs in groundwater

Table 1: Target Cleanup Goals – IR Sites 9, 13, and 19 Groundwater

Chemical of Concern	Target Cleanup Goal[a] (µg/L)
IR Site 9	
VC	0.5[a]
1,1-DCA	5[a]
cis-1,2-DCE	6[a]
Benzene	1[a]
Methyl tert-butyl Ether	13[a]
1,1-DCE	6[a]
1,2,3-TCP	0.5[b]
IR Site 13	
Benzene	1[a]
Ethylbenzene	300[a]
Toluene	150[a]
Total Xylene	1,750[a]
IR Site 19	
TCE	5[a]
PCE	5[a]
VC	0.5[a]

Notes:
[a] Based on Federal or more stringent State drinking water MCL.
[b] Based on the California Department of Public Health Response Level.

Table 2: Summary of Groundwater Remedial Alternatives – IR Sites 9, 13, and 19			
Remedial Alternatives	**Estimated Remediation Duration (years)**	**Total Cost (millions)**	**Description**
G-1: No Action	0	—	CERCLA requires the evaluation of a no-action alternative to establish a baseline for comparison with other alternatives. Under this scenario, no action would be performed to remediate groundwater at IR Sites 9, 13, and 19.
G-2: MNA and ICs	22 (IR Sites 9 and19) 14 (IR Site 13)	$2.8 (IR Sites 9 and19) $2.4 (IR Site 13)	Alternative G-2 would rely on natural attenuation processes and monitoring for remediation of COC-impacted groundwater at IR Sites 9, 13, and 19. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. Alternative G-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to assess their further migration in groundwater. The ICs including land and/groundwater-use restrictions would be implemented under Alternative G-2 to limit exposure of future landowner (s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of MNA. In addition, ICs will include restrictions on activities which could interfere with the effectiveness of the remedies until goals are achieved including protection of remediation systems and limits on the extraction of contaminated groundwater.
G-3: ISCO, MNA, and ICs	< 5	$4.6 (IR Sites 9 and19) $2.1 (IR Site 13)	Alternative G-3 would include injection of chemical oxidant into the subsurface to chemically oxidize the COCs present in groundwater at IR Sites 9, 13, and 19 into innocuous products such as carbon dioxide and water. Several commercially available oxidants may be used for ISCO such as Fenton's reagent, activated persulfate or ozone. Groundwater monitoring would be conducted following injection of chemical oxidant to assess the decreases in COC concentrations. Based on the analysis of groundwater monitoring data and with the concurrence of the regulatory agencies, active treatment using ISCO may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. Similar to Alternative G-2, ICs including land and/groundwater-use restrictions would also be implemented as part of Alternative G-3 until the concentrations of COCs are reduced to levels below TCGs.
G-4: In-situ Bioremediation, MNA, and ICs	< 5	$7.0 (IR Sites 9 and19) $2.4 (IR Site 13)	Alternative G-4 would include injection of commercially-available bioremediation amendments (e.g. food sources such as vegetable oil) into the subsurface to stimulate naturally-occurring bacteria to biologically degrade COCs present in groundwater at IR Sites 9, 13, and 19 into innocuous products such as carbon dioxide and water. This alternative may also include subsurface injection of commercially-available strains of bacteria known to degrade COCs presented in groundwater at IR Sites 9, 13, and 19. Groundwater monitoring would be conducted following injection of bioremediation amendments to assess the decreases in COC concentrations. Based on the analysis of groundwater monitoring data and with the concurrence of the regulatory agencies, active treatment using in-situ bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. Similar to Alternative G-2, ICs including land and/groundwater-use restrictions would also be implemented as part of Alternative G-4 until the concentrations of COCs are reduced to levels below TCGs.

would be permanently reduced through active treatment methods such as ISCO and bioremediation. Alternatives G-2, G-3, and G-4 would include active groundwater monitoring until the concentrations of COCs are reduced to less than their respective TCGs.

ICs would be implemented under Alternatives G-2, G-3, and G-4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective TCGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

4. Reduction of Toxicity, Mobility, or Volume

Alternative G-2 would rely on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Alternatives G-3 and G-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternatives G-3 includes implementation of ISCO and Alternative G-4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective TCGs.

5. Short-Term Effectiveness

Alternative G-2 would include limited remedial construction operations (e.g. installation of additional monitoring wells) compared to Alternatives G-3 and G-4. Alternatives G-3 and G-4 would include drilling/installation of monitoring wells, and handling and subsurface injection of reagents. Based on the sustainability evaluation (see text box on page 11), for IR Sites 9 and 19, the environmental footprint (estimated pollutant and green house gas emissions and energy use), and potential injury/ fatality risks to workers are estimated to be higher for Alternatives G-3 and G-4, compared to Alternative G-2. However, for IR Site 13, the environmental footprint (estimated green house gas emissions and energy use), and potential injury/fatality risks to workers are estimated to be higher for Alternative G-2, compared to compared to Alternatives G-3 and G-4.

6. Implementability

Alternative G-2 would be the simplest to construct and operate. The implementation of Alternative G-2 would require installation of monitoring wells and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for

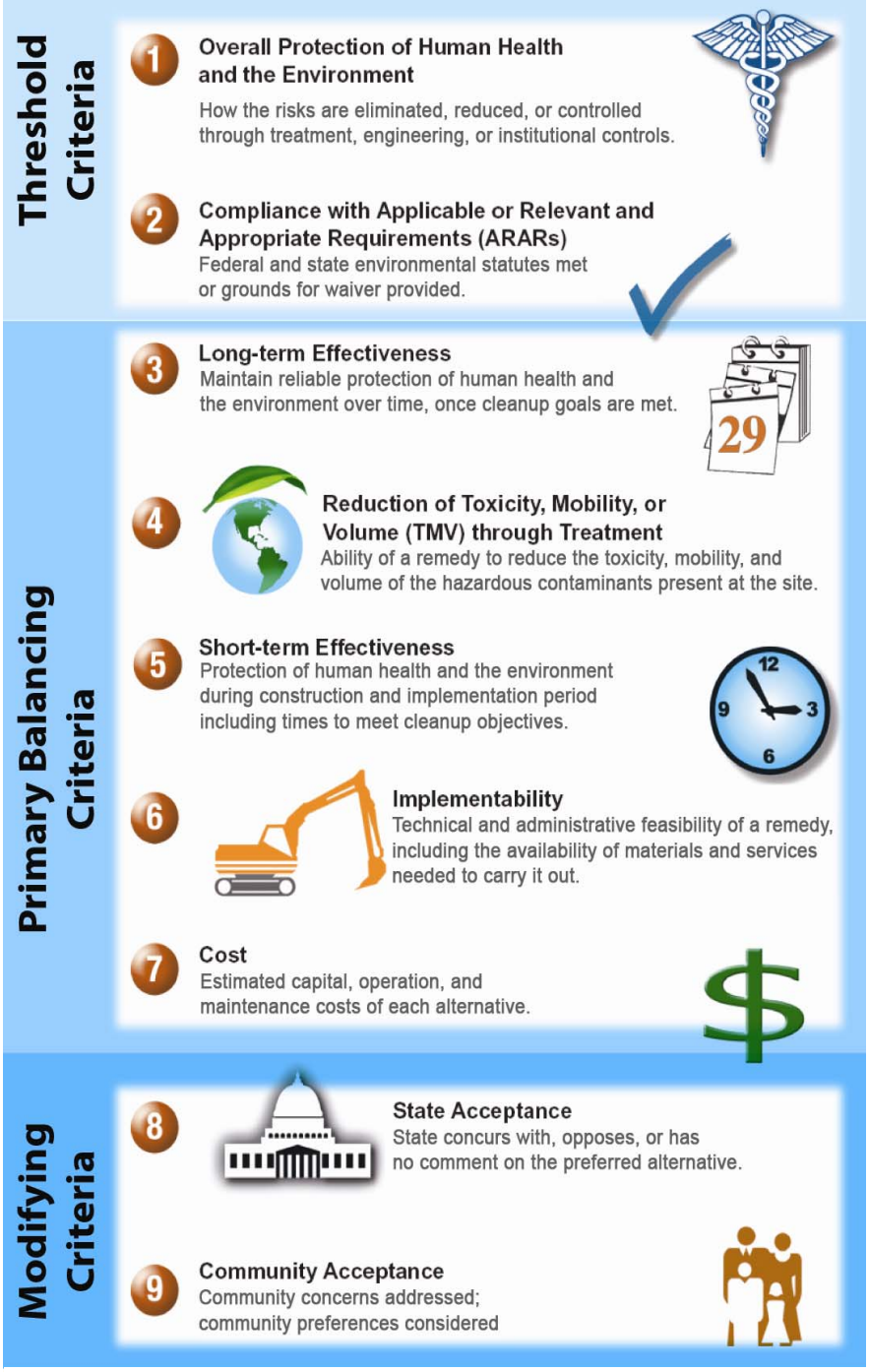

Figure 9: Criteria for Comparison of Alternatives

groundwater sampling and analysis are generally readily implementable.

Alternative G-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19.

The implementation of bioremediation under Alternative G-4 at IR Sites 9 and 19 may require additional testing. Therefore, technical implementation of bioremediation at IR Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.

For IR Site 13, the implementation of ISCO is expected to be difficult compared to implementation of bioremediation because ISCO has never been implemented at IR Site 13 in the past, while bioremediation has been implemented in the vicinity of IR Site 13 in the past.

7. Cost

For IR Sites 9 and 19, the estimated costs for Alternatives G-2, G-3, and G-4 are $2.8 million, $4.6 million, and $7.0 million. For IR Site 13, the estimated costs for Alternatives G-2, G-3, and G-4 are $2.4 million, $2.1 million, and $2.4 million.

THE PREFERRED GROUNDWATER REMEDIAL ALTERNATIVE – IR SITES 9 AND 19

The preferred remedial alternative for groundwater at IR Sites 9 and 19 is Alternative G-2 (MNA and

Sustainable Environmental Remediation Evaluation

As part of the evaluation of remedial alternatives with respect to short-term effectiveness, the sustainability of each alternative was evaluated with respect to metrics such as energy consumption, green house gas generation, pollutant emissions, water consumption, and worker safety. The results of this sustainable environmental remediation (SER) evaluation were presented in the FS and were considered by the Navy during the identification of the preferred alternatives.

Table 3: Comparative Analysis of Groundwater Remedial Alternatives – IR Sites 9, 13, and 19

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost[a]
G-1: No Action	No	Since Alternative G-1 is not protective of human health and the environment, no ratings have been assigned to the other criteria.					
G-2: MNA and ICs[b]	Yes	Yes	◑	◑[c]	● (IR Sites 9 and 19) ◑ (IR Site 13)	●	● (IR Sites 9 and 19) ◑ (IR Site 13)
G-3: ISCO, MNA, and ICs	Yes	Yes	●	●	◑ (IR Sites 9 and 19) ● (IR Site 13)	◑ (IR Sites 9 and 19) ○ (IR Site 13)	◑ (IR Sites 9 and 19) ● (IR Site 13)
G-4: In-situ Bioremediation, MNA, and ICs[b]	Yes	Yes	●	●	◑ (IR Sites 9 and 19) ● (IR Site 13)	○ (IR Sites 9 and 19) ◑ (IR Site 13)	○ (IR Sites 9 and 19) ◑ (IR Site 13)

Notes:

○ = Poor ◑ = Fair ● = Good

[a] Cost evaluation is based on the net present value (NPV). The lower cost receives a high rating because it is more cost-effective.

[b] Alternative G-2 is the preferred remedial alternative for IR Sites 9 and 19, and Alternative G-4 is the preferred remedial alternative for IR Site 13.

[c] Alternative G-2 has been assigned a fair rating as natural attenuation processes including biodegradation will lead to reduction in COC concentrations.

ICs). Based on the information available at this time, Alternative G-2 would be protective of human health and the environment, and would attain the RAOs for groundwater. In addition, based on the sustainability evaluation, Alternative G-2 was rated as having an overall lower impact to the environment during implementation.

As shown on Table 3, Alternative G-2 provides the best balance of trade-offs between the nine-NCP criteria for the evaluation and selection of the remedy at IR Sites 9 and 19. Alternative G-2 would rely on natural attenuation processes such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Groundwater monitoring would be conducted under Alternative G-2 to demonstrate that natural attenuation is occurring and to assess further migration of COCs in groundwater. In addition, ICs including land/groundwater-use restrictions would be implemented to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below their respective TCGs. The ICs would also ensure that the integrity of the remedial action components such as monitoring wells is maintained.

THE PREFERRED GROUNDWATER REMEDIAL ALTERNATIVE – IR SITE 13

The preferred remedial alternative for groundwater at IR Site 13 is Alternative G-4 (In-situ Bioremediation, MNA, and ICs). Based on the information available at this time, Alternative G-4 would be protective of human health and the environment, and would attain the RAOs for groundwater. In addition, based on the sustainability evaluation, Alternative G-4 is expected to have a lower impact to the environment than Alternative G-3 during implementation.

As shown on Table 3, Alternative G-4 provides the best balance of trade-offs between the nine-NCP criteria for the evaluation and selection of the remedy at IR Site 13. Alternative G-4 would include delivery of the source of molecular oxygen into the subsurface. This would stimulate naturally -occurring bacteria to biologically degrade COCs present in groundwater. Groundwater monitoring would be conducted following and/or in conjunction with oxygen delivery to assess the decreases in COC concentrations. Based on the analysis of groundwater monitoring data and with the concurrence of the regulatory agencies, active treatment using in-situ bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs.

Alternative G-4 would also include implementation of ICs to ensure protection of human-health and attainment of RAOs. The ICs would include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user (s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of in-situ bioremediation and MNA.

BRAC CLEANUP TEAM

The Base Realignment and Closure (BRAC) Cleanup Team (BCT) includes Remedial Project Managers (RPMs) from the Navy, EPA, DTSC, and the Water Board. The primary goals of the BCT RPMs are to protect human health and the environment, coordinate environmental investigations, and expedite the environmental restoration of Alameda Point. The BCT RPMs have collectively overseen all documents and investigations associated with OU-2A, including the RI and FS. Based on these reviews and discussions of key documents, the regulatory agencies have concurred with the proposed no further action recommendation for soil at all the OU-2A sites and the Navy's preferred remedial alternatives for groundwater at IR Sites 9, 13, and 19.

COMMUNITY PARTICIPATION

The Navy, EPA, DTSC, and Water Board encourage the public to gain a more thorough understanding of IR Sites 9, 13, 19, 22, and 23 located within OU-2A and the CERCLA activities that have been conducted at Alameda Point by visiting the information repository, reviewing the administrative record file, attending public meetings, and getting on the mailing list to receive regular project information. Restoration Advisory Board meetings are held on the first Thursday evening of every month and are open to the public. For more information, visit the Navy's website, www.bracpmo.navy.mil.

There are two ways for you to provide your comments on this Proposed Plan:

1. Public Comment Period. During the public comment period from **August 24 to September 24, 2011,** you may use the comment form included with this Proposed Plan to send written comments to the BRAC Environmental Coordinator, Navy BRAC Program Management Office West, at 1455 Frazee Road, Suite 900, San Diego, California 92108-4310. You may also submit comments electronically via e-mail or fax to the BRAC Environmental Coordinator derek.j.robinson1@navy.mil.

2. Public Meeting. You may provide written or oral comments during the public meeting on **August 31, 2011** which will be held in the Alameda Point Main Office Building 1, Room 201, 950 West Mall Square, Alameda California. A stenographer will be at the meeting to record all public comments.

After the public comment period is over, the Navy will review and consider the comments and in consultation with the regulatory agencies, the Navy may modify the preferred remedial alternative or select another cleanup remedy based on feedback from the community or on new information. Therefore, the community is strongly encouraged to review and comment. A final decision will not be made until all comments are considered. Community acceptance will be evaluated after the public comment period for this Proposed Plan. The Navy will address these comments in a responsiveness summary presented in the ROD. All relevant site-related documents are available for review at the information repositories shown on page 14.

PUBLIC COMMENT PERIOD

The 30-day public comment period for the Proposed Plan is from **August 24 to September 24, 2011**.

Submit Comments

There are two ways to provide comments during this period:

- Offer oral or written comments during the public meeting.
- Provide written comments by mail, e-mail, or fax (no later than **September 24, 2011**).

Public Meeting

The public meeting will be held on **August 31, 2011** at Alameda Point Main Office Building 1, Room 201, 950 West Mall Square, Alameda, California, from 6:30 pm to 8:00 pm. Navy representatives will provide visual displays and information on the environmental investigations and the remedial alternatives evaluated. You will have an opportunity to formally comment on this Proposed Plan.

Or you can send Comments to:

Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310
Phone (619) 532-0951
Fax (619) 532-0983

Information Repositories

Two information repositories have been established to provide public access to technical reports and other IR Program information that supports this proposed plan.

Alameda Public Library
1550 Oak Street,
Alameda, CA 97501
Telephone: (510) 747-7777

Alameda Point
Room 240, 950 West Mall Square, Bldg 1,
Alameda, CA 94501

Administrative Record File
Contact: Ms. Diane Silva
Administrative Records Coordinator
Naval Facilities Engineering Command, Southwest
Naval Base San Diego, Building 3519
2965 Mole Road
San Diego, California 92132-5190
Telephone: (619) 556-1280

You may view these documents by appointment during working hours (Monday through Friday, 8 a.m. to 5 p.m.). Please contact Ms. Silva at the number provided above to make an appointment.

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Glossary of Technical Terms

Applicable or relevant and appropriate requirement (ARARs): Federal, State, and local regulations and standards determined to be legally applicable or relevant and appropriate to remedial actions at a CERCLA site.

B(a)P equivalent concentration: The B(a)P equivalent concentration represents single value calculated to estimate overall cancer risk from the combination of different potentially cancer-causing PAHs. This calculation uses United States Environmental Protection Agency and California Department of Toxic Substances-approved methodology.

Baseline Human Health Risk Assessment (BHHRA): Estimate of potential harmful effects humans may experience as a result of exposure to chemicals.

California Department of Toxic Substances Control (DTSC): A part of the California Environmental Protection Agency and California's lead environmental regulatory agency. Its mission is to protect public health and the environment from toxic substances.

Cancer risk: The probability that an individual will develop cancer from direct exposure to chemicals classified as carcinogens. A carcinogen is a chemical that causes cancer.

Chemicals of concern (COCs): Chemicals that have been identified as having the potential to pose a significant threat to human health and the environment.

Comparison criteria: These are concentrations of chemicals set by Federal and State agencies as a basis of comparison to soil data from specific sites to identify potential contamination.

Soil data were compared with EPA residential regional screening levels (RSLs), California modified residential preliminary remediation goals (PRGs), lead screening valued established based on the DTSC Lead Spreadsheet, background concentrations of metals, and a screening level established by the Navy and agencies for PAHs (expressed as average benzo(a)pyrene (B[a]P)-equivalent concentrations).

Feasibility Study (FS): The second of two major studies (the Remedial Investigation is the first study) that must be completed before a decision can be made about how to clean up a site. The FS is a study to identify, screen, and compare remedial alternatives for a site.

Hazard index (HI): The HI is the sum of all individual hazard quotients. For human health, it is a calculated value used to represent a potential noncancer health risk for more than one chemical or exposure pathway. An HI value of 1.0 or less is considered an acceptable exposure level.

Institutional Control (IC): Administrative and legal controls, established and administered to restrict use of property to limit human exposure to contaminated waste, soil, sediment, or groundwater, and protect the integrity of the remedy.

In-situ biological treatment/bioremediation: This technology includes in-place treatment of groundwater without above-ground pumping and relies on naturally-occurring microbes (microscopic "bugs") that live in soil or groundwater to destroy the contaminants. The chemicals are injected into the subsurface that stimulate the activity of microbes and help them to grow and multiply. The microbes act on the contaminants and change them into water and harmless gases such as carbon dioxide.

In-situ chemical oxidation: This technology includes in-place treatment of groundwater without above-ground pumping. The chemicals called oxidants are injected/pumped directly into the contaminated groundwater. The oxidant mixes with contaminants and causes them to break down. When the process is complete, only water and other harmless chemicals are left behind.

Installation Restoration: The IR Program is the Department of Defense's comprehensive program to investigate and clean up environmental contamination at military facilities in full compliance with CERCLA.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. The MCLs are set by the United States Environmental Protection Agency and/or the State of California.

Monitored Natural Attenuation (MNA): MNA is a technique used to monitor or test the progress of natural attenuation processes that can degrade contaminants in soil and groundwater. The natural attenuation processes may include biological degradation by naturally occurring microbes, sorption (sticking) to soil, or dilution due to mixing with clean water.

Operable Unit: The DON is conducting investigations in accordance with the CERCLA at various sites at Alameda Point. As a management tool to accelerate site investigation, cleanup, and reuse, the thirty-five CERCLA sites at Alameda Point are divided into ten operable units (OUs). IR Sites 9, 13, 19, 22, and 23 fall under OU-2A.

Polychlorinated biphenyl (PCB): Any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees.

GLOSSARY OF TECHNICAL TERMS

Petroleum Program: The Petroleum Program is a program to investigate and cleanup environmental contamination due to releases of petroleum products such as gasoline and jet fuel. By law, the petroleum releases cannot be addressed under CERCLA.

Polycyclic aromatic hydrocarbon (PAH): Specific class or group of semi volatile organic compounds whose molecules consist of multiple benzene rings. "Polycyclic" means multi-ringed.

Preferred remedial alternative: The remedial alternative selected by the Navy, in conjunction with the regulatory agencies, based on the evaluation of remedial alternatives presented in the FS.

Proposed Plan: A document that reviews the remedial alternatives presented in the FS, summarizes the proposed preferred remedial alternative, explains the reasons for recommending the alternative, and notifies the community of the proposed preferred alternative.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The NCP is the Federal government's blueprint for responding to both oil spills and hazardous substance releases. The NCP contains the guidelines and procedures for implementing the CERCLA.

Record of Decision (ROD): A decision document that identifies the remedial alternatives chosen for implementation at a CERCLA site; the ROD is based on information from the RI and FS reports, the PP, and on public comments and community concerns.

Remedial Action Objective (RAO): A statement containing a cleanup goal for the protection of one or more receptors from one or more chemicals in a specific medium (such as soil, groundwater, or air) at a site.

Target Cleanup Goal (TCG): Chemical concentration limit that provides a numerical goal for the remedial alternatives; may be based on human or ecological risk calculations, federal or state regulations, background concentrations, or other numerical standard.

Groundwater data were compared with Federal/ State drinking water maximum contaminant levels (MCLs), background concentrations of metals at Alameda Point, and Preliminary Remediation Criteria (PRCs) established by the Navy and regulatory agencies for petroleum-impacted sites (for diesel, gasoline, and motor oil).

Resource Conservation and Recovery Act (RCRA): Establishes the framework for treatment, storage, transportation, and disposal of solid and hazardous wastes.

Risk-based concentration (RBC): The concentration of the chemical that is protective of human health and/or the environment calculated based on conditions present at a specific site.

Risk driver: Chemical that exhibits a significant impact in the results of a risk estimate.

Risk management range: The risk management range as derived from the NCP is used for making risk management decisions. The range is considered to represent an excess lifetime cancer risk to an individual between 1 in 10,000 and 1 in 1,000,000 (10^{-4} and 10^{-6}).

San Francisco Bay Regional Water Quality Control Board (Water Board): The California Water Quality Authority, which is part of the California Water Quality Control Board, within the California Environmental Protection Agency. Its mission is to preserve, enhance, and restore California's water resources.

Semi-volatile organic compound (SVOC): An organic (carbon containing) compound that does not readily evaporate at room temperature. SVOCs include certain oils, pesticides, and PAHs.

Total petroleum hydrocarbon (TPH): A family of several hundred chemical compounds in crude oil, such as benzene, hexane, toluene, and others. TPH includes motor oil-, diesel-, and gasoline-range hydrocarbons.

U.S. Environmental Protection Agency, Region 9 (EPA): The Federal regulatory agency responsible for administration and enforcement of CERCLA (and other Federal environmental regulations).

Volatile organic compound (VOC): An organic (carbon containing) compound that evaporates readily at room temperature. VOCs are found in industrial solvents commonly used in dry cleaning, metal plating, and machinery degreasing operations.

ATTACHMENT 1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that remedial actions meet Federal or State (if more stringent) environmental standards, requirements, criteria, or limitations that are determined to be applicable of relevant and appropriate requirements (ARARs). The following summarizes the key chemical-, and action-specific ARARs for the preferred groundwater remedial alternatives for IR Sites 9, 13, and 19 described in this Proposed Plan. Please refer to Appendix A in the Operable Unit-2A (OU-2A) Feasibility Study (FS) for more specific and comprehensive information on all potential ARARs including location-specific ARARs.

Potential Chemical-specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values for various environmental media, specified in Federal or State statutes or regulations.

Federal

Based on the study conducted in 2000, the groundwater beneath Alameda Point (including OU-2A) is a Class II aquifer (current or potential source of drinking water that has other beneficial uses). Therefore, the substantive provisions of the following requirements are potential ARARs for remediation of IR Sites 9, 13, and 19 groundwater:

- Federal maximum contaminant levels (MCLs) of volatile organic compound (VOC)-impacted groundwater at Title 40 Code of Federal Regulations (C.F.R.) Section (§) 141.61(a) and (c) and Federal non-zero maximum contaminant level goals (MCLGs) at 40 C.F.R. § 141.50.
- Resource Conservation and Recovery Act (RCRA) groundwater protection standards in California Code of Regulations (Cal. Code Regs.) title (tit.) 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b).

State

The substantive provisions of the following requirements are potential ARARs for remediation of IR Sites 9, 13, and 19 groundwater:

- State Water Resources Control Board (SWRCB) Resolution 88-63 (Sources of Drinking Water Policy)
- The State primary MCLs for VOCs at Cal. Code Regs. tit. 22, § 64444.
- Substantive requirements including beneficial uses and water quality objectives (WQOs) documented in the Comprehensive Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) (Cal. Water Code § 13240).

Potential Action-specific ARARs

Action-specific ARARs are regulations that apply to specific activities or technologies used to remediate a site, including design criteria and performance requirements.

Federal

The substantive provisions of the following requirements are potential ARARs for remediation of IR Sites 9, 13, and 19 groundwater:

- Groundwater monitoring requirements at Cal. Code Regs. tit. 22, § 66264.91(a)(4)and (c), except as it cross-references permit requirements;
- Monitoring requirements at Cal. Code Regs. tit. 22, § 66264.97 (b)(1) (A), (b)(1)(D)(1) and (2), (b) (4-7), (e)(6), (12)(A) and (B), (13), and (15);
- Requirements for detection monitoring program at Cal. Code Regs. tit. 22, § 66264.98(e) (1-5), (i), (j), (k)(1-3), (4) (A) and (D),(5), (7)(C) and (D),(n)(1),(2) (B), and (C); and
- Corrective action monitoring program at Cal. Code Regs. tit. 22, § 66264.100(a), (d), and (g)(1).

State

The substantive provisions of the following requirements are potential ARARs for remediation of IR Sites 9, 13, and 19 groundwater:

ATTACHMENT 1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

- SWRCB Resolution 68‑16 (Policy With Respect to Maintaining High Quality of Waters in California) (Cal. Water Code § 13140, Clean Water Act regulations 40 C.F.R. § 131.12) (for IR Site 13 groundwater response action only if groundwater recirculation system is implemented as part of the remedy);
- Land-use covenants, Cal. Code Regs. tit. 22, § 67391.1; and
- Institutional controls at California Civil Code § 1471, California Health and Safety Code (HSC) §§ 25202.5, 25222.1 and 25355.5 (a)(1)(C), 25233(c), 25234, and § 25232(b)(1)(A)–(E) (these requirements are ARARs for transfer of the property to a non-Federal entity).

Proposed Plan Comment Form

IR Sites 9, 13, 19, 22, and 23

The public comment period for the Proposed Plan for Installation Restoration Sites 9, 13, 19, 22, and 23 at Alameda Point, Alameda, California, is from **August 24 to September 24, 2011**. A public meeting to present the Proposed Plan will be held at the Alameda Point Main Office Building 1, Room 201, 950 West Mall Square, Alameda, California, on **August 31, 2011 from 6:30 pm to 8:00 pm**. You may provide comments verbally at the public meeting, where all comments will be recorded by a court reporter. Alternatively, you may provide written comments in the space provided below or on your own stationery. All written comments must be postmarked no later than **September 24, 2011**. After completing your comments and your contact information, please mail this form to the address provided on the reverse side. You may also submit this form to a Navy representative at the public meeting. Comments are also being accepted by e-mail; please address e-mail messages to derek.j.robinson1@navy.mil. Comments are also being accepted by fax: (619) 532-0995.

Name: _____

Representing: (optional) _____

Phone Number: (optional) _____

Address: (optional) _____

☐ Please check box if you would like to be added to the Navy's Environmental Mailing List for Alameda Point.

Comments:

_____

_____

_____

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_____

Comments:

Attn: Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Proposed Plan for Installation Restoration Sites 9, 13, 19, 22, and 23 Alameda Point, Alameda, California

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
4	Alameda Point	Section 2.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 1.3.1, Page 1-4, Figure 1-3. SulTech 2005.

CERCLA Site 22: Building 547 - Former Service Station

CERCLA Site 23: Building 530 - Missile Rework Operations/Former Plane Defueling

OU-2B Eastern Area

CERCLA Site 3: Area 97 – Abandoned Fuel Storage Area

CERCLA Site 4: Building 360 – Aircraft Engine Facility and Plating Shop

CERCLA Site 11: Building 14 – Engine Test Cell

CERCLA Site 21: Building 162 – Ship Fitting and Engine Repair

OU-2C Central Area

CERCLA Site 5: Building 5 – Naval Air Rework Facility

CERCLA Site 10: Building 400 – Missile Rework Facility

CERCLA Site 12: Building 10 – NAS Alameda Power Plant

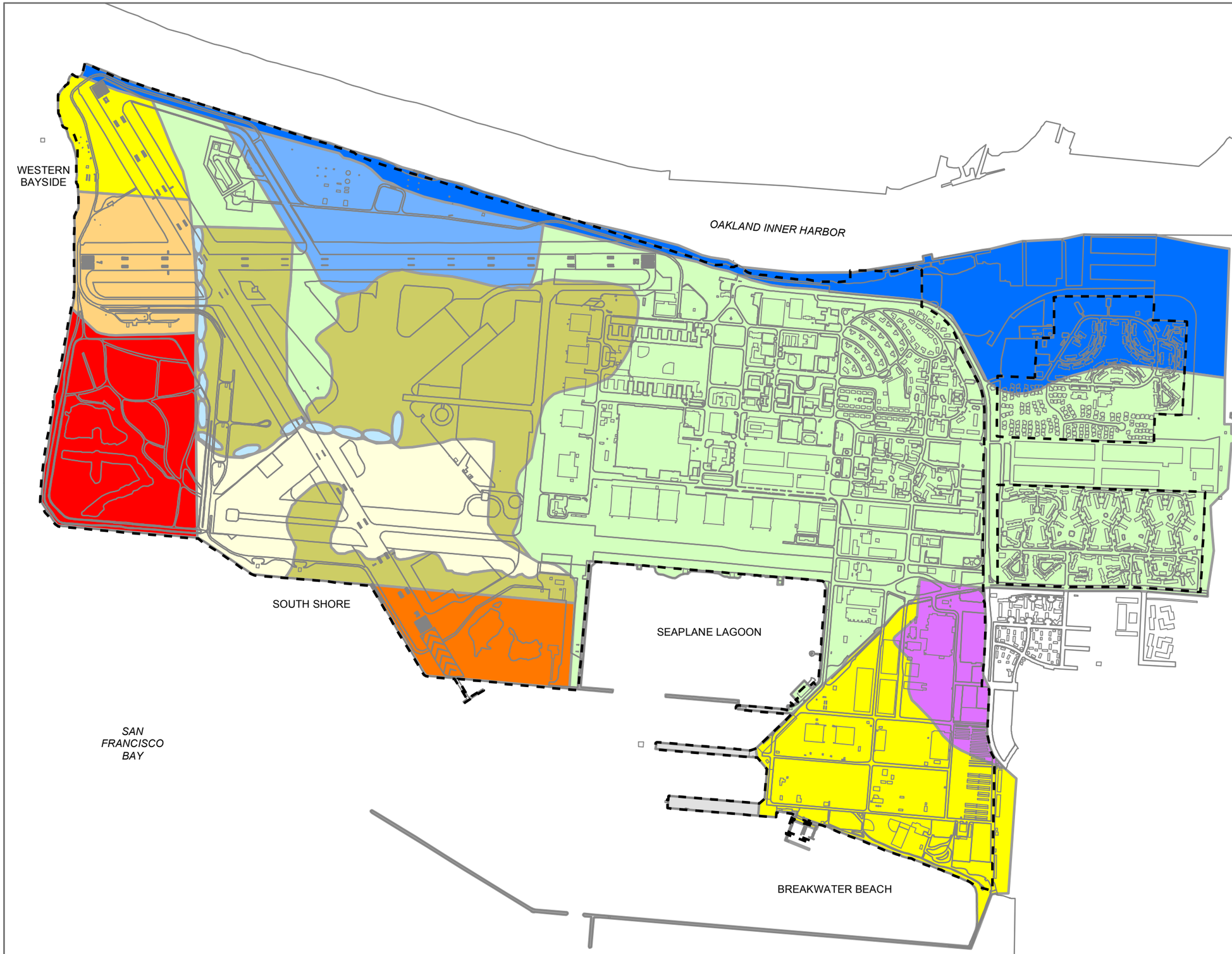
1.3 ALAMEDA POINT BACKGROUND

This section provides a brief summary of the history of Alameda Point, describes the operational history of the former installation, explains OU designations, and provides general descriptions and operational histories for each site in OU-2A.

1.3.1 Installation History

Originally a peninsula, Alameda Island was detached from the mainland in 1876 when a channel was cut to link San Leandro Bay with the San Francisco Bay (the Bay). The northern portion of Alameda Island was formerly tidal areas, marshlands, and sloughs adjacent to the historical San Antonio Channel, now known as the Oakland Inner Harbor. During the late 1800s the eastern portion of the base was used for industrial purposes, specifically the Pacific Coast Oil Company operated a refinery along the western shore of the island. The U.S. Department of the Army (Army) acquired the installation property from the City of Alameda in 1930 and began construction activities in 1931. In 1936, the Navy acquired title to the land from the Army and began building the air station in response to the military buildup in Europe before World War II. Construction of the base included several iterations of filling the existing tidelands, marshlands, and sloughs with dredge materials from the Bay (Navy 2001a) (see Figure 1-3).

After the end of the war in 1945, the installation continued its primary mission of providing facilities and support for fleet aviation activities. During its operations as an active naval base, the installation provided berthing for Pacific Fleet ships and was a major center of naval aviation.



Non-Fill
Pre-1887
1887 - 1915
1916 - 1929
1930 - 1939
1930 - 1934
1940 - 1941
1941
1942 - 1946
1947 - 1953
1958 - 1963
1953 - 1975
LAND COVER
ALAMEDA BOUNDARY

N

600 0 600 1200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 1-3
FILL HISTORY

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\do028\ou2a\ri\mxd\fig01-03_fill_history.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
5	operations	Section 2.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 1.3.1, Pages 1-6 through 1-7. SulTech 2005.

CERCLA Site 19: Yard D-13 - Hazardous Waste Storage

CERCLA Site 22: Building 547 - Former Service Station

CERCLA Site 23: Building 530 - Missile Rework Operations/Former Plane Defueling

OU-2B Eastern Area

CERCLA Site 3: Area 97 – Abandoned Fuel Storage Area

CERCLA Site 4: Building 360 – Aircraft Engine Facility and Plating Shop

CERCLA Site 11: Building 14 – Engine Test Cell

CERCLA Site 21: Building 162 – Ship Fitting and Engine Repair

OU-2C Central Area

CERCLA Site 5: Building 5 – Naval Air Rework Facility

CERCLA Site 10: Building 400 – Missile Rework Facility

CERCLA Site 12: Building 10 – NAS Alameda Power Plant

1.3.3 Historical Operations and General Site Descriptions for OU-2A

Activities performed at the installation by the Navy and former tenants include the following:

- **Aircraft Intermediate Maintenance Department (AIMD).** AIMD was responsible for the intermediate repair of aircraft components for transient and tenant aircraft. AIMD used substances such as fuel products and cleaning solvents.
- **Air Operations.** The Navy Public Works Center (PWC) and Naval Aviation Depot Alameda (NADEP) supported a wide variety of air operations across the installation. These operations used substances such as fuel products and cleaning solvents.
- **Navy Exchange Service Stations.** Two service stations were operated on the installation. At both stations, waste oils were stored in underground tanks and pumped out as needed by a local contractor (Ecology and Environment Inc. [E&E] 1983).
- **Weapons Department.** The Weapons Department was responsible for receiving, issuing, storing, and shipping ammunition, ammunition components, and explosives. The department also operated a small arms firing range and saluting battery and coordinated ordnance disposal with the explosive ordnance disposal (EOD) detachment.

- **Supply Department.** The Supply Department was responsible for providing fueling support activities. Fuel products were distributed throughout the installation by a complex of underground storage tanks (UST), aboveground storage tanks (AST), and underground piping systems.

The installation and its two largest tenants, PWC and NADEP, supported several activities involving use of substances such as industrial solvents, acids, paint strippers, degreasers, caustic cleaners, and metals from plating operations. Oils, fuels, and asbestos also were used at the installation. Several other tenants and support units may have used minor amounts of fuel products, pesticides, PCBs, and cleaning solvents. General descriptions of each site in OU-2A are presented in the following text. The site features are included as figures in Sections 5 through 9.

1.3.3.1 Site 9 – Paint Stripping Facility

Site 9 covers approximately 2.9 acres in the southwestern corner of OU-2A. Two buildings (Buildings 410 and 351) covering approximately 37,000 square feet are still present at Site 9. Building 410 was constructed in 1958 as an aircraft paint stripping facility run by Naval Area Rework Facility (NARF), and has been used for storage since the early 1990s. Building 351, located immediately north of Building 410, was a support building that served as a lunch room/locker room for Building 410 staff. Both buildings are inactive and scheduled for demolition. The Industrial Waste Treatment Plant (IWTP) 410, known as Structure 588, was located east of Building 351 and treated paint stripping wastes under a Resource Conservation and Recovery Act (RCRA) permit. This facility and 11 associated ASTs have been removed from Site 9, and the permit has been closed under RCRA.

AST 410A was a 10,000-gallon methylene chloride tank. AST 410B was a 10,000-gallon phenol tank, and AST 410C was a 1,500 gallon surfactant tank. The remaining eight ASTs were directly associated with industrial waste treatment processes at IWTP 410. Acids, bases, coagulants, and other IWTP-related chemicals were stored in these tanks until their removal. One oil water separator (OWS) was also associated with IWTP 410 and closed under RCRA. Two additional OWSs were operated by NARF. There is no historical evidence of USTs at Site 9.

1.3.3.2 Site 13 – Former Oil Refinery

An oil refinery operated from 1879 to 1903 at the location of Site 13 before Navy operations at Alameda Point. Site 13 covers approximately 17.5 acres in the northern half of OU-2A. Site 13 includes Building 397, a 17,400-square-foot aircraft overhaul plant and engine test facility constructed in 1958 and operated by NARF. A self-storage facility occupies the southeastern corner of the site. The majority of the rest of the site is paved or open space.

Five ASTs (324 through 328), of unknown capacity, were located on the eastern portion of the site. These tanks held fuel and were removed in 1990. There is no historical record of USTs at

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
6	OU-2A	Section 2.1	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.1.2, Page 2-2, Figure 2-3. Oneida Total Integrated Enterprises LLC 2011.

Weapons Department. The Weapons Department was responsible for receiving, issuing, storing, and shipping ammunition, ammunition components, and explosives. The department also operated a small arms firing range and saluting battery and coordinated ordnance disposal with the explosive ordnance disposal (EOD) detachment.

Supply Department. The Supply Department was responsible for providing fueling support activities. Fuel products were distributed throughout the installation by a complex of underground storage tanks (UST), aboveground storage tanks (AST), and underground piping systems.

The installation and its two largest tenants, PWC and NADEP, supported several activities involving use of substances such as industrial solvents, acids, paint strippers, degreasers, caustic cleaners, and metals from plating operations. Oils, fuels, and asbestos also were used at the installation. Several other tenants and support units may have used minor amounts of fuel products, pesticides, PCBs, and cleaning solvents. General descriptions of each site in OU-2A are presented in the following sections.

2.1.2 Operable Unit-2A

The DON is conducting investigations in accordance with the CERCLA (Title 42 United States Code [U.S.C.] 9601-9675) at various sites at Alameda Point. As a management tool to accelerate site investigation, cleanup, and reuse, a comprehensive OU strategy was developed, which separates 35 CERCLA sites into a total of 10 OUs (OU-1, OU-2A, OU-2B, OU-2C, OU-3, OU-4A, OU-4B, OU-4C, OU-5, and OU-6). Figure 2-2 shows the locations of CERCLA sites and corrective action areas under the Petroleum Program at Alameda Point.

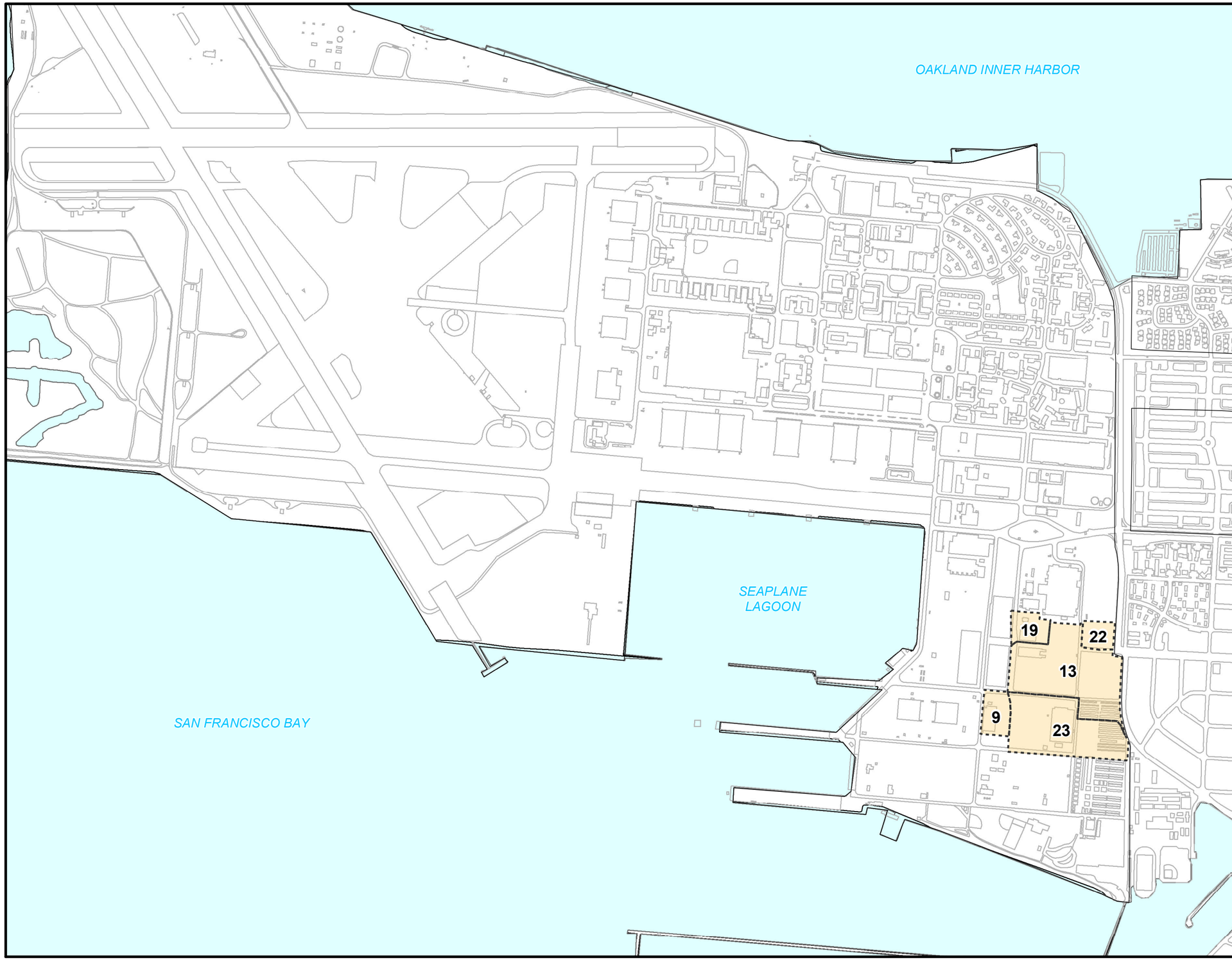
The CERCLA sites that comprise OU-2A and are included in this report are IR Site 9 – Paint Stripping Facility, IR Site 13 – Former Oil Refinery, IR Site 19 – Hazardous Waste Storage, IR Site 22 – Former Service Station, and IR Site 23 – Missile Rework Operations/Former Plane Defueling Area. The locations of OU-2A and IR Sites 9, 13, 19, 22, and 23 are presented on Figure 2-3.

2.1.2.1 IR Site 9 – Paint Stripping Facility

IR Site 9 covers approximately 2.9 acres in the southwestern corner of OU-2A (Figure 2-3). Two buildings (Buildings 410 and 351) covering approximately 37,000 square feet are still present at IR Site 9 (see Figure 2-4). Building 410 was constructed in 1958 as an aircraft paint stripping facility run by Naval Area Rework Facility (NARF), and has been used for storage since the early 1990s. According to the initial assessment study (IAS) conducted at NAS Alameda in 1983, paint stripping and aircraft cleaning activities included the use of phenol, methylene chloride, trichloroethane (TCA), chromium, detergents, wipe-down solvents, and parts cleaners (E&E 1983). Anecdotal evidence suggests that numerous undocumented releases of aircraft fuel have occurred inside Building 410 (IT 2001). Based on activities performed inside Building 410, other industrial solvents likely included naphthalene and tetrachloroethylene (PCE). Wastes generated at this site were discharged to the Seaplane Lagoon from 1958 until 1972 (SulTech 2005b).

Building 351, located immediately north of Building 410, was a support building that served as a lunch room/locker room for Building 410 staff. Both buildings are inactive and scheduled for demolition. The Industrial Waste Treatment Plant (IWTP) 410, known as Structure 588, was located east of Building 351 and treated paint stripping wastes under a Resource Conservation and Recovery Act (RCRA) permit. This facility and 11 associated ASTs have been removed from IR Site 9, and the permit has been closed under RCRA.

AST 410A was a 10,000-gallon methylene chloride tank. AST 410B was a 10,000-gallon phenol tank, and AST 410C was a 1,500 gallon surfactant tank. The remaining eight ASTs were directly associated



LEGEND

- ROAD/RUNWAY/BUILDING
- 9 — IR SITE AND SITE NUMBER
- OU-2A
- ALAMEDA POINT BOUNDARY
- WATER

ABBREVIATIONS AND ACRONYMS:

OU - OPERABLE UNIT

FS - FEASIBILITY STUDY

IR - INSTALLATION RESTORATION

N

600 0 600 1,200 Feet

Scale: 1" = 1200'

OU-2A FS

Final

OU-2A Location

Alameda, CA

Date: 06-11	Project No. 106687	Figure 2-3

OTIE Oneida Total Integrated Enterprises

AECOM

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
7	IR Site 9	Section 2.1.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 5.1.2, Pages 5-1 through 5-3, Figure 5-1. SulTech 2005.

5.0 BACKGROUND AND RI RESULTS FOR CERCLA SITE 9 BUILDING 410 (PAINT STRIPPING FACILITY)

This section provides a comprehensive site summary and analysis of contamination located at CERCLA Site 9. The physical features and history of the site are presented in Section 5.1. The environmental investigations conducted at Site 9 are presented in Section 5.2. The initial data evaluation, which includes the site-specific conceptual site model, data quality assessment, and background evaluation, is presented in Section 5.3. The nature and extent evaluation is presented in Section 5.4, and the fate and transport analysis is included in Section 5.5. The human health and ecological risk assessments are summarized in Sections 5.6 and 5.7, respectively. Conclusions and recommendations for Site 9 are identified in Section 5.8.

5.1 PHYSICAL FEATURES AND SITE HISTORY

This section summarizes the physical features and history of Site 9. The physical features of Site 9 are described in Section 5.1.1. The history and activities conducted at Site 9, including generation of hazardous wastes and past disposal and storage practices associated with these wastes, are summarized in Section 5.1.2. The Site 9 regulatory history is provided in

5.1.1 Site 9 Physical Features

Site 9 is located approximately 900 feet east of the Seaplane Lagoon, in the southeast portion of NAS Alameda (see Figure 1-2). Site 9 is approximately 3 acres in size, relatively flat, mostly paved, and is composed primarily of open space surrounding Building 410. Before the construction of Building 410 in 1958, Site 9 was used for aircraft storage. Site features include Buildings 351 and 410; former IWTP 410, which consisted of former Building 588, and eight former ASTs and OWS-588 associated with the RCRA Part A permitted IWTP; and three ASTs associated with Building 410 (410A, B, and C) (see Figure 5-1). All ASTs have been removed (EFA West 1999). Storm and industrial wastewater sewer lines run from Building 410 to the area previously occupied by Building 588 and extend to the Seaplane Lagoon. Two OWSs (410A and 410B) were located south of Building 410; both remain in place. During site investigations, these OWSs were observed to be clean and to contain groundwater. No USTs or underground fuel lines were identified at Site 9.

Seventy percent of Site 9 consists of open space that is extensively covered with asphalt and concrete. These areas were primarily used for aircraft storage, roadways, vehicle and equipment parking, materials storage, and as washdown areas for maintenance, gear, and equipment. Minor landscaped areas are also present at the site.

5.1.2 Site 9 History

The area of Site 9 was part of the Bay before the Navy established NAS Alameda. Between 1942 and 1946, the area was filled by dredging sand from the floor of the Bay and pumping it onto the area.

Until 1958, the area of Site 9 was open space used for aircraft storage (IT 2001). Aerial photographs from 1949 and 1953 show that planes were parked in open spaces that probably were surfaced with compacted soil or pavement. During 1958, the Navy constructed Building 410 in the western portion of Site 9 and added storm sewers, which conveyed runoff and industrial wastes to the Seaplane Lagoon.

Building 410 is the primary structure at Site 9 and housed the corrosion control facility, which included aircraft cleaning and paint stripping activities. According to the initial assessment study (IAS) conducted at NAS Alameda in 1983, paint stripping and aircraft cleaning activities included the use of phenol, methylene chloride, trichloroethane (TCA), chromium, detergents, wipe-down solvents, and parts cleaners (E&E 1983). The building has concrete floors, metal walls and ceilings, and is approximately 35,000 square feet (ft^2) in size. Anecdotal evidence suggests that numerous undocumented releases of aircraft fuel have occurred inside Building 410 (IT 2001). Based on activities performed inside Building 410, other industrial solvents likely included naphthalene and tetrachloroethylene (PCE). Wastes generated at this site were discharged to the Seaplane Lagoon from 1958 until 1972.

Floor drains within Building 410 drained to storm sewer laterals extending from Building 410 toward the east and north to a storm sewer main line located parallel to the northern edge of Site 9 (see Figure 5-1). This sewer main line flows from east to west and empties at Outfall J in the Seaplane Lagoon. Industrial wastes were discharged into these lines from 1958 until 1972. A catch basin (5-0A) for a second storm sewer line is located south of the southwest corner of Building 410. This second storm sewer line is oriented north-south and runs south to Outfall O and the Bay.

Building 351, constructed between 1953 and 1969, served as an office and break room for staff that worked in the Building 410 corrosion control facility until 1990. The building covers an area of about 900 ft^2 and has a concrete floor and metal walls. The building is no longer in use.

In 1973, the Navy constructed IWTP 410; a RCRA Part A permitted facility located north of Building 410, which included Building 588, OWS-588, and eight associated ASTs. Acids, bases, coagulants, and other IWTP chemicals were stored and used in this area (IT 2001). Former Building 588 and the eight associated ASTs occupied about 4,500 ft^2 and were removed between 1997 and 2002 during decommissioning of IWTP 410. Figure 5-1 depicts the former locations of the three largest ASTs removed and the general location of IWTP 410. From 1973 until operations ceased in 1990, IWTP 410 received wastewater laden with oil, paint, paint skins, detergents, and paint stripper at a rate of about 16,000 gallons per day (gpd) (IT 2001).

The Navy prepared a closure plan for IWTP Building 410 and associated ASTs in April 1988. In February 1997, a closure summary report was prepared by E&E (1997). The Navy provided certification for the IWTP 410 closure summary report on April 1, 1997. The Navy received a letter from DTSC regarding approval of the IWTP 410 closure certification report on November 9, 1998 (DTSC 1998). This facility is a separate administrative unit within Site 9 and received NFA closure under RCRA. No further evaluation of this IWTP is needed.

In 1990, the Navy ceased paint stripping and aircraft cleaning operations at Building 410. The building was used to temporarily store investigation-derived soil waste and was used as a garbage transfer station between 1990 and 1996. Nelson's Marine, a boat storage facility, currently occupies Building 410. Nelson's Marine stores boats, trailers, and recreational vehicles (RV) inside and outside of Building 410. Private parties are allowed to access their boats and conduct repair activities. The Navy's review of site activity suggested that engine repair is conducted on site.

ASTs 410A, B, and C were located east of Building 410. ASTs 410A and 410B had capacities of about 10,000 gallons each, and AST 410C had a capacity of 1,500 gallons. It is unclear when these ASTs were installed. These ASTs stored methylene chloride, phenol, and surfactant, respectively. These compounds were used extensively within Building 410. All three ASTs were removed before 2001 (IT 2001), and NFA recommendations are included in SWMU Appendix (Appendix G).

In 1991, the Navy inspected, cleaned, or replaced much of the storm sewer system at Alameda Point. At Site 9, the entire length of storm drain line that discharged to Outfall J, in the Seaplane Lagoon, was inspected and cleaned, and the entire length of the storm drain line that discharged to Outfall O, in the Seaplane Lagoon, was replaced with PVC piping (IT 1997).

The Navy conducted an inspection of OWSs 410A and 410B, south of Building 410. The OWSs appear to have been cleaned and contain clear water. OWS-410A is located west of a wash rack and was at one time connected to a drain within the wash rack area. The wash rack is no longer in use and is currently used for the storage of equipment. OWS-410B collected storm water runoff from the concrete open space on the east side of Building 410

5.1.3 Site 9 Regulatory History

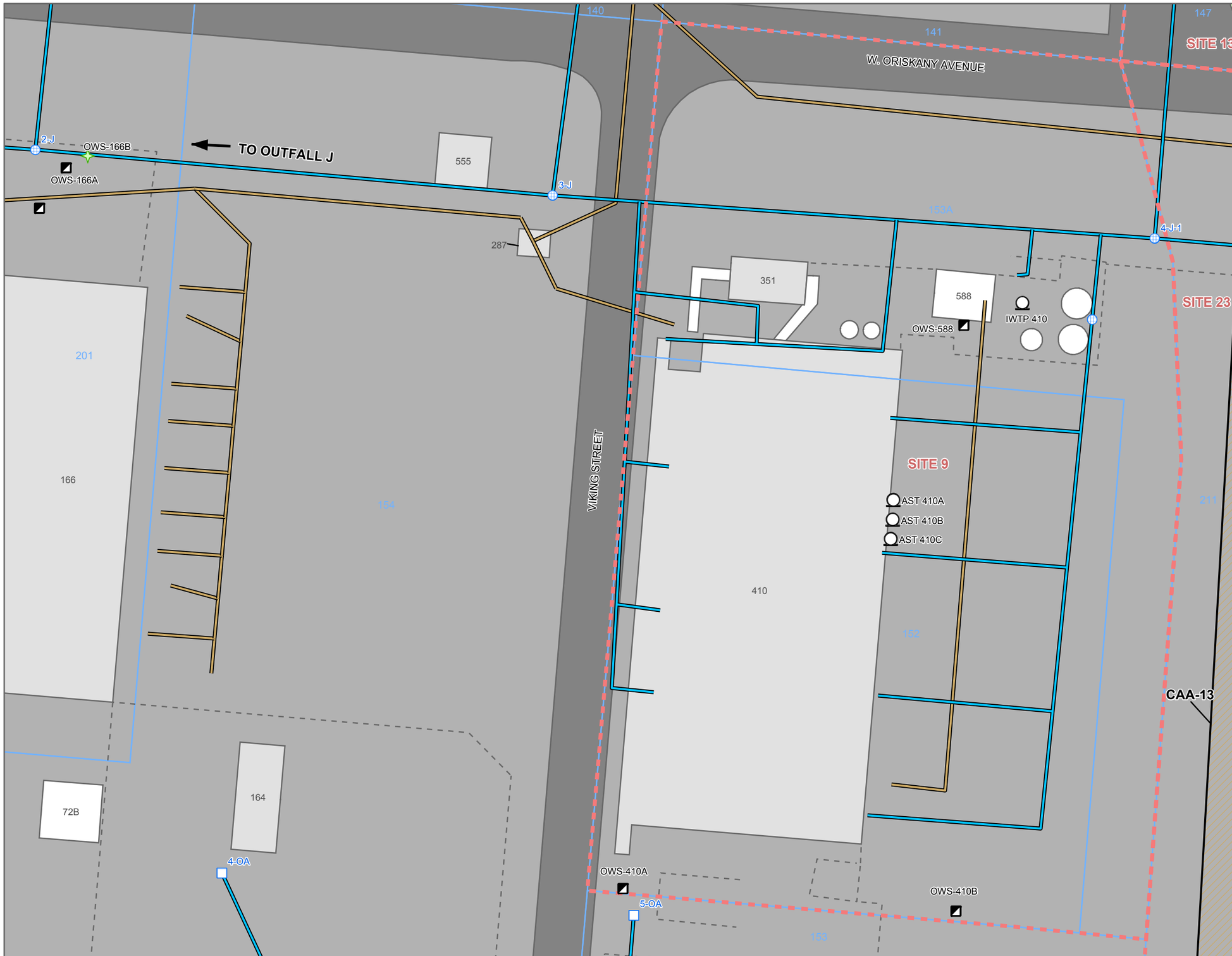
Several facilities and areas within Site 9 are regulated by different programs. These programs include the CERCLA program and the RCRA program. No investigations have been conducted under the TPH program at Site 9. The following subsections briefly describe the history of involvement of each of these programs at Site 9.

5.1.3.1 CERCLA Program

Site 9 was originally identified as Parcel 152 and selected for evaluation under CERCLA during the 1983 IAS investigation (E&E 1983).

On June 6, 1988, the California Department of Health Services (currently known as DTSC) issued a Remedial Action Order requiring the Navy to investigate Site 9 (DTSC 1988).

In July 2000, Site 9 was expanded under the CERCLA program to include Parcel 153A because investigation results indicated that Parcel 153A was impacted by Building 410 activities.



ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

- Unpaved
- Paved
- Road

BUILDING

- Present
- Removed

Note:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 5-1
SITE 9 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig05-01_s09_features.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
8	certified closed by DTSC	Section 2.1.1	Letter From Department of Toxic Substances Control to Navy Transition Office, Alameda Point regarding Acceptance of closure certificatnoi report for Building 410 Industrial Wastewater Treatment Plan (IWTP), Naval Air Station Alameda, Alameda CAP EPA ID No. CA2 170 023 236. Dated November 9, 1998.

Cal/EPA

Department of Toxic Substances Control

700 Heinz Avenue, Bldg. F, Suite 200 Berkeley, CA 94710

Pete Wilson
Governor

Peter M. Rooney
Secretary for Environmental Protection

November 9, 1998

Mr. Roger Caswell
Navy Transition Office, Alameda point
950 Mall Square West
Alameda, CA 94501-5000

ACCEPTANCE OF CLOSURE CERTIFICATION REPORT FOR BUILDING 410 INDUSTRIAL WASTEWATER TREATMENT PLANT (IWTP), NAVAL AIR STATION ALAMEDA, ALAMEDA CA EPA ID No. CA2 170 023 236

Dear Mr. Caswell:

The Department of Toxic Substances Control has reviewed the closure certification report titled "Draft Additional Environmental Sampling Investigation, Building 410, Industrial Waste Treatment Plant, Naval Air Station Alameda, Alameda, California" dated March 1998. Based on this report and the "Closure Summary Report, Building 410, Industrial Waste Treatment Plant" dated February 1997, DTSC understands the following:

1) The report certified that Building 410 Industrial Wastewater Treatment Plant (IWTP) has been closed in accordance with the approved closure plan.

2) The closure complied with the requirements in California Code of Regulations, Title 22, Chapter 15, Article 7 (closure of ISD facilities).

3) Confirmation soil samples show metals, volatile organic compounds and semi-volatile organic compounds are all below residential preliminary remediation goals (PRGs).

This letter is to acknowledge that DTSC has reviewed this report and accepts this closure certification and considers Building 410 IWTP officially closed. However, since there are remaining units under the Alameda Naval Air Station Hazardous Waste Facility Permit that have not been certified closed, the terms and conditions of that permit remain in effect.

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FAX TRANSMITTAL # of pages ▸ 2

Glynis Foulk | From Sue Neishi
t./Agency | Phone #
Fax #

DTSC's approval of this closure is not a certification that Naval Air Station Alameda does not pose any environmental or public health threat, nor does it remove any liabilities associated with past hazardous waste management practices which occurred at the Building 410 IWTP. This approval also does not release Building 410 IWTP from any investigations that may be required by DTSC's Site Mitigation Branch-Office of Military Facilities.

If you have any questions, please contact Bernie Edrada at (510) 540-3955.

Sincerely,

Mohinder S. Sandhu, P.E., Chief
Standardized Permits and Corrective Action

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
9	Marsh Crust	Section 2.1.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 2.2.2, Pages 2-5 through 2-6, Figures 1-3 and 2-2. SulTech 2005.

2.2.2 Installation Geology

This section provides a description of the Alameda Point installation geology based on interpretation of the occurrence of unconsolidated, Quaternary-aged units encountered in subsurface investigations completed to date. The installation geology is described beginning with the uppermost units encountered at the surface down to bedrock.

Artificial Fill. The artificial fill is the uppermost lithologic unit and underlies most of Alameda Point, ranging in thickness from 0 to 30 feet. The artificial fill is thickest in the western portion of Alameda Point and generally thins eastward across Alameda Point. The artificial fill is thinnest in the locations of former tidal flats. The varying thickness of the artificial fill results from natural variations in the surface topography of the estuary before artificial filling activities began in the late 1800s.

The artificial fill at Alameda Point consists of sediments dredged from the surrounding Bay and the Oakland Inner Harbor. Although the composition of the artificial fill varies, it generally consists of silty sand or sand with minor inclusions of clay or gravel or both. The composition of the artificial fill most likely consists of dredged portions of the Merritt Sand Unit and the Bay Sediment Unit (BSU) (Rogers and Figuers 1991). The installation fill history is shown on Figure 1-3.

Bay Sediment Unit. The BSU, which consists of Holocene-aged estuarine (tidal flat) deposits, is the youngest, naturally occurring unit in the vicinity of Alameda Point. The BSU is equivalent to the Young Bay Mud discussed in Section 2.2.1. The BSU is about 40 feet thick in the western portion of Alameda Point, thinning and pinching out in the southeastern region at the former shoreline of Alameda Island (Figure 2-2). The BSU is encountered at a depth of about 25 feet below ground surface (bgs) in the western portion of Alameda Point and at a depth of about 5 feet bgs in the eastern portion of the installation. The BSU is made up of tidal flat deposits consisting of varying degrees of fine- and coarse-grained material that grade westward, away from the former shoreline, into finer grained subtidal deposits. The BSU consists of gray to black silt and clay with discontinuous, poorly graded, silty and clayey sand layers. In some parts of the western region of Alameda Point, the lower portion of the BSU is composed predominantly of gray to black sand.

A layer with high organic content, called the "marsh crust," typically marks the top of the BSU throughout the eastern portion of the installation. The marsh crust is a layer of contaminated sediment that was formed by the discharge of petroleum wastes into the former tidal flats from two gas plants and an oil refinery before Navy acquisition of the property. After deposition in the tidal flats, this waste migrated over much of the surface of the surrounding marshlands and was dispersed and deposited through tidal actions in subtidal areas that later were filled to become Alameda Annex and the eastern portion of Alameda Point. Fill materials were placed in these areas from as early as 1887 to as recently as 1975 (see Figure 1-3). The marsh crust is encountered at depths of 10 to 20 feet bgs in the eastern half of the installation (Navy 2001a) (see Figure 2-2). Areas where the marsh crust is known to exist are subject to excavation restrictions

known as the Marsh Crust Ordinance (City of Alameda 2000) that limits the extent of excavations to designated threshold depths.

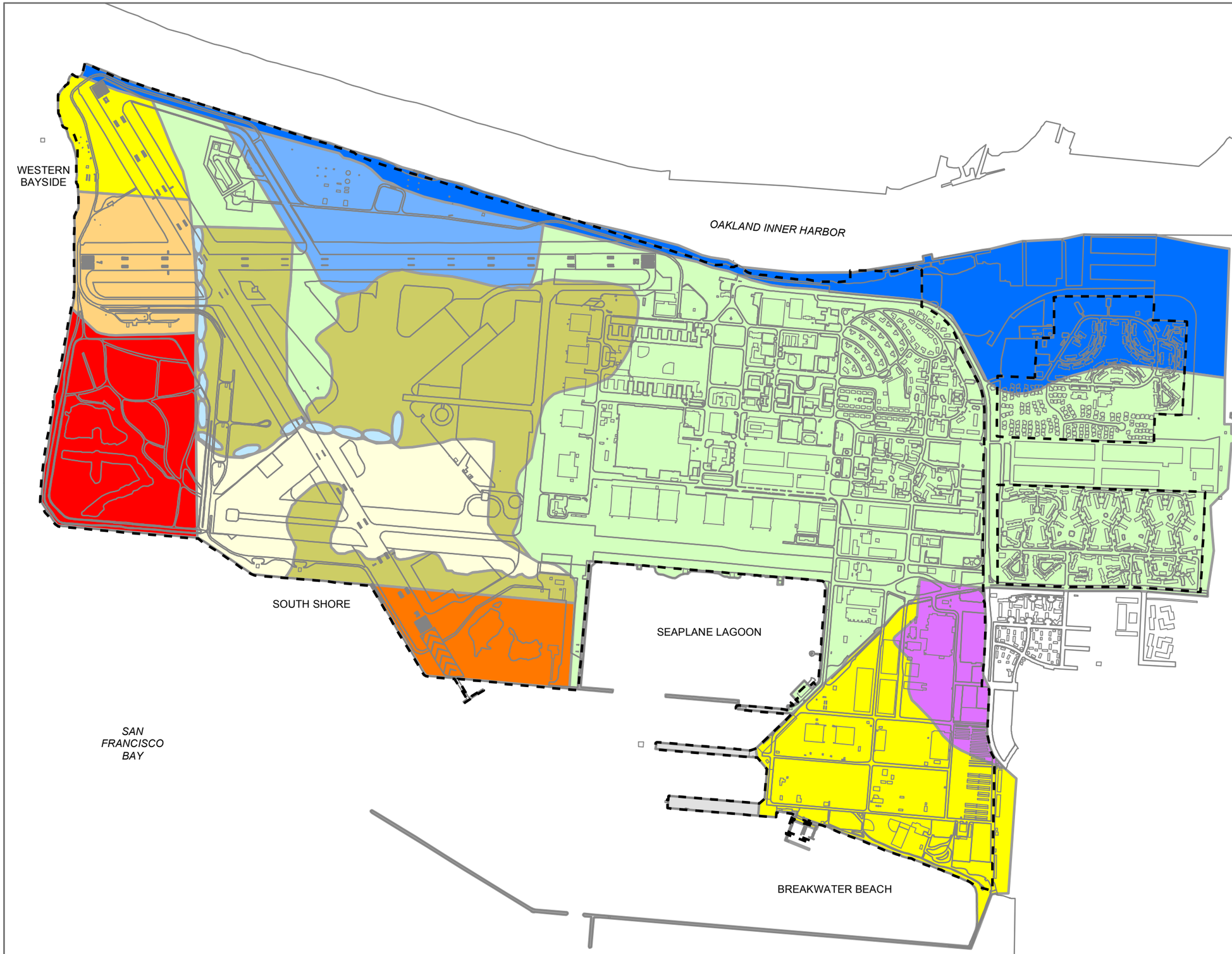
Merritt Sand. Over most of the installation, the Merritt Sand underlies the BSU. The Merritt Sand is encountered at depths ranging from 40 feet bgs in the western portion of the installation to surface outcrops in the southeastern portion of the installation. At Alameda Point, the Merritt Sand is composed of brown, fine- to medium-grained, poorly graded sand. Bivalve shells and shell hash are observed in parts of the Merritt Sand, indicating some marine reworking during the most recent sea level rise. The thickness of the Merritt Sand ranges from 8 feet to 60 feet across Alameda Point.

San Antonio Formation (upper member). At Alameda Point, the upper member of the San Antonio Formation generally uncomformably underlies the Merritt Sand and consists of interbedded layers of gray sand and clay ranging in thickness from 10 to 40 feet in the eastern portion and from 7 to 70 feet in the central portion of the installation. A persistent layer containing shells and sand is present near the top of the formation. The San Antonio Formation is present over most of the installation but is absent where a paleochannel crosses the northern half of the central and western portions of the installation. Greenish-gray clay layers within the upper member of the San Antonio Formation may not be regionally continuous. An organic-rich layer containing plant debris or peat is occasionally present at the base of the formation.

A paleochannel (former stream channel cut through existing sediments then filled with younger sediments) underlying Alameda Point is located along an east-west trending axis through the middle of the installation. The paleochannel was cut through the Merritt Sand and into the upper unit of the San Antonio Formation. Then it was filled with the encroaching BSU, which consisted of low-permeability silts and clays with discontinuous layers of poorly graded sands. Those poorly graded sands become continuous and thicker in the western region of the installation. Although the southern bank of the east-west trending paleochannel is located more than 1,000 feet north of OU-2A, tributaries of this ancient stream created north-south trending channels that may have caused localized depositional variability at OU-2A.

Yerba Buena Mud (Lower San Antonio). Yerba Buena Mud at Alameda Point reaches a maximum thickness of 50 feet at the west end and thins to the east but does not pinch out. The top of the Yerba Buena Mud occurs at elevations of 50 to 100 feet below mean sea level (msl). The top of the Yerba Buena Mud dips approximately 2 degrees to the southwest under the installation (Rogers and Figuers 1991). In borings conducted at OU-2A, it is described as a stiff, plastic, dark gray to blue fat clay. The presence of organic matter and changes in sand or silt content vary locally.

Alameda Formation. The Alameda Formation underlying Alameda Point ranges in thickness from approximately 250 feet at the western edge of the installation to approximately 850 feet at the eastern end of the installation. In the central portion of the installation, the formation is about 600 feet thick (Rogers and Figuers 1991).



Non-Fill
Pre-1887
1887 - 1915
1916 - 1929
1930 - 1939
1930 - 1934
1940 - 1941
1941
1942 - 1946
1947 - 1953
1958 - 1963
1953 - 1975
LAND COVER
ALAMEDA BOUNDARY

N

600 0 600 1200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 1-3
FILL HISTORY

Operable Unit 2A
Remedial Investigation Report

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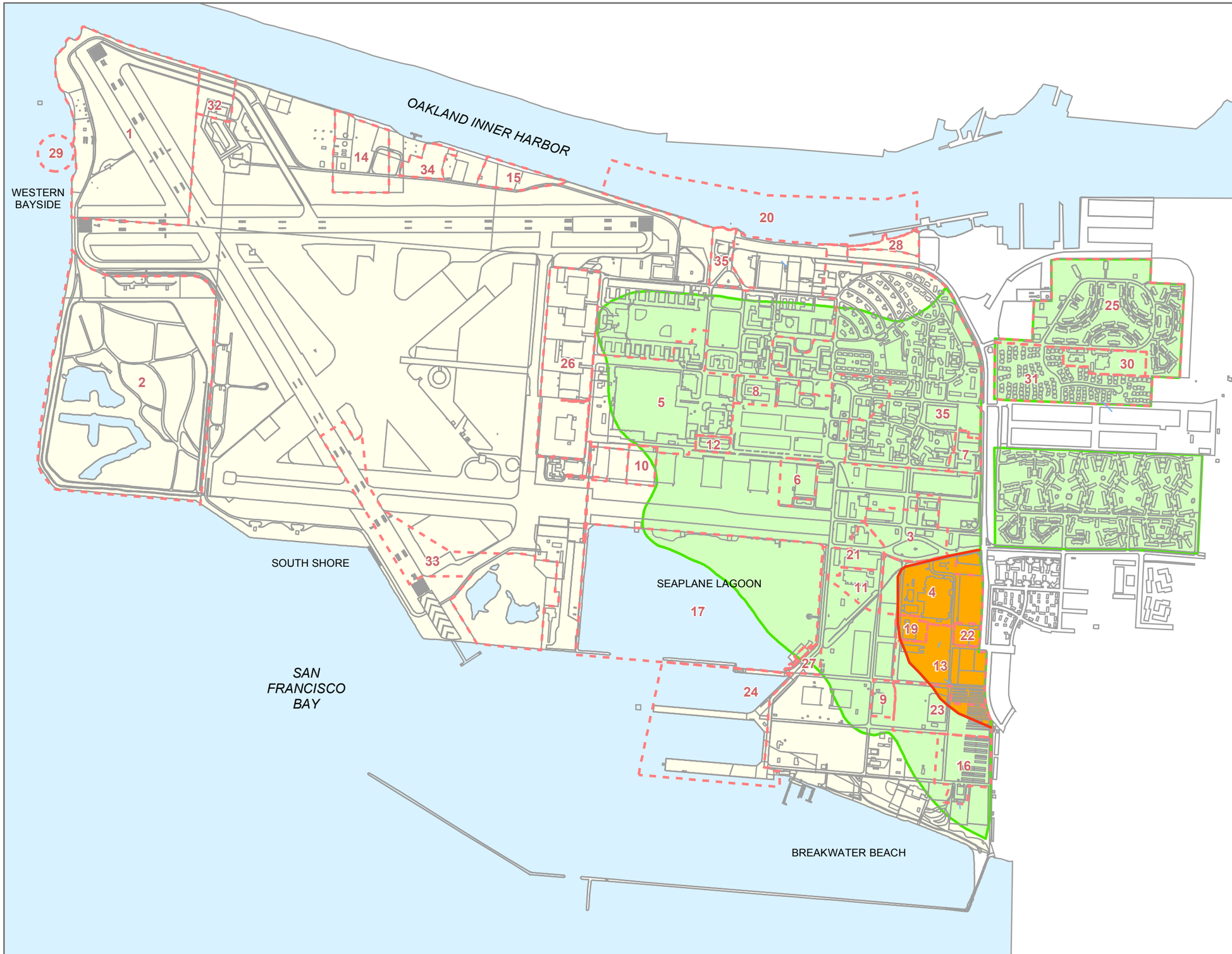

EXTENT OF BAY SEDIMENT UNIT

AREA SUBJECT TO MARSH CRUST RESTRICTIONS

EXTENT OF FORMER ISLAND 1865 (RADBRUCH 1957)

CERCLA SITE

LAND COVER

WATER

Notes:
Source: NAVY 2001a
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

600 0 600 1200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 2-2
EXTENT OF BAY SEDIMENT UNIT AND MARSH CRUST AREA

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\do28\ou2a\ri\mxd\fig02-02_marsh_crust.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
10	IR Site 13	Section 2.1.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.1.2, Pages 6-2 through 6-4, Figures 6-1 and 6-2. SulTech 2005.

6.1.2 Site 13 History

The eastern portion of Site 13 was located within the original boundaries of Alameda Island. The southwest portion of the site was submerged below the Bay. Site 13 was originally farmland.

Between 1879 and 1903, the oil refinery operated in Alameda at the current location of Site 13 and possibly portions of adjoining CERCLA Sites 19, 22, and 23. Most of the operations occurred in the southern part of Site 13. The refinery used an acid-sludge process for refining fresh crude oil. A 1897 Sanborn fire insurance map shows the location of the refinery structures, which consisted of pump and lubricating houses, two laboratories, agitators, and bleaching tanks as well as approximately 19 ASTs, 6 USTs, and a storage area containing drums of oil (Sanborn 1897) (see Figure 6-2). The former tanks were used to store crude oil and finished products. In addition, some of the tanks were used to complete processes such as bleaching and condensing. In the late 1800s, petroleum refinery operations included distilling crude oil to kerosene, lubricating, and fuel oils. Common oil refining practices also included mixing strong acid with the crude oil to "crack" the oil to increase yields of kerosene. Sulfuric acid was a relatively inexpensive strong acid available in bulk quantities. Wastes from this type of operation would be expected to include heavier-end hydrocarbons. Although the type and quantity of wastes and the disposal locations are not documented, it is assumed that the refinery wastes and asphaltic residues were disposed of at Site 13 and the surrounding tidal lands. Wastes and residues are considered a potential source of the hydrocarbon-rich material observed at the ground surface in two locations at Site 13. Oil refinery operations ceased in 1903. There is no documentation regarding the decommissioning of the refinery equipment.

In 1930, the Army acquired the installation property from the City of Alameda and began construction activities in 1931. In 1936, the Navy acquired title to the land from the Army and began building the air station in response to the military buildup in Europe before World War II.

Former Building 401, a 137-ft^2 structure used as a bus shelter, was built in 1945. The area it formerly occupied is now open space (IT 2001).

Former Building 298, a 306-ft^2 structure used as a weather station, was built in 1946. The building was demolished in 1989.

In 1947, ASTs 324 through 328 were installed in the eastern portion of Site 13. ASTs 324 through 328 consisted of steel fuel storage tanks on top of concrete foundations. The tanks were demolished in May 1990 (IT 2001). The specific capacities and contents of the tanks are unknown. During the late 1940s and 1950s, open space in this area was used as aircraft storage, and these tanks likely contained fuels to support aircraft operation and maintenance. No documented release is known to have occurred from these tanks.

Former Structure 285 was built before 1947 and consisted of 18 buildings. The buildings were located on the east side of Site 13. Sixteen of the buildings were demolished before August

1953, and the remaining 2 buildings were demolished before November 1981 (IT 2001). Base history for these buildings is incomplete.

In 1958, Building 397 was constructed. The building is approximately 17,400 ft^2 in size and is located in the northwest portion of Site 13. It served as an aircraft overhaul plant services facility until 1997. It contains two JETCs, JETC-15 and JETC-16, which were operated by NADEP. Between 1980 and 1981, the building was renovated to include new exhaust towers. Materials stored at Building 397 included petroleum products, halogenated and nonhalogenated solvents, and aircraft fuel (IT 2001). Several additional features associated with Building 397 operations included floor drains that discharge to OWSs, fuel lines, and a GAP, which are discussed below. As of May 2002, Building 397 was being leased from the Alameda Reuse and Redevelopment Authority (ARRA) to the City of Alameda for storage. The City of Alameda stores equipment from their parks and recreation department and fire department within and around Building 397.

NADEP GAP 62 was a nonpermitted RCRA GAP located in shop 96231 at the west end of Building 397. GAP 62 served as a temporary storage area for 30- to 55-gallon drums containing hazardous waste, including Mil-L-23699 lubrication and engine oil. The Phase I EBS concluded that NADEP GAP 62 did not require further investigation because Site 13 was paved and site inspectors did not observe staining. DTSC recommended NFA on November 4, 1999 (DTSC 1999a). The Navy recommends NFA in Appendix G of this report.

OWSs 397A, 397B, 397C, and 397D were installed near the eastern end of Building 397 for recycling oil from the waste stream before process water or storm water was discharged to the storm drains. OWS 397A and 397B have 6,000-gallon capacities, and the capacities of OWS 397C and 397D are unknown. OWSs 397A, 397B, and 397C were filled with cement slurry and closed in place in 1993. OWS 397D was removed in 1993 (Navy 1993).

Industrial waste treatment sewer lines were likely installed at Building 397 in 1972 to transport the industrial waste to an off-site municipal treatment plant. The original lines transported waste from the JETCs to the treatment plant operated by EBMUD. In 1981, two small segments of the lines were relocated during installation of the new exhaust towers on the east side of Building 397. In 1989, the line was plugged to satisfy the requirements of a cease and desist order from EBMUD; therefore, Building 397 was no longer discharging waste to the off site treatment plant.

In 1987, the southeastern portion of Site 13 was developed as a self storage area, which consists of Buildings MS-01 through MS-10, and was the Navy exchange mini-storage area, including a mobile trailer and self-storage office (EFA West 1999). A private lessee currently operates this area.

An underground fuel line ran from Building 372 (located on Site 11 to the north) into Building 397 to support fuel jet engine testing activities. The line was approximately 1,000 feet in length and supplied JP-5 to Building 397. In June 1991, a scheduled pressure test was conducted on the line as part of a preventive maintenance program. The line lost approximately

15 pounds per square inch (psi) of pressure from an initial 100 psi in about 20 minutes (PRC and JMM 1992). This loss of pressure was considered a minor leak by the NAS Fuel Department. The location of the leak was not known, and the pipe continued to be used. The fuel line was removed in October 1998 (Tetra Tech and R&M 2000). Results of confirmation sampling are discussed in Section 6.3.

In early 1991, between 3,500 to 17,000 gallons of JP-5 were released from Building 397. It is believed that the release occurred when a small drain valve on a fuel supply line in the fuel room of Building 397 was left open. A flexible hose attached to the open drain valve ran into a floor drain leading to an OWS. The flexible tubing obscured the release of fuel from the supply line to the floor drain. The floor drain emptied to three OWSs (OWS 397A, 397B, and 397C) located at the eastern end of Building 397, which in turn drained to the storm sewer system. The release occurred over an unknown period of time from January 21, 1991, to March 1, 1991, when an investigation by NADEP discovered the drain valve on the supply line open (PRC and JMM 1992). Immediate cleanup involved pumping floating free product from the OWS, manholes, and storm water lines that contained free product. The EBS conducted by IT in 2001 concluded that jet fuel contamination at Site 13 would be addressed as part of the basewide TPH strategy. Currently, the site is part of CAA-13, and remediation is being handled under the TPH program.

Floor drains in Building 397 discharged to OWS and then to storm sewer systems installed during base development. In 1991, the Navy conducted a storm sewer inspection, cleaning, and replacement project at Site 13. The following storm sewers were addressed:

- East-west storm sewer line that parallels the southern side of West Oriskany Avenue to Outfall J and crosses Site 13 was cleaned and inspected
- North-south sewer line beneath Skyhawk Street that crosses Site 13 was cleaned and inspected
- One section of storm sewer line was replaced at Site 13
- East-west storm sewer line located along West Pacific Avenue was replaced with PVC pipe

Building 397 is currently used by the City of Alameda for storage, and the self storage area is still in operation.

6.1.3 Site 13 Regulatory History

Several facilities and areas within Site 13 are regulated by different programs. These programs include the CERCLA program, the TPH program, and the RCRA program. This section briefly describes each program at Site 13.

ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

SOLID WASTE MANAGEMENT UNIT (SWMU)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-1
SITE 13 FEATURES

Operable Unit 2A
Remedial Investigation Report

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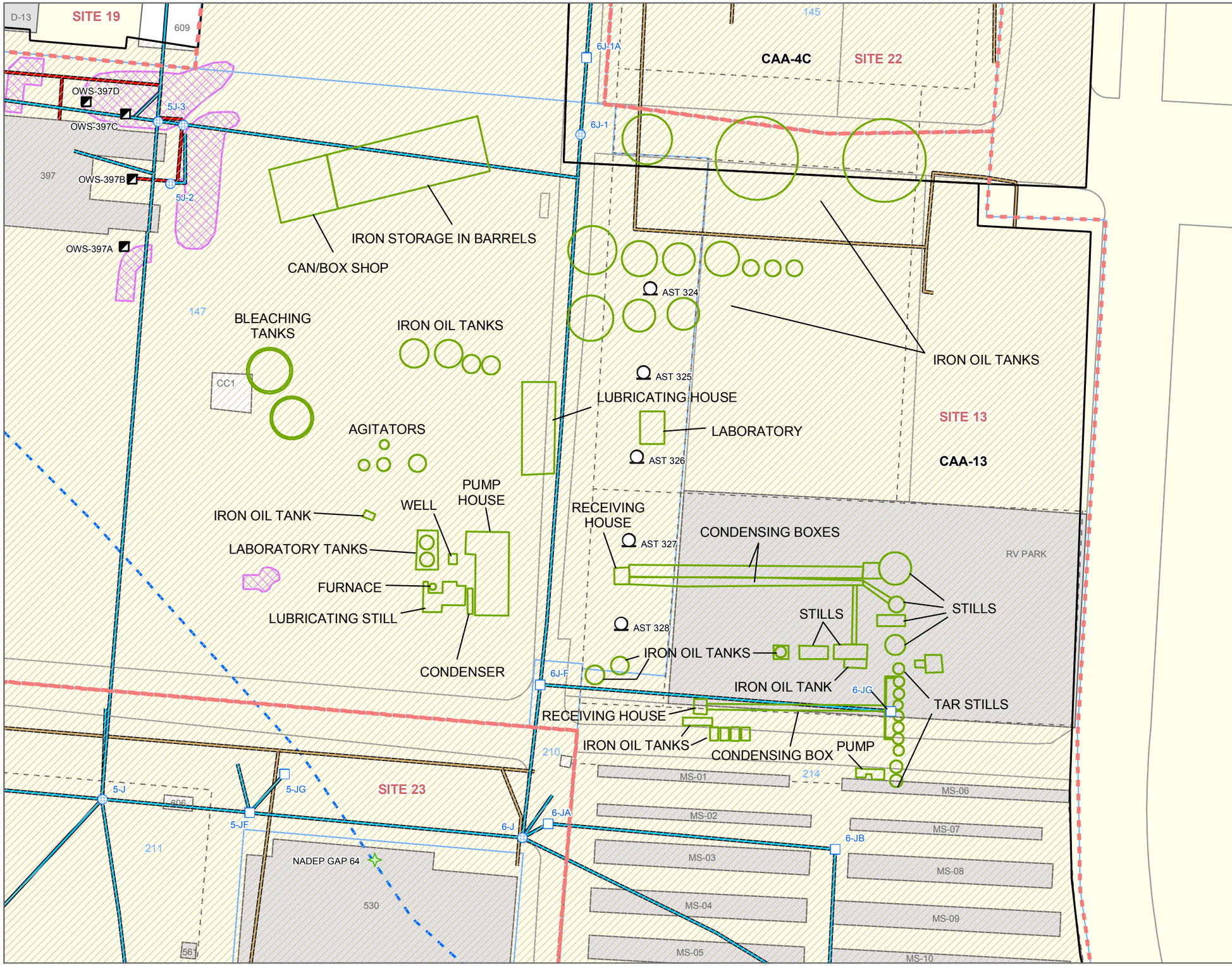

ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

EXCAVATION

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

40 0 40 80 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-2
SITE 13
FORMER OIL REFINERY FEATURES

Operable Unit 2A
Remedial Investigation Report

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
11	IR Site 19	Section 2.1.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.1.2, Pages 7-1 through 7-3, Figure 7-1. SulTech 2005.

7.0 BACKGROUND AND RI RESULTS FOR CERCLA SITE 19 YARD D-13 (HAZARDOUS WASTE STORAGE YARD)

Section 7.0 includes a comprehensive site summary and analysis of contamination located at CERCLA Site 19. The physical features and history of the site are presented in Section 7.1. The investigation history is presented in Section 7.2, and the initial data evaluation, which includes the site-specific conceptual site model, data quality assessment, and background evaluation, are presented in Section 7.3. The nature and extent evaluation is presented in Section 7.4, and the fate and transport analysis is included in Section 7.5. The HHRA and ERA are summarized in Sections 7.6 and 7.7, respectively. Conclusions and recommendations for Site 19 are identified in Section 7.8.

7.1 PHYSICAL FEATURES AND SITE HISTORY

This section summarizes the physical features, history, and activities at Site 19. The physical features of Site 19 are summarized in Section 7.1.1. The history and activities conducted at Site 19, including generation of hazardous wastes and past disposal and storage practices associated with these wastes, are described in Section 7.1.2. The Site 19 regulatory history is provided in Section 7.1.3.

7.1.1 Site 19 Physical Features

Site 19 is located approximately 1,000 feet east of the Seaplane Lagoon, in the northwest corner of OU-2A (see Figure 1-2). Site 19 is approximately 2.3 acres in size. The main structure at the site is Yard D-13 (also known as RCRA site HW-07), a hazardous waste storage yard. Other site features include Building 616, former Building 609, a closed-in-place underground fuel line, and Navy-installed USTs 616-1 and 616-2 (also known as AOC 616) (see Figure 7-1). No ASTs, washdown areas, or OWSs were identified at Site 19. Approximately 50 percent of Site 19 consists of paved open space.

Two storm sewer lines are located in the vicinity of Site 19. An 18-inch diameter, paved invert corrugated (PIC) iron pipe parallels the western border of Site 19 beneath Orion Street. A 24-inch-diameter PIC line crosses the eastern side of Site 19 from north to south and connects to the storm sewer line beneath West Pacific Avenue.

7.1.2 Site 19 History

The area known as Site 19 was on this historic shoreline of Alameda Island. The eastern portion of Site 19 was onshore, and the western portion was part of the Bay before the Navy took possession of NAS Alameda. The area was filled between 1942 and 1946 by dredging sand from the floor of the Bay and pumping it onto the area.

From the late 1940s to 1975, Site 19 was used for material storage (IT 2001). Aerial photographs from 1949, 1953, and 1969 show unidentified objects of various sizes, most likely crates and equipment, being stored at Site 19 in varying configurations.

In 1975, former Building 609 was built to store engine parts (IT 2001). Various articles can be seen stored around this 11,000-ft^2 facility in an aerial photograph from 1979. No other details about the construction or use of this facility are available (IT 2001). The building was demolished in 1991.

In 1982, Building 616 was constructed to provide office and storage space. It originally served as a hazardous materials storage area. The building has a concrete floor, wood framing, drywall panels, and corrugated metal roofing and is about 1,800 ft^2 in size (IT 2001). Two USTs, 616-1 (5,000-gallon capacity) and 616-2 (10,000-gallon capacity), were installed at the same time as the building and were used for spill control, functioning as emergency overflow tanks for fire control. The tanks were never used and are not believed to have ever contained hazardous waste materials (see Figure 7-1). The tanks were identified in the RFA as AOC 616. Both tanks were closed in place in 1987 (Tetra Tech 2003b). The Navy recommends NFA for AOC 616 in Appendix G of this report.

In 1984, a larger hazardous waste storage area (Yard D-13) was built that covered approximately 25,000 ft^2. It is a concrete area with built-in berms around individual containment areas (see Figure 7-2). A steel roof was added later at an unknown date. Yard D-13 was used as a RCRA-permitted storage area for containers of hazardous wastes generated by Alameda Point activities. Empty 55-gallon drums and drums containing wastes such as corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel were stored at Yard D-13. Drums containing wastes were organized by chemical type and stored in separate bermed areas in the open-sided building (see Figure 7-2). The wastes were removed from the storage area in 1996. The table below documents the materials and quantity of materials spilled in Yard D-13 (IT 2001). No spills were reported to enter the secondary containment overflow system.

Documented Spills at Yard D-13

Date	Material	Quantity
1989	Nitric Acid	50 gallons
January 12, 1990	Zyglow penetrant	Unknown
June 28, 1990	Poly paint	8-10 gallons
July 19, 1990	PD-680	10 gallons
August 28, 1990	Oil and fuel	250 gallons

In 1996, Building 616 and Yard D-13 ceased operating as hazardous waste storage facilities and received RCRA closure in 1999 (DTSC 1999b).

Currently, Yard D-13 is leased to Foss Environmental for use as an equipment and materials storage yard. Foss Environmental conducts some vehicle maintenance at Site 19 but primarily uses the property as a staging ground for environmental response activities.

7.1.3 Site 19 Regulatory History

Several facilities and areas within Site 19 are regulated by different programs. These programs include CERCLA, TPH, and RCRA. This section briefly describes each program at Site 19.

7.1.3.1 CERCLA Program

Site 19 was suspected of being part of the former oil refinery property discussed in Section 6.0, and DTSC requested that the Navy investigate the oil refinery. In 1990, the Navy added Site 19 to the CERCLA program by including it in the RI/FS work plan (Canonie 1989, 1990). The work plan discussed collecting samples for analysis of TPH associated with the refinery and to evaluate whether releases from the hazardous waste storage facility had occurred.

7.1.3.2 RCRA Program

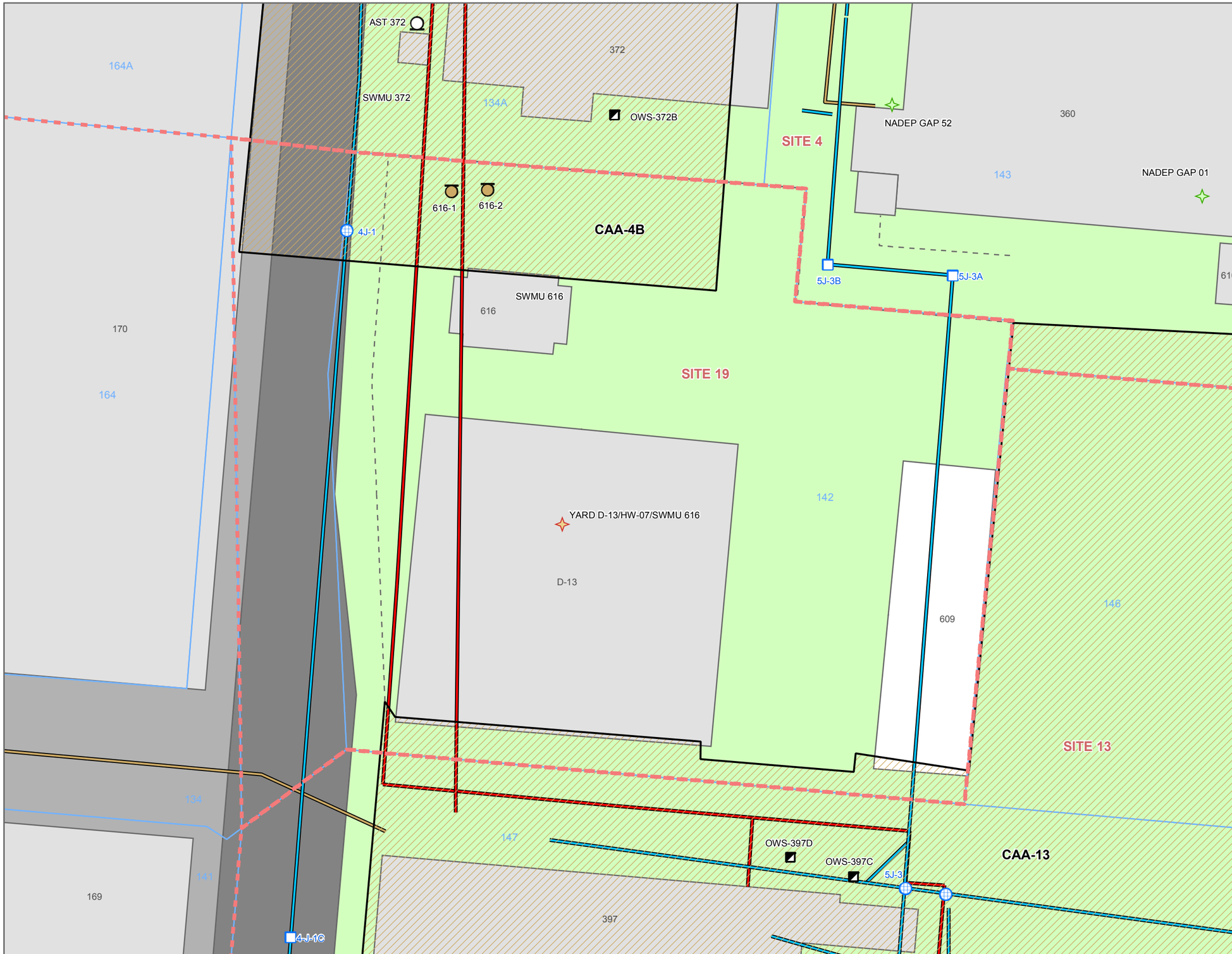
Yard D-13 at Site 19 was used to manage RCRA hazardous wastes. The RFA also identified AOC 616 at Site 19.

Yard D-13/HW-07 (Yard D-13) was a RCRA Part B-permitted site located in the south-central portion of Site 19. Yard D-13 was used to store waste for more than 90 days. On March 4, 1998, the Navy provided a closure certification report for the RCRA-permitted facility, and DTSC accepted the site closure certification in a letter dated July 21, 1999 (DTSC 1999b). Yard D-13 and Building 616 were referred to as SWMU/Unknown in the RFA; these two units were closed together (DTSC 1999b).

AOC 616 refers to two steel USTs installed north of Building 616 in CAA-4B at Site 19. The USTs, 616-1 (5,000-gallon capacity) and 616-2 (10,000-gallon capacity), were installed at the same time as the building and were used for spill control, functioning as emergency overflow tanks for fire control. The tanks were never used and are not believed to have ever contained hazardous waste materials. Both tanks were closed in place in 1987 (Tetra Tech 2003b). The Navy recommends NFA for AOC 616 in Appendix G of this report.

7.1.3.3 TPH Program

After Alameda Point was identified for closure in September 1993, the TPH program was implemented to decommission all USTs and other fuel-related items. As part of the program, TPH contamination was evaluated at 22 CAAs and 3 fuel line-specific CAAs. Several investigations have occurred under the TPH program, which are summarized in Section 7.2.4. The northwestern portion of Site 19 is included in the southern portion of CAA-4B (see Figure 7-1).



ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), PRESENT

SOLID WASTE MANAGEMENT UNIT (SWMU)

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-1
SITE 19 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig07-01_s19_features.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
12	IR Site 22	Section 2.1.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8.1.2, Pages 8-1 through 8-2, Figure 8-1. SulTech 2005.

8.0 BACKGROUND AND RI RESULTS FOR CERCLA SITE 22 BUILDING 547 (FORMER SERVICE STATION)

Section 8.0 includes a comprehensive site summary and analysis of contamination located at CERCLA Site 22. The physical features and history of the site are presented in Section 8.1. The physical features and history of the site are presented in Section 6.1. The investigation history is presented in Section 8.2, and the initial data evaluation, which includes the site-specific conceptual site model, data quality assessment, and background evaluation, are presented in Section 8.3. The nature and extent evaluation is presented in Section 8.4, and the fate and transport analysis is included in Section 8.5. The HHRA and ERA are summarized in Sections 8.6 and 8.7, respectively. Conclusions and recommendations for Site 22 are identified in Section 8.8.

8.1 PHYSICAL FEATURES AND SITE HISTORY

This section summarizes the physical features and history of Site 22. The physical features of Site 22 are summarized in Section 8.1.1. The history and activities conducted at Site 22, including hazardous wastes generated and past disposal and storage practices associates with the wastes, are described in Section 8.1.2. The Site 22 regulatory history is summarized in Section 8.1.3.

8.1.1 Site 22 Physical Features

Site 22 occupies approximately 2.1 acres in the northeast corner of OU-2A (see Figure 1-2). Site 22 generally coincides with the location of EBS Subparcel 145 and CAA 4C. The site operated as a gasoline service station between 1971 and 1980. Activities at the site included gasoline storage and pumping, car washing, and miscellaneous automobile repairs. Several former USTs located at Site 22 were used to store gasoline and waste oils. An OWS (OWS 547) is adjacent to the location of the former car wash.

Most of Site 22 is paved with concrete and retains some of the foundations from the former service station and fuel pump island. Grass and other landscaping exist in the western portion of the site, and along the northern border. Site 22 is bordered to the west by the City of Alameda, to the south and east by Site 13, and to the north by Site 4.

8.1.2 Site 22 History

Before the Navy took possession of NAS Alameda in 1936, the area known as Site 22 existed at the western edge of the peninsula of Alameda. Aerial photographs from 1930 show what appears to be a large barn and farmland in the area.

After the Navy took possession of the property, it was used for barracks until the mid 1970s. Aerial photographs from 1959 and 1963 show 14 Quonset huts around a large open area in the middle of Site 22. Roads border Site 22 on the south and west.

In 1970, a gasoline service station was constructed on the site and operated by the Navy. Several buildings were constructed, including a cashier/bathroom building (Building 547-A), a fuel pump island (Structure 547), and a car wash (Building 547-1). OWS 547 is located adjacent to the car wash. Three USTs (547-1 through -3, also known as UST(R)-17) and associated fuel lines to the fuel pump island were also installed. The locations of these features are shown on Figure 8-1.

In 1980, one of the USTs (tank number unknown) was punctured when a measuring dipstick was dropped into the bottom of the tank. The UST was reportedly repaired between 1980 and 1987. Additional testing during 1988 revealed that the UST was leaking, and it was removed from service. In 1982, leaking fuel lines were replaced.

In 1994, the service station was demolished. USTs 547-1 through 547-3 were removed by the Navy PWC in 1994, and associated fuel lines were removed in 1995 (PWC 1997). The OWS remains in place, although it has received water from the car wash since it was demolished.

8.1.3 Site 22 Regulatory History

Several facilities and areas within Site 22 are regulated by different programs. These programs include the CERCLA program, the TPH program, and the RCRA program. The sections below briefly describe the history of each program at Site 22.

8.1.3.1 CERCLA Program

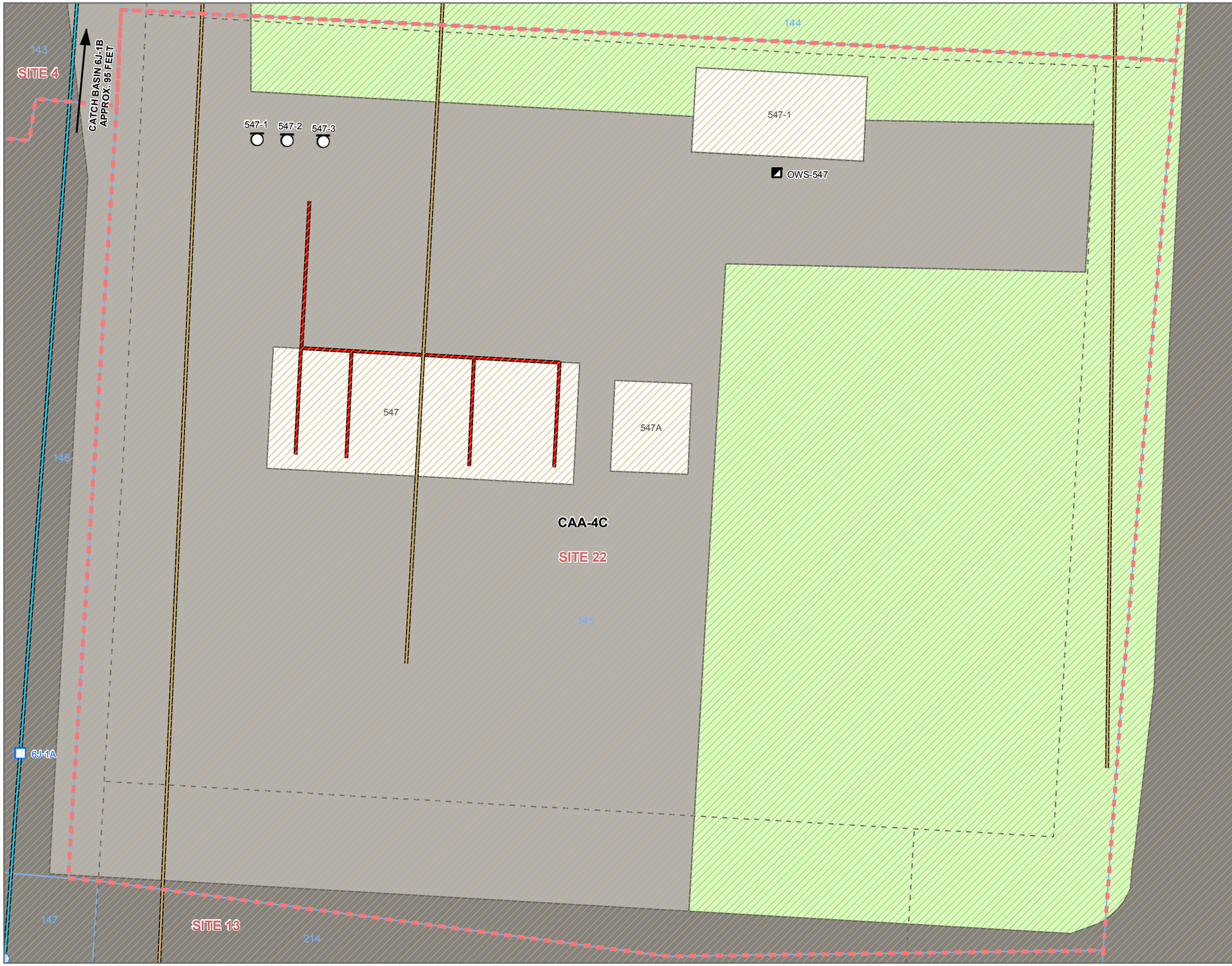
Site investigations were conducted at Site 22 to assess whether waste oil tanks reportedly on site had released CERCLA contamination into soil and groundwater. Site 22 was included in the RI/FS work plan prepared by Canonie (1989, 1990).

8.1.3.2 RCRA Program

One item within Site 22, UST(R)-17, was identified in the RFA (DTSC 1992a). UST(R)-17 consists of three USTs that contained gasoline. These USTs have been removed and are currently being addressed under the TPH Program. This site is recommended for continued closure under the TPH Program; Navy recommendations are included in SWMU Appendix (Appendix G).

8.1.3.3 TPH Program

After Alameda Point was identified for closure in September 1993, the TPH program was implemented to decommission all USTs and other fuel-related items. As part of the program, TPH contamination was evaluated at 16 sites, known as CAAs. Several investigations were conducted under the TPH program and are summarized in Section 8.2.4. Site 22 was designated as CAA 4C under the TPH program.



UNDERGROUND STORAGE TANK (UST), REMOVED

CATCH BASIN

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-1
SITE 22 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig08-01_s22_features.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
13	IR Site 23	Section 2.1.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Sections 9.1.1 through 9.1.2, Pages 9-1 through 9-3, Figures 9-1 and 9-2. SulTech 2005.

9.0 BACKGROUND AND RI RESULTS FOR CERCLA SITE 23 BUILDING 530 (MISSILE REWORK OPERATIONS)

Section 9.0 provides a comprehensive site summary and analysis of contamination located at CERCLA Site 23. The physical features and history of the site are presented in Section 9.1. The environmental investigations conducted at Site 23 are presented in Section 9.2, and the initial data evaluation, which includes the site-specific CSM, data quality assessment, and background comparison, are presented in Section 9.3. The nature and extent evaluation is presented in Section 9.4, and the fate and transport analysis is included in Section 9.5. The HHRA and ERA are summarized in Sections 9.6 and 9.7, respectively. Conclusions and recommendations for Site 23 are identified in Section 9.8.

9.1 PHYSICAL FEATURES AND SITE HISTORY

This section summarizes the physical features, history, and activities at Site 23. The physical features of Site 23 are summarized in Section 9.1.1. The history and activities, including hazardous wastes generated and past disposal and storage practices associated with the wastes, conducted at Site 23 are described in Section 9.1.2. The Site 23 regulatory history is summarized in Section 9.1.3.

9.1.1 Site 23 Physical Features

Site 23 is located in the southern portion of OU-2A, approximately 1,100 feet east of Seaplane Lagoon and 1,200 feet north of Breakwater Beach. The site is approximately 14 acres in size, relatively flat, and mostly paved, as shown on Figure 9-1. Site 23 includes Buildings 530 and 600; a self storage area known as OTH211 (consisting of Buildings MS-11 through MS-19); Structures 529, 561, and 586; OWSs 529 and 530; and several storm sewer, industrial waste, and fuel lines.

Historic site features include the plane defueling area west of Building 530 and may include the Pacific Coast Oil Works Company Refinery. The refinery operated from 1879 to 1903, and no structures from the refinery remain at Site 23. In addition, Buildings 352, 460A, and 606; and ASTs 530A, 530B, and 530C were formerly located at Site 23.

Currently, approximately 80 percent of Site 23 consists of open space. Most of the ground surface is paved with asphalt or concrete, with some minor areas of exposed soil and weeds. Current uses include vehicle parking and storage.

9.1.2 Site 23 History

Between 1879 and 1903, the Pacific Coast Oil Works Company Refinery operated in Alameda at the current location of Site 13 and possibly portions of adjoining CERCLA Sites 19, 22, and 23. Most operations occurred in the southern part of Site 13. The refinery used an acid-sludge process for refining fresh crude oil. Wastes from this type of operation would be expected to

include heavier-end hydrocarbons. Although the type and quantity of wastes and the disposal locations are not documented, it is reasonable to assume that the refinery wastes and asphaltic residues may have been disposed of at Sites 13 and 23 and the surrounding tidal lands. The wastes and residues are considered a potential source of the hydrocarbon-rich material observed coming to the surface in two locations at Site 13 that may also be present at Site 23

The northeast corner of Site 23 is the only area that existed before the Navy obtained the property in 1936. Up until 1936, the original portion of Site 23 was used for agricultural purposes. From 1942 to 1946, the rest of Site 23 was filled in with material dredged from the Oakland Inner Harbor and the Bay. In 1945, Building 352, a 1,002-ft^2 wood and metal Quonset hut, was constructed. The building was used to store explosives and warheads. No servicing or maintenance of the explosives was conducted, and the building was demolished in 1977.

In 1947, the western half of Site 23 was used as a staging area for planes, missiles, and bombs. Between 1958 and 1963, the material and equipment storage yard and defueling area was constructed and used for defueling activities and storage. The defueling activities took place directly west of Building 530, as shown on aerial photographs taken from 1953 to 1958. These photographs show heavily stained soils in this area of Site 23. The area was used for equipment and materials storage from 1947 through 1994. The eastern half of the area is currently paved with concrete (approximately 30 percent), and the remainder is paved with asphalt (see Figure 9-1).

In 1961, Building 460A was built on the east side of the plane defueling area. It housed the control equipment for the defueling facility. The 196-ft^2 building was removed in January 2001. The exact location of this building is unknown.

In 1974, Building 529, located at the southern end of Building 530, was constructed to supply auxiliary power for Building 530. Building 529 is a 3,200-ft^2 structure consisting of concrete construction over a concrete slab. During an inspection conducted as part of the EBS (IT 2001), several oil-like stains were noted and nine 55-gallon drums containing petroleum products and miscellaneous chemicals were stored in the building.

Built in 1975, Structure 561 is electrical substation 11 (transformer pad), located on the west side of Building 530. The transformer located on this pad was labeled as containing less than 1 part per million of PCBs.

Built in 1975, Structure 586 is a 1,000-ft^2 sewage lift station.

In 1973, Building 530, the main building present on Site 23, was built. The 82,251-ft^2 building has a concrete floor and walls and a steel frame roof with corrugated metal roofing. The building was used for missile rework operations until the base closed in 1997. Operations historically performed in Building 530 included missile rework operations, overhauling aviation components, electrical maintenance, cleaning, grinding, welding, painting, paint stripping, drum storage, and parts fabrication. Hazardous materials known to have been used in the building

include lead-based paint, hydraulic fluid, silver solder, ethylene glycol, lead, zinc, silver, tin, chromium, nickel, mercury, TCE, and petroleum (E&E 1983).

The waste streams generated by the missile rework processes were controlled and all wastes and paint stripping bath liquids were disposed of in 55-gallon drums at an off-site facility (Canonie 1990). Building 530 houses three RCRA sites: NADEP GAP 63, NADEP GAP 63A, and NADEP GAP 64. The three SWMUs are no longer active; a letter from DTSC recommended NFA for each unit (DTSC 1999a). Building 530 is being leased from the ARRA. Alameda Aerospace is currently leasing Building 530 as a repair shop for commercial flight instruments.

The three ASTs (530A, 530B, and 530C) were associated with Building 530 and had capacities of 10,000 gallons, 10,000 gallons, and 15,000 gallons, respectively. All three tanks were located in the plane defueling area, near the southwest corner of Building 530. The tanks have been dismantled and removed. AST 530A stored 1010 oil, AST 530B stored fuel or oil, and AST 530C stored jet fuel.

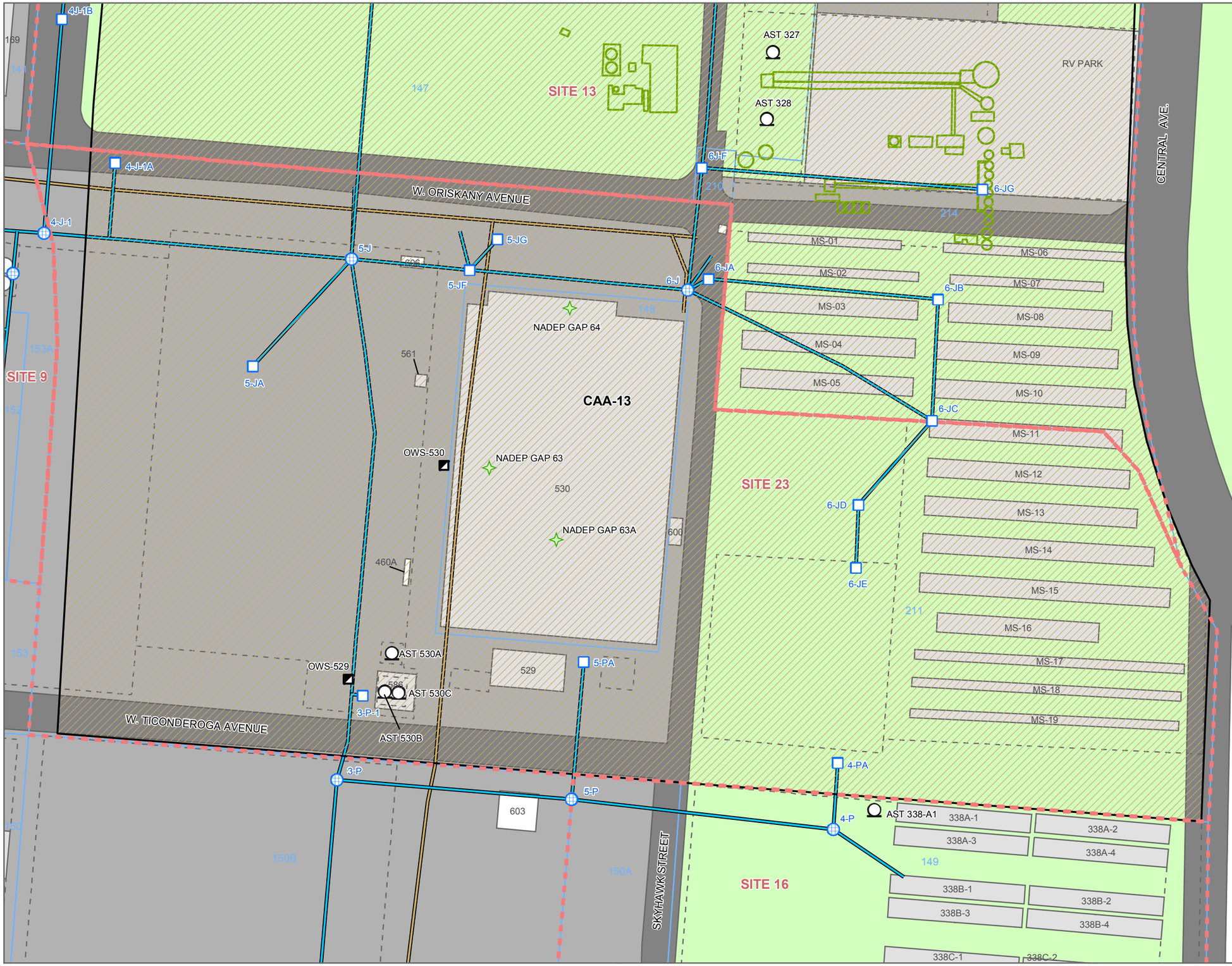
OWS 529 is located at the east end of Avenue M, west of the former ASTs (530A, 530B, and 530C) and was associated with the plane defueling area. Also once associated with the plane defueling area, OWS 530 is located at the northwest corner of a fenced area, west of Building 530. The material stored and disposed of and the capacity of OWS 529 and OWS 530 are unknown.

Building 600 was constructed in 1975 as a support building for Building 530. It is approximately 343 ft^2 in size and is located directly east of Building 530. The building contains cooling towers and associated cooling equipment. During the EBS (IT 2001), several 55-gallons drums of lubricating oil and canisters of freon and minor oil stains were observed in Building 600. These drums have been removed.

Building 606 was a portable type structure with aluminum siding and a wood roof. The building appeared to be an administration building and was located near the northwest corner of Building 530. The building was removed between 1988 and 1996.

The Navy exchange mini-storage area was built in 1987. The separate buildings within the mini-storage area have been designated MS-01 through MS-19; only MS-11 through MS-19 are located within Site 23.

Nearly all the open space, which is roughly 80 percent of Site 23, is paved with asphalt. Areas not paved generally consist of exposed soil. PCB oil was used for weed control in the mini-storage area until 1963. Former uses included a material and equipment storage yard, a defueling facility, aircraft parking (1947 to 1970), vehicle parking, and surrounding roadways (1975 to present) (IT 2001).



ABOVEGROUND STORAGE TANK (AST), REMOVED

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

GENERATOR ACCUMULATION POINT (GAP)

FENCE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

FORMER OIL REFINERY

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-1
SITE 23 FEATURES

Operable Unit 2A
Remedial Investigation Report

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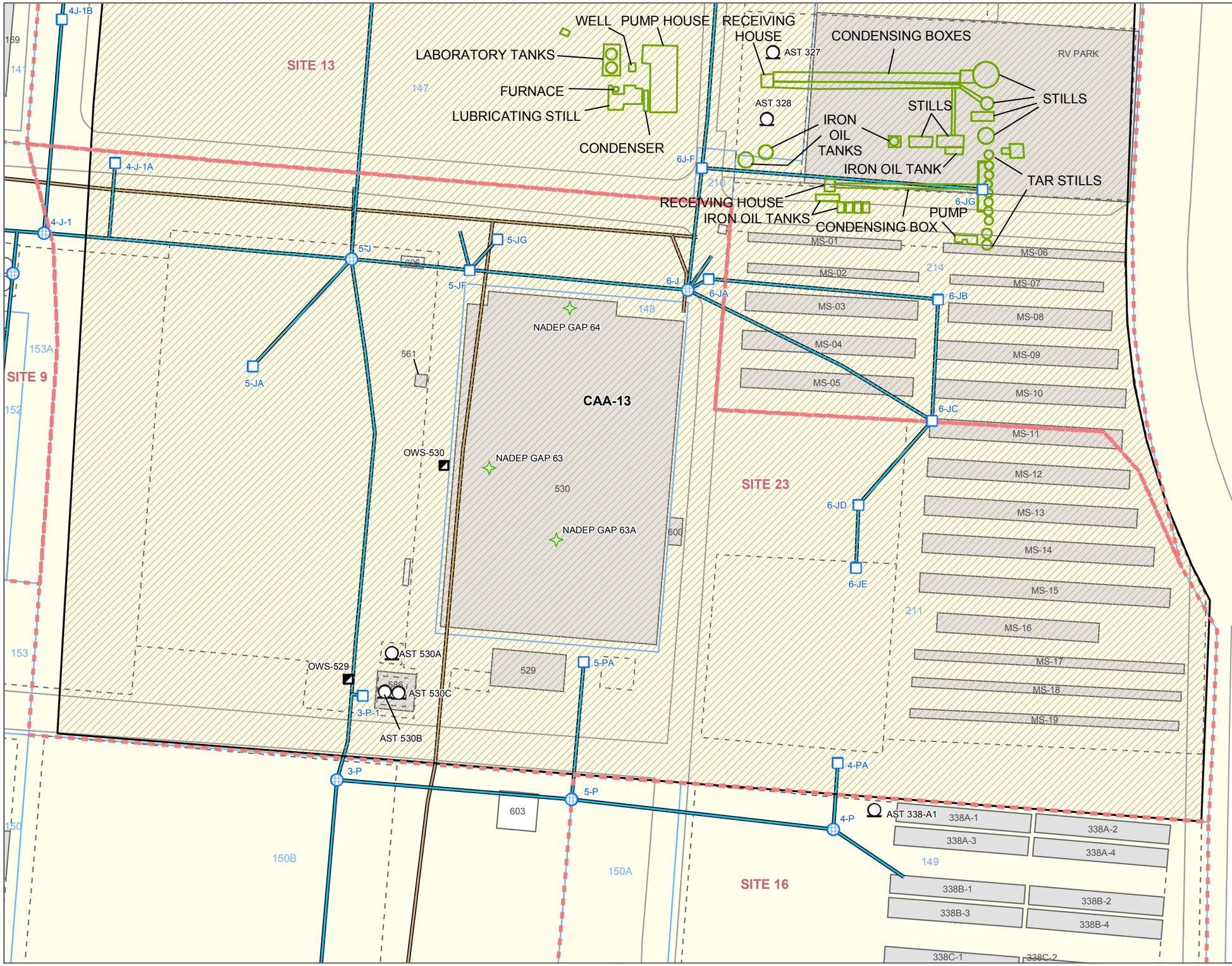

ABOVEGROUND STORAGE TANK (AST), REMOVED

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

GENERATOR ACCUMULATION POINT (GAP)

FENCE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

FORMER OIL REFINERY

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

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FIGURE 9-2
SITE 23
FORMER OIL REFINERY FEATURES

Operable Unit 2A
Remedial Investigation Report

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
14	geology	Section 2.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 4.1, Pages 4-1 through 4-3, Figures 2-2, and 4-1 through 4-11. SulTech 2005.

4.0 RESULTS OF GEOLOGICAL AND HYDROGEOLOGICAL INVESTIGATIONS

The following sections describe the results of geologic and hydrogeologic investigation activities at OU-2A, which encompasses Sites 9, 13, 19, 22, and 23. Because these five sites are contiguous, the geologic and hydrogeologic conditions at the sites are similar and interrelated; therefore, they are discussed together in the following sections. The site-specific geology of OU-2A is described in Section 4.1, followed by a discussion of the site-specific hydrogeology presented in Section 4.2.

4.1 OPERABLE UNIT 2A GEOLOGY

The OU-2A geology, investigated in the RI, includes four upper Quaternary units (as described in Section 2.2), plus a surficial layer of artificial fill material. The OU was characterized by reviewing logs from 178 soil borings and cone penetrometer tests conducted at the sites. Conceptual geologic cross sections showing the idealized geology of OU-2A are presented as Figure 4-1. Detailed geologic cross sections, two per site (see Figures 4-2 through 4-11), were developed based on information collected during exploration activities, including:

- Information from the boring logs
- Stratigraphic contacts that were determined using changes in lithology
- Color of the lithologic matrix
- Grain features (such as frosting, angular, subangular, and rounded)
- Presence of debris, oxidized root channels, and oxide staining
- Presence of key shell marker beds, buried vegetative surfaces, roots, stems, leaves, old soil surfaces, peat layers, and shell hash
- Degree of consolidation
- Changes in cone penetrometer testing (CPT) tip resistance and blow counts

Geologic logs are presented in Appendix B.

Artificial Fill. The artificial fill is the uppermost unit that underlies most of OU-2A, ranging in thickness from 0 to 15 feet bgs. The artificial fill is thickest in the western portion of Site 9 and decreases in thickness until it pinches out at Site 22 and the northeast corner of Site 13. The fill at OU-2A mainly comprises dense to medium density brown silty sand. Local variations in the fill include the presence of discontinuous clay and gravel lenses. Construction debris (such as concrete, asphalt, and wood debris) has been encountered in borings at numerous locations in OU-2A.

Holocene Estuarine Deposits (Bay Sediment Unit). At OU-2A, the BSU underlies the artificial fill material at Site 9 and the western portions of Sites 13, 19, and 23, where it pinches out along the former shoreline of Alameda Island (see Figure 2-2). Northeast of the former shoreline, the BSU is not present. The BSU reaches a maximum thickness of 9 feet at Sites 9 and 13. The BSU at OU-2A comprises subtidal deposits because the tidal flat sediments are located to the north.

At OU-2A, the BSU consists of loose silt and soft gray to black clay with laterally discontinuous, poorly graded, silty and clayey sand layers associated with subtidal deposits. The marsh crust (see Section 2.2.2) is found on top of the BSU at Sites 9, 13, 19, and 23.

Late Pleistocene/Holocene Eolian Deposits (Merritt Sand). At OU-2A, the Merritt Sand is present at the ground surface in the eastern portion of Site 22 and in the northeast portion of Site 13. In the western portion of Site 22, and the central portions of Sites 13, 19, and 23, the Merritt Sand underlies the artificial fill, as shown in Figures 4-4 through 4-7 and 4-10 through 4-11. At Site 9 and the western portions of Site 13, 19, and 23, the Merritt Sand Formation underlies the Bay Sediments, as shown in Figures 4-2 through 4-7 and 4-10 through 4-11. At OU-2A, the Merritt Sand ranges in thickness from 55 feet at Site 9 to 80 feet at Sites 13 and 23.

The Merritt Sand at OU-2A is composed of brown, dense to medium dense, fine- to medium-grained, poorly graded sand. Thin, continuous clayey or silty sand layers are common, as shown in Figures 4-3 and 4-11. Bivalve shells and shell hash are observed in parts of the Merritt Sand, indicating some marine reworking during the most recent sea level rise.

Late Pleistocene/Holocene Alluvial Deposits (Upper San Antonio Formation). At OU-2A, the upper unit of the San Antonio Formation was encountered in nine borings. The depth of the top of the upper unit of the San Antonio Formation is between 68 feet bgs at Site 19 (see Figure 4-6) and 84 feet bgs at Site 23 as shown in Figure 4-10. The thickness of the upper unit of the San Antonio Formation, seen in eight of the nine borings, ranges from 3 to 8 feet at Site 9 (see Figure 4-2) and from 15 to 28 feet at Site 13 (see Figure 4-5). The Upper San Antonio Formation at OU-2A consists of medium-grained dark gray to olive brown sand containing varying amounts of silt and clay. Bedding planes were found in several borings at Sites 19 and 13.

Late Pleistocene Estuarine Deposits (Yerba Buena Mud). At OU-2A, the lower unit of the San Antonio Formation (Yerba Buena Mud) was encountered in seven borings. The depth of the top of the Yerba Buena Mud occurs between 79 feet bgs at Site 9 (see Figure 4-2) to 100 feet bgs at Sites 13 and 23 (see Figures 4-5 and 4-10). Borings advanced at OU-2A penetrated the unit a maximum of 5 feet; the total thickness of this unit was not explored during RI activities. The Yerba Buena Mud encountered at OU-2A is described as a bluish gray, stiff silty clay or fat clay with some organic matter present.

Alameda Formation/Franciscan Complex. Geologic units underlying the Yerba Buena Mud, the Alameda Formation and the Franciscan Complex, were not encountered in borings conducted during the RI program.

4.2 OPERABLE UNIT 2A HYDROGEOLOGY

The following sections provide a description of the hydrogeology of OU-2A at Alameda Point.

4.2.1 Hydrostratigraphy

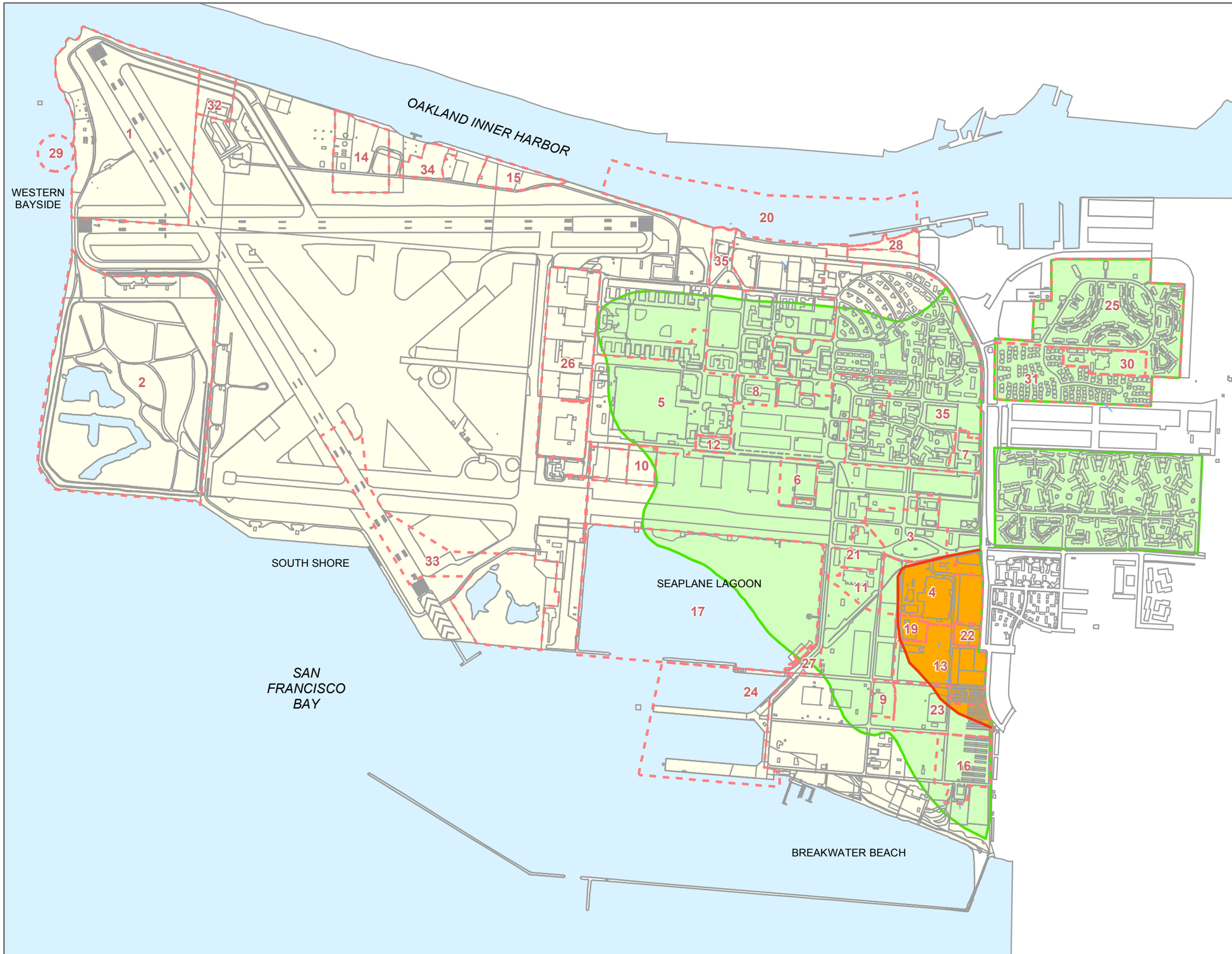
As discussed in Section 2.3.2.1, there are five hydrostratigraphic units at Alameda Point, each of which is represented in OU-2A. Hydrostratigraphic units occurring within OU-2A include the FWBZ, the BSU Aquitard, the SWBZ, the Yerba Buena Aquitard, and the Alameda Aquifer. Figure 4-12 shows the conceptual site model of the hydrostratigraphic features at OU-2A. The FWBZ occurs in all of OU-2A. The SWBZ occurs only in the southwestern portion of OU-2A, where the BSU Aquitard is present and separates the FWBZ from the SWBZ. The lithologic BSU Aquitard pinches out beneath OU-2A, approximately coincident with the former Alameda Point shoreline; the approximate eastern extent of the BSU in OU-2A is shown on Figure 2-2. The SWBZ does not occur in the eastern part of OU-2A, where the BSU Aquitard is absent.

The SWBZ in OU-2A is confined by the overlying BSU Aquitard. The regional aquitard (Yerba Buena Mud) separates the FWBZ and, where present, the SWBZ from the underlying Alameda Formation. Detailed descriptions of the hydrostratigraphic units were provided in Section 2.3.2.1; the occurrence of these hydrostratigraphic units within OU-2A is described as follows:

FWBZ. The FWBZ is the uppermost water-bearing zone at OU-2A and occurs throughout the OU as a water table aquifer. At OU-2A, the FWBZ occurs within both the artificial fill deposits in the western portion of OU-2A and in the Merritt Sand in the eastern portion of OU-2A. Artificial fill was placed in most areas of OU-2A at thicknesses up to 15 feet. The artificial fill was placed on top of native materials including the Merritt Sand and the BSU. Where the BSU Aquitard is present, the FWBZ is approximately 15 feet thick and is comprised primarily of artificial fill.

Where the BSU Aquitard is absent, the FWBZ reaches a maximum thickness of at least 55 feet and is comprised of either artificial fill and the Merritt Sand or only the Merritt Sand in the northeastern part of OU-2A (Site 22). In this part of OU-2A, the FWBZ is subdivided vertically into the FWBZU and the FWBZL. In general, the FWBZU is coincident with the artificial fill deposits where present and the upper part of the Merritt Sand. The FWBZL occurs only in the Merritt Sand in the eastern portion of OU-2A.

Bay Sediment Unit Aquitard. The BSU Aquitard occurs only in the southwestern portion of OU-2A. The BSU Aquitard underlies the artificial fill material at Site 9 and occurs in the



EXTENT OF BAY SEDIMENT UNIT

AREA SUBJECT TO MARSH CRUST RESTRICTIONS

EXTENT OF FORMER ISLAND 1865 (RADBRUCH 1957)

CERCLA SITE

LAND COVER

WATER

Notes:
Source: NAVY 2001a
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

600 0 600 1200 Feet

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 2-2
EXTENT OF BAY SEDIMENT UNIT AND MARSH CRUST AREA

Operable Unit 2A
Remedial Investigation Report

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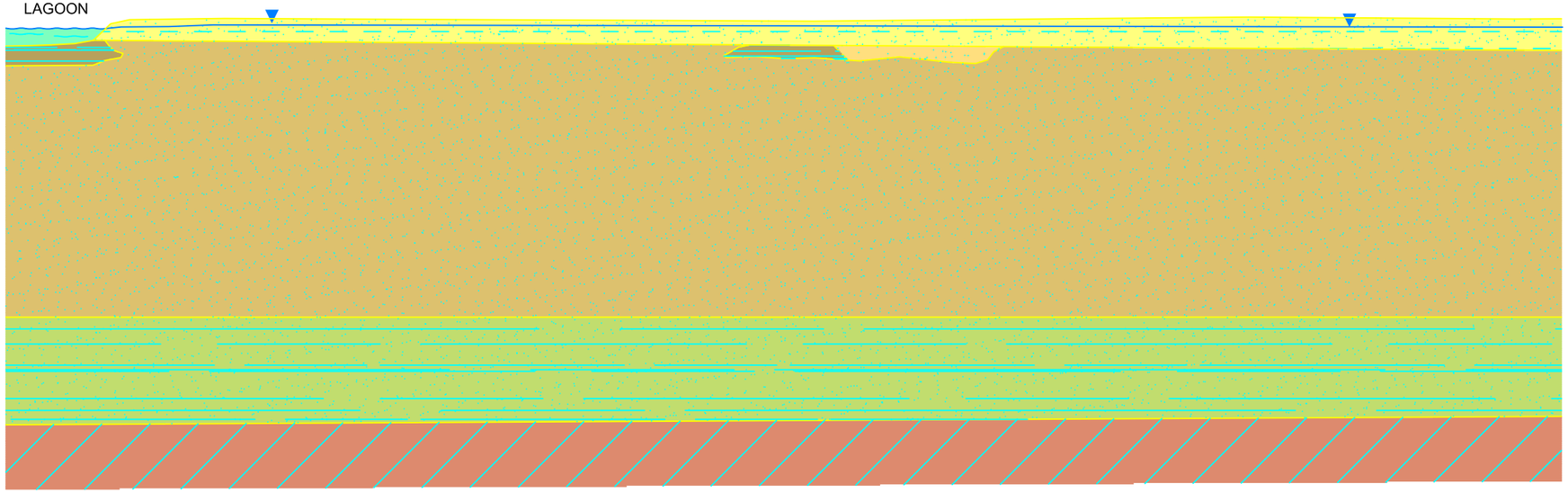
WEST

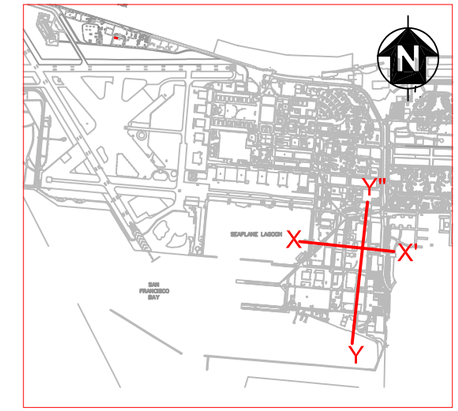
X

SEAPLANE LAGOON

EAST

X'





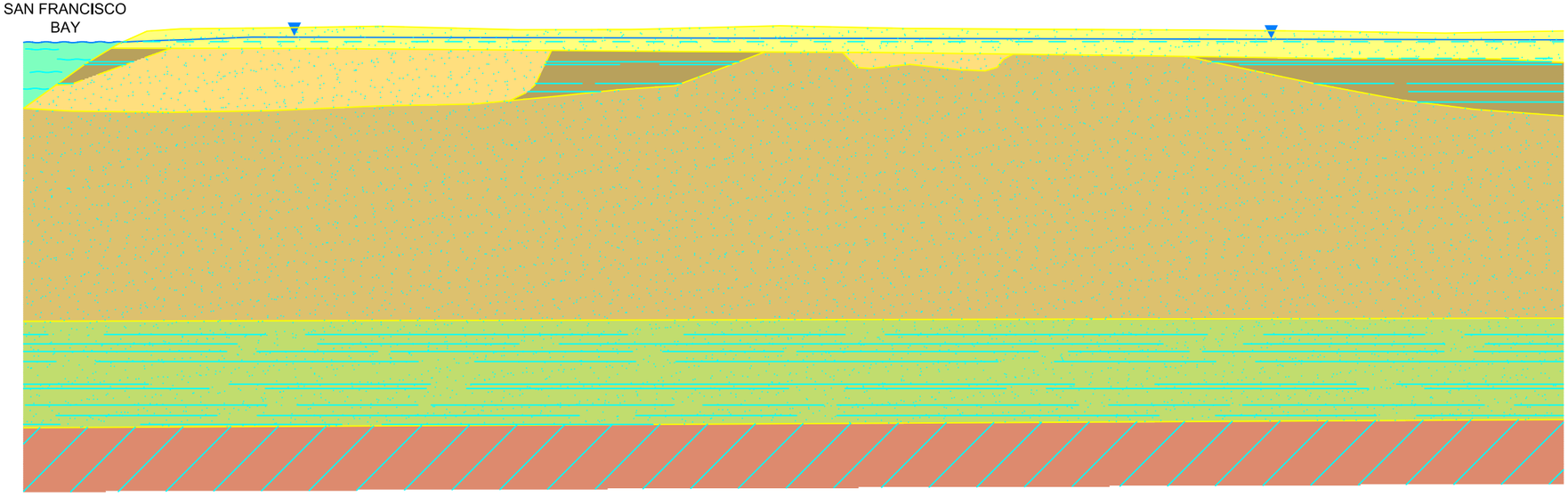
SOUTH

Y

SAN FRANCISCO BAY

NORTH

Y'



LEGEND

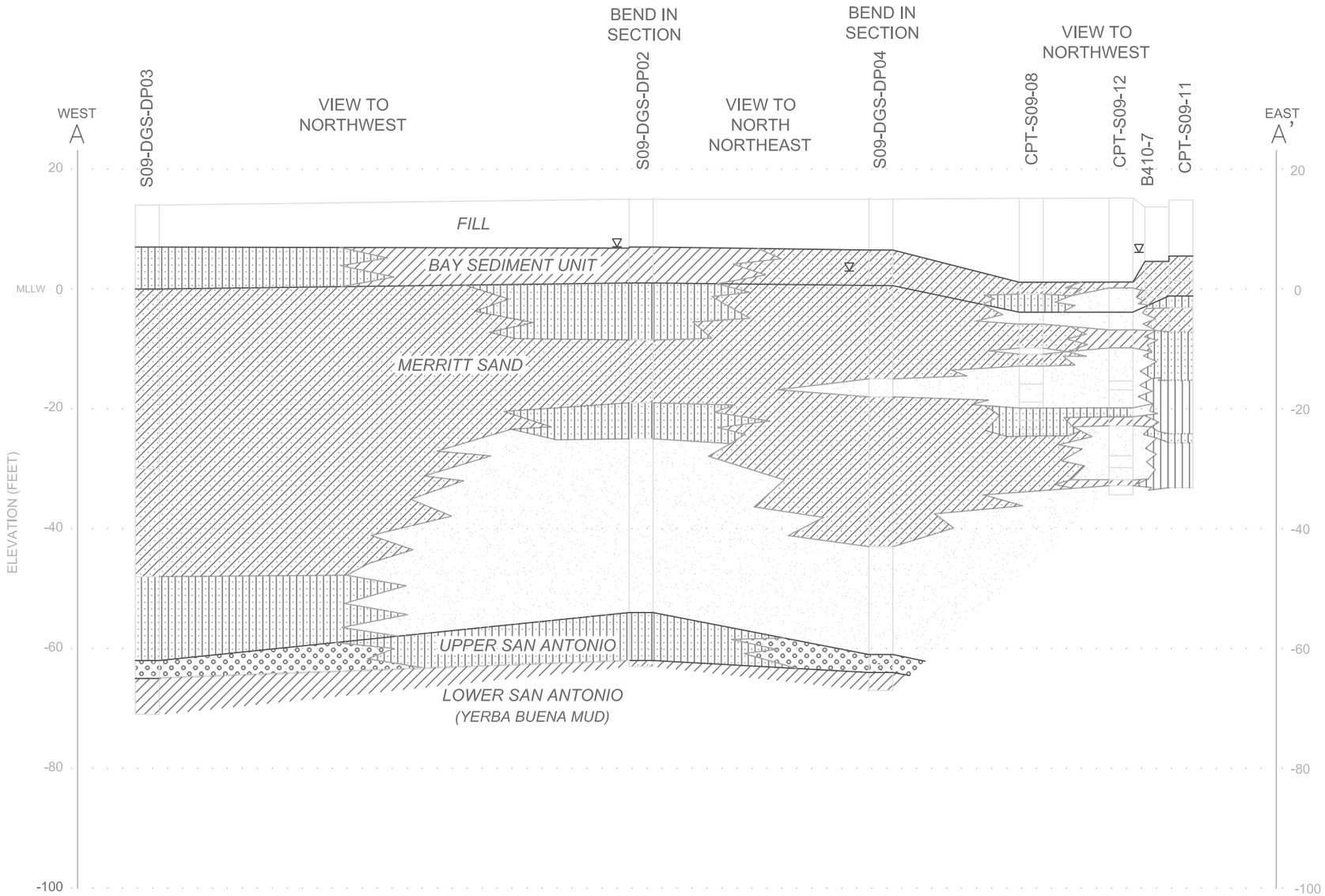
- WATER BODIES
- FILL
- BAY SEDIMENTS CLAY
- BAY SEDIMENTS SAND
- MERRITT SAND
- SAN ANTONIO INTERBEDDED SAND AND CLAY
- YERBA BUENA MUD
- CONTACT OF LITHOLOGIC UNITS
- CONTACT OF FINE AND COARSE MATERIAL WITHIN BAY SEDIMENTS
- SHALLOW WATER-BEARING ZONE WATER TABLE

NOT TO SCALE

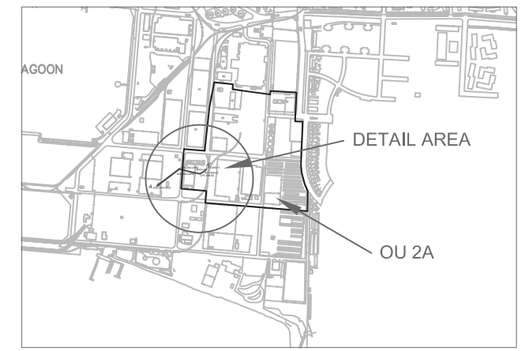
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 4-1
CONCEPTUAL GEOLOGIC CROSS SECTIONS
Operable Unit 2A
Remedial Investigation Report



DETAIL AREA



LOCATION MAP

40" 0 40' 80'

HORIZONTAL SCALE: 1" = 80'

Vertical Exaggeration = 4X.

LEGEND

- FILL
- SM - SILTY SANDS
- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS
- CH - ORGANIC CLAYS, HIGH PLASTICITY
- MH - INORGANIC SILTS
- LITHOLOGIC CONTACT
- FORMATION CONTACT
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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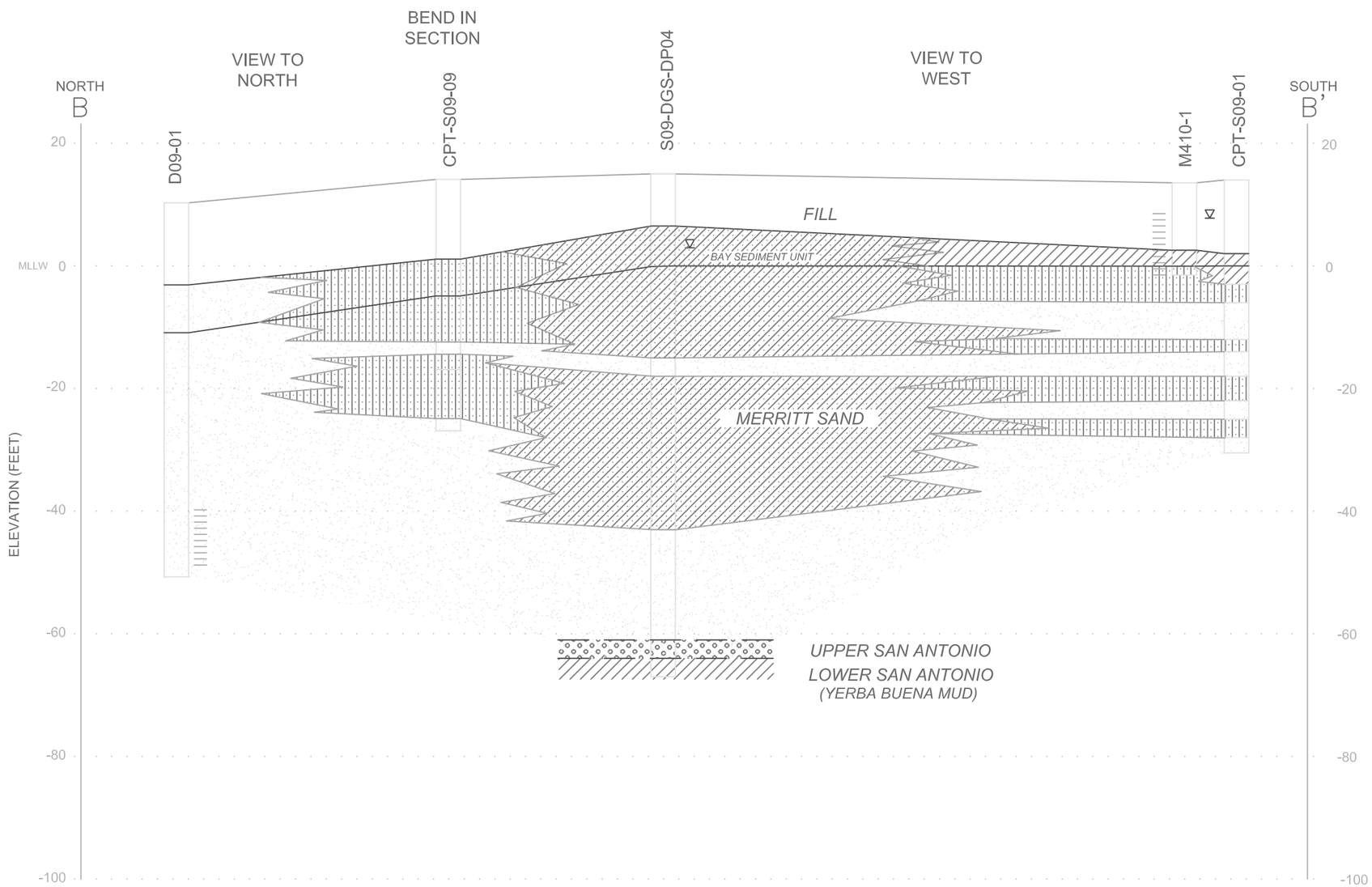
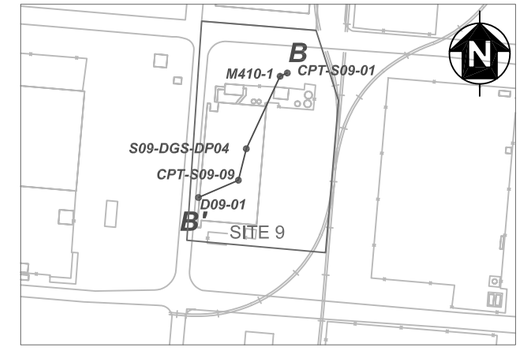
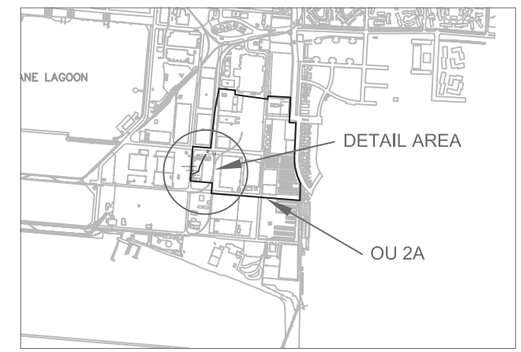
FIGURE 4-2
GEOLOGICAL CROSS SECTION A-A'
SITE 9

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

20' 0 20' 40'

HORIZONTAL SCALE: 1" = 40'

Vertical Exaggeration = 2X.

LEGEND

- FILL
- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS
- CH - ORGANIC CLAYS, HIGH PLASTICITY
- LITHOLOGIC CONTACT
- FORMATION CONTACT (DASNED WHERE INFERRED)
- MONITORING WELL SCREENED INTERVAL
- MLLW — MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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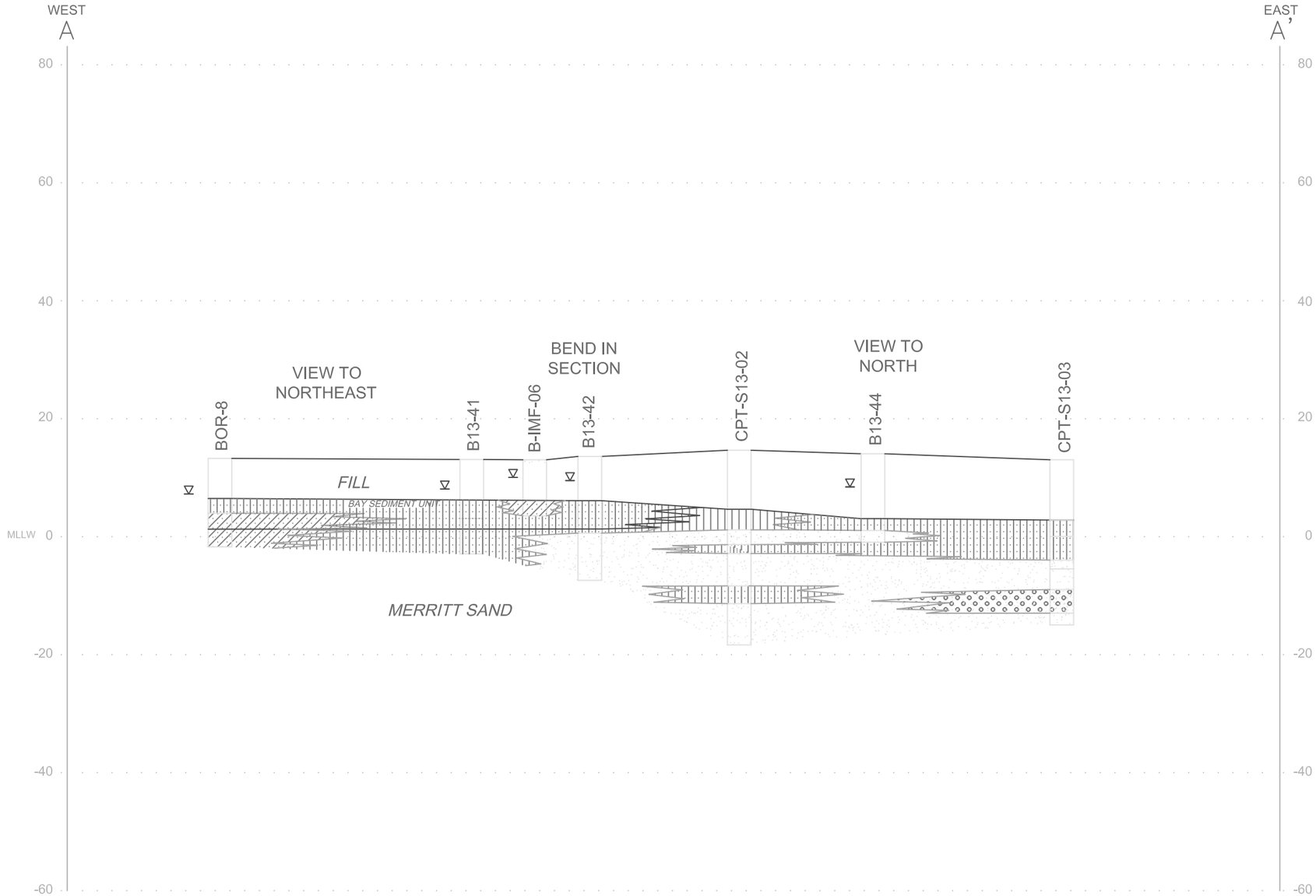
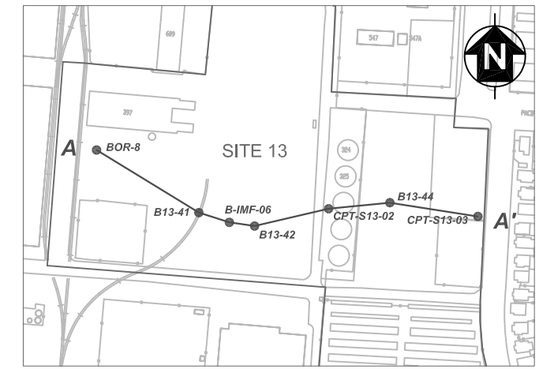
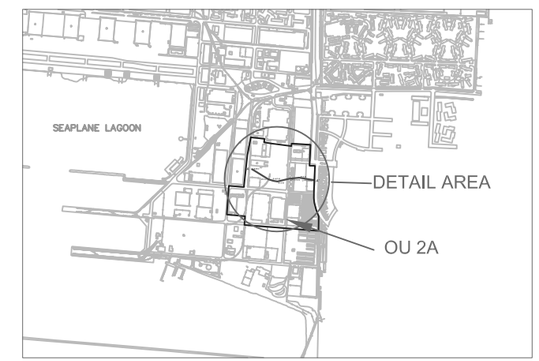
FIGURE 4-3
GEOLOGICAL CROSS SECTION B-B'
SITE 9

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

75' 0 75' 150'
HORIZONTAL SCALE: 1" = 150'
Vertical Exaggeration = 7.5X.

LEGEND

- FILL
- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- CL - SANDY CLAYS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- LITHOLOGIC CONTACT
- FORMATION CONTACT
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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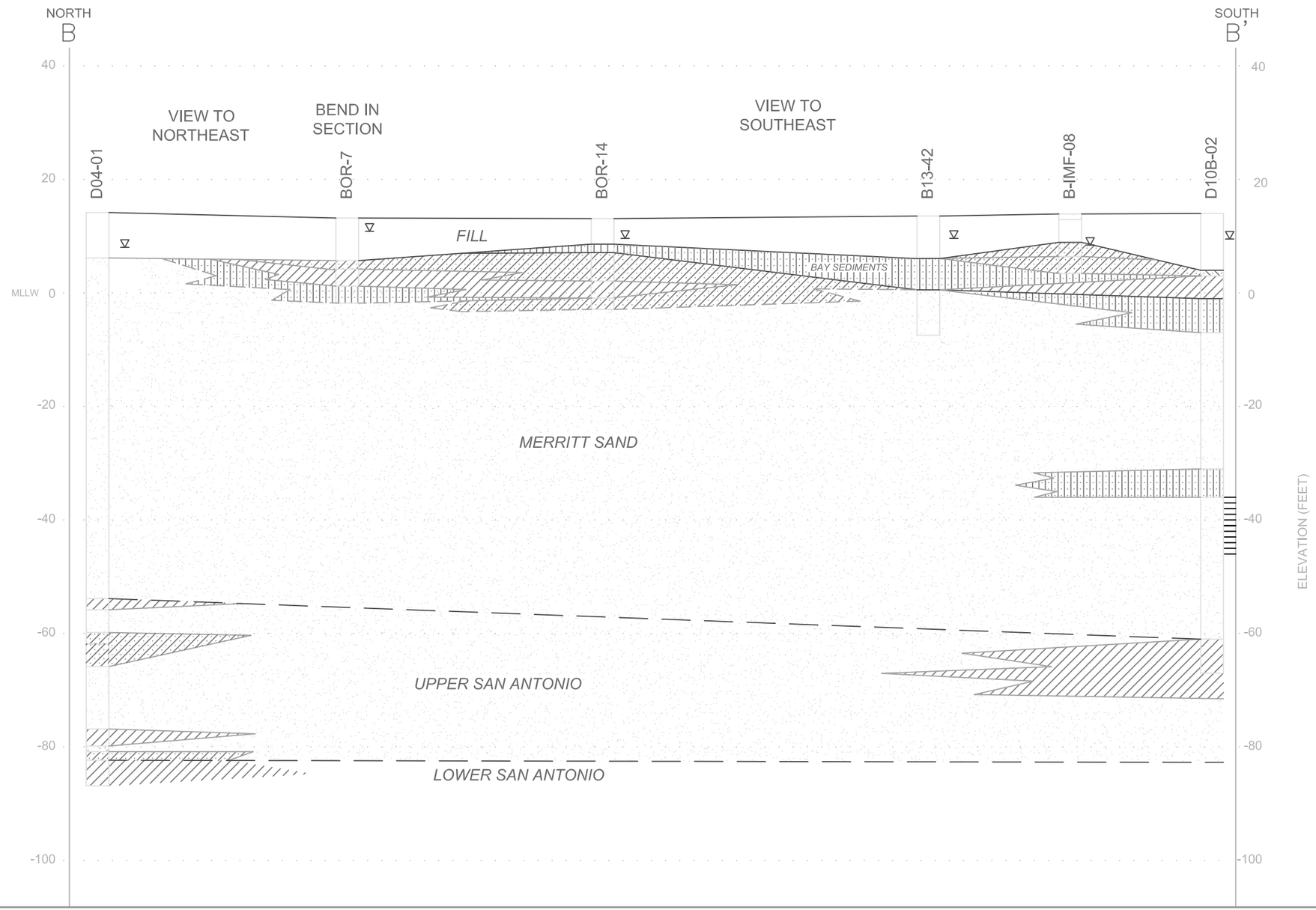
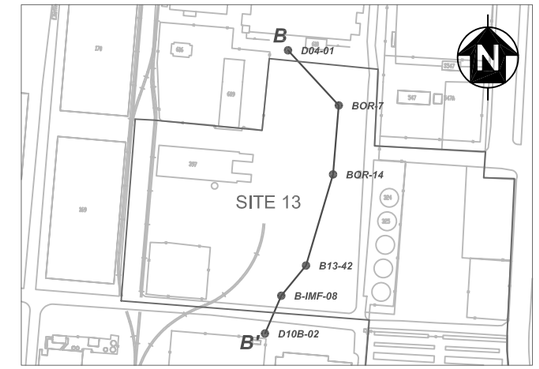
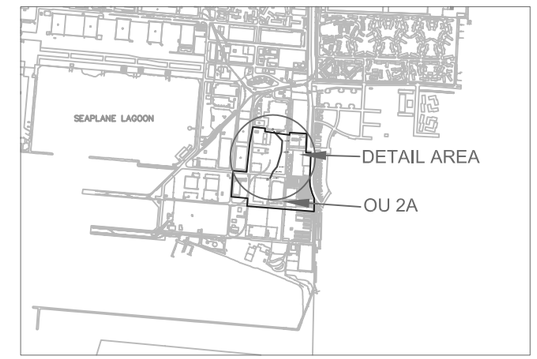
FIGURE 4-4
GEOLOGICAL CROSS SECTION A-A'
SITE 13

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

50' 0 50' 100'
HORIZONTAL SCALE: 1" = 100'
Vertical Exaggeration = 5X.

LEGEND

- FILL
- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS
- LITHOLOGIC CONTACT
- FORMATION CONTACT (DASHED WHERE INFERRED)
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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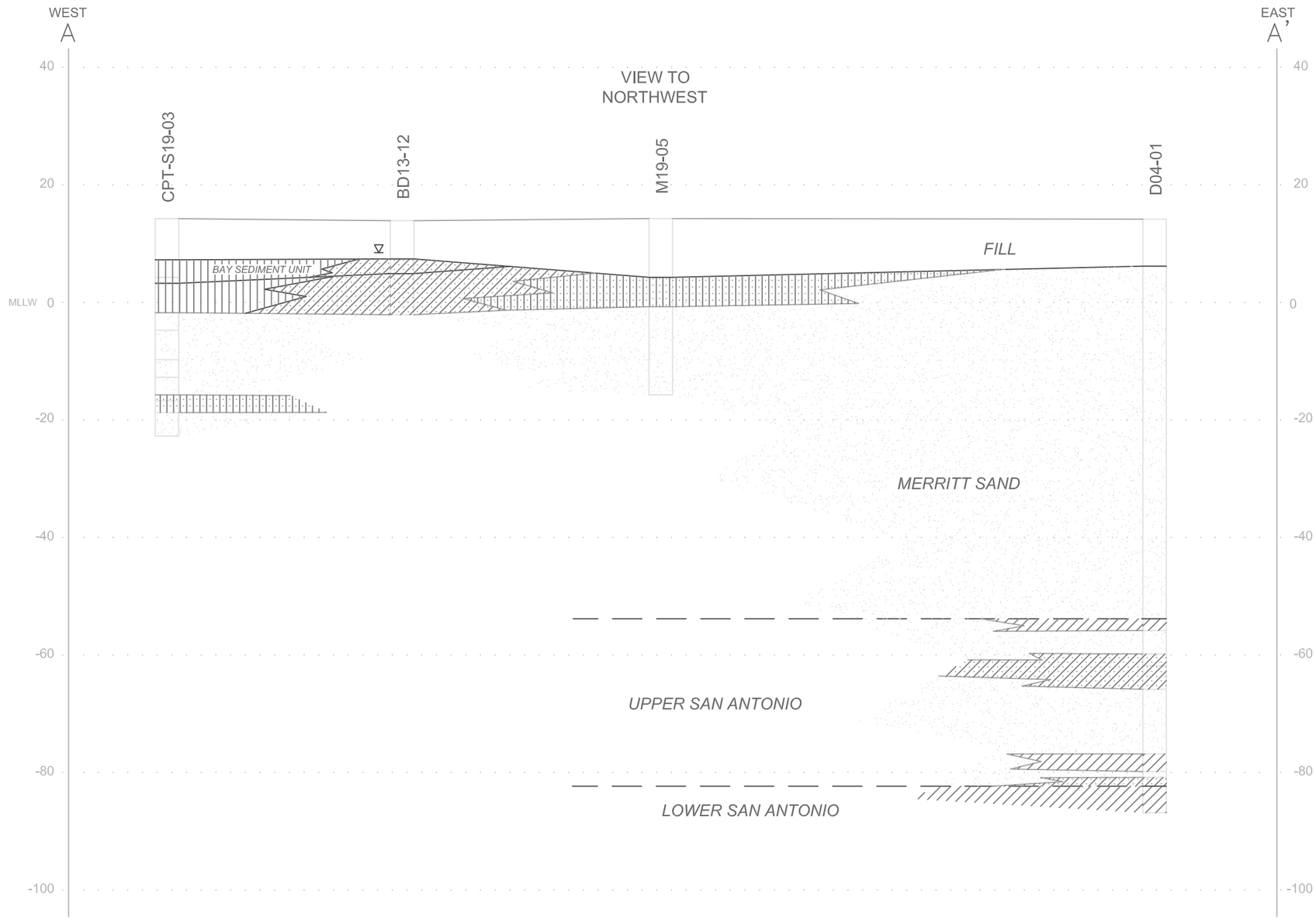
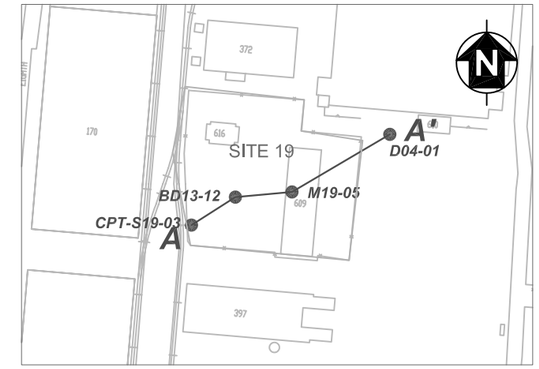
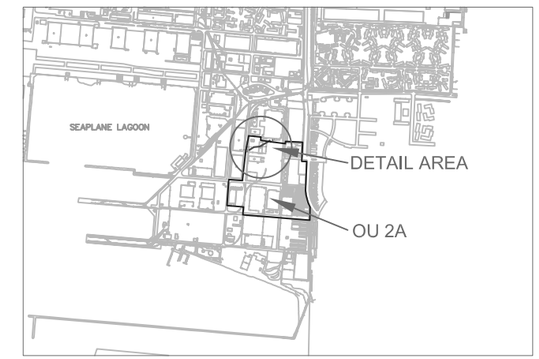
FIGURE 4-5
GEOLOGICAL CROSS SECTION B-B'
SITE 13

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

25' 0 25' 50'

HORIZONTAL SCALE: 1" = 50'

Vertical Exaggeration = 2.5X.

LEGEND

- FILL
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS, SILTY CLAYS

- LITHOLOGIC CONTACT
- FORMATION CONTACT (DASHED WHERE INFERRED)
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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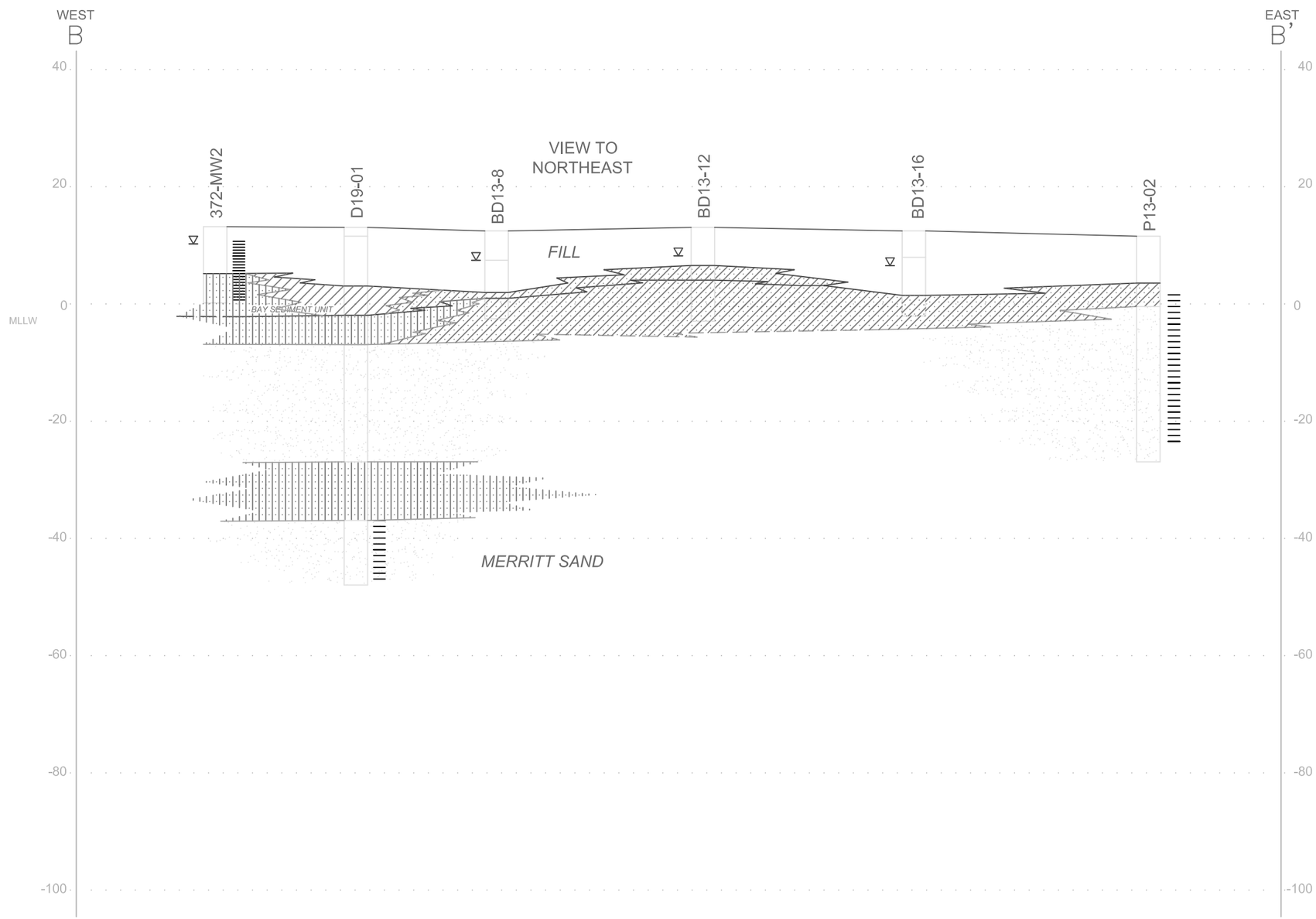
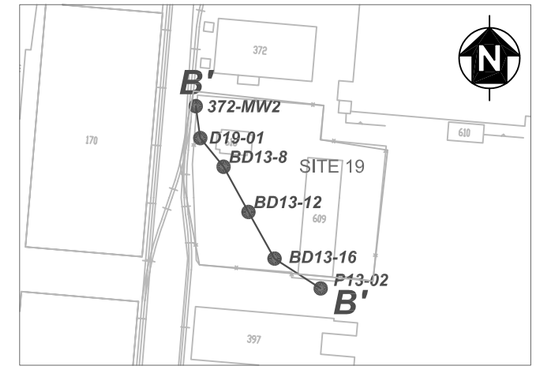
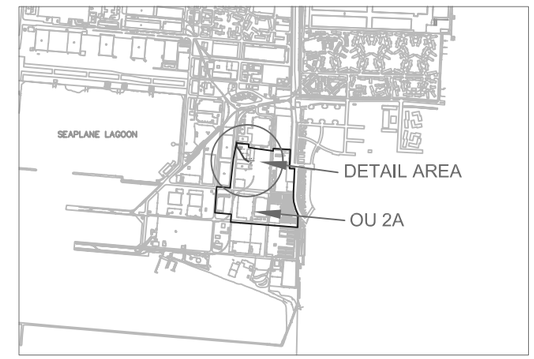
FIGURE 4-6
GEOLOGICAL CROSS SECTION A-A'
SITE 19

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

25' 0 25' 50'

HORIZONTAL SCALE: 1" = 50'

Vertical Exaggeration = 2.5X.

LEGEND

- FILL
- GM - SILTY GRAVELS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- CL - SANDY CLAYS, SILTY CLAYS
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- FORMATION CONTACT
- MONITORING WELL SCREENED INTERVAL
- MLLW — MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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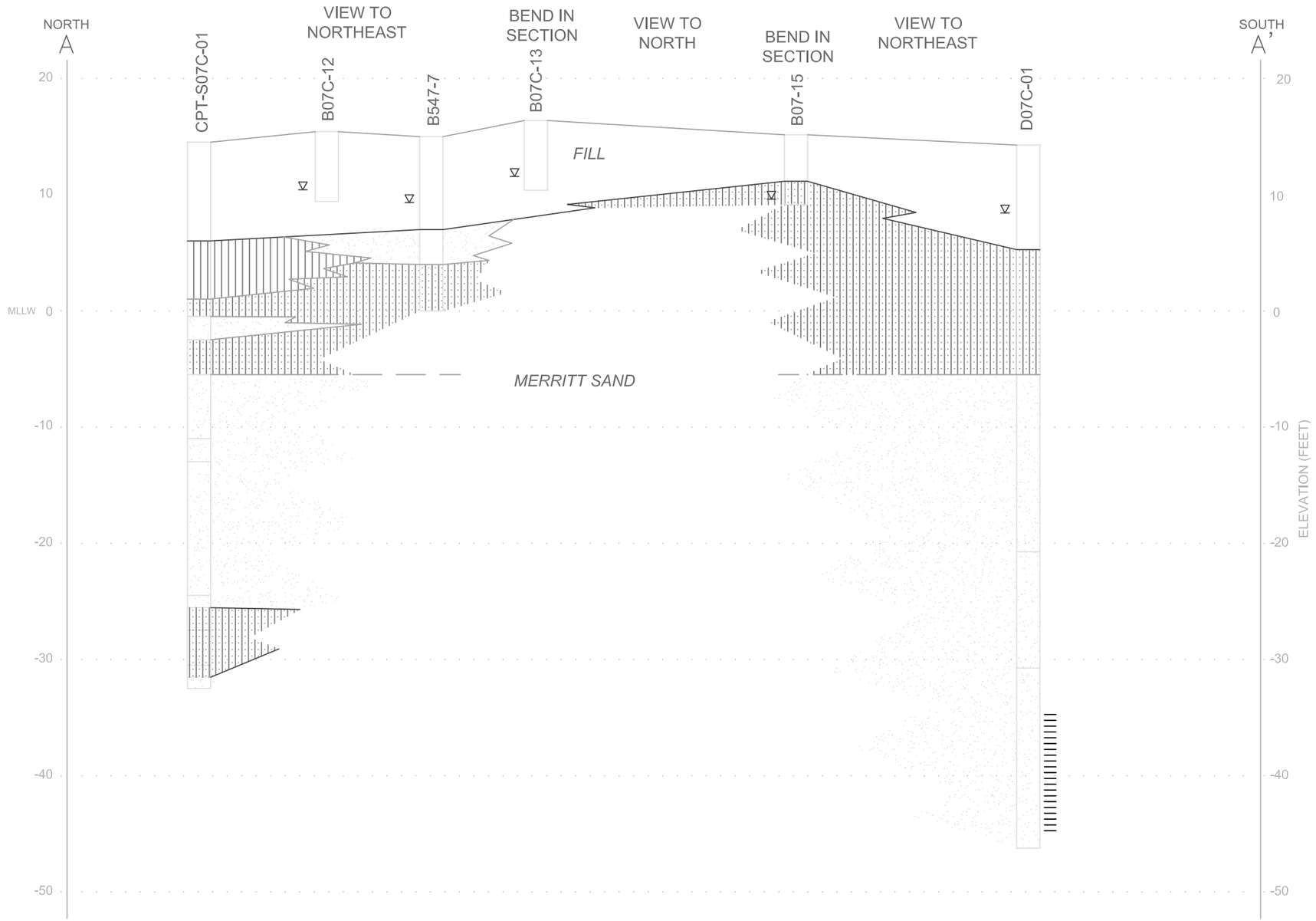
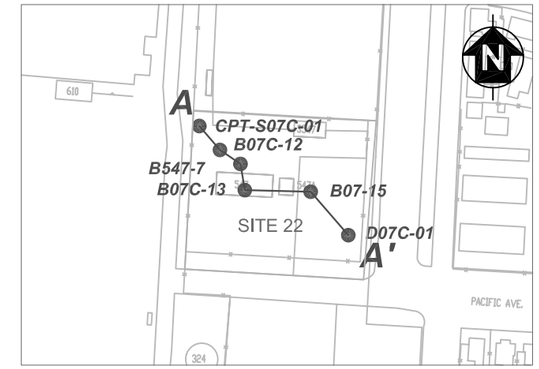
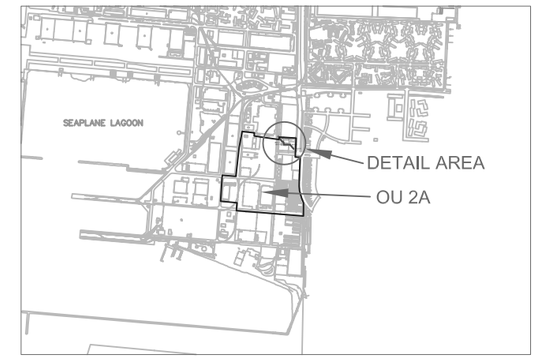
FIGURE 4-7
GEOLOGICAL CROSS SECTION B-B'
SITE 19
Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

25' 0 25' 50'
HORIZONTAL SCALE: 1" = 50'
Vertical Exaggeration = 5X.

LEGEND

- FILL
- ML - SANDY SILTS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- CL - SANDY CLAYS, SILTY CLAYS
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- FORMATION CONTACT
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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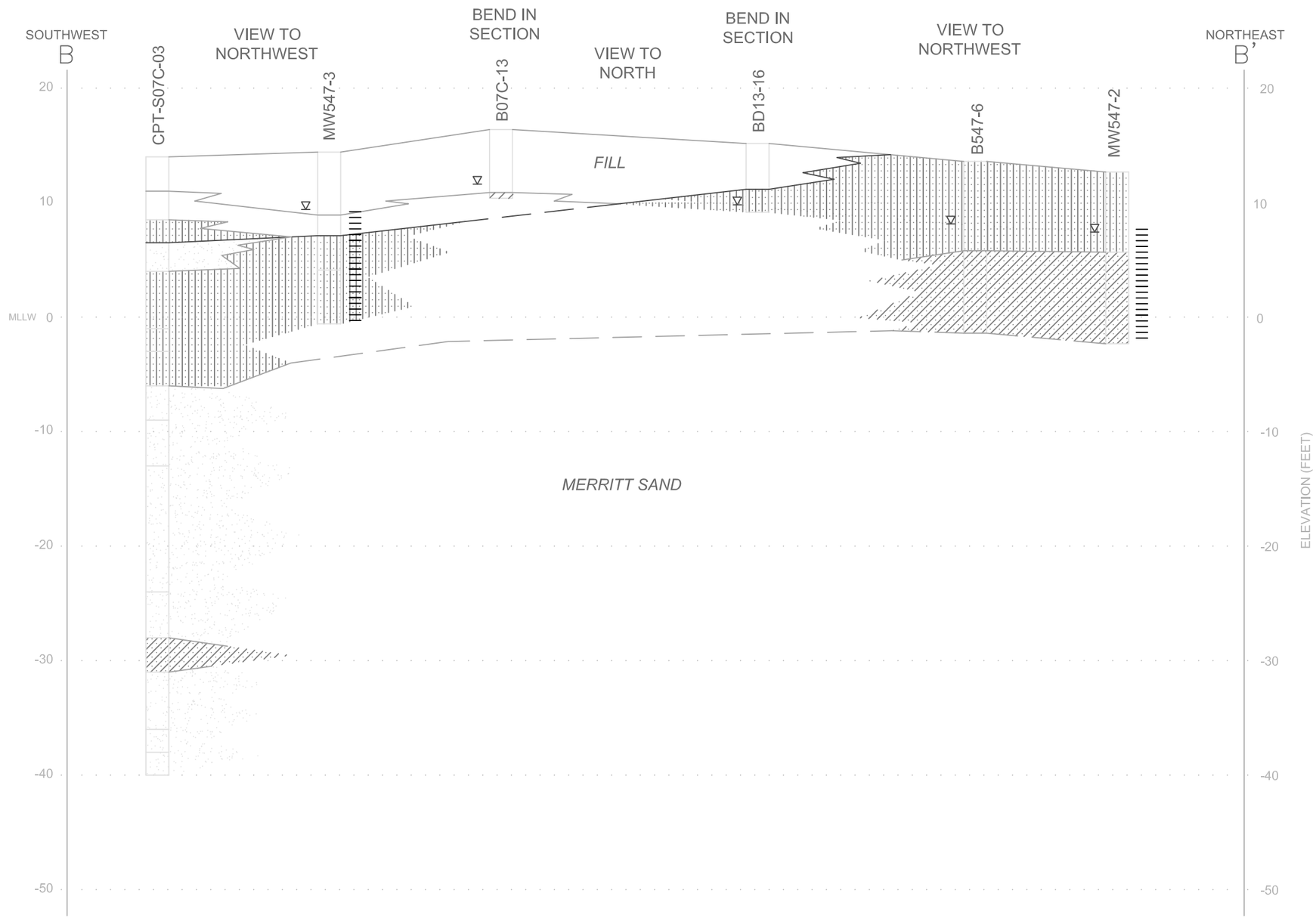
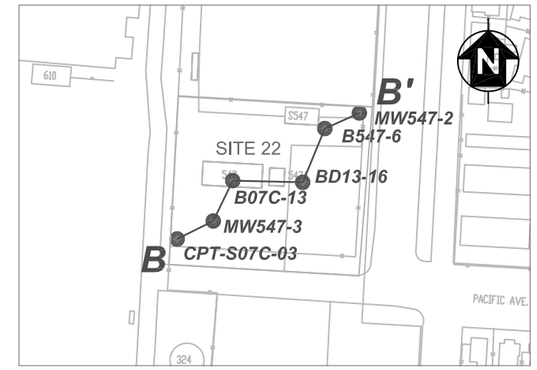
U.S. Navy Southwest Division, NAVFAC, San Diego

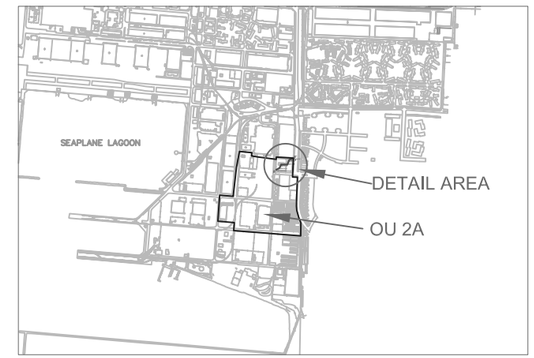
FIGURE 4-8
GEOLOGICAL CROSS SECTION A-A'
SITE 22

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

25' 0 25' 50'

HORIZONTAL SCALE: 1" = 50'

Vertical Exaggeration is 2.5X.

LEGEND

- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS, SILTY CLAYS

- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- FORMATION CONTACT
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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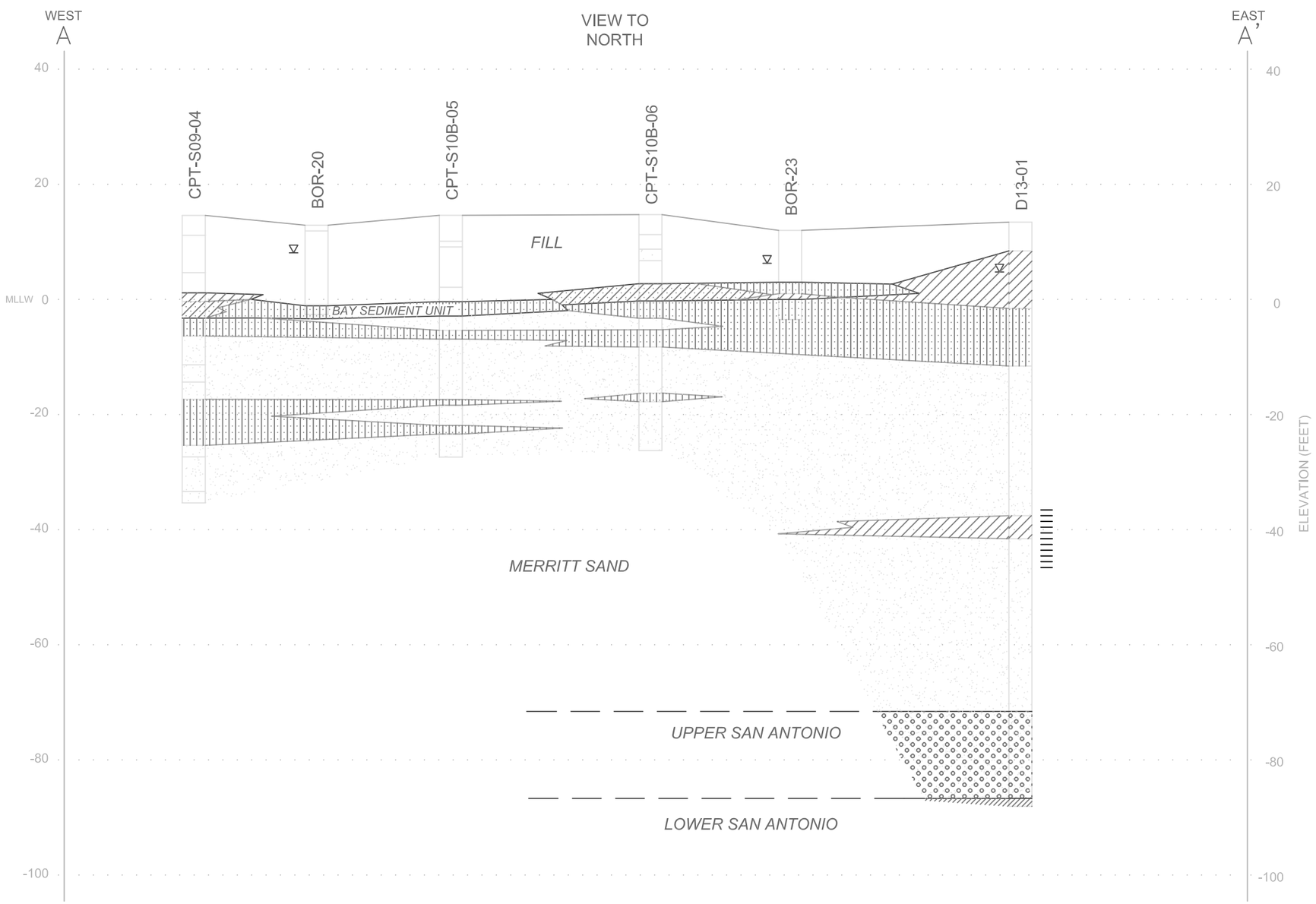
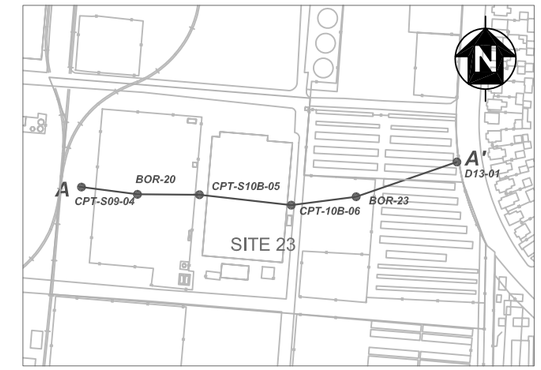
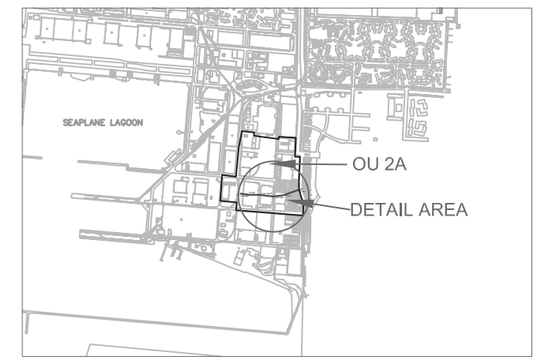
FIGURE 4-9
GEOLOGICAL CROSS SECTION B-B'
SITE 22

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

75' 0 75' 150'

HORIZONTAL SCALE: 1" = 150'
Vertical Exaggeration is 7.5X.

LEGEND

- GP - POORLY GRADED GRAVELS
- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS, SILTY CLAYS
- CH - ORGANIC CLAYS, HIGH PLASTICITY
- LITHOLOGIC CONTACT
- FORMATION CONTACT (DASHED WHERE INFERRED)
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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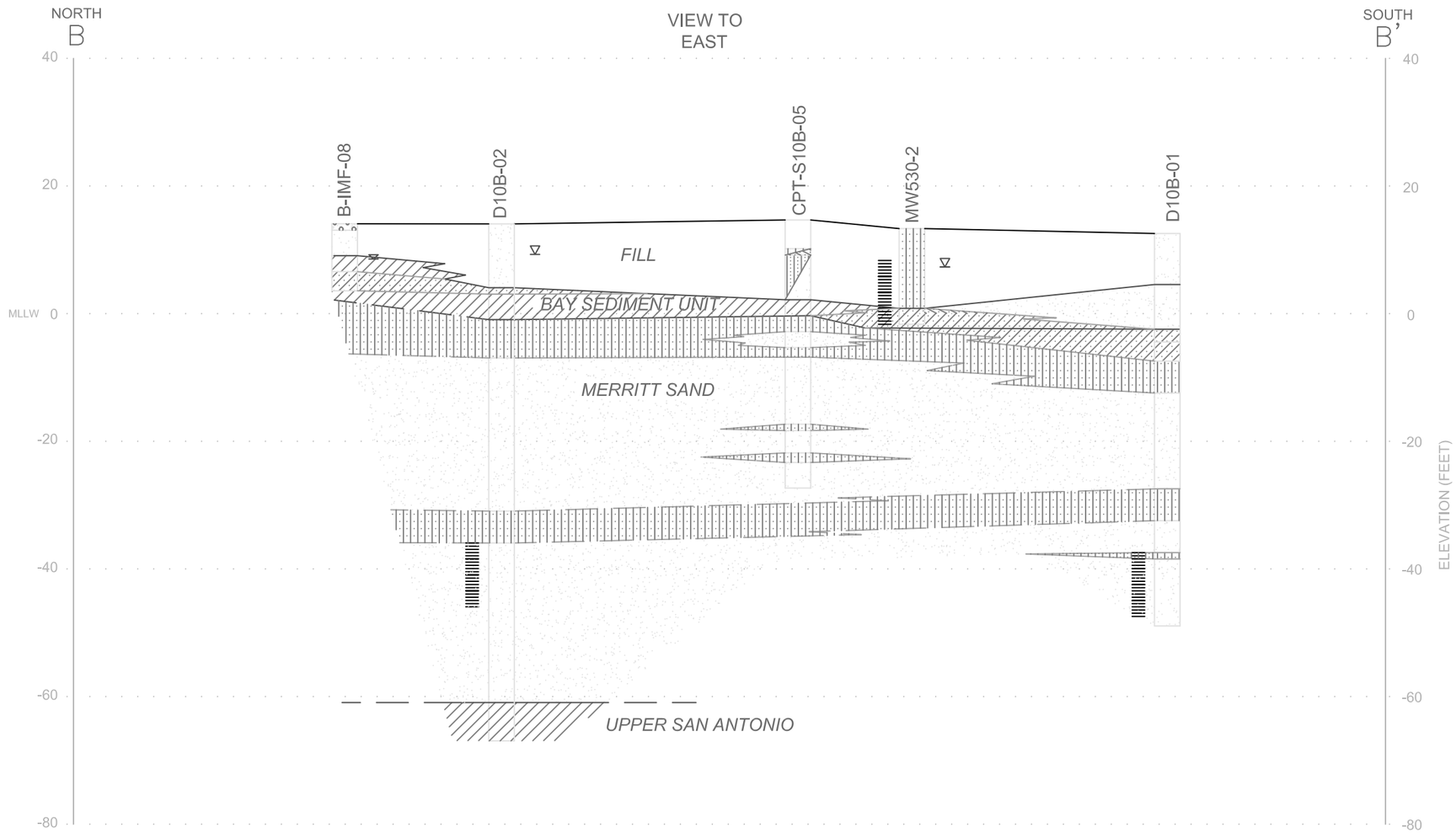
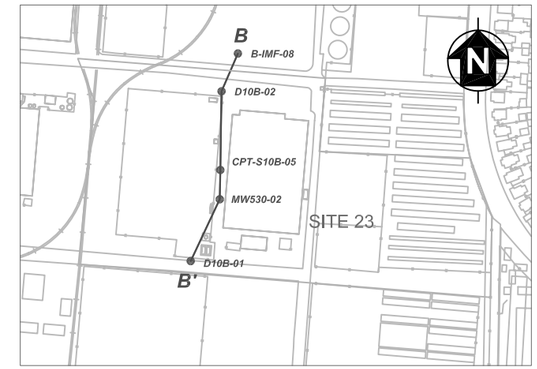
U.S. Navy Southwest Division, NAVFAC, San Diego

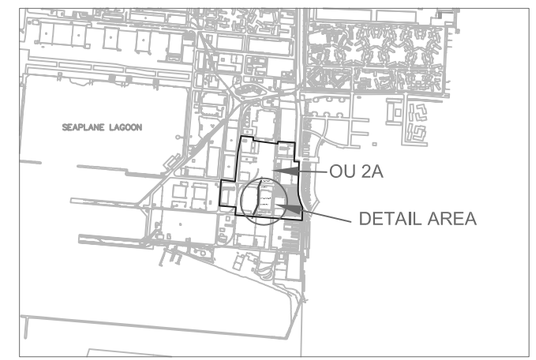
FIGURE 4-10
GEOLOGICAL CROSS SECTION A-A'
SITE 23

Operable Unit 2A
Remedial Investigation Report





DETAIL AREA



LOCATION MAP

50' 0 50' 100

HORIZONTAL SCALE: 1" = 100'

Vertical Exaggeration is 5X.

LEGEND

- SW - WELL GRADED SANDS
- SP - POORLY GRADED SANDS
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- ML - SANDY SILTS
- CL - SANDY CLAYS
- CH - ORGANIC CLAYS, HIGH PLASTICITY
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- FORMATION CONTACT (DASHED WHERE INFERRED)
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER
- WATER ENCOUNTERED DURING DRILLING

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FIGURE 4-11
GEOLOGICAL CROSS SECTION B-B'
SITE 23

Operable Unit 2A
Remedial Investigation Report

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
15	hydrogeology	Section 2.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 4.2, Pages 4-3 through 4-9, Figures 2-2 and 4-12 through 4-15; Tables 4-1 and 4-2. SulTech 2005.

Alameda Formation/Franciscan Complex. Geologic units underlying the Yerba Buena Mud, the Alameda Formation and the Franciscan Complex, were not encountered in borings conducted during the RI program.

4.2 OPERABLE UNIT 2A HYDROGEOLOGY

The following sections provide a description of the hydrogeology of OU-2A at Alameda Point.

4.2.1 Hydrostratigraphy

As discussed in Section 2.3.2.1, there are five hydrostratigraphic units at Alameda Point, each of which is represented in OU-2A. Hydrostratigraphic units occurring within OU-2A include the FWBZ, the BSU Aquitard, the SWBZ, the Yerba Buena Aquitard, and the Alameda Aquifer. Figure 4-12 shows the conceptual site model of the hydrostratigraphic features at OU-2A. The FWBZ occurs in all of OU-2A. The SWBZ occurs only in the southwestern portion of OU-2A, where the BSU Aquitard is present and separates the FWBZ from the SWBZ. The lithologic BSU Aquitard pinches out beneath OU-2A, approximately coincident with the former Alameda Point shoreline; the approximate eastern extent of the BSU in OU-2A is shown on Figure 2-2. The SWBZ does not occur in the eastern part of OU-2A, where the BSU Aquitard is absent.

The SWBZ in OU-2A is confined by the overlying BSU Aquitard. The regional aquitard (Yerba Buena Mud) separates the FWBZ and, where present, the SWBZ from the underlying Alameda Formation. Detailed descriptions of the hydrostratigraphic units were provided in Section 2.3.2.1; the occurrence of these hydrostratigraphic units within OU-2A is described as follows:

FWBZ. The FWBZ is the uppermost water-bearing zone at OU-2A and occurs throughout the OU as a water table aquifer. At OU-2A, the FWBZ occurs within both the artificial fill deposits in the western portion of OU-2A and in the Merritt Sand in the eastern portion of OU-2A. Artificial fill was placed in most areas of OU-2A at thicknesses up to 15 feet. The artificial fill was placed on top of native materials including the Merritt Sand and the BSU. Where the BSU Aquitard is present, the FWBZ is approximately 15 feet thick and is comprised primarily of artificial fill.

Where the BSU Aquitard is absent, the FWBZ reaches a maximum thickness of at least 55 feet and is comprised of either artificial fill and the Merritt Sand or only the Merritt Sand in the northeastern part of OU-2A (Site 22). In this part of OU-2A, the FWBZ is subdivided vertically into the FWBZU and the FWBZL. In general, the FWBZU is coincident with the artificial fill deposits where present and the upper part of the Merritt Sand. The FWBZL occurs only in the Merritt Sand in the eastern portion of OU-2A.

Bay Sediment Unit Aquitard. The BSU Aquitard occurs only in the southwestern portion of OU-2A. The BSU Aquitard underlies the artificial fill material at Site 9 and occurs in the

western portions of Sites 13, 19, and 23. The aquitard discontinues along an approximate northwest-southeast trending line, as determined from boring logs, and is illustrated in Figure 2-2. The BSU Aquitard consists of silty to clayey fine or very fine sand and reaches a maximum thickness of approximately 5 feet at the western edge of Site 19 and approximately 9 feet at the western edge of Site 9.

SWBZ. The SWBZ occurs in the southwestern part of OU-2A in Sites 9, 13, 19 and 23, coincident with the occurrence of the BSU Aquitard. The SWBZ is in the Merritt Sand and the Upper San Antonio Formation. The maximum thickness of the SWBZ in OU-2A is estimated to be 60 feet in the western part of Site 9.

Yerba Buena Aquitard. The Yerba Buena Aquitard occurs at depths of 79 to 100 feet below the ground surface at OU-2A. No OU-2A monitoring wells are screened in or below this unit.

Alameda Aquifer. The Alameda Aquifer occurs below the Yerba Buena Aquitard at OU-2A. No OU-2A monitoring wells are screened in or below this unit.

4.2.2 Groundwater Flow

Groundwater flow in the FWBZ and the SWBZ in OU-2A is described in this section.

4.2.2.1 Groundwater Flow in the FWBZ

Groundwater elevations measured in the FWBZ in OU-2A in 2002 and 2003 range from approximately 6 to 9 feet above the MLLW. Groundwater in the FWBZ at OU-2A generally flows from northeast to southwest.

Groundwater elevation measurements were collected during quarterly groundwater monitoring during the June, September, December 2002 and April 2003 sampling events. Data collected during the first three quarterly events were collected over periods of several days to weeks, and therefore cannot be used to estimate flow direction. With the exception of two wells at the eastern edge of Site 13, MWOR-4 and M13-09, the April 2003 data set was collected on April 7, 2003. MWOR-4 and M13-09 were measured on April 8, 2003.

Groundwater elevation data collected in OU-2A monitoring wells on April 7 and 8, 2003, are presented in Figure 4-13. Groundwater elevation contours from those data indicate that groundwater flow patterns in OU-2A are similar to those interpreted from the June and December 2002 data. Groundwater elevations are highest at Site 22 and lowest in the western portion of Site 23. A general northeast to southwest groundwater flow direction is indicated. There is also localized groundwater flow in the western portion of Site 23 from the southeast to the northwest.

4.2.2.2 Groundwater Flow in SWBZ

Groundwater elevations in the SWBZ in OU-2A range from approximately 4 to 7 feet above MLLW. Based on two groundwater elevation contour maps of data collected in June 2002 and April 2003, the groundwater flow direction in the SWBZ at OU-2A is from east to west. A groundwater elevation contour map generated from the June 2002 data is shown on Figure 4-14. The tidally corrected April 2003 groundwater elevation data, which were collected on April 7, 2003, are shown on the Figure 4-15 contour map.

4.2.3 Aquifer Hydraulic Parameters

Table 4-1presents estimates of aquifer hydraulic parameters for Sites 9 and 13, based on data collected from slug tests and pumping tests that were conducted in 2003 (Shaw 2003a). The hydraulic conductivity (K) of the FWBZ at Site 9, as determined from slug testing, is estimated at 1.7 feet per day. K values for Site 13 ranged from 3.4 to 5.3 feet per day, as interpreted from pumping test data.

The hydraulic conductivity of the SWBZ at Site 9, as determined from pumping test data, is 2.3 feet per day. The estimated transmissivity and storativity of the SWBZ at Site 9, as determined from pumping test data, are 52 square feet per day and 0.0023 (dimensionless).

4.2.4 Hydraulic Gradients

A description of horizontal and vertical hydraulic gradients is provided in this section.

4.2.4.1 Horizontal Hydraulic Gradients

The horizontal hydraulic gradient in the FWBZ, as estimated from groundwater elevation data collected in December 2003, ranges from 0.0038 in the vicinity of Sites 13, 19, and 22 to 0.01 in the southern portion of Site 23. In the northeastern part of Site 23, the horizontal hydraulic gradient in December 2002 was approximately 0.003.

On April 7, 2003, the horizontal hydraulic gradient in the FWBZ ranged from 0.002 in the vicinity of Sites 13, 19, and 22 to 0.004 in the southern portion of Site 23.

Horizontal hydraulic gradients in the SWBZ in June 2002 ranged from 0.0035 in the northern part of OU-2A to 0.0048 in the southern part of OU-2A. In April 2003, the horizontal hydraulic gradient ranged from 0.0015 in the northern portion of OU-2A to 0.0015 in the southern portion of OU-2A.

4.2.4.2 Vertical Hydraulic Gradients

Vertical hydraulic gradients within the FWBZ and between the FWBZ and the SWBZ were estimated using groundwater elevation data from six monitoring well pairs. The well pairs consist of adjacent or closely spaced wells screened in multiple hydrostratigraphic zones. Vertical hydraulic gradients in OU-2A were estimated using groundwater elevation data collected over a period of weeks from June and December 2002 and are considered approximate; vertical hydraulic gradients for OU-2A were also calculated from tidally corrected groundwater elevation data collected on April 7, 2003.

Vertical hydraulic gradients were calculated by dividing the difference in hydraulic heads between two adjacent wells by the difference in the midpoint elevations of the screened intervals. Vertical hydraulic gradients are indicative of the magnitude and direction of the vertical component of groundwater flow. Vertical hydraulic gradients calculated using the groundwater elevation data were generally downward, suggesting that groundwater in the FWBZ moves horizontally towards the Seaplane Lagoon and the Bay with some component of flow downward to recharge the lower FWBZ and the SWBZ. The low permeability materials of the BSU function as an aquitard, most likely preventing the downward flow of groundwater from the FWBZ to the SWBZ.

In the eastern portion of OU-2A, where the BSU Aquitard is absent, slight (0.001 to 0.006) downward vertical gradients between the upper and lower FWBZ were present in June 2002 in two monitoring well pairs. A low vertical hydraulic gradient (0.002) calculated at one monitoring well pair using the December 2002 data was upward, indicating a small component of upward flow from the lower FWBZ to the upper FWBZ. Vertical hydraulic gradients calculated using the April 7, 2003, data are both downward and are greater than those calculated using previous, nonsynchronized data. These results suggest that the primary component of groundwater flow in the FWBZ in the eastern part of OU-2A is horizontal but that some downward movement of groundwater occurs between the upper FWBZ and lower FWBZ.

In the western part of OU-2A, where the BSU is present, downward vertical gradients between the FWBZ and the SWBZ (ranging from 0.023 to 0.063) were generally present according to the June 2002 and the April 2003 groundwater elevation data. The slightly greater vertical gradients between the FWBZ and the SWBZ are most likely caused by the BSU functioning as an aquitard, acting to slow the vertical component of groundwater flow from the FWBZ to the SWBZ. At one location in Site 23, a localized low upward vertical hydraulic gradient was noted in each of the three rounds of groundwater elevation data.

Example vertical gradient calculations for the June 2002 dataset are provided on Table 4-2.

4.2.5 Tidal Influence

Aquifers located adjacent to tidal water bodies are subject to short-term fluctuations in water levels in response to the tides. Water levels in monitoring wells near tidal bodies demonstrate

fluctuations in hydraulic head that parallel the rise and fall of the tide. The amplitude of the fluctuation is generally greatest at the coast and diminishes inland. At Alameda Point, water level fluctuations in the Bay cause groundwater levels near the coast to respond hydraulically, moving up and down according to the tidal cycle; groundwater affected in this way is said to be "tidally influenced." Groundwater levels in tidally influenced monitoring wells move up and down after the corresponding high and low tides occur. The length of time required for the water in a well to respond to the ocean tidal cycle is known as the "tidal time lag" (Fetter 1994). The ratio of the tidal amplitude in a well to that of the ocean is termed the "tidal efficiency."

The FWBZ is tidally influenced on the northern, southern, and western sides of Alameda Point. Tidal influence studies indicate the region of influence extends about 250 to 300 feet inland on the northern and southern sides of Alameda Island and about 1,000 to 1,500 feet inland on the west side. Groundwater that is tidally influenced in OU-2A occurs at the western and southwestern edges in Sites 9, 13, 19, and 23, as determined during tidal studies performed at Alameda Point. Diurnal tidal fluctuations measured in the FWBZ range from 0.1 to 4 feet (PRC 1997a).

In the FWBZ, tidally influenced groundwater occurs at monitoring wells MWOR-2, MW410-1, M10B-01, and MW530-1. Groundwater in the SWBZ at the western and southwestern edges of OU-2A is tidally influenced, as indicated by data from monitoring wells D19-01, D09-01, and D10B-01.

Estimated lag time for tidal response in monitoring well D09-01 was about 1 to 1.5 hours during the study conducted in 1997. The gradient near this well was approximately 0.0019 feet/foot at high tide and 0.0025 feet/foot at low tide (PRC 1997a).

4.2.6 Seawater Intrusion

In aquifers near the coast, fresh water generally grades into saline water with a steady increase in the dissolved solids content. Because of the difference in the concentration of dissolved solids, the density of the saline water is greater than that of fresh water. As a result, along seacoasts there is a salt water-freshwater contact zone or interface in aquifers that extends under the sea. At coastal locations, the fresh groundwater beneath the ground surface is discharging across the fresh water-salt water interface and mixing with saline groundwater under the sea floor (Fetter 1994).

Normally, freshwater moves seaward continuously at a rate that is related to the hydraulic head above mean sea level in a freshwater aquifer (Hem 1989); this natural flow of fresh water toward the sea limits the landward encroachment of sea water (Domenico and Schwartz 1990).

The shape and position of the interface between saline groundwater and fresh groundwater is a function of the volume of fresh water discharging from the aquifer. Any action that changes the volume of fresh water discharge results in a consequent change in the salt water-fresh water boundary. Minor fluctuations in the boundary position occur with tidal actions and seasonal and

annual changes in the amount of fresh water discharge (Fetter 1994). With development of groundwater supplies and subsequent lowering of the water table or piezometric surface, the dynamic balance between fresh and sea water is disturbed, permitting seawater to intrude into usable parts of the aquifer above the coastline (Domenico and Schwartz 1990). This phenomenon is referred to as "salt water intrusion" or "saline-water encroachment."

Specific conductance is a measure of the ability of a solution to carry an electric current and depends on the total concentration of ionized substances dissolved in the water. Although all ions contribute to conductivity, their valences and mobilities differ, so their actual and relative concentrations affect conductivity. When the concentration of ions is high, conductivity is elevated. The approximate specific conductance of seawater is 50,000 micromhos per centimeter (µmhos/cm) (Hem 1989). The California Secondary MCL recommended for the specific conductance of drinking water is less than 900 µmhos/cm.

At Alameda Point, fresh groundwater occurs in the FWBZ; the SWBZ primarily consists of water that is fresh to brackish, with specific conductance readings ranging from less than 500 µmhos/cm to greater than 3,000 µmhos/cm. Specific conductance values measured in monitoring wells in OU-2A were measured in 1990 and 1994, and more data points were measured in 1994. In 1990, specific conductance readings from 20 monitoring wells screened in the FWBZ ranged from approximately 380 to 2,000 µmhos/cm with slightly higher conductivities at two monitoring wells occurring at 2,580 and 4,020 µmhos/cm. In 1994, specific conductance measured in 32 monitoring wells screened in the FWBZ ranged from approximately 300 to 2,000 µmhos/cm with several isolated data points ranging from 5,160 to 14,600 µmhos/cm.

In monitoring wells in the SWBZ, where conductivities were measured only in 1994, the values were 1 to 2 orders of magnitude higher than those in the FWBZ, ranging from 2,600 to 37,000 µmhos/cm. The highest conductivities were measured in wells in the SWBZ at the southern and western edges of OU-2A, including 20,000 µmhos/cm at D19-01, 34,000 µmhos/cm at D10B-01, and 37,000 µmhos/cm at D09-01. These monitoring well locations are closest to the coast; the higher conductivities may indicate the location of the top of the salt water-fresh water interface.

Overpumping of groundwater extraction wells drilled into the Merritt Sand on Alameda Island before the turn of the century resulted in salt water intrusion and closure of these production wells. Only minor pumping of groundwater from the aquifer underlying Alameda Island has occurred since 1990 (Figuers 1998).

4.2.7 Existing Uses of Groundwater

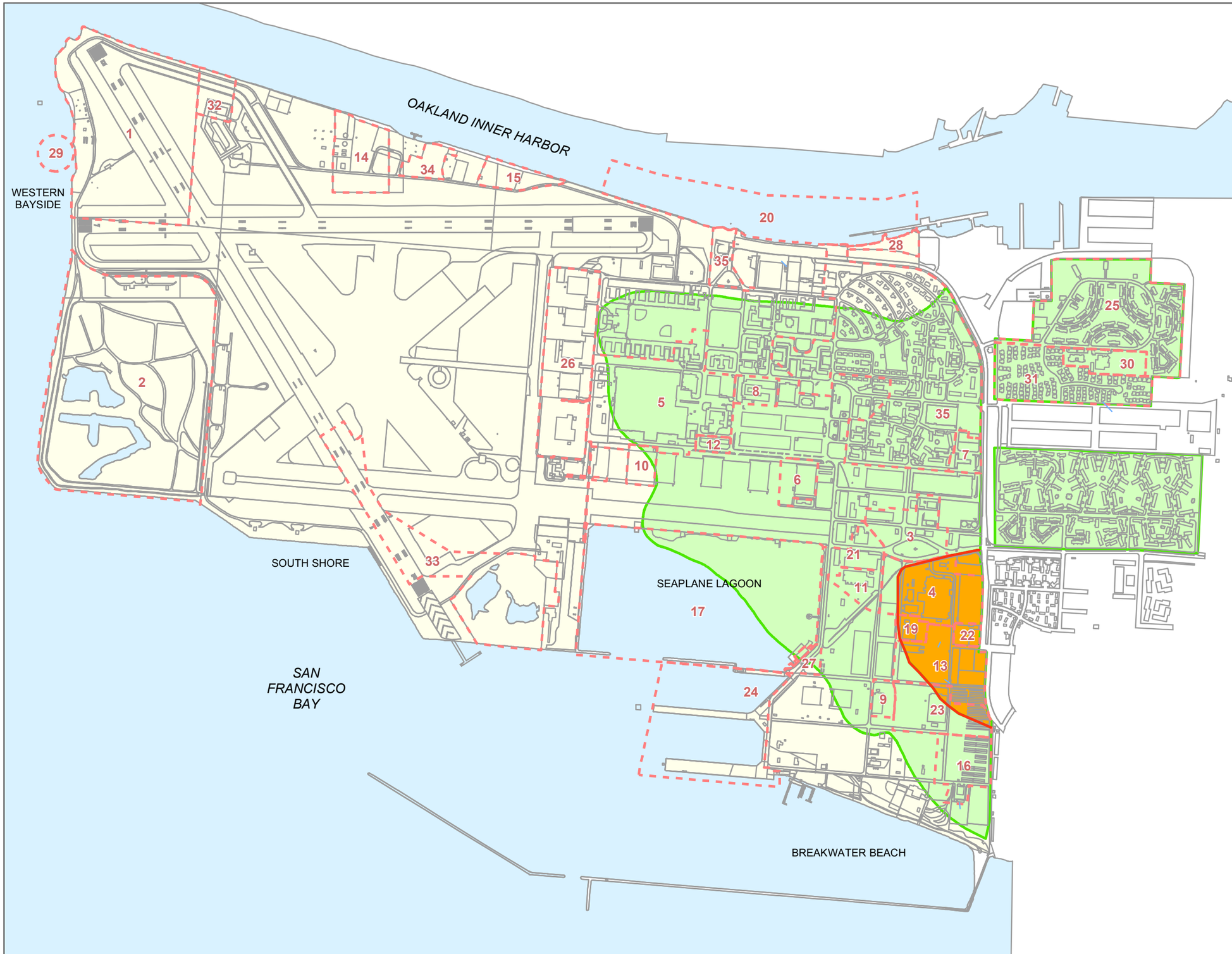
A technical memorandum has been prepared on the quality and beneficial uses of groundwater at Alameda Point (Tetra Tech 2000a). The memorandum focuses on applicable water quality policies and regulations, the rationale for and assessment of groundwater quality, the feasibility of using the groundwater resource, and the determination of the probable beneficial use of the

groundwater resource at Alameda Point. The technical memorandum is currently being revised to reflect EPA groundwater classification and use scenarios.

Nine state-registered wells are screened in the unconfined Merritt Sand unit east of Alameda Point. These wells are located in the neighborhood south of Atlantic Avenue and west of Webster Street. In addition, there are several unregistered, private irrigation wells screened in the unconfined Merritt Sand unit and the Alameda Formation. All the neighborhood wells are located upgradient of Alameda Point. Many of the unregistered wells screened in the Merritt Sand aquifer were installed by private landowners to obtain water for lawn and horticultural irrigation during periods of drought. The irrigation wells are known to be in current use for lawn irrigation within the community. The irrigation wells were installed in accordance with historical well construction standards before the enactment of current Alameda County well construction standards. Current Alameda County standards prohibit screening of municipal or domestic water supply wells in the unconfined Merritt Sand unit.

Three wells on or near Alameda Point are screened in the confined Alameda Formation. Two of the wells are in operation, and one of the wells has been closed. Of the two operational wells, one is near the intersection of Pan Am Way and West Red Line Avenue on Alameda Point, and the other is near the intersection of 5th Street and Pacific Avenue east of Alameda Point. Both of these wells are used for irrigation.

Groundwater wells to be used for domestic consumption could be installed in the Alameda Formation (a confined aquifer), because of the regional aquitard that protects it from contamination. However, the pumping rates of any new wells in this aquifer must be controlled to prevent significant drawdown that would adversely affect the current domestic groundwater wells in the area.



EXTENT OF BAY SEDIMENT UNIT

AREA SUBJECT TO MARSH CRUST RESTRICTIONS

EXTENT OF FORMER ISLAND 1865 (RADBRUCH 1957)

CERCLA SITE

LAND COVER

WATER

Notes:
Source: NAVY 2001a
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

600 0 600 1200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 2-2
EXTENT OF BAY SEDIMENT UNIT AND MARSH CRUST AREA

Operable Unit 2A
Remedial Investigation Report

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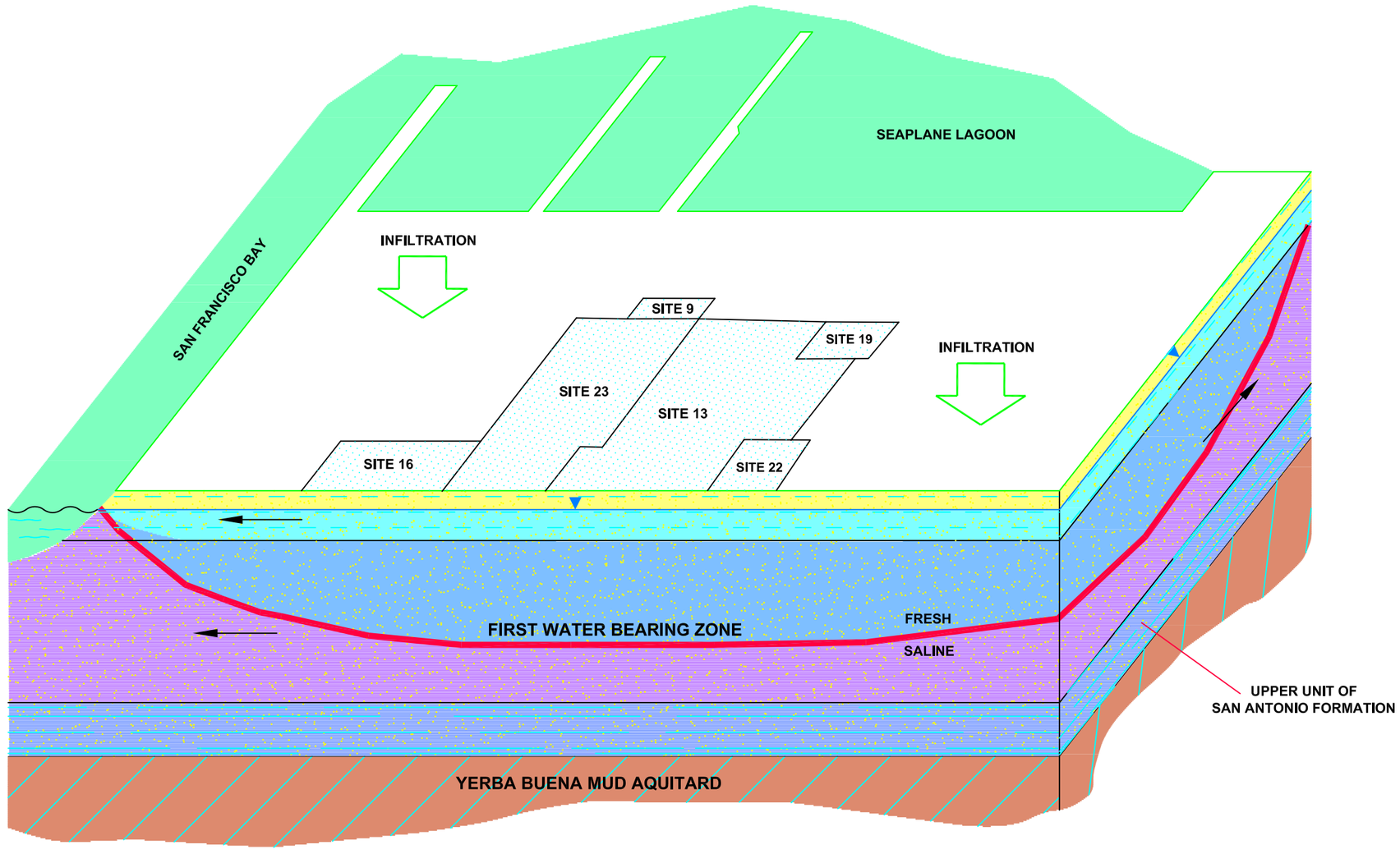

LEGEND

- INSTALLATION RESTORATION SITE
- SEAWATER
- ARTIFICIAL FILL WITH FRESH WATER
- MERRITT SAND WITH FRESH WATER
- MERRITT SAND WITH SALINE WATER
- UPPER UNIT OF SAN ANTONIO FORMATION WITH SALINE WATER
- YERBA BUENA MUD AQUITARD
- CONTACT OF LITHOLOGIC UNITS
- FIRST WATER-BEARING ZONE WATER TABLE
- GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS [TDS] > 10,000 MILLIGRAMS PER LITER [mg\L])

NOT TO SCALE

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 4-12
CONCEPTUAL HYDROGEOLOGIC MODEL FOR THE SOUTHEASTERN REGION

Operable Unit 2A
Remedial Investigation Report

MONITORING WELL AND GROUNDWATER ELEVATION (FEET MLLW) APRIL 2003 (8.11)

GROUNDWATER ELEVATION CONTOUR LINE (FEET MLLW) (DASHED WHERE INFERRED) (9)

CERCLA SITE BOUNDARY

BUILDING

Present

Removed

LAND COVER

Note:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

MLLW = Mean Lower Low Water

N

100 0 100 200 Feet

Tetra Tech EM Inc.

Alameda Point

U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 4-13
GROUNDWATER LEVEL ELEVATIONS WITHOUT TIDAL CORRECTIONS APRIL 2003

Operable Unit 2A
Remedial Investigation Report

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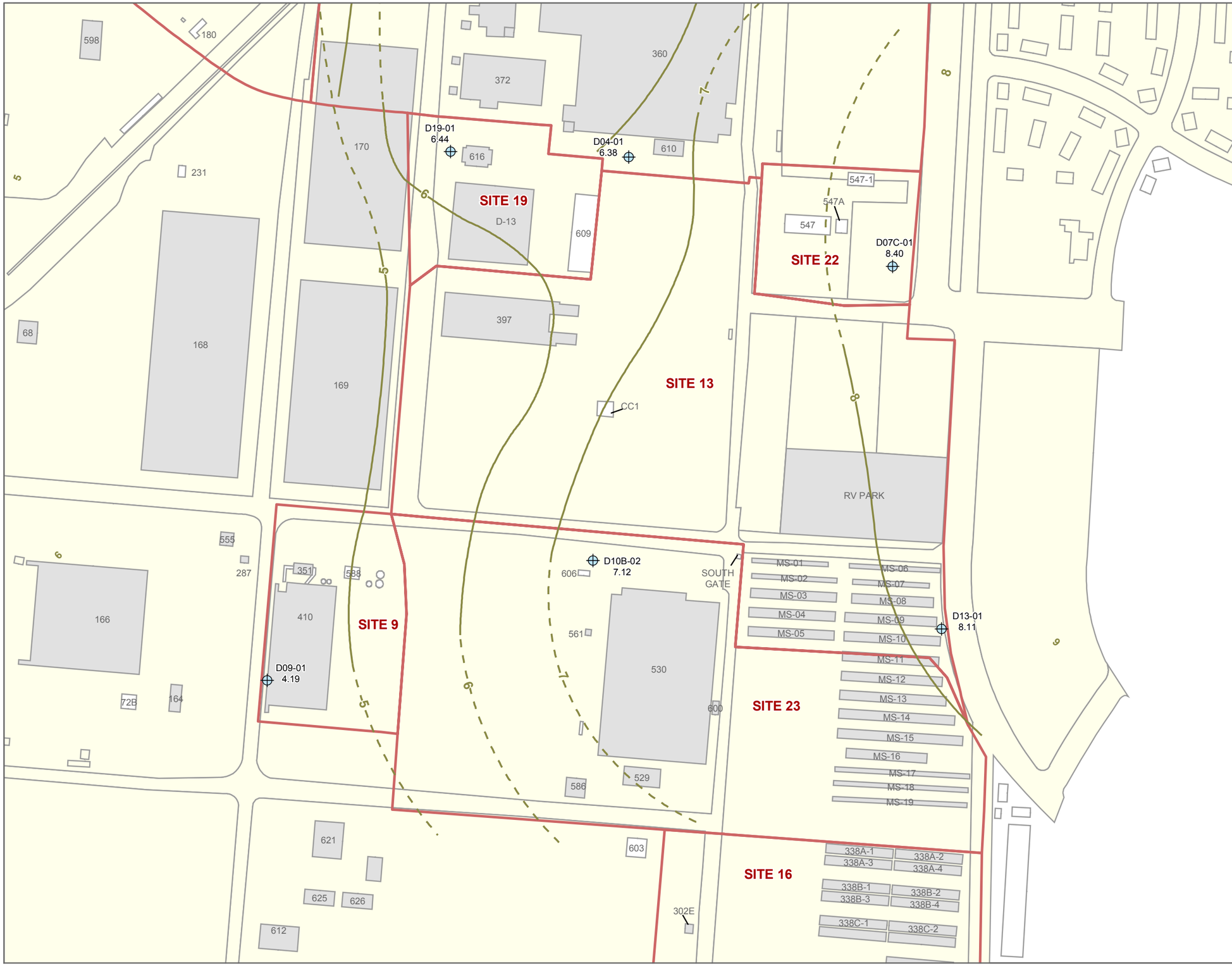

8.11 MONITORING WELL AND GROUNDWATER ELEVATION (FEET MLLW) JUNE 2002

—9— POTENTIOMETRIC SURFACE CONTOUR LINE (FEET MLLW) (DASHED WHERE INFERRED)

CERCLA SITE BOUNDARY

BUILDING

Present

Removed

LAND COVER

Note:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

MLLW = Mean Lower Low Water

N

100 0 100 200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 4-14
POTENTIOMETRIC SURFACE MAP
SECOND WATER BEARING ZONE
JUNE 2002

Operable Unit 2A
Remedial Investigation Report

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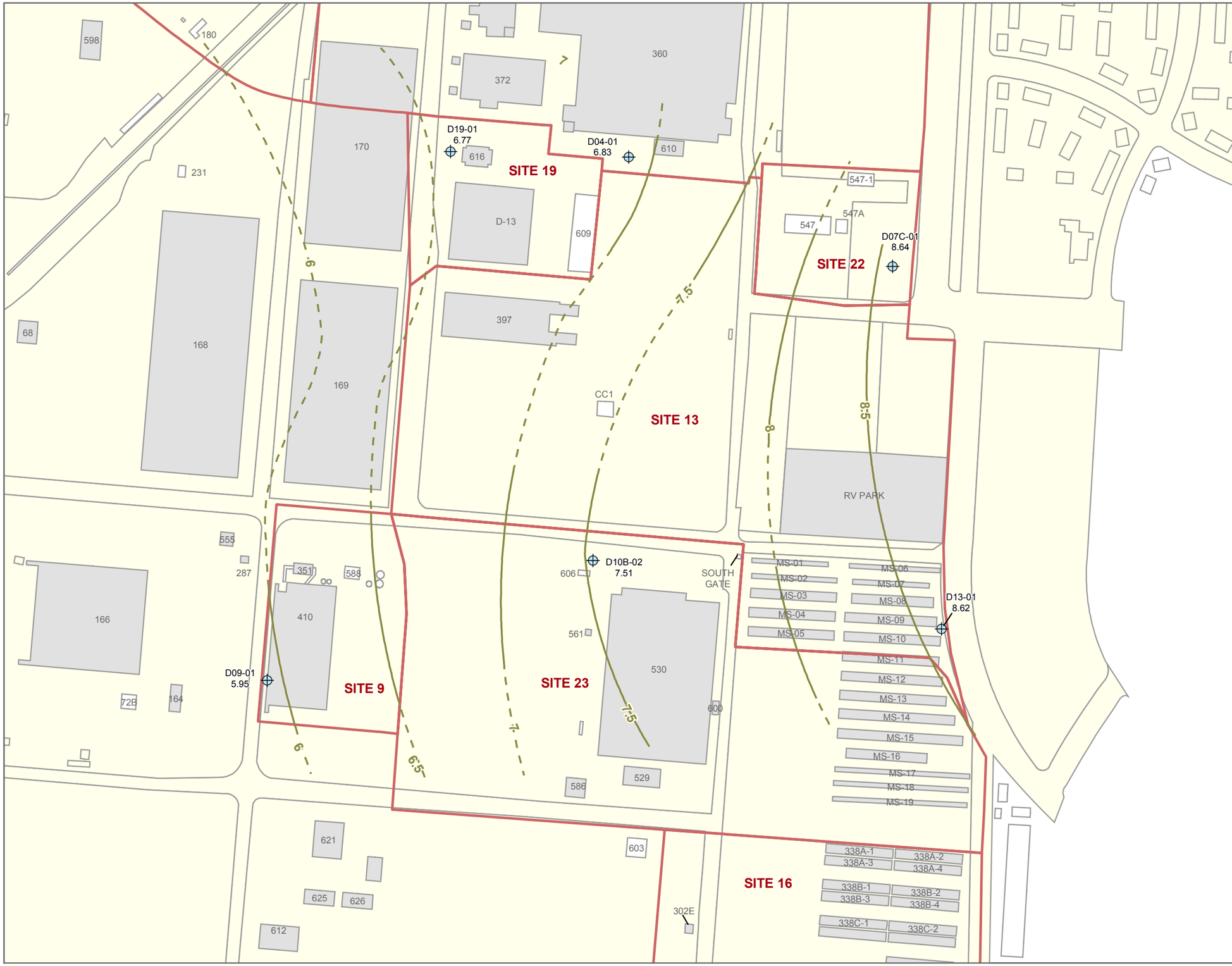

MONITORING WELL AND GROUNDWATER ELEVATION (FEET MLLW) APRIL 2003

8.11

POTENTIOMETRIC SURFACE CONTOUR LINE (FEET MLLW) (DASHED WHERE INFERRED)

CERCLA SITE BOUNDARY

BUILDING

Present

Removed

LAND COVER

Note:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

MLLW = Mean Lower Low Water

N

100 0 100 200 Feet

Tetra Tech EM Inc.

Alameda Point

U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 4-15
POTENTIOMETRIC SURFACE MAP
SECOND WATER BEARING ZONE
APRIL 2003

Operable Unit 2A
Remedial Investigation Report

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TABLE 4-1: ESTIMATED VALUES OF AQUIFER HYDRAULIC PARAMETERS

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

OU-2A Site	Test Method	Method of Analysis	Transmissivity (ft^2/min)	Hydraulic Conductivity (ft/min)	Hydraulic Conductivity (ft/day)	Storage Coefficient[1] S	Specific Yield[1] S_y	Source
FIRST WATER BEARING ZONE								
Site 9	soil (lab)	unknown		0.0019	2.74			TtEMI 1998
	slug test	Bouwer and Rice			1.70			Shaw 2003
Site 13	pumping test	Theis	0.1170	0.0037	5.265	0.0009	NA	PRC 1996
		Neuman	0.0763	0.0024	3.431	0.0007	0.12	PRC 1996
		Cooper-Jacob	0.1418	0.0035	5.103	0.0033	NA	PRC 1996
		Hantush[2]	0.1100	0.0034	4.950			PRC 1996
SECOND WATER BEARING ZONE								
Site 9	pumping test	Hantush-Jacob	0.036	0.0016	2.3	0.0023		Shaw 2003

Notes:

[1] Dimensionless
[2] Method without storage
ft/day Feet per day
ft/min Feet per minute
ft^2/min Square feet per minute

TABLE 4-2: EXAMPLE VERTICAL HYDRAULIC GRADIENT CALCULATIONS, JUNE 2002

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Well	OU-2A Site	Hydrostratigraphic Unit	Well Elevation (feet MLLW)	Screened Interval Depth (feet bgs)	Screened Interval Depth (feet MLLW)	Screen Midpoint Depth (feet bgs)	Screen Midpoint Depth (feet MLLW)	Groundwater Elevation (6/02) (feet MLLW)	Vertical Hydraulic Gradient (6/02) (feet/feet)	Vertical Hydraulic Gradient Direction (6/02)
MWOR-4	23	FWBZU	11.76	5 - 15	6.76 to -3.24	7.5	4.26	8.40		
D13-01	23	FWBZL	11.9	50 - 60	-38.1 to -48.1	55	-43.1	8.11	0.006	downward
M07C-08	22	FWBZU	12.68	3.5 - 13.5	9.18 to -.082	8.5	4.18	8.46		
D07C-01	22	FWBZL	13.04	49 - 59	-35.96 to -45.96	54	-40.96	8.40	0.001	downward
MW410-2	9	FWBZ	13.44	5 - 15	8.44 to -1.56	7.5	5.94	7.01		
D09-01	9	SWBZ	13.79	50 - 60	-36.21 to -46.21	55	-41.21	4.19	0.060	downward
MW360-3	19	FWBZ	12.67	5 - 15	7.67 to -2.33	7.5	5.17	8.21		
D04-01	19	SWBZ	12.74	86 - 96	-73.26 to -83.26	91	-78.26	6.38	0.022	downward
MWD13-3	19	FWBZ	12.79	5 - 15	7.79 to -2.21	7.5	5.29	8.08		
D19-01	19	SWBZ	12.14	50 - 60	-37.86 to -47.86	55	-42.86	6.44	0.034	downward
M10B-01	23	FWBZ	12.95	3 -11	9.95 to 1.95	7	5.95	6.69		
D10B-02	23	SWBZ	12.67	50 - 60	-37.33 to -47.33	55	-42.33	7.12	-0.009	upward

Notes:

bgs below ground surface
FWBZU First Water Bearing Zone Upper
FWBZL First Water Bearing Zone Lower
MLLW Mean Low Low Water

Example Calculation:

$$\text{Vertical Hydraulic Gradient} = \frac{\text{Groundwater Elevation FWBZU - Groundwater Elevation FWBZL}}{\text{Screen Midpoint Depth FWBZU - Screen Midpoint Depth FWBZL}}$$

$$\text{Vertical Hydraulic Gradient} = \frac{(8.40 - 8.11)}{(4.26 - -43.1)} = \frac{0.26}{47.36} = 0.00612$$

A positive gradient indicates downward movement while a negative gradient indicates upward movement

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
16	ecology	Section 2.2	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.1.3, Page 3-4, Table 3-2. Oneida Total Integrated Enterprises LLC 2011.

3.1.2.5 SALTWATER INTRUSION

Saltwater intrusion is the movement of saline water into freshwater aquifers and occurs in virtually all coastal aquifers. At Alameda Point, fresh groundwater occurs in the FWBZ; the SWBZ primarily consists of water that is fresh to brackish, with specific conductance readings ranging from less than 500 micromhos per centimeter (µmhos/cm) to greater than 3,000 µmhos/cm. Specific conductance values measured in monitoring wells in OU-2A were measured in 1990 and 1994, and more data points were measured in 1994. In 1990, specific conductance readings from 20 monitoring wells screened in the FWBZ ranged from approximately 380 µmhos/cm to 2,000 µmhos/cm with slightly higher conductivities at two monitoring wells occurring at 2,580 µmhos/cm and 4,020 µmhos/cm. In 1994, specific conductance measured in 32 monitoring wells screened in the FWBZ ranged from approximately 300 µmhos/cm to 2,000 µmhos/cm with several isolated data points ranging from 5,160 µmhos/cm to 14,600 µmhos/cm.

In monitoring wells in the SWBZ, where conductivities were measured only in 1994, the values were 1 to 2 orders of magnitude higher than those in the FWBZ, ranging from 2,600 µmhos/cm to 37,000 µmhos/cm. The highest conductivities were measured in wells in the SWBZ at the southern and western edges of OU-2A, including 20,000 µmhos/cm at D19-01, 34,000 µmhos/cm at D10B-01, and 37,000 µmhos/cm at 09-01. These monitoring well locations are nearest to the coast.

3.1.3 Ecology

OU-2A sites are considered intensively developed areas and are bordered by other intensively developed areas. The intensively developed areas consist primarily of buildings, roads, and parking lots and have little vegetation (DON 1999). These areas are primarily in the eastern end of the installation. Typical urban wildlife, such as California ground squirrels, scrub jays, and American robins, may be observed in the intensively developed areas but to a lesser extent than in the landscaped/developed areas because less foraging habitat is available in these areas. Feral cats also are found in the intensively developed area.

The U.S. Fish and Wildlife Service (U.S. FWS) has identified certain special status species that occur or are expected to occur at Alameda Point (U.S. FWS 1993). These species were listed in the OU-2A RI (SulTech 2005b). As part of preparation of this FS, the list presented in the RI was reviewed and compared against the April 2010 revision of the California Department of Fish and Game Natural Diversity Database (CDFG 2010a and CDFG 2010b). Based on this comparison, a list of State and Federally listed endangered, threatened animals and plants is presented in Table 3-2.

3.1.4 Land and Groundwater Use

3.1.4.1 PROPOSED FUTURE LAND USE

According to the May 2003 Amendment to the City of Alameda General Plan, the area encompassing OU-2A is designated as a mixed-use area (City of Alameda 2003). The ARRA has developed a preliminary development concept (PDC) (ARRA 2006) for redevelopment of Alameda Point that implements the City of Alameda General Plan vision for a mixed use plan. The land-use plan for Alameda Point included in the PDC is presented on Figure 3-3.

In accordance with this land-use plan, the area overlying the current boundaries of OU-2A is planned to be used for the following purposes:

> *Residential:* Includes single family dwellings, secondary units, duplex or attached duel units, shop houses, multi-family rental units, existing affordable housing.

Table 3-2: Special Status Species

	Common Name	Scientific Name	Status
Plants	Alkali milk-vetch	*Astragalus tener var. tener*	--
	Beach layia	*Layia carnosa*	FE, SE
	Bent-flowered fiddleneck	*Amsinckia lunaris*	--
	Knot grass (Kellogg's horkelia)	*Horkelia cuneata ssp. Sericea*	--
	Robust spinflower	*Chorizanthe robusta var. robusta*	Not listed
	Rose linanthus	*Linanthus rosaceus*	Not listed
	Round-leaved filaree	*Erodium macrophyllum*	--
	Saline clover	*Trifolium depauperatum var. hydrophilum*	Not listed
	San Fracisco Bay spineflower	*Chorizanthe cuspidate var. cuspidate*	Not listed
	Santa Cruz tarplant	*Holocarpha macradenia*	FT, SE
	Kellogg's horkelia	*Horkelia cuneata sericea*	--
	Point Reyes bird's beak	*Cordylanthus maritimus palustris*	Not listed
Birds	California least tern[1]	*Sternula antillarum browni*	FE, SE, DFG_FP
	White-tailed kite	*Elanus leucurus*	DFG_FP
	Double-crested cormorant, rookery sites	*Phalacrocorax auritus*	DFG_WL
	California black rail	*Laterallus jamaicensis coturniculus*	ST, DFG_FP
	California clapper rail	*Rallus longirostris obsoletus*	FE, SE, DFG_FP
	Northern harrier	*Circus cyaneus*	DFG_SSC
Reptile	California tiger salamander	*Ambystoma californiense*	FT, SE , DFG_SSC
Fish	Tidewater goby	*Eucyclogobius newberryi*	FE, DFG_SSC
Mammals	Saltmarsh harvest mouse[2]	*Reithrodonomys raviventris*	Not Listed

Notes:

[1] Nesting colonies within Alameda Point, west of the sites.

[2] In 1995, a survey for the saltmarsh harvest mouse was conducted in the West Beach Landfill and the Runway Area Wetlands to identify potential receptors for evaluation in ecological risk assessments being conducted by the Navy under the Installation Restoration Program. No individuals were captured during the surveys of the West Beach Landfill and Runway Area Wetlands.

DFG_FP	California Department of Fish and Game – Fully Protected
DFG_SSC	California Department of Fish and Game – Species of Special Concern
DFG_WL	California Department of Fish and Game – Watch List
FE	Federally endangered
FT	Federally threatened
SC	Federal species of concern
SE	State endangered

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
17	RI Report for IR Site 9	Section 2.3.1	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 5.2 through 5-4, Pages 5-4 through 5-33, Figures 5-1 through 5-15; Tables 5-1 through 5-20. SulTech 2005.

5.1.3.2 RCRA Program

Several facilities or activities within Site 9 had separate regulatory involvement. IWTP 410 was a RCRA Part A permitted facility. The Navy received a letter from DTSC regarding approval of the IWTP 410 closure certification report on November 9, 1998 (DTSC 1998).

Three ASTs (410A, B, and C) were removed before 2001 (IT 2001),. NFA is recommended in the SWMU appendix (Appendix G).

5.2 SITE 9 ENVIRONMENTAL INVESTIGATIONS

This section describes the environmental investigations conducted at Site 9, which include investigations conducted before the IRP, under CERCLA, under the EBS, and during removal actions. No investigations were conducted under the TPH program at Site 9.

Tables 5-1 and 5-2 summarize the soil and groundwater samples collected under each environmental investigation at Site 9 and the types of analyses conducted. Sampling locations are shown on Figure 5-2 and are categorized by investigation. Results for each of the investigations are presented in Tables 5-3 through 5-13. The tables are organized by analytical group and detail the number and percent of detections; the minimum, average, and maximum detected concentration; the minimum and maximum detection limit; the number of detections exceeding either the residential (for soil) or tap water (for groundwater) PRGs (EPA 2002a); the number of detection limits for nondetected samples exceeding the PRG; and the PRG.

The following subsections summarize investigations conducted at Site 9 prior to the IRP (Section 5.2.1), under the CERCLA (Section 5.2.2), EBS (Section 5.2.3), and TPH programs (Section 5.2.4), and as a part of removal actions and treatability studies (Sections 5.2.5 and 5.2.6, respectively).

5.2.1 Investigations Conducted Before the IRP

In 1982, the Navy initiated the NACIP to identify, assess, and control contamination of the environment resulting from base activities. The IAS, completed in 1983 (E&E 1983), identified several areas for additional investigation. In addition, information from several active portions of NAS Alameda was documented in the IAS. The IAS discussed activities conducted in Building 410 as part of the NARF. Until 1972, Building 410 discharged wastewater laden with oil, paint, detergents, and paint strippers directly to the Seaplane Lagoon. After 1972, the wastewater was discharged to the industrial wastewater treatment system (IWTP 410).

5.2.2 CERCLA Investigations

The following subsections summarize investigations conducted at Site 9 under CERCLA. These investigations included the Phase 1 and 2A investigation performed in 1991, the follow-on investigations conducted in 1994 and 1998, the storm sewer investigation in 2000, the

supplemental RI data gaps sampling event performed in 2001, the basewide groundwater monitoring conducted in 2002 and 2003, and the PAH study in 2003.

5.2.2.1 Phase 1 and 2A Investigation, 1991

The Navy contracted with Canonie to determine whether contamination from surface spills or leaks in the subsurface sewer system at Building 410 had affected soils and groundwater (Canonie 1989). Canonie field notes did not indicate any visual evidence of surface spills.

Soil

Seven soil borings were drilled (B410-1 through B410-7), and four of the seven borings were completed and renamed as monitoring wells (MW410-1, MW410-2, MW410-3, and MW410-4). Figure 5-2 presents the sampling locations. Borings B410-6 and MW410-4 were advanced upgradient on Site 23 and were not considered part of the Site 9 investigation for this report. Seventy soil samples were collected at Site 9. To evaluate if compounds were present in the areas investigated, 30 samples were analyzed for VOCs, 38 for SVOCs, 38 for metals, and 6 each for total organic carbon (TOC) and other general chemistry parameters (PRC and MW 1993a) (see Table 5-3). The table below summarizes chemicals detected at concentrations greater than the PRG and the sampling location with the highest detected result for each chemical.

Site 9 1991 Phase 1 and 2A Investigation Soil Summary

Analytical Group	Detected Chemical Exceeding 2002 Residential PRG	Location of Highest Concentration Exceeding PRG
VOC	None	Not Applicable
SVOC	Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene	B410-7
Metals	Arsenic and iron	B410-5
	Thallium	MW410-1

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs were detected in soil above their respective PRGs. The investigation report concluded that 2-butanone was detected in some of the laboratory blanks and was suspect as a laboratory contaminant (PRC Environmental Management Inc. [PRC EMI] and James M. Montgomery, Consulting Engineers, Inc. [JMM] 1992).

PAHs were detected exceeding the PRGs for samples from boring B410-7, collected from 14.5 to 15 feet bgs; no other SVOC exceeded PRGs. It was noted in the investigation report that PAH compounds were typically detected from 11.5 feet bgs to 15.0 feet bgs (PRC EMI and JMM 1992). The investigation report concluded that n-nitroso-di-n-propylamine and

pentachlorophenol were detected in some of the laboratory blanks and were suspected as laboratory contaminants (PRC EMI and JMM 1992).

Groundwater

Three groundwater samples, one from each monitoring well (MW410-1, MW410-2, and MW410-3), were analyzed for VOCs, SVOCs, metals, and general groundwater properties (see Figure 5-2). The table below summarizes chemicals detected at concentrations greater than the PRG and the sampling location with the highest detected result for each chemical.

Site 9 1991 Phase 1 and 2A Investigation Groundwater Summary

Analytical Group	Detected Chemical Exceeding 2002 Tap Water PRG	Location of Highest Concentration Exceeding PRG
VOC	None	None
SVOC	None	None
Metals	Aluminum, arsenic, iron, manganese, and vanadium	MW410-3

No VOCs, SVOCs, or PAHs were detected in groundwater, although detection limits for select compounds exceeded PRGs (see Table 5-4). Aluminum, arsenic, iron, manganese, and vanadium from monitoring well MW410-3 exceeded the 2002 residential PRG.

Analytical detection limits of numerous VOC, SVOC, and metal compounds, in soil and groundwater, exceeded the 2002 residential PRGs (see Table 5-4). Furthermore, quality assurance/quality control (QA/QC) information was not available for data validation during preparation of the investigation report. Therefore, the groundwater and soil data from the 1991 Phase 1 and 2A investigation at Site 9 were used for qualitative purposes only in the investigation report.

Recommendations for future work included the collection of additional groundwater samples to; evaluate tidal influence on the shallow and deeper water-bearing zone, to verify that the groundwater has not been impacted by VOCs, to better characterize metals in groundwater, and to evaluate whether groundwater beneath the site was considered a potential drinking water source.

The investigation report concluded that based on the samples collected, sufficient VOC, SVOC, and metals data had been collected in soil for the RI/FS investigation and that compounds detected at Site 9 would be addressed during the risk assessment (PRC and JMM 1992).

5.2.2.2 Follow-On Investigation, 1994

Based on the recommendations of the 1991 investigation, and discussions with the regulatory agencies, PRC and MW conducted a follow-on field investigation to provide additional lithologic, chemical, and hydrogeologic information (PRC and MW 1995). Data collection

focused on areas around Building 410 and industrial waste sewer lines associated with the building.

During the 1994 follow-on investigation, an industrial drain line connected to a floor drain in Building 410 was inspected using a video camera. The purpose of the inspection was to determine whether cracks or leaks in the drain line could have served as source areas for chemical migration to groundwater and to assist in determining locations for six shallow Hydropunch sampling locations along the drain line beneath the building (PRC and MW 1995).

The video survey did not indicate cracking or leaking along the portions of the drain line that were accessible by the camera. Some portions of the drain line were inaccessible because of obstructions in the line and were not inspected (PRC and MW 1995). Several soil and groundwater sampling locations were based on areas of obstruction noted during the video survey.

Activities conducted under the 1994 follow-on investigation consisted of soil sampling as well as shallow and deep groundwater sampling activity at 12 locations. Several borings were advanced at each location to evaluate concentrations of chemicals in shallow groundwater, deep groundwater, and soil. In addition, four quarters of groundwater sampling data were collected at all Site 9 wells. This phase of investigation evaluated soil and groundwater beneath Building 410 and around the storm sewer and industrial waste collection systems east of the building. The vertical extent of groundwater contamination was evaluated by collecting deeper groundwater samples and installing a deep monitoring well (D09-01) near the southwestern corner of Building 410. Two nonpoint samples from storm drains were also collected in 1994.

Soil

At 7 of 12 locations (M09-06, CPT-S09-05, CPT-S09-06, CPT-S09-07, CPT-S09-08, CPT-S09-09, and CPT-S09-10), soil samples were collected at three depths (2.5, 5.5, and 8.5 feet bgs) (see Figure 5-2). Twenty-one soil samples were collected and analyzed for VOCs, total metals, and general chemistry (see Table 5-5). Two of these samples were analyzed for TOC. No soil samples were analyzed for SVOCs or PAHs.

No VOCs were detected in soil above their respective PRGs. These findings support those of the 1991 investigation.

Various metals were detected in soil (PRC EMI and MW 1994), but only arsenic concentrations exceeded the PRG in samples from CPT-S09-05. The table below summarizes chemicals detected at concentrations exceeding the PRG and the sampling location with the highest detected result for each chemical.

Site 9 1994 Follow-On Investigation Soil Summary		
Analytical Group	**Detected Chemical Exceeding 2002 Residential PRG**	**Location of Highest Concentration Exceeding PRG**
VOC	None	Not Applicable
SVOC	None	Not Applicable
Metals	Arsenic	CPT-S09-05

Groundwater

At 8 of 12 locations (SHP-S09-05, SHP-S09-07, SHP-S09-08, SHP-S09-09, SHP-S09-10, SHP-S09-11, SHP-S09-12, and DHP-S09-06), grab groundwater samples were collected from less than 15 feet bgs using Hydropunch borings. At 9 of the 12 locations (DHP-S09-02, DHP-S09-03, DHP-S09-05, DHP-S09-07, DHP-S09-08, DHP-S09-09, DHP-S09-10, DHP-S09-11, and DHP-S09-12), grab groundwater samples were collected from between 20 and 30 feet bgs using Hydropunch borings. Sampling locations are presented on Figure 5-2. Boring logs were prepared to evaluate the lithology of the site. Eighteen groundwater samples collected using Hydropunch methodologies were analyzed for VOCs, SVOCs, dissolved metals, and general chemistry (see Table 5-6). The table below summarizes chemicals detected at concentrations exceeding the PRG and the sampling location with the highest detected result for each chemical.

Site 9 1994 Follow-on Investigation Groundwater Summary		
Analytical Group	**Detected Chemical Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration Exceeding PRG**
VOC	1,1-DCA and TCE	SHP-S09-09
	1,2-DCA and 1,2-DCP	DHP-S09-09
	1,2-DCE, ethylbenzene, and total xylenes	SHP-S09-10
	Benzene	SHP-S09-07
	Chloroform	D09-01
	PCE	MW410-3
	Vinyl chloride	DHP-S09-06
SVOC	4-Methylphenol	SHP-S09-07
	Pentachlorophenol	SHP-S09-09
	Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene	SHP-S09-11
	Naphthalene	SHP-S09-10
Metals	Unfiltered arsenic	MW410-1
	Filtered antimony	DHP-S09-05
	Filtered arsenic	SHP-S09-07
	Filtered cadmium	D09-01

DCA Dichloroethane
DCE Dichloroethene

VOCs were detected in groundwater above their respective tap water PRGs in samples from SHP-S09-07, SHP-S09-09, SHP-S09-10, DHP-S09-06, DHP-S09-09, D09-01, and MW410-3.

SVOCs were detected in groundwater above their respective tap water PRGs in samples from SHP-S09-07 and SHP-S09-09.

PAHs were detected in groundwater above their respective tap water PRGs in samples from SHP-S09-11 and SHP-S09-10.

Filtered and unfiltered metals were detected in groundwater above their respective tap water PRGs in samples from 280-S09-028, DHP-S09-05, SHP-S09-07, and D09-01.

Based on elevated concentrations of 1,2-DCE detected at location SHP-S09-10, two shallow monitoring wells were installed, M09-05 and M09-06. Well M09-05 is located east and upgradient of Site 9; therefore, it is not discussed for Site 9. Well locations are presented on Figure 5-2. One deep monitoring well (D09-01) was also installed at Site 9. Five monitoring wells (M09-06, D09-01, MW410-1, MW410-2, and MW-410-3) were sampled as part of the 1994 investigation. All of the wells were sampled during the fourth quarter of 1994. Samples from four wells were collected in February 1995, and all wells were sampled in June and August 1995.

Nonpoint Source Samples

One sediment sample was collected from a catch basin east of Building 410 to assess the potential for the utilities to act as conduits for transporting chemicals off site. The sample was analyzed for VOCs, SVOCs, TPH-P, TPH-E, and metals. Chemicals from all analytical groups were detected in the sample. Chemicals found at concentrations greater than residential PRGs included benzo(a)pyrene, antimony, arsenic, cadmium, chromium, iron, lead, and nickel.

In general, few VOCs were detected in soil during the 1994 investigation, but elevated VOCs were detected in groundwater adjacent to former industrial wastewater and storm sewer systems beneath and east of Building 410.

The investigation report concluded that chemicals detected in soil and groundwater varied from those found during the previous (1991) investigation due to the close proximity of sample collection points to the industrial drain lines (PRC and MW 1995). The report also indicated that additional soil or groundwater data were not required for further characterization of the site, but that additional data may be necessary for or human health risk assessment.

5.2.2.3 Follow-On Investigation, 1998

The 1998 investigation consisted of 1 year of basewide quarterly groundwater monitoring to assess and monitor the status of plumes at various sites at Alameda Point. Both filtered and

unfiltered groundwater samples were collected. Two wells (D09-01 and M09-06) located within Site 9 were included in the monitoring program to assess the migration of chlorinated hydrocarbons detected in 1994. In general, these wells monitored the upgradient and vertical extent of the groundwater contamination plumes at Site 9. Groundwater samples collected from these wells were analyzed for VOCs, dissolved metals, and general groundwater chemistry (Tetra Tech and Uribe and Associates, Inc. [U&A] 1998) (see Table 5-7). Data from the latter two analyses were used in the basewide analysis of ambient water quality (Tetra Tech 1998) and in the evaluation of beneficial uses of groundwater (Tetra Tech 2000a). Samples from the first quarter of groundwater monitoring were also analyzed for TOC to help evaluate the biodegradation potential for petroleum hydrocarbons. Sampling locations are presented on Figure 5-2. The table below summarizes chemicals detected at concentrations exceeding the PRG and the sampling location with the highest detected result for each chemical.

Site 9 1998 Follow-On Investigation Groundwater Summary

Analytical Group	Detected Chemical Exceeding 2002 Tap Water PRG	Location of Highest Concentration Exceeding PRG
VOC	Chloroform	D09-01
Metals	Manganese	D09-01

During quarter four, the VOC chloroform was detected in groundwater above the 2002 tap water PRG in monitoring well D09-01. This result was also found in the duplicate sample.

Various metals were detected in filtered and unfiltered groundwater samples; however, manganese was detected above the 2002 tap water PRG in unfiltered and filtered samples collected from monitoring well D09-01.

5.2.2.4 Storm Sewer Investigation, 2000

This basewide storm sewer investigation evaluated the physical conditions of storm sewers and the places where storm sewers were submerged below groundwater; identified locations where contaminated groundwater intercepts submerged, damaged sections of storm sewers; and identified significant data gaps for further evaluation.

The 2000 storm sewer investigation noted that the east-west oriented storm sewer main line (to Outfall J) is submerged, but does not intercept the groundwater contamination plumes at Site 9 (see Figure 5-4). The storm sewer report recommended that samples be collected from catch basin 3-J during the following phase of investigation (Tetra Tech 2000b). A second storm sewer line, oriented north-south, has one catch basin (5-OA) line near the southwestern corner of Building 410 that runs south to Outfall O. In 1991, this storm sewer line was replaced with an 8-inch diameter polyvinyl chloride (PVC) line that enters a 20-inch diameter PVC line located south of West Ticonderoga Avenue. This storm sewer does not intercept groundwater contamination plumes and was not identified for further evaluation.

5.2.2.5 Supplemental Data Gaps Sampling Investigation, 2001

Based on identified data gaps, a supplemental data gap sampling effort was conducted at OU-2A to address two primary data gaps categories: (1) the status of groundwater contaminant plumes and (2) preferential flow paths associated with the storm sewer system (Tetra Tech 2002a). This sampling effort included sampling of groundwater monitoring wells and bedding material at the storm sewers.

Five groundwater monitoring wells (MW410-1, MW410-2, MW410-3, M09-06, and D09-02) at Site 9 were sampled to monitor the status of groundwater contaminant plumes. Direct-push grab groundwater sampling was conducted to delineate the horizontal and vertical extent of chlorinated hydrocarbon contamination in groundwater. Vacuum extraction location S09-DGS-VE01, soil gas sampling location S09-DGS-SG03, sampling locations S09-GGS-DP-01 through S09-DGS-DP-12, and the monitoring wells are presented on Figure 5-2. Twelve direct-push borings were advanced, and 44 groundwater samples were collected. One water sample was collected from storm sewer catch basin 3-J. Every groundwater sample was analyzed for VOCs (totaling 44 samples), and 27 samples were selected for SVOC analysis (see Table 5-8).

Groundwater contaminant plumes were delineated to establish current site conditions, identify point-of-compliance wells for long-term monitoring, and approximate exposure areas for risk assessment (Tetra Tech 2002a). Water level elevations were also collected to provide local conditions of groundwater flow. The table below summarizes chemicals detected at concentrations greater than the PRG and the sampling location with the highest detected result for each chemical.

Site 9 2001 Supplemental Data Gaps Sampling Investigation

Analytical Group	Detected Chemical Exceeding 2002 Tap Water PRG	Location of Highest Concentration Exceeding PRG
VOC	1,1-DCA and vinyl chloride	S09-DGS-DP02
	1,2-DCA	S09-DGS-DP01
	Benzene and ethylbenzene	S09-DGS-DP05
	MTBE	S09-DGS-DP08
	PCE and TCE	MW410-3
SVOC	Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene	D09-DGS-DP04
PAH	Naphthalene	S09-DGS-DP05

VOCs were detected in groundwater above their respective tap water PRGs in samples from S09-DGS-DP01, S09-DGS-DP02, S09-DGS-DP05, S09-DGS-DP08, P-9-IWS-01, and MW410-3.

No SVOCs (aside from PAHs) were detected in groundwater above their respective tap water PRGs.

PAHs were detected in groundwater above their respective tap water PRGs in samples from S09-DGS-DP04 and S09-DGS-DP05.

VOCs and PAHs were detected in groundwater above their respective MCLs. No SVOCs were detected above the MCLs.

To determine whether storm sewer bedding materials were acting as a preferential pathway for contaminant migration, soil and groundwater samples were collected from along storm sewer lines at Site 9 (Tetra Tech 2002a). Vacuum excavation borings were advanced immediately adjacent to storm sewer lines, and undisturbed samples of the bedding material were collected. For comparison purposes, samples of native soil were collected at the approximate depth of the storm sewer, 10 feet away from the vacuum excavation locations. Soil samples were analyzed for geotechnical parameters. Groundwater samples were collected from the vacuum extraction locations and analyzed for TPH-P and TPH-E and VOCs. TPH in the diesel, gasoline, and motor oil ranges were detected in samples collected from Site 9. No PRGs or MCLs are associated with TPH.

One vacuum excavation boring was advanced within the storm drain bedding material, and water samples collected from catch basin 3-J were tested for VOCs and SVOCs as part of a storm sewer evaluation (five additional VOC samples) (Tetra Tech 2002a). The data gaps sampling investigation determined that VOCs were not being transported through the storm sewer line that discharges to Outfall J and that storm drain bedding material was not a preferential pathway for contaminant migration (Tetra Tech 2002a).

One boring was advanced for soil gas sampling at a location selected with assistance from the BCT (see Figure 5-2) for use in a future human health risk assessment. At the soil gas sampling location, two continuous core soil borings were completed to determine specific groundwater depths and evaluate physical soil parameters required for the indoor vapor intrusion risk assessment model. Samples were collected at depths of 1.5 and 4.0 feet bgs. Chlorinated hydrocarbons and BTEX compounds were detected in the soil gas samples. (Tetra Tech 2002a)

The data gaps sampling investigation defined the horizontal and vertical extent of chlorinated hydrocarbons in groundwater west of Building 410. Sampling was conducted in accordance with the field sampling plan (FSP) and accompanying quality assurance project plan (QAPP) and the project-specific data quality objectives (DQO) (Tetra Tech 2001a). Analytical detection limits goals were established based on MCLs, rather than 2002 residential PRGs.

5.2.2.6 Basewide Groundwater Monitoring, 2002 and 2003

The specific objectives of the 2002 and 2003 basewide groundwater monitoring investigation were to (1) evaluate contaminant plumes in groundwater and (2) determine the main chemicals of concern (Shaw 2003a). The monitoring scheme for OU-2A included 23 of the 46 wells located within the five sites (Sites 9, 13, 19, 22, and 23) of OU-2A. Three wells (D09-01, MW410-01, and MW410-02) were sampled in June, September, and December 2002, and in

April 2003 (Shaw 2003a, 2003b) (see Table 5-9). Sampling locations are presented on Figure 5-2.

The table below summarizes chemicals detected at concentrations exceeding the tap water PRG and sampling locations with the highest detected result for each chemical.

Site 9 2002 and 2003 Basewide Groundwater Monitoring Investigation

Analytical Group	Detected Chemical Exceeding the 2002 Tap Water PRG	Location of Highest Concentration Exceeding PRG
VOC	1,1-DCA, benzene, 1,2,3-Trichloropropane, ethylbenzene, MTBE, TCE, and vinyl chloride	MW410-2
Metals	Arsenic	MW410-2
	Manganese	D09-01

VOCs were detected in groundwater above their respective tap water PRGs in samples from MW410-2.

Various filtered metals were detected in groundwater above their respective tap water PRGs in samples from MW410-2 and D09-01.

VOCs and metals were detected in groundwater above their respective MCLs in samples from MW410-2 and D09-01.

TPH in the diesel, gasoline, and JP-5 ranges were detected in samples collected from Site 9.

5.2.2.7 Basewide PAH Study, 2003

The primary objective of the 2003 PAH study was to collect sufficient PAH data to calculate exposure point concentrations (EPC) for ecological and human health risk assessments at CERCLA sites (Bechtel 2003). The historical PAH data collected at each CERCLA site were used to estimate the mean and standard deviation of BaP concentrations to identify the appropriate number of PAH samples to collect at each site. At Site 9, 13 soil borings were advanced north, south, and east of Building 410 using direct-push sampling methods. Samples were collected from each of the following four depth intervals: 0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs. This investigation detected PAHs at concentrations less than PRGs (EPA 2002a) and the site-specific action level of 0.62 mg/kg for BaP equivalents (Navy 2001d). Sampling locations for this investigation are presented on Figure 5-2. Table 5-10 provides a statistical summary of analytical results.

The table below summarizes chemicals detected at concentrations exceeding the residential PRG and sampling locations with the highest detected result for each chemical.

Site 9 2003 Basewide PAH Soil Study			
Analytical Group	**Detected Chemical Exceeding the 2002 Tap Water PRG**	**Location of Highest Concentration Exceeding PRG**	**Chemical Detected Below 2002 Residential PRG***
PAHs	None	Not Applicable	Numerous

Note:

* Includes compounds with no PRG

5.2.3 EBS Investigations

The EBS was performed to identify the environmental condition of all base property and structures to facilitate transfer to the community as quickly as possible. Two phases of the EBS were conducted at the installation. Tables 5-11 and 5-12 provide a statistical summary of analytical results for Phases 2A and 2B of the EBS.

Phase 1. The first phase of investigation comprised an examination of aerial photographs and historical records as well as the performance of site inspections and interviews with current and former employees involved in operations. The Phase 1 EBS found that many parcels could not be classified as transferable because of insufficient information; therefore, recommendations for additional investigations were prepared and presented in the zone analysis and parcel evaluation plans (ERM-West 1995a, 1995b).

Phase 2A. As recommended by the IAS (E&E 1983), Phase 2 investigations did not focus on areas already under evaluation. No EBS samples were collected at Parcel 152 because it was being evaluated under the IRP. Other Navy land uses or areas that may impact transfer were the subjects of the investigations. Site 9 lies within Zone 22 and comprises Parcels 152 and 153A (see Figure 5-1). Parcel 153A was sampled in January and May 1995 as part of the EBS Phase 2A (IT 2001) (see Figure 5-2). Seven soil borings were advanced on Parcel 153A. Nine soil samples from six of these borings were tested for VOCs. Six samples from three borings were tested for metals, and four samples were tested for pesticides and SVOCs. Six of the seven borings were located in or around the footprint of IWTP-410. EBS soil samples were collected to depths of 3.5, 7.0, 8.0, 8.5, and 10.0 feet bgs from Parcel 153A. Only estimated concentrations of two VOCs and seven SVOCs were detected during the January and May 1995 EBS sampling events (see Tables 5-11 and 5-12). As a result, no further investigation of Parcel 153A was deemed necessary (IT 2001).

Phase 2B. Parcel 154, immediately west and downgradient of Site 9, also was sampled in October 1995 as part of the EBS Phase 2B (IT 2001). Four direct-push groundwater samples were collected and analyzed for VOCs and TPH. One sample was analyzed for SVOCs and dissolved metals. All samples were collected from less than 9.5 feet bgs. No VOCs or SVOCs were detected in the samples. The only chemicals detected were diesel and motor oil-range petroleum hydrocarbons in sample 154-SN-007. These hydrocarbons did not resemble the laboratory standards, suggesting that areas west of Building 410 are not source areas for VOCs.

5.2.4 TPH Investigations

As defined under the Alameda TPH program, Site 9 is not within a CAA. No TPH program sampling activity has taken place on Site 9.

5.2.5 Removal Actions

The Navy sought to conduct a full-scale groundwater removal action at CERCLA Sites 9, 11, 16, and 21 beginning in March 2002; this removal action was expected to last approximately 1 year, and a draft action memorandum was issued June 17, 2002 (Tetra Tech 2002d). This removal action was a non-time-critical removal action for dissolved phase chlorinated solvents in groundwater. The removal action was designed to remove chlorinated solvents from soil and groundwater by injection of chemical oxidation agents such as permanganate, Fenton's reagent, or hydrogen peroxide into the subsurface, transforming the chemicals into less toxic chemical compounds. The removal action, while substantially reducing the potential for exposure to chemicals by potential receptors, was anticipated to be an interim action, requiring subsequent investigation and response. From June to December 2002, the Navy conducted a pilot scale test to evaluate the best oxidizing agent for the transformation of the chemicals present at Site 9.

The purpose of the pilot test was to evaluate the radial effects associated with application of the oxidant (Fenton's reagent) and to evaluate the effectiveness of the oxidant in destroying chlorinated hydrocarbons at Site 9. The pilot test included collecting hydrogeologic data from a slug test and a pump test conducted at Site 9, collecting pretest groundwater contamination data, injecting the chemical oxidant into shallow (less than 15 feet bgs) and deeper (between 22 and 45 feet bgs) groundwater, and collecting post-test groundwater contamination data.

The shallow pilot test was conducted east of Building 410, and the deeper pilot test was conducted west of Building 410 (see Figure 5-3). Results of the shallow pilot test indicated that concentrations of trimethylbenzene, vinyl chloride, benzene, 1,1-DCA, and 1,2-DCE in shallow groundwater were effectively reduced and that the radius of influence was approximately 20 feet from each injection point. The deeper pilot test experienced short-circuiting and did not evaluate the radius of influence or effectiveness of the oxidant in destroying groundwater contamination west of Building 410; therefore, the field summary report for the pilot test (IT 2003) recommended additional pilot testing to measure the efficacy of this technology for deeper groundwater.

The draft action memorandum issued in June 17, 2002 (Tetra Tech 2002d), discussed the Navy's plans to conduct additional pilot test activity and full-scale remediation of chlorinated solvents dissolved in groundwater starting in 2003 (Tetra Tech 2002d). Full-scale removal operations were scheduled to begin in the shallow zone in October 2003, and additional pilot testing was planned for the deeper water zone. Construction plans in the shallow zone have been delayed by the discovery of floating petroleum product (Shaw 2003c). Table 5-13 presents statistical summaries of the analytical results.

5.2.6 Treatability Studies

No treatability studies were conducted at Site 9.

5.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 5.2, the Navy completed an initial data evaluation for Site 9. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

5.3.1 Site 9 CSM

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 9. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 9 is described in the following text and presented on Figure 5-5.

Through environmental investigations and literature searches for Site 9, physical features and activities at Site 9 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination:

- Building 410 (Paint Stripping Facility) – Chemicals used included 1,1,1-TCA, naphthalene, methylene chloride, phenol, chromium, detergents, wipe down solvents (such as PCE), and parts cleaners; paint stripping process may have potentially released metals.

- ASTs 410A, 410B, and 410C – Located east of Building 410; contained methylene chloride, phenol, and surfactant.

- OWS-410A – Located south of the southwestern corner of Building 410; received water from a nearby wash rack; no sampling locations are located near this OWS. Because data gaps are associated with this OWS, it is considered a potential source of contamination.

- OWS-410B – Located southeast of the southeastern corner of Building 410 and is associated with former plane washing activities; ; no sampling locations are located near this OWS. Because data gaps are associated with this OWS, it is considered a potential source of contamination.

- Historical aircraft storage and fueling activities – Associated with numerous releases of petroleum.

- Placement of dredged fill material used to build the island – Potential source of PAHs.

Building 351 and IWTP 410 were not considered potential sources because (1) Building 351 served as an office and break room until 1990 for staff that worked in Building 410 and (2) IWTP 410 included Building 588, OWS-588, and eight associated ASTs. The Navy received a letter from DTSC approving the IWTP 410 closure certification report on November 9, 1998 (DTSC 1998). This concurrence states that no VOCs, SVOCs, or metals were present at concentrations greater than PRGs. This concurrence indicates that the IWTP is not a source of contamination at Site 9 and will not be discussed further in this document.

Of the potential sources, (1) paint stripping within Building 410, (2) releases of petroleum fuel from storage and defueling activities near Building 410, and (3) fill material containing PAHs were identified as likely sources of contaminants in soil and groundwater at Site 9. The exposure pathways and primary and secondary release mechanisms may include the following (see Figure 5-5):

- Direct release of chlorinated solvents, petroleum distillates, and petroleum fuels to groundwater from activities conducted within Building 410. These compounds were discharged to floor drains connected to storm sewers and industrial waste discharge sewers extending east of Building 410. Industrial waste sewer piping extending east from Building 410 is located below the depth of groundwater. It is likely that underground industrial waste sewer pipes east of Building 410 leaked, and chemicals used in Building 410 entered groundwater directly from these leaks.

- Direct release of petroleum products to soil and groundwater from spills around and within Building 410.

- Placement of fill material that contained PAHs.

- Secondary release from soil to air through volatilization or resuspension of particulates.

- Secondary release from soil into the food chain from plant uptake.

- Secondary release from soil to groundwater through infiltration.

- Secondary release from groundwater to air through volatilization.

- Secondary release from groundwater into domestic use through a well.

As shown in the CSM for Site 9 (see Figure 5-5), residential, commercial/industrial, and construction worker receptors were identified as potential human receptors. Exposure scenarios that include ingestion of homegrown produce and ingestion, dermal contact, and inhalation of soil and groundwater are evaluated in the HHRA (see Appendix H). Exposure of potential

ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ERA (see Appendix I).

Exposure of potential ecological receptors to groundwater from migration to surface water was considered an incomplete pathway. Tidal influence studies indicated that only two wells (MW410-1 and D09-01) at Site 9 are tidally influenced (PRC 1997a), groundwater is not expected to migrate to San Francisco Bay, and the storm sewer system at Site 9 is not considered a preferential pathway for contaminant migration. In addition, based on the results of the supplemental RI data gaps sampling conducted in 2001, the bedding material was not considered a preferential pathway.

The storm sewer line (sewer line J) that runs across the northern portion of Site 9 with lateral lines leading to Building 410 was determined to be in sound condition between Site 9 and the outfall (Outfall J); it also is submerged in groundwater. The line (sewer line O) that extends close to the southern portion of the site is submerged in groundwater and in sound condition (Tetra Tech 2000b) (see Figure 5-4). Because data show that the groundwater contamination plumes do not intersect sewer line J, it is unlikely that the sewer line will create a preferential migration pathway to San Francisco Bay. Data collected from storm drain manhole 3J indicate that very low concentrations of VOCs are present in storm water. Samples collected from the storm drain bedding did not contain VOCs at concentrations that exceed detection limits. Data suggest that the groundwater contamination plumes do not intersect sewer line O; however, limited data are available to complete this evaluation.

5.3.2 Site 9 Data Quality Assessment

As discussed in Section 5.2, several environmental investigations were conducted at Site 9 as a part of CERCLA and EBS programs to identify and assess the extent of contamination in soil and groundwater and to determine risk. Data were collected over a period of approximately 13 years, from 1990 through 2003, using a biased and phased sampling approach. Sampling focused on the following:

- Industrial, sanitary, and storm sewers;
- Building 410 to assess the presence of VOCs, SVOCs, metals, and petroleum products in soil and groundwater;
- Fill material and native sediments to assess the presence of PAHs; and
- Groundwater to assess and delineate VOCs.

These data, through an iterative process, were used to construct and refine the site-specific CSM presented in Section 5.3.1. They also were used to identify and fill data gaps until the quantity and quality of the data at Site 9 were judged to be adequate to complete the RI, as determined by applying the DQOs presented in Section 3.4.

Detection limits for some of the data used to evaluate Site 9 are elevated over residential PRGs (EPA 2002a); these elevated detection limits are the consequence of one or more of the following circumstances: (1) the evolution of lower detection limits as technology improves, (2) the revision of PRGs over time (which are not always technologically feasible), (3) and matrix interference. The first two of these circumstances generally do not result in significantly elevated detection limits. However, matrix interferences sometimes cause significant elevations in the detection limits for a chemical contaminant, which leads to uncertainty as to whether that undetected compound could be present in significant concentrations at a site. Although some detection limits (SQL) were elevated above 2002 residential PRGs, detection limits for nondetected chemicals were typically sufficiently low to permit identification of potential health risks. However, because detection limits were elevated in both soil and groundwater for some non-detected SVOCs (excluding PAHs) and VOCs, the need for further sampling and analysis of soil and groundwater for SVOCs (excluding PAHs) and VOCs were identified to confirm that these chemicals are not present in soil or groundwater. A data gap for soil and groundwater associated with OWS-410A was also identified.

Although soil and groundwater data gaps were identified, it was determined that the types and numbers of samples collected at the site (see Figures 5-6A through 5-6L) and the analytical suite (see Tables 5-1 and 5-2) were adequate to characterize Site 9 and to conduct risk assessments because data collection at Site 9 focused mainly on potential sources and was conducted in phases. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of the data collected and the need for additional data to identify releases and complete the RI report. It is unlikely that the RI would recommend NFA if the site poses a potential significant risk to human health or the environment.

Both definitive and screening-level data were generated. Screening data were considered appropriate for use only in evaluations of nature and extent and fate and transport of chemicals. Section 3.4.2 provides further detail on the assessment of data quality and the use of definitive and screening-level data.

Data generated during the environmental investigations that were considered to be of sufficient quality for use in the RI report are presented in Appendix D and in the subsections below. Tables 5-14 through 5-16 summarize results of the CERCLA and EBS investigations for soil, groundwater, and soil gas. No data were collected at Site 9 under the TPH investigations. The summaries are organized according to analytical group and include the following: (1) the number and percent of detections of chemicals; (2) the average, minimum, and maximum detected concentrations; (3) minimum and maximum detection limits for nondetected samples; and (4) whether the maximum detected concentrations or detection limits exceed Region 9 residential PRGs or Cal-modified PRGs (EPA 2002a). Cal-modified PRGs are used for some chemicals if the California EPA PRG is more protective than the federal EPA value. PRGs and MCLs are provided in the tables for comparison only.

5.3.2.1 Soil

Soil samples collected under the environmental investigations at Site 9 were analyzed for VOCs, SVOCs, pesticides and PCBs, PAHs, and metals as well as selected physical parameters (organic metals, pH, TPH, total organic carbon, and percent moisture) (see Table 5-1). Of the samples collected and analyzed, results for 63 samples analyzed for VOCs and 42 samples for SVOCs were considered acceptable for use in this RI report. Results for one sample analyzed for PCBs, which were nondetected, and 63 samples analyzed for metals were also considered acceptable for use in this RI report. Three soil samples were analyzed for pesticides. Pesticide and PCB data were collected at depths below 7 feet bgs. The minimal pesticide and PCB data were not perceived as a data gap because the site is mostly paved and use of pesticides and PCBs was not identified at Site 9.

Results for 52 samples were considered acceptable from the additional PAH sampling conducted in 2003. Data for PAHs in soil samples collected during previous investigations were not evaluated because of the high detection limits. Laboratory detection limits for some other chemicals exceeded residential PRGs (EPA 2002a) and are noted in Table 5-14. Detection limits for some of the nondetected SVOCs and nondetected thallium in soil were also elevated above residential PRGs (EPA 2002a), and detection limits for these chemicals in groundwater were also elevated. However, Site 9 was not identified as a source of thallium (see Section 5.3.1), and detected concentrations are similar to concentrations detected in ambient soil.

A subset of these data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Only data collected with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS program are more of a screening nature, and inclusion of these data could add more uncertainty to the risk assessments.

Data for soil from each site were aggregated in depth intervals of 0 to 2, 0 to 4, and 0 to 8 feet bgs. The depth intervals evaluate potential exposures associated with site use. The 0-to-2-feet and 0-to-8-feet-bgs depth intervals evaluate potential human health exposures, and the 0-to-4-feet-bgs depth interval evaluates potential ecological exposures. The total number of samples for each analytical group included in the data set for each of these depth intervals is presented in the table below.

Numbers of Suitable Soil Data for Site 9 Risk Assessments			
Analytical Group	**0 to 2 feet bgs**	**0 to 4 feet bgs**	**0 to 8 feet bgs**
VOCs	8	21	37
SVOCs	6	13	22
PAHs	26	39	52
Pesticides and PCBs	0	0	0
Metals	13	26	42

The minimal data for VOCs in soil from 0 to 2 feet bgs are not perceived as a data gap because Site 9 is mostly paved and VOCs in surface soil would likely volatilize and no longer be present in soil at the site. Data for 2 to 8 feet bgs are sufficient to evaluate the nature and extent and risk from VOCs at Site 9.

The minimal data for SVOCs in soil from 0 to 2 feet bgs are not perceived as a data gap because data for 2 to 8 feet bgs are sufficient to evaluate the nature and extent and risk from SVOCs at Site 9. In addition, the release mechanism for SVOCs (through storm and industrial waste sewers) is likely to include soil at depth rather than at the surface. However, detection limits for some of the nondetected SVOCs in soil were elevated above residential PRGs (see Table 5-14) (EPA 2002a), and detection limits for these SVOCs in groundwater were also elevated (see Table 5-15).

Only one soil sample, which was collected in 1995 at a depth of 10 to 11 feet bgs, was analyzed for PCBs; the result was not validated. PCBs were not detected in this sample. Only three soil samples were analyzed for pesticides, which were EBS samples collected at depths greater than 7 feet bgs. The lack of PCB and pesticide data was not perceived as a data gap because Site 9 is mostly paved and the use of pesticides and PCBs was not identified at Site 9.

The quantity of data for metals in soil was considered sufficient to evaluate risk; however, thallium was nondetected in soil with detection limits elevated above residential PRGs (EPA 2002a).

5.3.2.2 Groundwater

Groundwater samples collected at Site 9 were analyzed for VOCs, SVOCs, PAHs, and metals (see Table 5-2). Of the samples collected and analyzed, results for 159 samples for VOCs and 70 samples for SVOCs were considered acceptable for use in this RI report. Results for 32 samples for PAHs and 52 filtered samples for metals also were considered acceptable for use in this RI report. No samples were analyzed for pesticides and PCBs. The lack of PCB and pesticide data was not perceived as a data gap because use of pesticides and PCBs was not identified at Site 9. Laboratory detection limits for some chemicals in groundwater exceeded residential PRGs (EPA 2002a); these exceedances are noted in Table 5-15. Detection limits for

some PAHs and VOCs detected in groundwater at a low frequency were significantly elevated over tap water PRGs and MCLs. Detection limits for some nondetected SVOCs and for nondetected thallium in groundwater also were elevated; detection limits for these chemicals were elevated in soil.

A subset of these groundwater data was selected for use in the risk assessments (see table below). Data were considered appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Data for groundwater were aggregated by contaminant plume rather than site. Data for groundwater later replaced with more current data were not included because they do not reflect current conditions at Site 9. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS were not used to evaluate risk because they were collected with DQOs that differ from the CERCLA investigations. At least four quarters of groundwater data from monitoring wells were used. However, if data were lacking for an analytical group, older data were included for all analytical groups. Groundwater data included samples collected from 1994 to 2003. Field and screening-level data typically were not used; however, data obtained using direct-push methods were used because of a lack of data from monitoring wells in the concentrated plume areas.

Numbers of Suitable Groundwater Data for Site 9 Risk Assessments

Analytical Group	Suitable for RI Report	Used in Risk Assessments
VOCs	159	44
SVOCs	70	37
PAHs	32	0
Pesticides and PCBs	0	0
Metals	52	30

As shown in the table above, large percentages of the data collected for each analytical group were excluded from the risk assessments based on criteria described in the paragraph prior to the table. For example, only 44 of the 159 samples for VOCs in groundwater were included, and 115 of these samples were excluded from the risk assessments. Of the 115 samples excluded, 83 were not validated; therefore, only 32 validated samples were excluded from the risk assessments. Sixteen of the 32 excluded validated samples represented old data that were replaced by more recent, representative data from monitoring wells. Another four of these samples were excluded because they were collected for the EBS from areas outside the contaminant plume identified in groundwater. The remaining 12 samples were excluded either because they were collected outside of the contaminant plume or were from grab groundwater samples that were less representative than data from nearby monitoring wells.

There is no perceived data gap for pesticides and PCBs because Site 9 is mostly paved and use of pesticides and PCBs was not identified at Site 9.

5.3.2.3 Soil Gas

Data for soil gas were collected to evaluate indoor air risk in the HHRA. Two soil gas samples were collected at Site 9 near the sampling location where maximum VOC concentrations were detected in groundwater at depths of 1.5 and 3.5 to 4 feet bgs. These samples were analyzed for VOCs and SVOCs (see Table 5-16). Detection limits for some of the nondetected chemicals exceeded PRGs for ambient air; however, SQLs were not set to meet the PRGs.

5.3.3 Site 9 Background Comparison

A background comparison was conducted for Site 9 by comparing a background data set with analytical results for metals in samples representative of Site 9. This comparison was used to determine if metals in soil and groundwater are statistically similar to background and could be considered to be either naturally occurring (background) or potentially resulting from historical site activities. The complete approach is presented in Appendix A and summarized previously in Section 3.4.3.

Metals that exceeded background in soil included barium, beryllium, and lead.

The statistical evaluation of lead in soil determined that lead at Site 9 is not background based on frequency of detection using the test of proportions. However, comparison of detection frequencies using only the test of proportions cannot be used to evaluate whether the distribution of concentrations measured at the site exceeds background. An important assumption of the test of proportions is that the censoring mechanism is the same for five of the highest eight measurements in the pooled site and that the background data set would need to come from the site data set for site concentrations of lead to be statistically elevated relative to background. In this case, only two of the highest eight measurements come from Site 9, and the maximum detected background concentration (41 mg/kg) is almost double the level measured at the site (22.2 mg/kg). Side-by-side outlier box plots and quantile tables (see Appendix A) were also used to show that the distribution of lead at Site 9 is well within ambient limits. In this case, the available evidence (that is, results of the quantile test, comparison of box plots and quantiles) suggests that concentrations of lead at Site 9 are below background.

Aluminum, barium, chromium, copper, iron, manganese, selenium, and vanadium exceeded background in groundwater at Site 9.

The statistical evaluation of manganese in groundwater determined that manganese concentrations at Site 9 are not background. A review of the range of concentrations shows that manganese concentrations at Site 9 are greater than manganese in the background data set. These elevated manganese concentrations may be attributable to reducing conditions associated with organic material present in the BSU and the marsh crust. With the exception of higher concentrations present in deeper groundwater at Site 9, there is no discernable pattern to the distribution of elevated manganese in groundwater. Manganese is not associated with site

activity, but its relatively high concentrations in deeper groundwater at Site 9 are likely due to reducing conditions at Site 9 and saltwater intrusion.

5.4 NATURE AND EXTENT OF CHEMICALS IN SOIL AND GROUNDWATER

This section summarizes the nature and extent of contamination in soil and groundwater at Site 9. The nature and extent evaluation summarizes (1) TPH detected at the site, (2) types and concentrations of CERCLA chemicals that most likely were used at the site, and (3) CERCLA chemicals that demonstrate significant risk to human health or the environment (also known as "risk drivers"). Only chemicals that pose risk to human health or the environment (see Appendices H and I) or relate to past site activity are discussed in the sections below. Section 5.4.2, Chemicals Used at Site 9, assisted the Navy in determining whether contamination "hot spots" were present at Site 9. The nature and extent of risk drivers, excluding those that may occur naturally at the site, are evaluated in Section 5.4.3. Risk drivers are those chemicals that pose a cancer risk above 1E-06 or an HI above 1 to human receptors or pose significant risk to ecological receptors. The evaluation of risk drivers includes (1) site-specific figures to assess the spatial distribution and concentration patterns of risk drivers and (2) a review of the figures, data, and site hydrology to identify the boundaries of the contamination, the volume of the affected media, and, if possible, the suspected source of the risk drivers at the site.

5.4.1 TPH

Although TPH is not a CERCLA contaminant, soil and groundwater were sampled at various locations across Site 9 and analyzed for TTPH, which includes all TPH-fractions (TPH as diesel, gasoline, jet fuel, or motor oil) and TPH-associated constituents (BTEX, lead, and MTBE) (see Figure 5-2). An evaluation of TPH in soil and groundwater at Site 9 was conducted based on the TPH strategy for Alameda Point (see Appendix F) to assess contamination and possible risk at the site. On the basis of this evaluation, further action is not warranted for soil at Site 9. Further action is warranted for groundwater at Site 9. TPH in groundwater is commingled with other CERCLA contaminants and should be further evaluated under the CERCLA program after the floating petroleum product is removed from Site 9.

Potential sources of TPH contamination at Site 9 include plane defueling inside and around Building 410; engine repair and vehicle and boat storage inside and outside of Building 410 by current lessee Nelson's Marine; IWTP 410, which received wastewater laden with oil from Building 410; the OWS-588; and eight associated ASTs that were used during IWTP processes and were located directly east of Building 588. IWTP 410 and associated ASTs and OWS were investigated and closed under RCRA in 1998. Other potential sources include OWS-410A and OWS-410B located south of Building 410.

Floating petroleum product was detected in four remedial action wells during November 2003. Wells P-9-MWS-04, F9SMW04, F9SMW-05, and 9-2 were installed as part of an interim remedial action to reduce concentrations of chlorinated hydrocarbons in groundwater at Site 9. Each of the four wells contained measurable floating petroleum product (see Figure 5-3). Concentrations of benzene detected in groundwater at 12 sampling locations (MW410-2,

SHP-S09-07, S09-DGS-DP04, S09-DGS-DP05, 9S-CH1, 9S-CH2, 9S-CH3, 9S-CH-4, P-9-IWSI-01, P-9MWS-01, P-9MWS-03, and P-9MWS-04) ranged from 1 to 5.6 µg/L. Toluene was detected at concentrations of 230 and 220 µg/L in groundwater samples from locations DHP-S09-06 and SHP-S09-10, respectively. Maximum concentrations of MTBE ranged from 6.8 to 40 µg/L in groundwater samples from locations MW410-2 and S09-DGS-DP08. Finally, lead was detected at concentrations of 88, 90, and 28.9 µg/L in groundwater samples from three sampling locations MW410-1, MW410-2, and SHP-S09-10, respectively.

5.4.2 Chemicals Used at Site 9

This section focuses on chemicals detected in soil and groundwater that were used historically at Site 9. Chemicals that most likely were used at Site 9 and their breakdown products include methylene chloride, phenol, 1,1,1-TCA, naphthalene, and other solvents such as PCE. Numerous releases of petroleum fuels likely associated with historical aircraft defueling were reported during interviews with site personnel during the EBS (IT 2001). These chemical concentrations and a general description of their extent are presented below by medium. Most of the chemicals detected across Site 9 are consistent with historical activities known to have occurred at the site, which included paint stripping and defueling. Statistical summaries of all results for soil, groundwater, and soil gas are presented in Tables 5-14, 5-15, and 5-16.

Soil

The table below lists the chemicals that most likely were used at Site 9 (or their breakdown components), the residential PRG (EPA 2002a), the range of concentrations detected in soil at the site, and the sampling locations where the maximum concentration of each chemical was detected. It also lists chemicals not detected in soil but detected in groundwater at Site 9. Figure 5-2 shows the sampling locations.

Soil Analytical Results for Chemicals Used at Site 9

Chemical	Residential PRG (mg/kg)	Range of Concentrations (mg/kg)	Sampling Location of Maximum Detected Concentration
1,1,1-TCA	1,200	Not Detected	Not applicable
1,1-DCA	2.8*	Not Detected	Not applicable
1,2-DCA	0.28	Not Detected	Not applicable
PCE	1.5	0.001 to 0.002	153-IW-002
Trichloroethylene	0.053	Not Detected	Not applicable
1,2-DCE (total)	43 (as cis-)	0.001 to 0.130	CPT–S09-10
Vinyl Chloride	0.079	Not Detected	Not applicable
1,2-Dichloropropane	0.34	Not Detected	Not applicable
1,2,3-Trichloropropane	120	Not Detected	Not applicable
Benzene	0.6	Not Detected	Not applicable
Ethylbenzene	8.9	0.002 to 0.200	B410-8
Toluene	520	0.002 to 0.730	B410-7
Xylene	270	0.002 to 3.100	CPT-S09-10

Soil Analytical Results for Chemicals Used at Site 9			
Chemical	**Residential PRG (mg/kg)**	**Range of Concentrations (mg/kg)**	**Sampling Location of Maximum Detected Concentration**
Chromium	210	0.019 to 0.178	CPT-S09-07
Naphthalene	56	0.035 to 0.170	9S-CH3
Methylene chloride	9.1	0.002 to 0.007.7	9S-CH3
Phenol	37,000	0.042	B410-5

Note: Residential PRG is provided for reference only. Risks are quantified in the HHRA section of this document.

* Denotes California-modified PRG

The maximum concentration of PCE was detected in a soil sample collected near former IWTP 410 that was located in the northeastern portion of Site 9 (see Figure 5-4). The maximum concentration of 1,2-DCE was detected in soil collected from the southeastern portion of the site near storm sewer and industrial wastewater lines connected to IWTP 410 (see Figure 5-2). Concentrations of PCE and the breakdown component 1,2-DCE (total) were detected only in these areas. No other detections were reported for these chemicals, and vinyl chloride and TCE were not detected in soil at Site 9.

Maximum concentrations of BTEX were detected in soil in the eastern portion of Site 9. Benzene was not detected in soil at the site. The maximum concentration of toluene was collected east of the eastern storm sewer line, and the maximum concentrations of ethylbenzene and xylene were collected to the west of the eastern storm sewer line (see Figure 5-2).

Although phenol and chromium were used during site operations, concentrations of these chemicals were detected in soil at Site 9 significantly below their PRGs. The maximum concentration of chromium was detected in a sample collected near a floor drain within Building 410. Phenol was detected in a sample collected near a storm sewer line located to the north of Building 410; this storm sewer line is connected to the building.

Groundwater

The table below lists the chemicals that were most likely used at Site 9, the tap water PRG (EPA 2002a), the range of concentrations detected in groundwater at the site, and the sampling location of the maximum concentration detected. Figures 5-2 and 5-3 show the groundwater sampling locations at Site 9. Chlorinated hydrocarbon plumes in groundwater are presented on Figure 5-7.

Groundwater Analytical Results for Chemicals Used at Site 9			
Chemical	**Tap Water PRG (µg/L)**	**Range of Concentrations (µg/L)**	**Sampling Location of Maximum Detected Concentration**
1,1,1-TCA	3,200	0.7 to 3	D09-01
1,1-DCA	2.0*	0.5 to 1,200	S09-DGS-DP02
1,2-DCA	0.12	0.5 to 0.7	S09-DGS-DP01

Groundwater Analytical Results for Chemicals Used at Site 9			
Chemical	**Tap Water PRG (µg/L)**	**Range of Concentrations (µg/L)**	**Sampling Location of Maximum Detected Concentration**
PCE	0.66	0.7 to 3	MW410-3
TCE	0.028	0.7 to 22	SHP-S09-09
1,2-DCE (total)	61 (as cis-)	0.5 to 2,400	SHP-S09-10
Vinyl chloride	0.02	0.5 to 280	9-1
DCP	0.16	2	DHP-S09-09
1,2,3-TCP	30	0.3	MW410-2
Benzene	0.34	0.58 to 5.6	P-9-MWS-04
Ethylbenzene	2.9	0.5 to 150	9S-CH3
Toluene	720	0.2 to 230	DHP-S09-06
Xylene	210	2 to 1,200	SHP-S09-10
Chromium	110	0.51 to 350	MW410-3
Naphthalene	6.2	0.9 to 29,000	SHP-S09-10
Methylene chloride	4.3	0.58 to 7.3	9-3
Phenol	22,000	7 to 59	S09-DGS-DP05

Note: Residential PRGs are provided for reference only. Risks are quantified in the HHRA section of this document.

DCP 1,2-dichloropropane

TCP 1,2,3-trichloropropane

Although 1,1,1-TCA was historically used in large quantities inside of Building 410, it was detected in only 2 of 159 groundwater samples at D09-01 and storm sewer sample 3J in 1995. It is likely that this compound chemically degraded into 1,1-DCA and 1,1-DCE. Of the 159 samples analyzed for 1,1,1-TCA, 133 contained less than the laboratory detection limit of 1 µg/L or lower. The detection limit for 22 of the 159 samples was 5 µg/L or lower.

1,1-DCA, a breakdown component of TCA, likely entered groundwater between 1958 and 1990 through leaks in the storm sewer and sanitary sewer lines, which were connected to Building 410. Groundwater samples from beneath Site 9 contained concentrations of 1,1-DCA (see Figure 5-8 and Table 5-17), suggesting that parent products that were discharged to shallow groundwater through the storm sewer and sanitary sewer lines east of Building 410 transformed to 1,1-DCA as the contaminants migrated downward and southwest with groundwater.

Concentrations of 1,1-DCA appear highest in groundwater between 30 and 45 feet bgs, west of Building 410 as shown on Figure 5-9. Shallow groundwater west of Building 410 contains lower concentrations of 1,1-DCA, suggesting no sources of groundwater contamination west of Building 410. The highest concentration (1,200 µg/L) was detected in a sample collected at 35 feet bgs from Hydropunch location S09-DGS-DP02. Concentrations of 1,1-DCA decrease with depth to below the laboratory reporting limit of 1 µg/L at 78 feet bgs. This location is approximately 80 feet west of Building 410. Samples collected farther west and southwest have decreasing but detectable concentrations within the depth interval of 30 to 40 feet bgs. The downgradient limit of this contamination plume is defined by location S09-DGS-DP03, which is approximately 250 feet west-southwest of Building 410. In addition, 1,1-DCA was not detected

in samples collected from the storm drain bedding material downgradient from the suspected source area at Site 9 (S09-DGS-VE01). Planned remedial action by chemical injection is expected to reduce concentrations of 1,1-DCA in groundwater at Site 9 by chemically destroying the compound. Of the 158 samples analyzed for 1,1-DCA, 101 contained less that the laboratory detection limit of 1 µg/L or lower. Nine additional samples contained less than the laboratory detection limit of 5 µg/L or lower.

The maximum concentrations of PCE, TCE, 1,2-DCE (total), and vinyl chloride were detected in groundwater in the area beneath or east of Building 410, adjacent to the storm sewer systems. The maximum concentrations of 1,1-DCA were detected within groundwater in the area west of and downgradient from Building 410. The compounds TCE, 1,2-DCE, and 1,1-DCA are likely breakdown components of 1,1,1-TCA and PCE, which were used in Building 410.

Groundwater samples from beneath Building 410 and west of the building contained concentrations of 1,1-DCE. This suggests that parent products discharged to shallow groundwater through the storm sewer and sanitary sewer lines east of Building 410 transformed to 1,1-DCE as the contaminants migrated downward and southwest with groundwater. This compound was detected at concentrations below the tap water PRG (EPA 2002a); however, its breakdown compound, vinyl chloride, is present at the same locations as 1,1-DCE, indicating that natural attenuation is occurring. Of the 159 samples analyzed for 1,1-DCE, 117 contained less than the laboratory detection limit of 1 µg/L or lower. Twenty-three additional samples contained less than the laboratory detection limit of 10 µg/L or lower.

DCP and TCP were detected in only one sample. DCP was detected east of Building 410 and TCP beneath Building 410. TCP was detected at a concentration below the PRG.

BTEX in groundwater may be the result of paint stripping activities at Building 410, petroleum releases associated with aircraft defueling, or the current tenant. The maximum concentrations of benzene, toluene, and xylene were detected in groundwater samples collected in the area beneath or east of Building 410, near the storm sewer systems. Of the 63 samples analyzed for toluene, 57 contained less than the laboratory detection limit of 5 µg/L or lower.

Dissolved chromium was detected at concentrations above the PRG of 110 µg/L for total chromium in groundwater collected near a storm sewer in the northern portion of the site.

Phenol was detected in groundwater beneath Building 410 at concentrations below the PRG of 22,000 µg/L.

Methylene chloride was detected at concentrations that exceed the PRG; however, there is no discernable pattern in the distribution and concentrations. Methylene chloride was detected in 40 of the 159 groundwater samples analyzed for methylene chloride; however, it was also present in the method blank ("B" qualified) for all of these samples. Only two of these samples (design data points 9-3 and 9S-CH2) contained methylene chloride at concentrations greater than the PRG. Design data points were not validated and therefore not included in the risk assessments.

Of the groundwater samples not detected for methylene chloride, only 15 had laboratory detection limits greater than the PRG of 4.3 µg/L. Of these 15 elevated detection limits, 11 were at 10 µg/L or less and 8 were 5 µg/L or less.

Remedial efforts under a CERCLA non-time-critical removal action are addressing dissolved phase chlorinated solvents in groundwater. The results of the shallow pilot test indicated that concentrations of trimethylbenzene, vinyl chloride, benzene, 1,1-DCA, and 1,2-DCE in shallow groundwater were effectively reduced.

5.4.3 Risk Drivers

Although numerous chemicals were detected at Site 9, most of the chemicals do not pose significant risk as defined by the risk assessments. As a result, the purpose of this section is to further characterize the nature and extent of CERCLA chemicals driving risk at Site 9 that are not background. Selection of these chemicals was based on the background comparison for metals and results of the HHRA and ERA. Based on the HHRA, arsenic was identified as a risk driver in soil and 1,2-DCP, 2-methylnaphthalene, 4-methylphenol, 1,2,3-trichloropropane, antimony, arsenic, benzene, manganese, naphthalene, PAHs, PCE, PCP, TCE, and vinyl chloride were identified as risk drivers in groundwater. No chemicals were determined to pose risk to terrestrial ecological receptors. Arsenic in soil and antimony and arsenic in groundwater are attributed to background, so the nature and extent of these metals was not evaluated further.

5.4.3.1 Risk Drivers in Soil

No risk drivers were identified for soil.

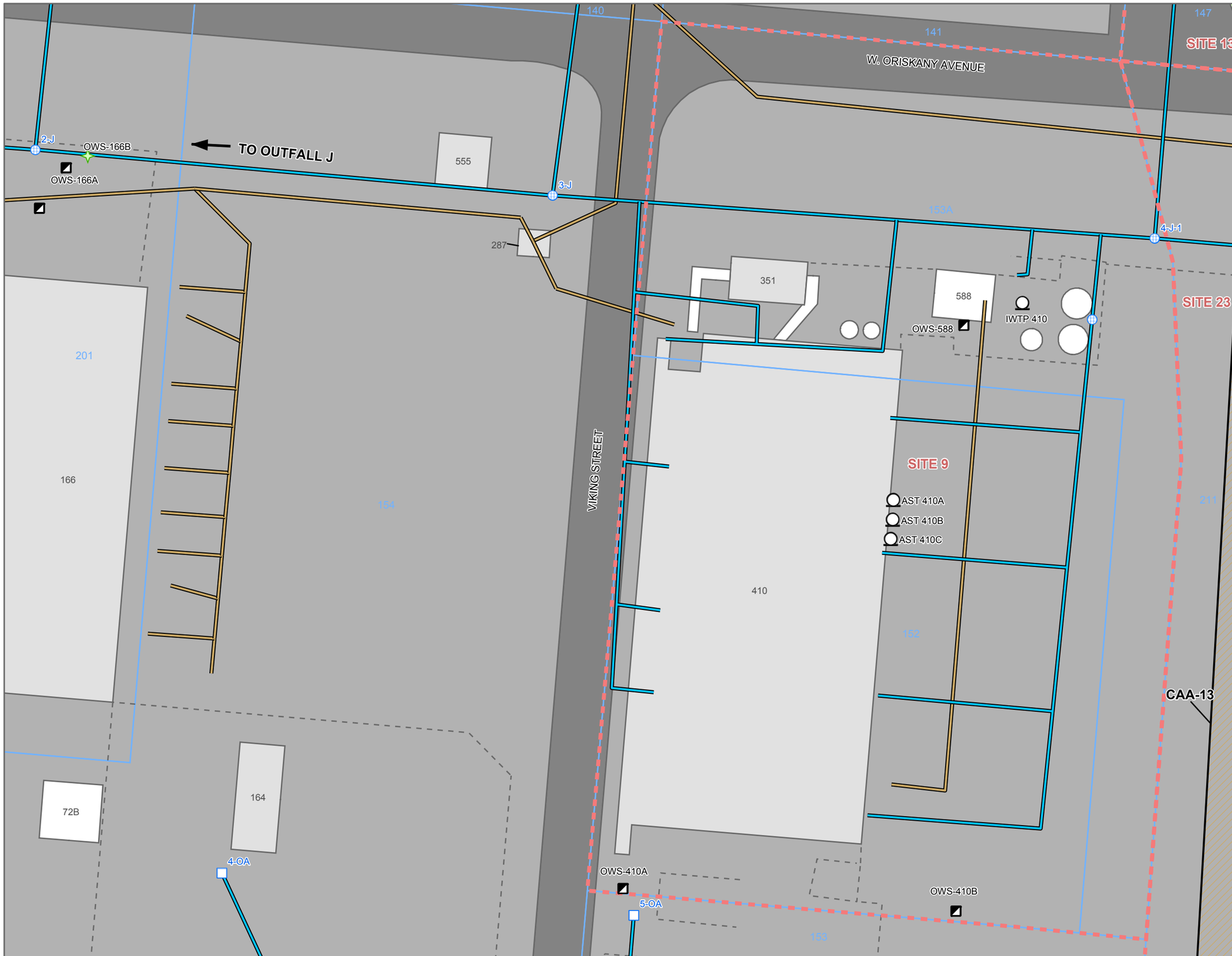
5.4.3.2 Risk Drivers in Groundwater

The following discussions focus on the nature and extent of 1,2-DCP; 2-methylnaphthalene, 4-methylphenol, 1,2,3-trichloropropane; benzene; manganese; naphthalene; PAHs; PCE; PCP; TCE; and vinyl chloride in groundwater. 1,2 DCE is discussed because it is a breakdown component of the chemicals identified as risk drivers. TCA is discussed because it is a parent compound of risk drivers.

PAHs

The following five PAH compounds were detected in grab groundwater samples collected from borings (S09-DPS-01 through S09-DPS-05) at Site 9:

- BaP (between 0.3 to 2.5µg/L)
- Benzo(a)anthracene (0.1 to 1 µg/L)
- Benzo(b)fluoranthene (0.2 to 2 µg/L)



ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

- Unpaved
- Paved
- Road

BUILDING

- Present
- Removed

Note:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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FIGURE 5-1
SITE 9 FEATURES

Operable Unit 2A
Remedial Investigation Report

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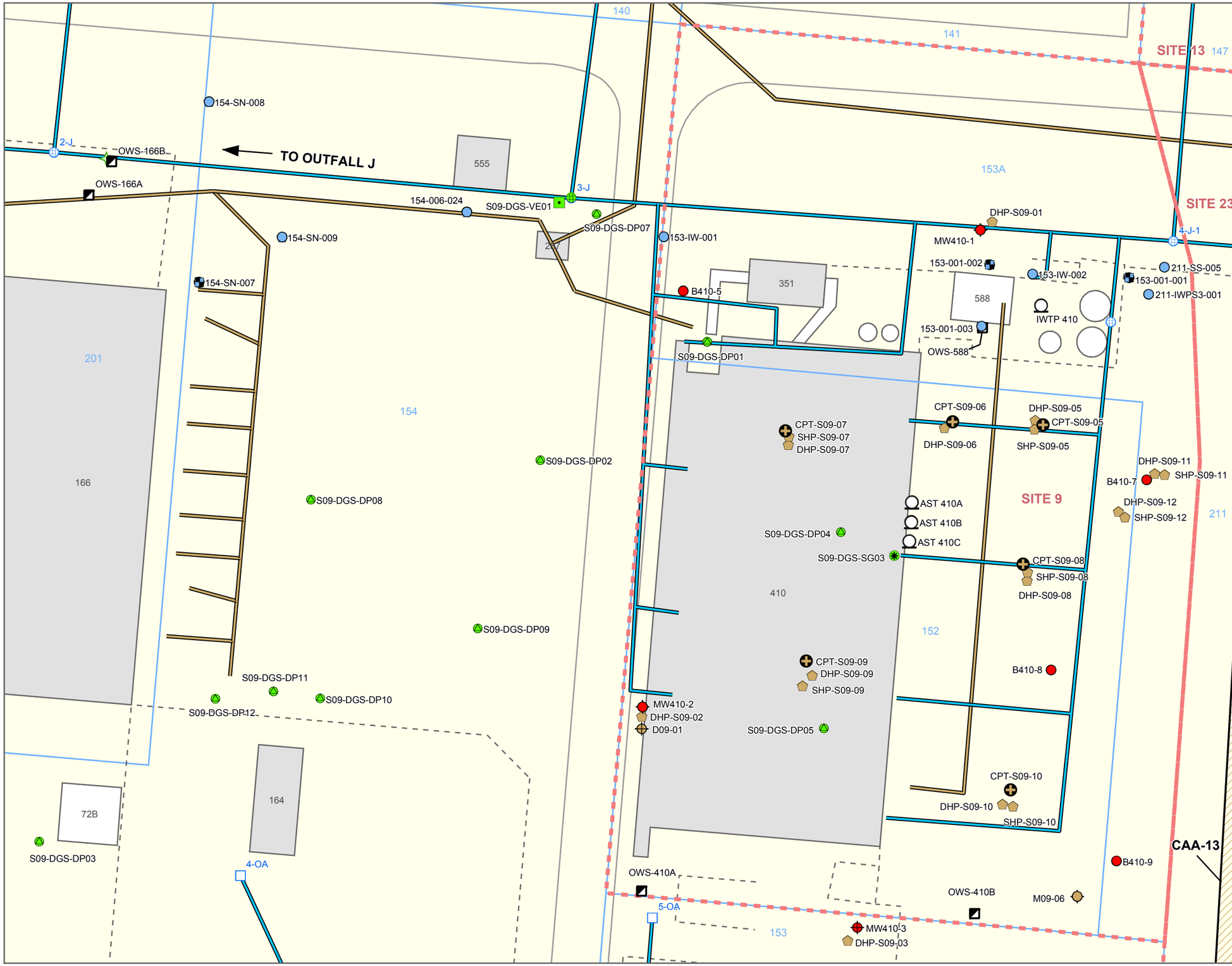

SAMPLE LOCATION
- Direct-Push
- Hydropunch
- Monitoring Well
- Vacuum Extraction
- Soil Boring
- Soil Gas
- Soil Punch

SAMPLE INVESTIGATION
- Phase 1 & 2A, 1991
- Follow-On Investigation 1994
- Follow-On Investigation 1998
- Data Gap Sampling 2001
- Environmental Basline Survey (EBS) 2001

ABOVEGROUND STORAGE TANK (AST)
- Removed
- OIL-WATER SEPARATOR (OWS)
- CATCH BASIN
- MANHOLE
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Former

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

25 0 25 50 Feet

N

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FIGURE 5-2
SITE 9 REMEDIAL INVESTIGATION AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

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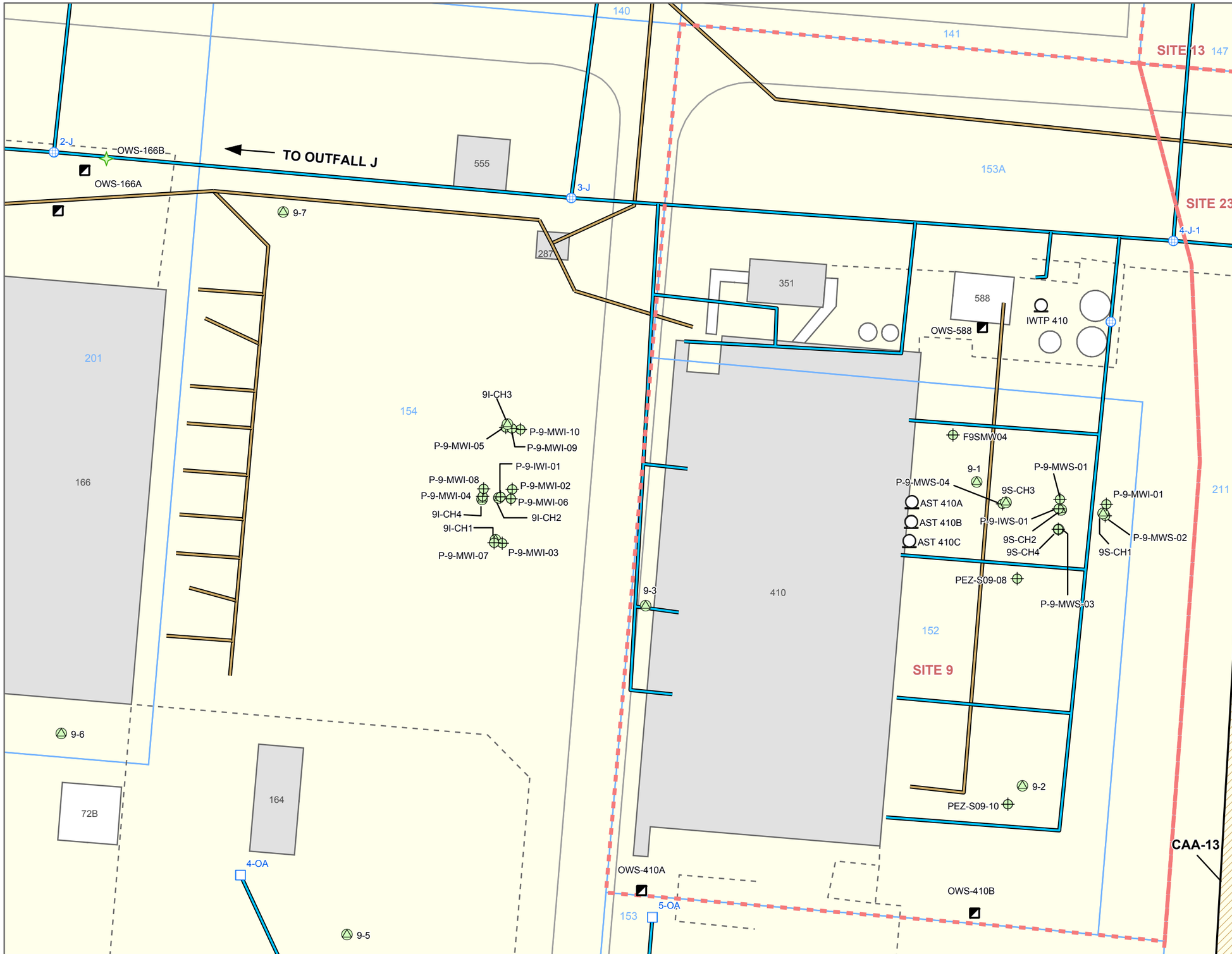

SAMPLE LOCATION

- Direct-Push
- Monitoring Well

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Former

Note:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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FIGURE 5-3
SITE 9 CHEMICAL OXIDATION PILOT TEST DATA POINTS

Operable Unit 2A
Remedial Investigation Report

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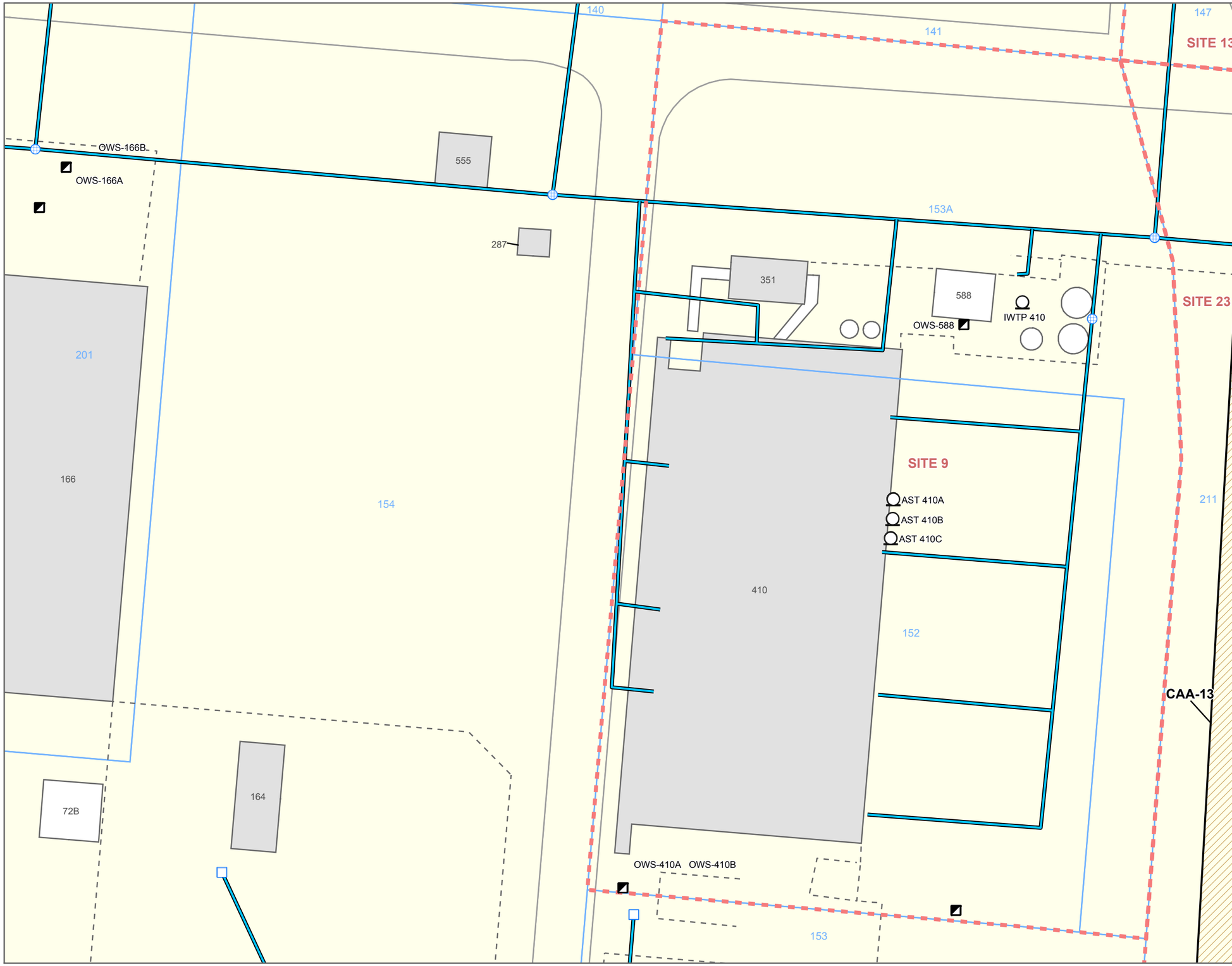

CONDITION OF LINE

Unclassified

ABOVEGROUND STORAGE TANK (AST)

Removed

CATCH BASIN

MANHOLE

OIL WATER SEPARATOR (OWS)

FENCE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL

LAND COVER

BUILDING

Present

Former

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

25 0 25 50 Feet

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FIGURE 5-4
SITE 9
CONDITIONS OF STORM SEWERS

Operable Unit 2A
Remedial Investigation Report

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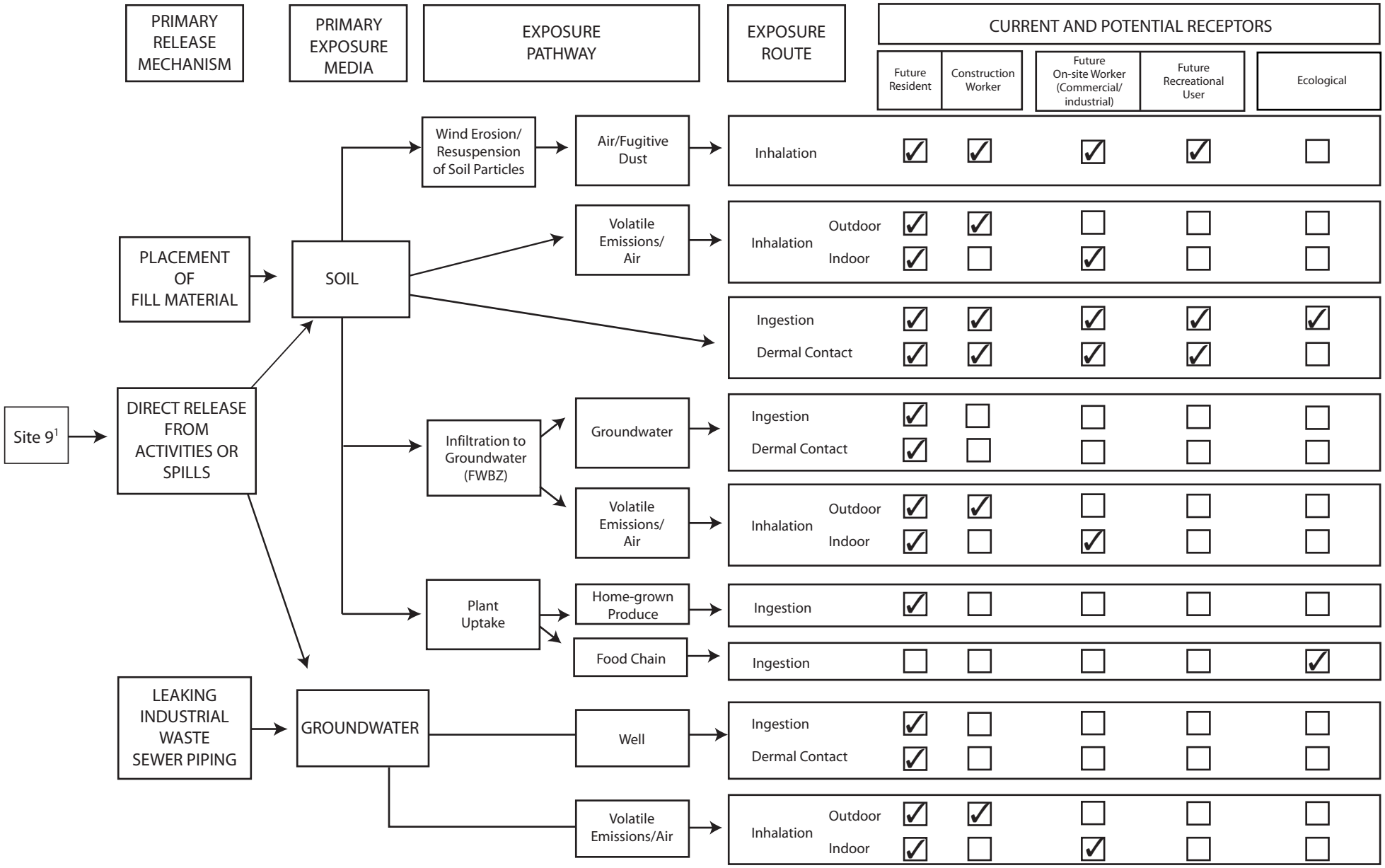

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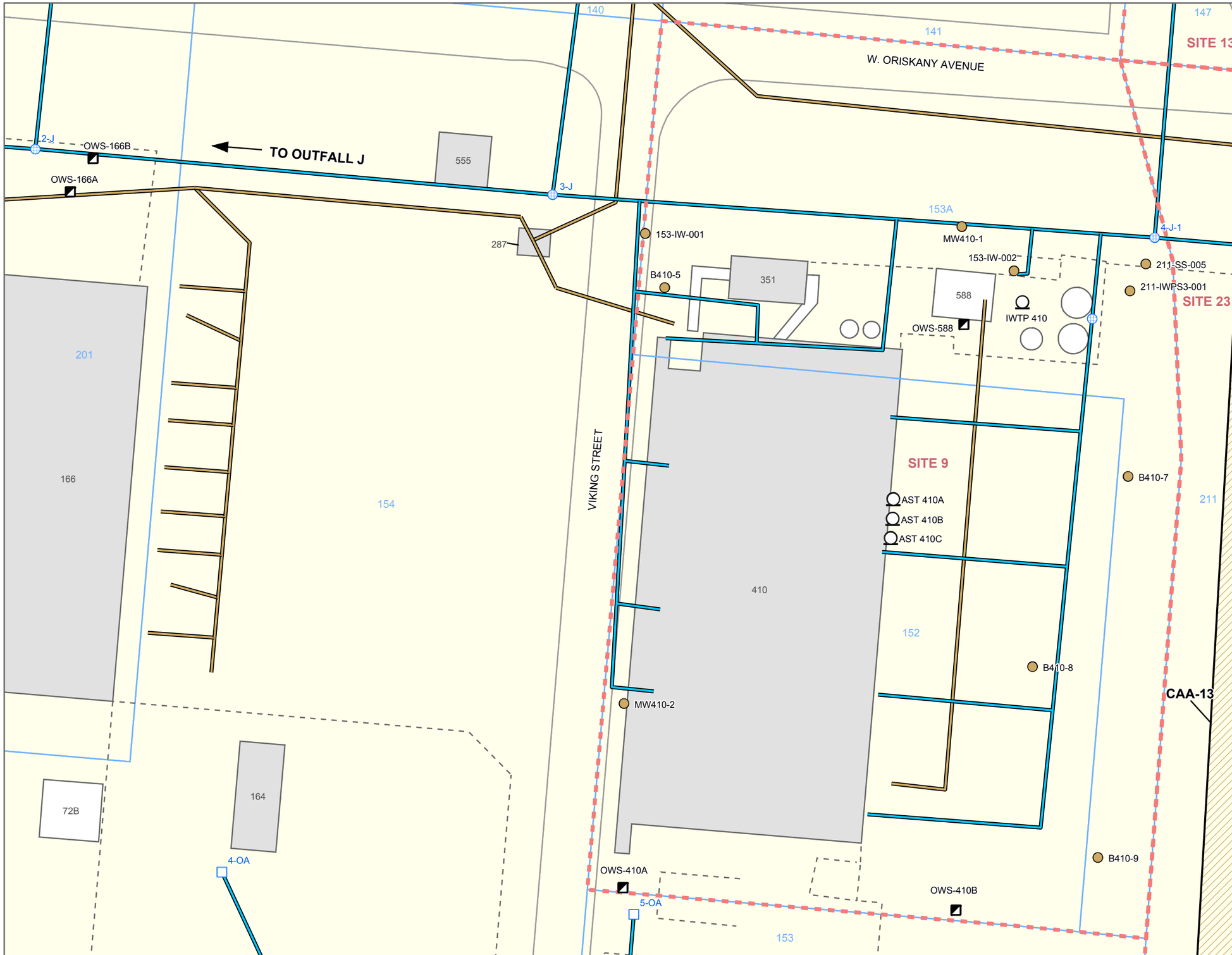
FIGURE 5-5
SITE 9 CONCEPTUAL SITE MODEL
Operable Unit 2A
Remedial Investigation Report

[1]Building 410, paint stripping, historical defueling and storage activities, fill material

☑ Potentially Complete Exposure Pathway



SAMPLING LOCATION

- Soil Boring

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
SVOC = Semivolatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 5-6A
SITE 9 SAMPLING LOCATIONS FOR SVOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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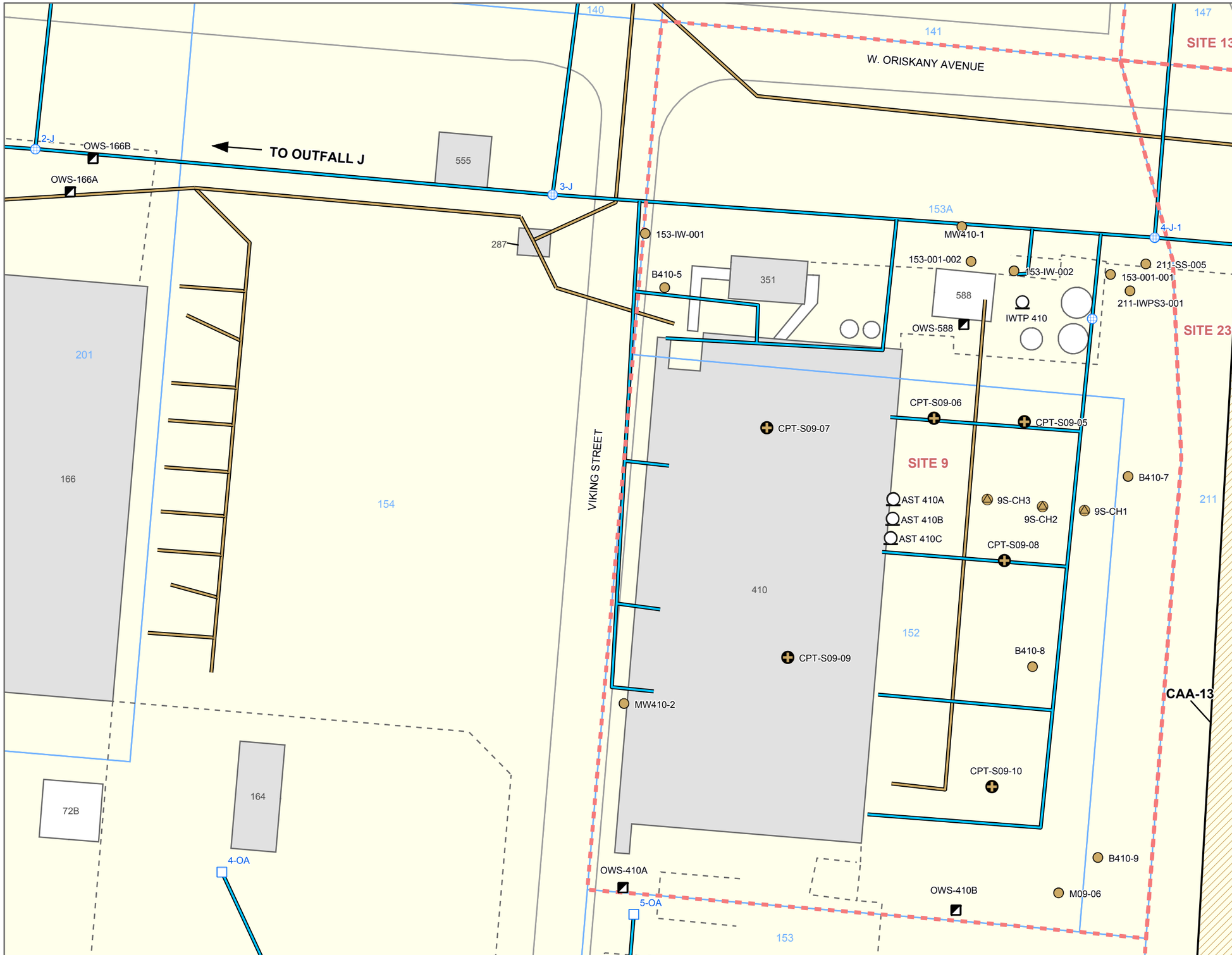

SAMPLING LOCATION
- Direct-Push
- Soil Boring
- Soil Punch

ABOVEGROUND STORAGE TANK (AST)
- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
VOC = Volatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 5-6B
SITE 9 SAMPLING LOCATIONS FOR VOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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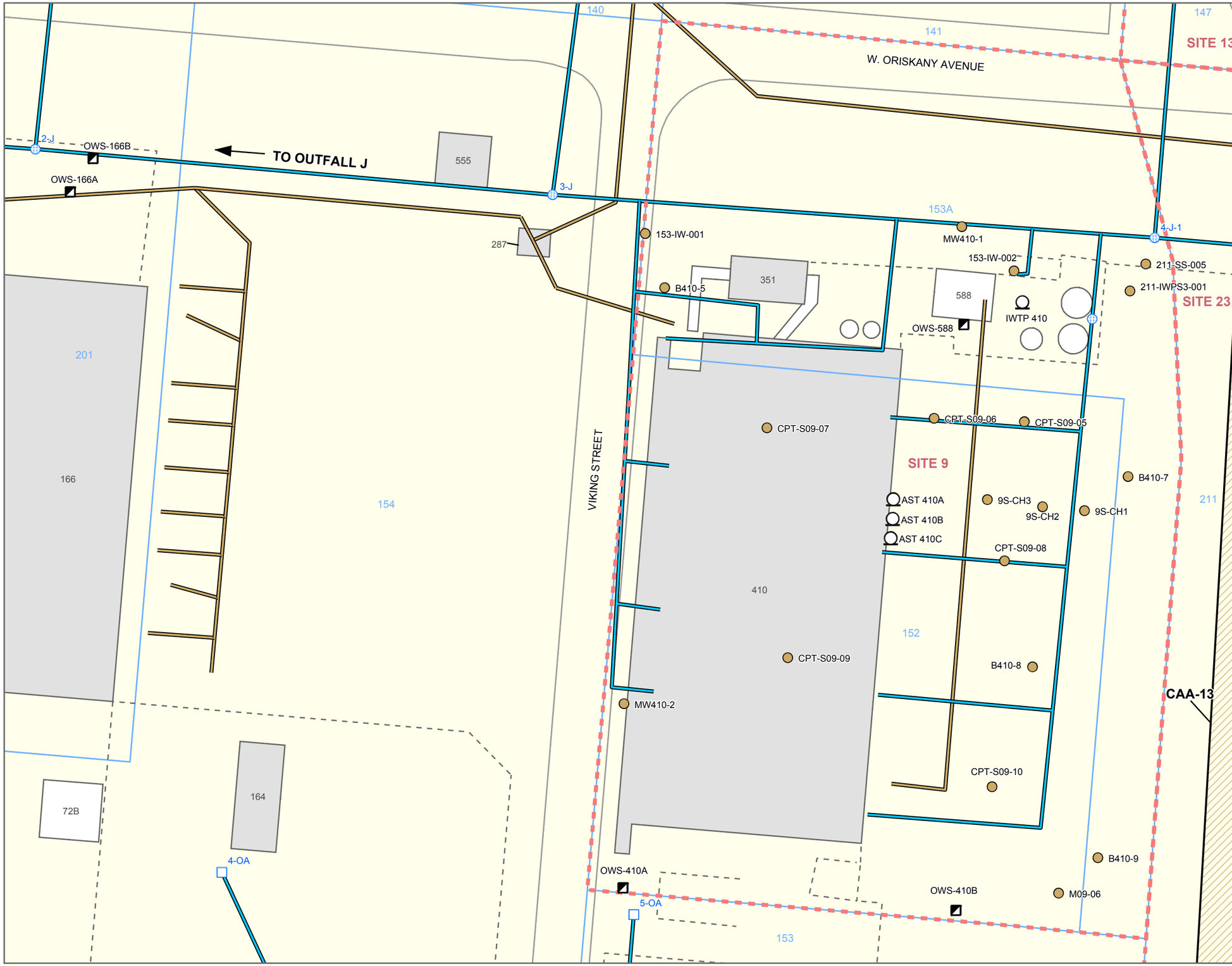

SAMPLING LOCATION
- Soil Boring

ABOVEGROUND STORAGE TANK (AST)
- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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FIGURE 5-6C
SITE 9 SAMPLING LOCATIONS FOR METALS IN SOIL

Operable Unit 2A
Remedial Investigation Report

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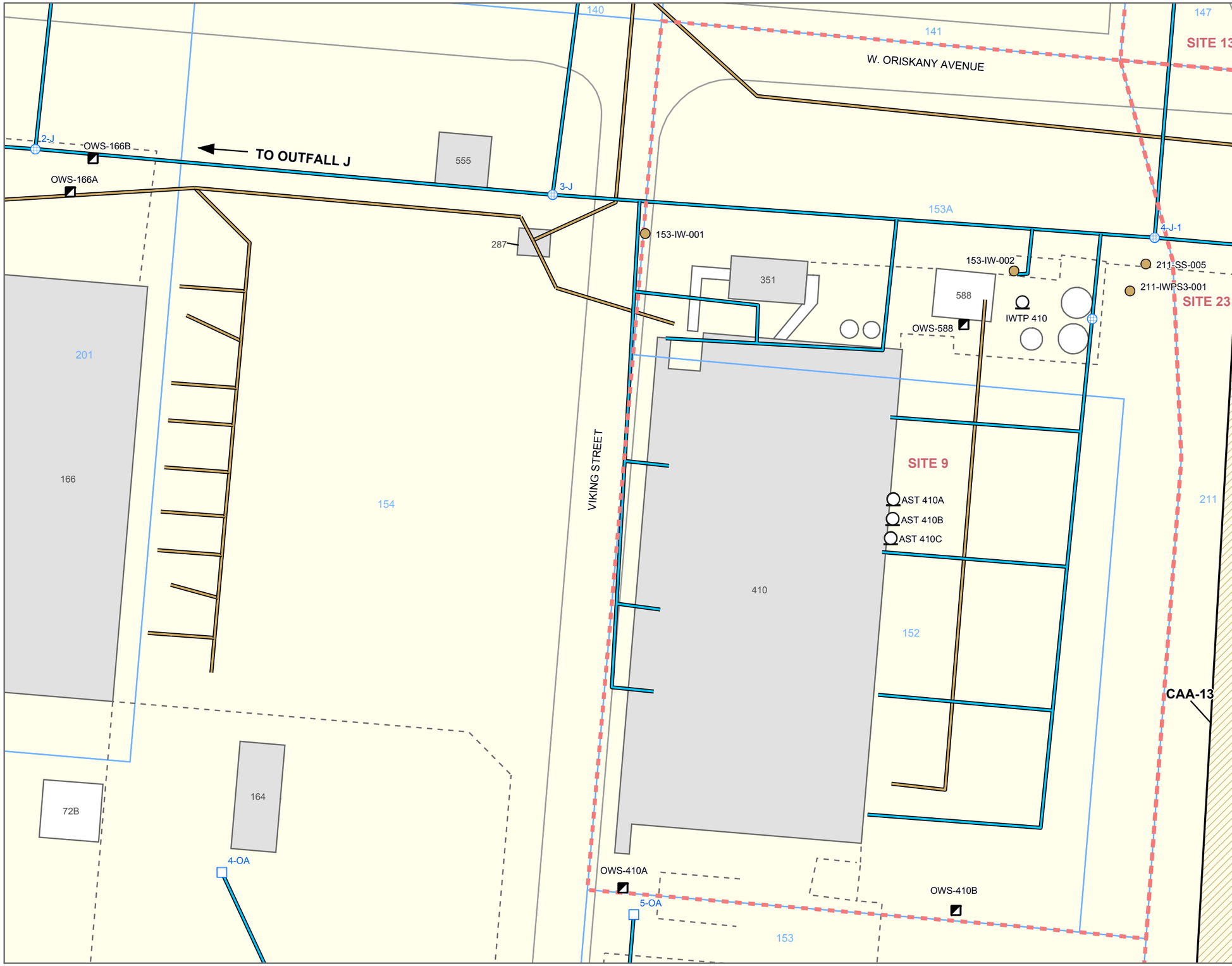

SAMPLING LOCATION

- Soil Boring

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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FIGURE 5-6D
SITE 9 SAMPLING LOCATIONS FOR PESTICIDES IN SOIL

Operable Unit 2A
Remedial Investigation Report

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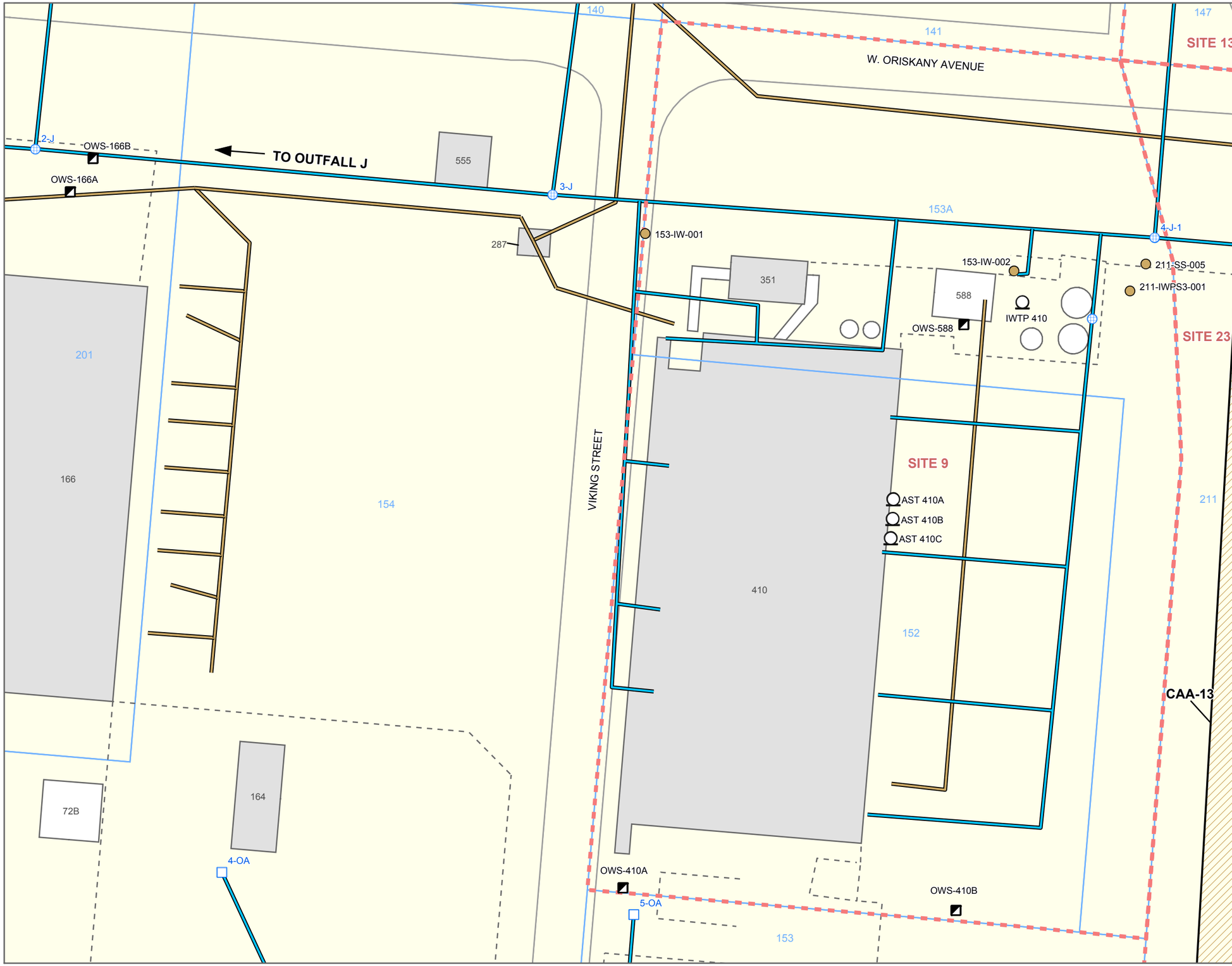

SAMPLING LOCATION
- Soil Boring

ABOVEGROUND STORAGE TANK (AST)
- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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FIGURE 5-6E
SITE 9 SAMPLING LOCATIONS FOR PCBs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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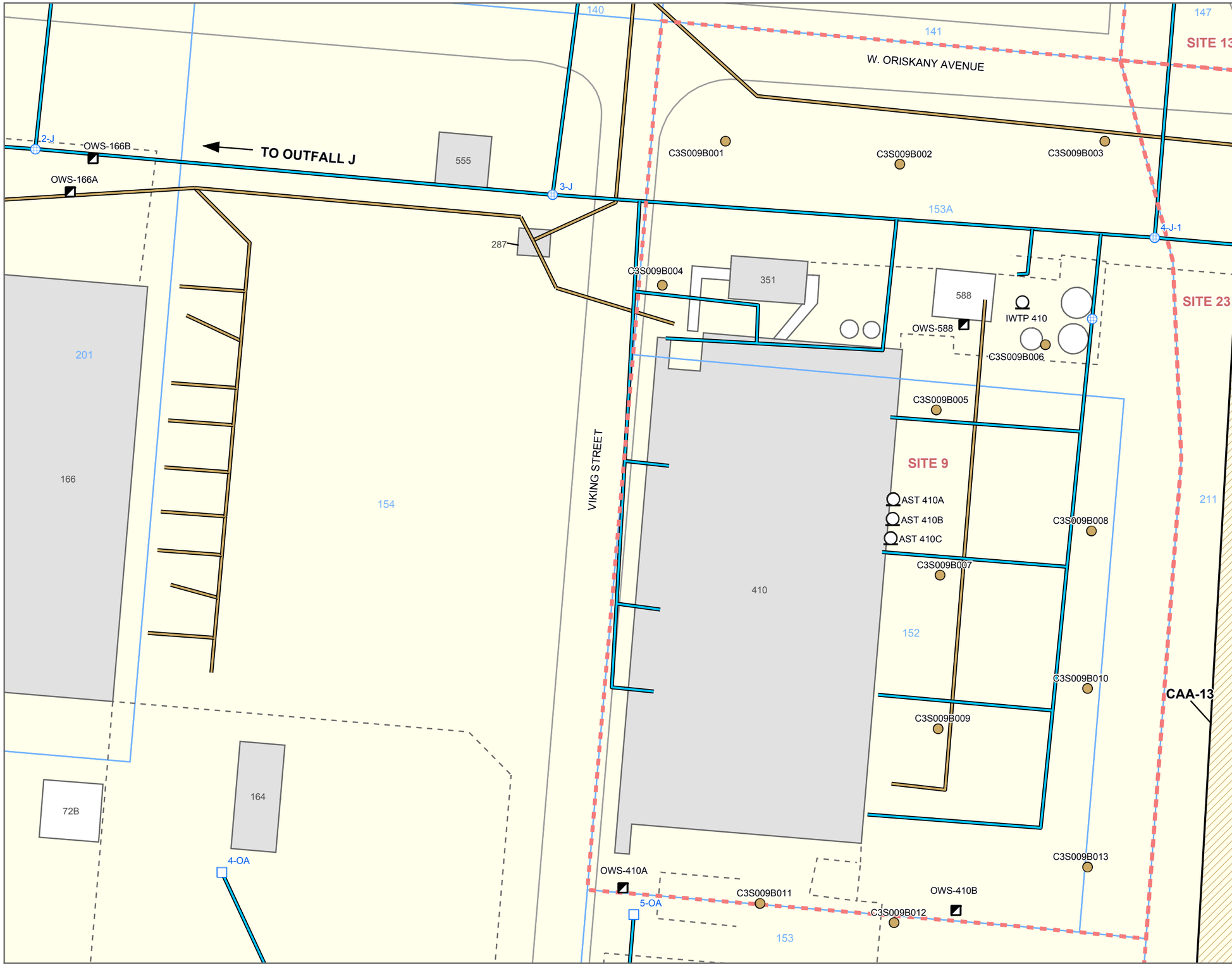

SAMPLING LOCATION

- Soil Boring

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
PAH = Polynuclear Aromatic Hydrocarbon

N

25 0 25 50 Feet

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FIGURE 5-6F
SITE 9 SAMPLING LOCATIONS FOR PAHs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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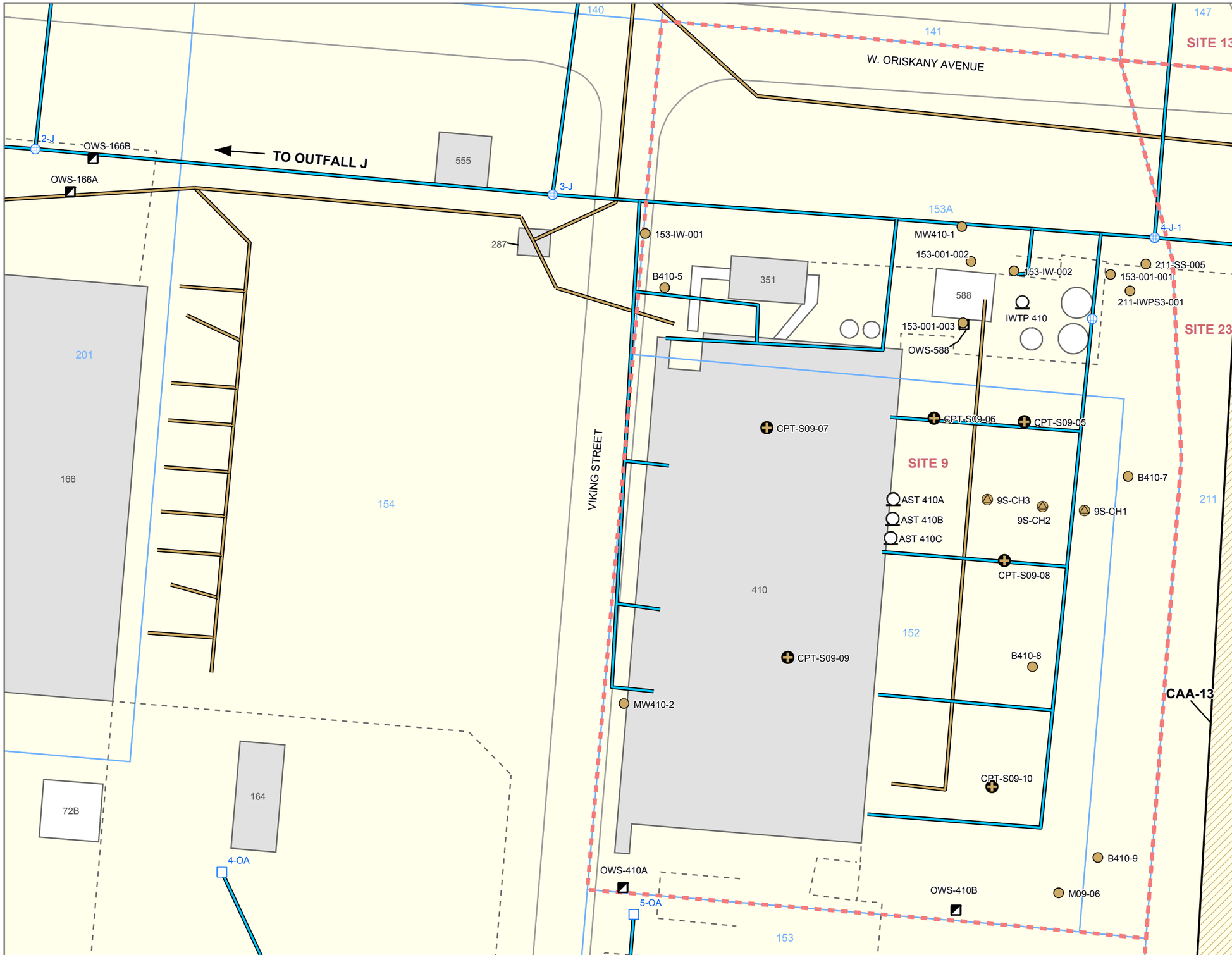

SAMPLING LOCATION
- Soil Boring
- Direct Push
- Soil Punch

ABOVEGROUND STORAGE TANK (AST)
- Removed

- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
TPH = Total Petroleum Hydrocarbons

N

25 0 25 50 Feet

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FIGURE 5-6G
SITE 9 SAMPLING LOCATIONS FOR TPH IN SOIL

Operable Unit 2A
Remedial Investigation Report

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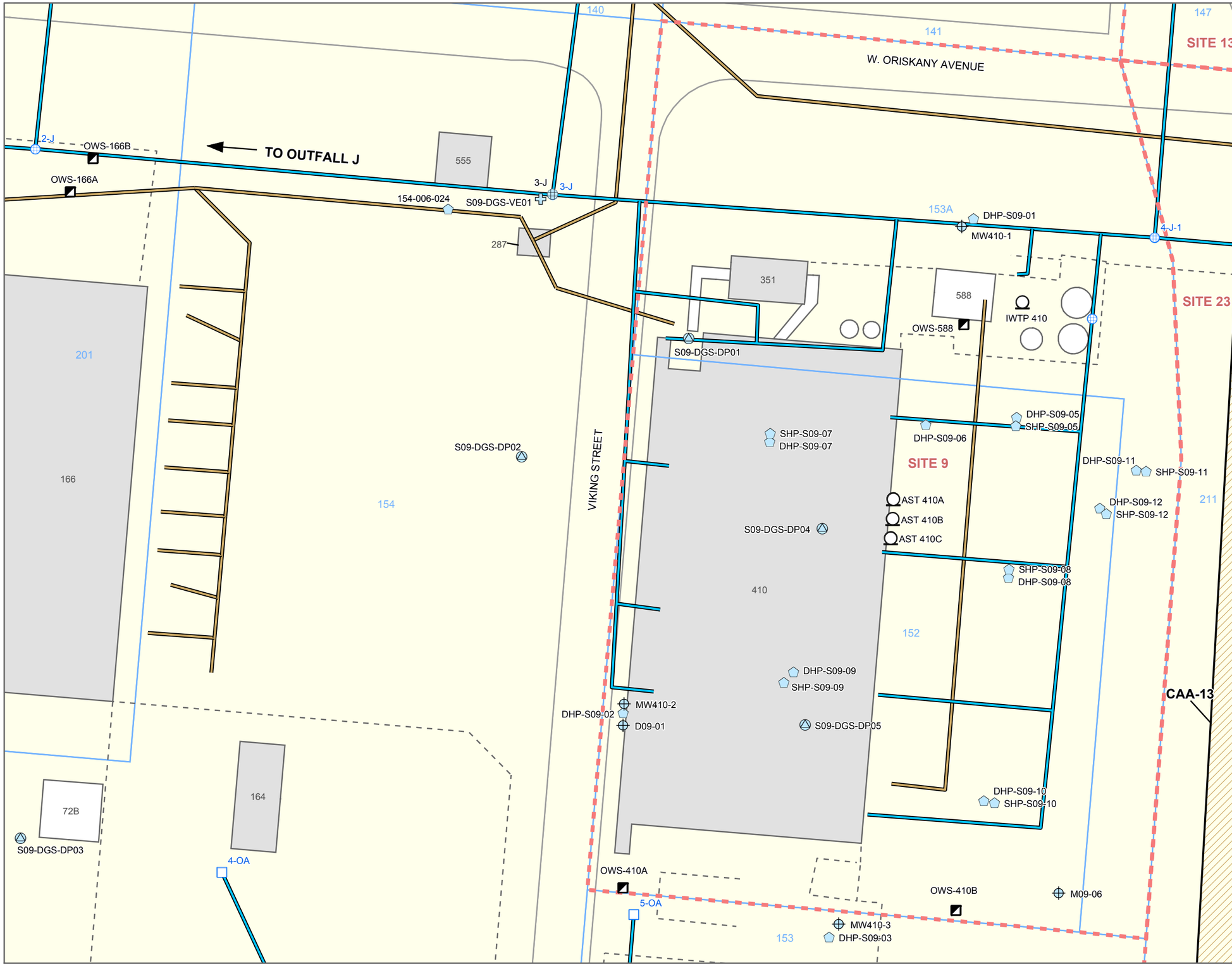

SAMPLING LOCATION
- Direct-Push
- Hydropunch
- Man Hole/Storm Drain
- Monitoring Well
- Vacuum Extraction

ABOVEGROUND STORAGE TANK (AST)
- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
SVOC = Semivolatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 5-6H
SITE 9 SAMPLING LOCATIONS FOR SVOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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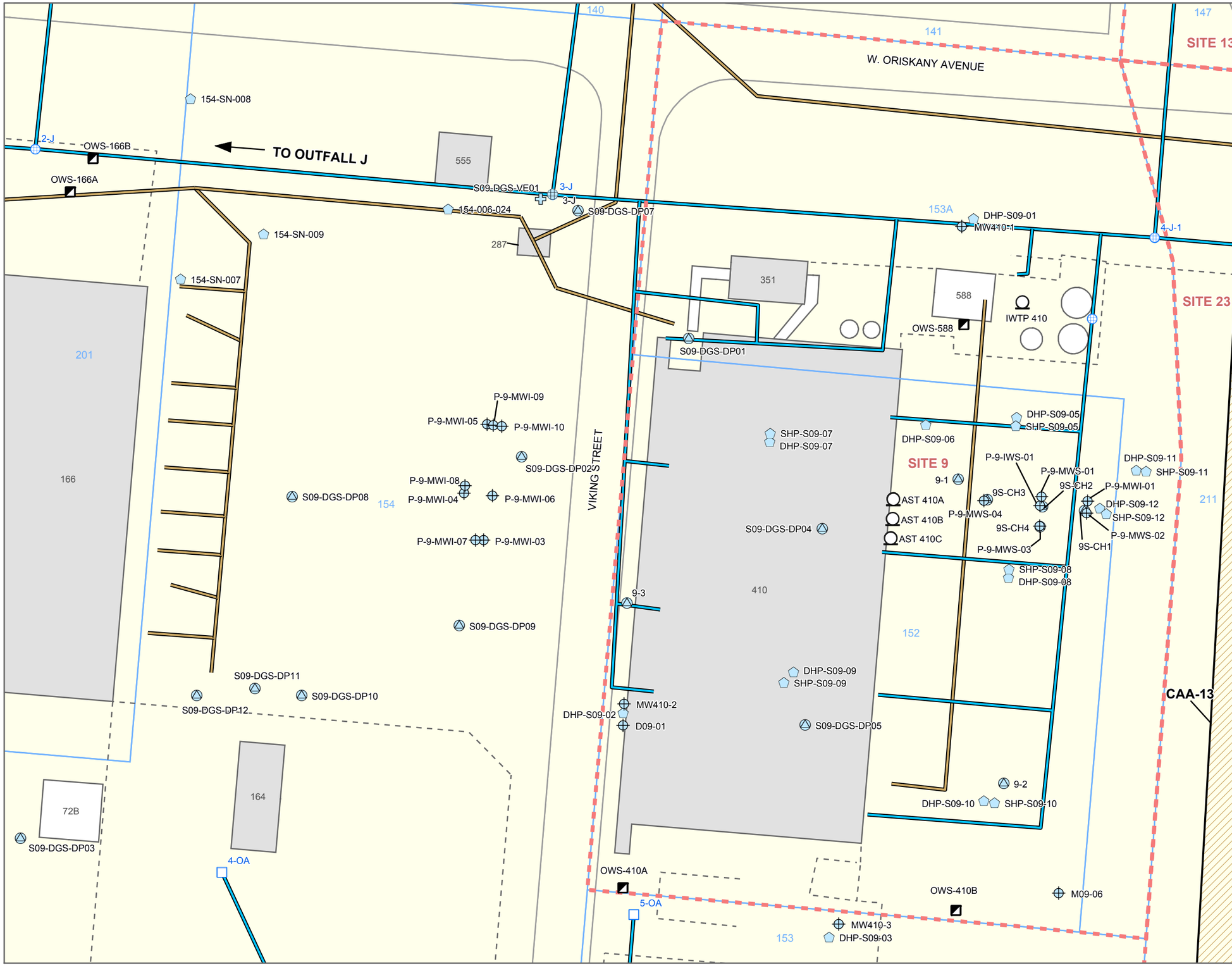

SAMPLING LOCATION
- Direct-Push
- Hydropunch
- Man Hole/Storm Drain
- Monitoring Well
- Vacuum Extraction

ABOVEGROUND STORAGE TANK (AST)
- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
VOC = Volatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 5-6I
SITE 9 SAMPLING LOCATIONS FOR VOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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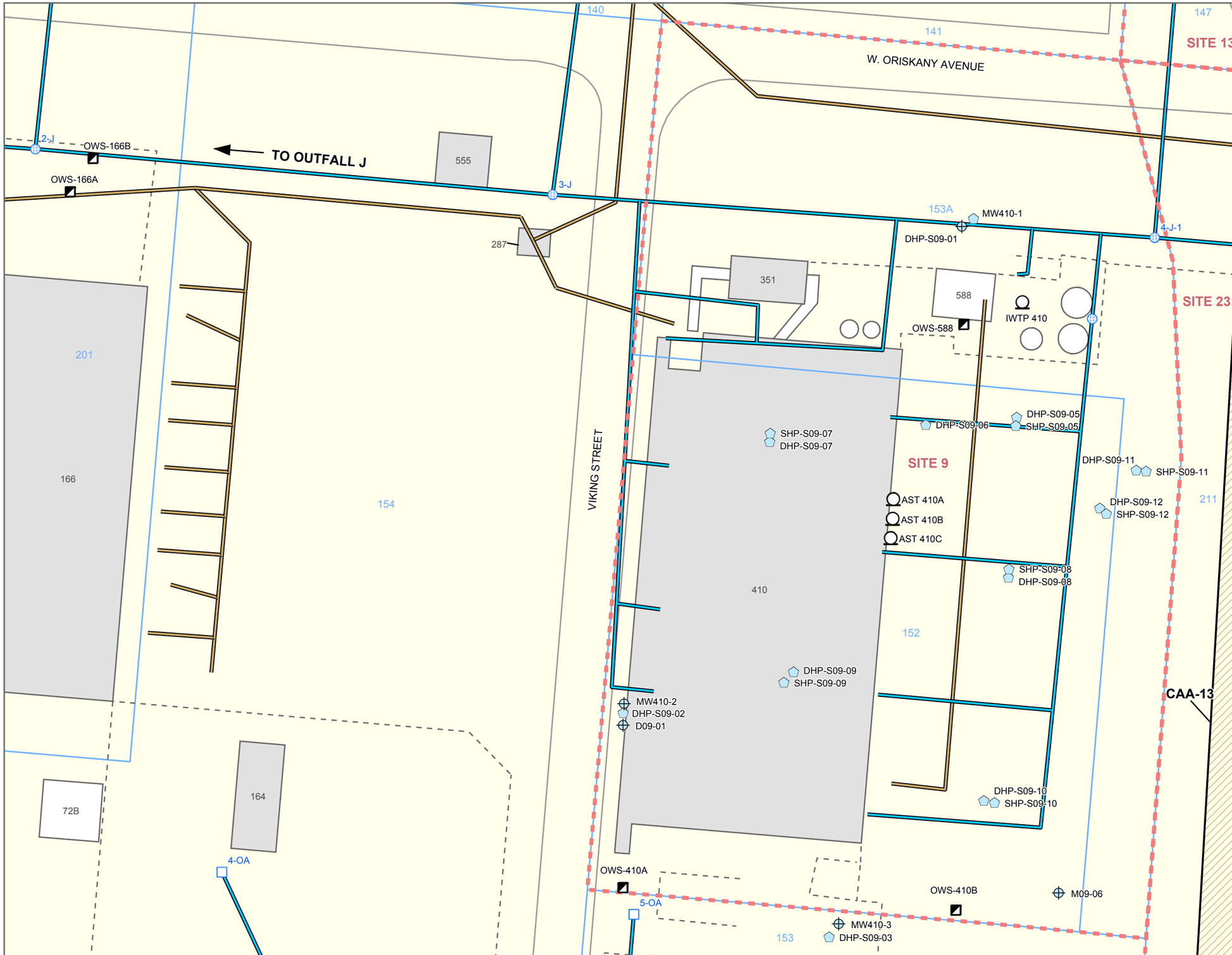

SAMPLING LOCATION

- Hydropunch
- Monitoring Well

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

25 0 25 50 Feet

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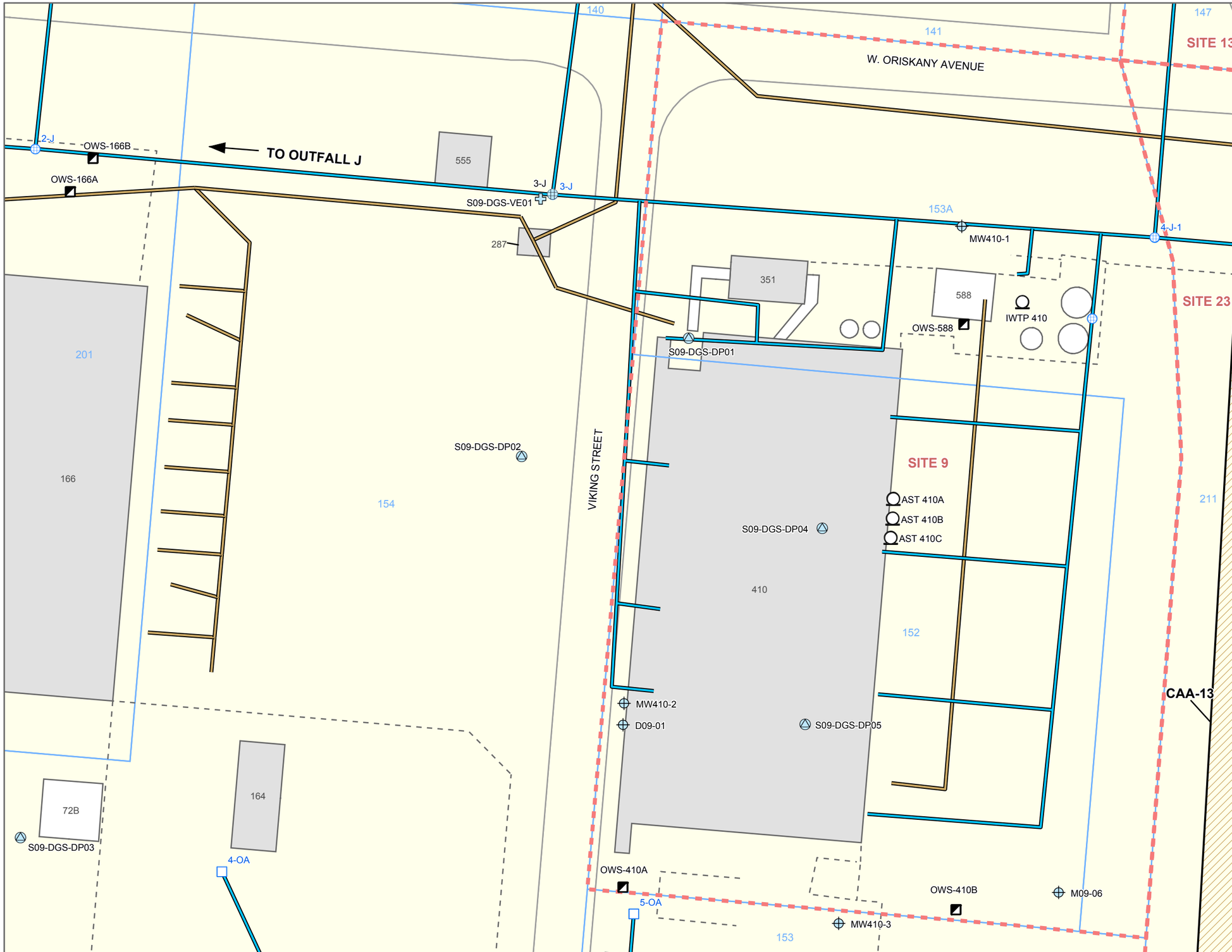
FIGURE 5-6J
SITE 9 SAMPLING LOCATIONS FOR METALS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

12/14/2004 U:\almda_sa\DO028\OU2A\RI\mxd\fig05-6J_s09_gw_metal.mxd TtEMI-SA T. Munley



SAMPLING LOCATION

- Direct-Push
- Man Hole/Storm Drain
- Monitoring Well
- Vacuum Extraction

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
PAH = Polynuclear Aromatic Hydrocarbon

N

25 0 25 50 Feet

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FIGURE 5-6K
SITE 9 SAMPLING LOCATIONS FOR PAHs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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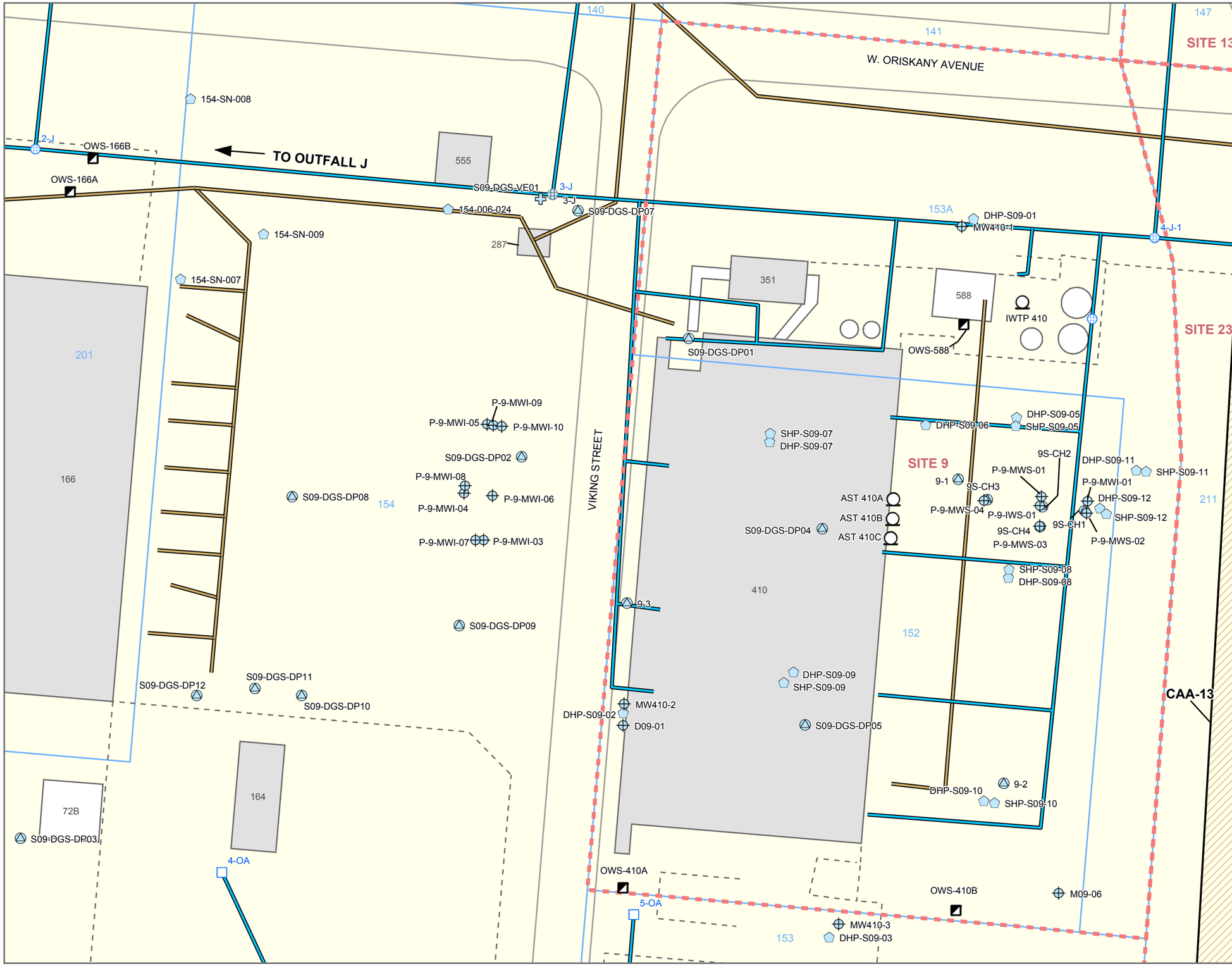


SAMPLING LOCATION

- Man hole Storm Drain
- Vacuum Extraction
- Hydropunch
- Direct Push
- Monitoring Well

ABOVEGROUND STORAGE TANK (AST)

- Removed
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
TPH = Total Petroleum Hydrocarbons

N

25 0 25 50 Feet

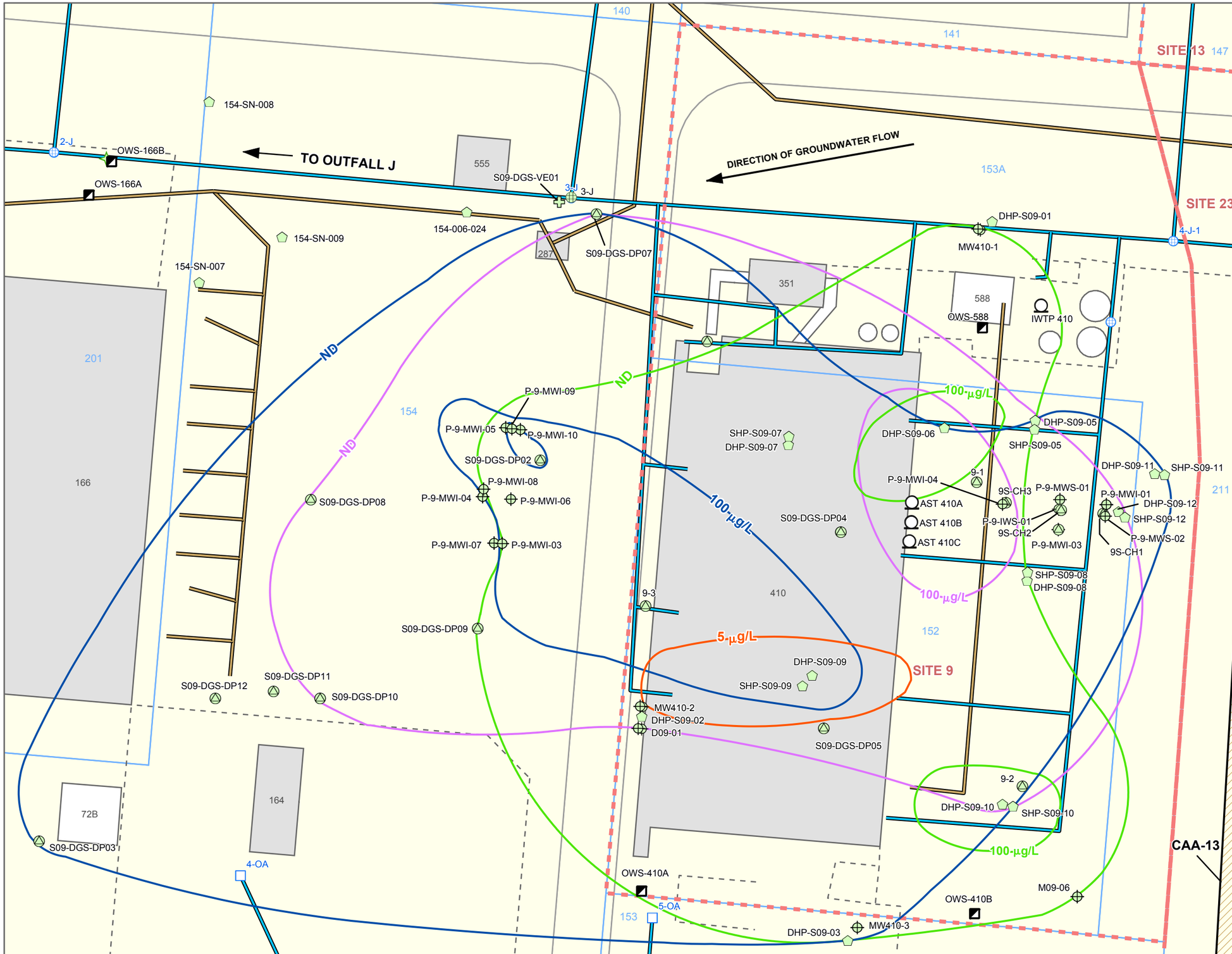
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 5-6L
SITE 9 SAMPLING LOCATIONS FOR TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

12/16/2004 U:\almda_sa\DO028\OU2A\RI\mxd\fig05-6L_s09_gw_tph.mxd TtEMI-SA T. Munley



SAMPLE LOCATION

- Direct-Push
- Hydropunch
- Manhole / Storm Drain
- Monitoring Well
- Vacuum Extraction

ABOVEGROUND STORAGE TANK (AST)

- Removed
- OIL-WATER SEPARATOR (OWS)
- CATCH BASIN
- MANHOLE
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- 1,1-DICHLOROETHANE PLUME
- 1,2-DICHLOROETHENE PLUME
- TRICHLOROETHENE PLUME
- VINYL CHLORIDE PLUME
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Former

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
Groundwater data used in the RI was collected between 1990 and April 2003.
IWTP = Industrial Waste Treatment Plant
ND = Non-detect
µg/L = Micrograms per liter

25 0 25 50 Feet

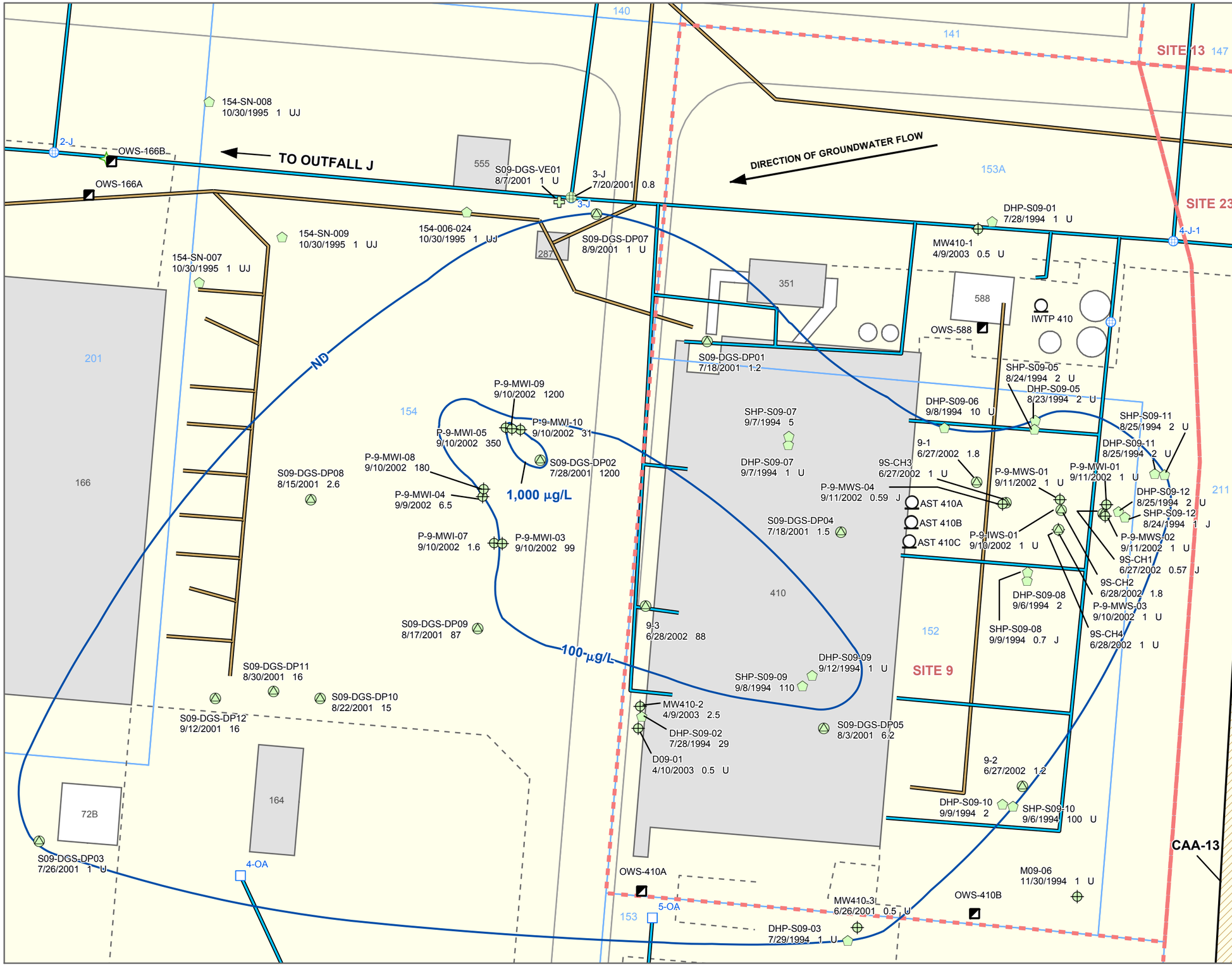
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 5-7
SITE 9 CHLORINATED HYDROCARBON GROUNDWATER PLUMES

Operable Unit 2A
Remedial Investigation Report

2004-12-28 U:\almda_sa\DO028\OU2A\ri\mxd\fig05-07_s09_ hydro_plumes.mxd TtEMI-SA K. Johnson



SAMPLE LOCATION

- Direct-Push
- Hydropunch
- Manhole / Storm Drain
- Monitoring Well
- Vacuum Extraction

ABOVEGROUND STORAGE TANK (AST)

- Removed
- OIL-WATER SEPARATOR (OWS)
- CATCH BASIN
- MANHOLE
- 1,1-DICHLOROETHANE (DCA) PLUME
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Former

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
J = Estimated
ND = Non-detect
µg/L = Micrograms per liter
U = Not detected

See cross section, Figure 5-9. Full data are presented in Table 5-5 1,1-DCA.

Concentrations presented are either most recent monitoring well data or highest concentration detected in grab groundwater samples from a single point.
Groundwater data used in the RI were collected between 1990 and April 2003.

25 0 25 50 Feet

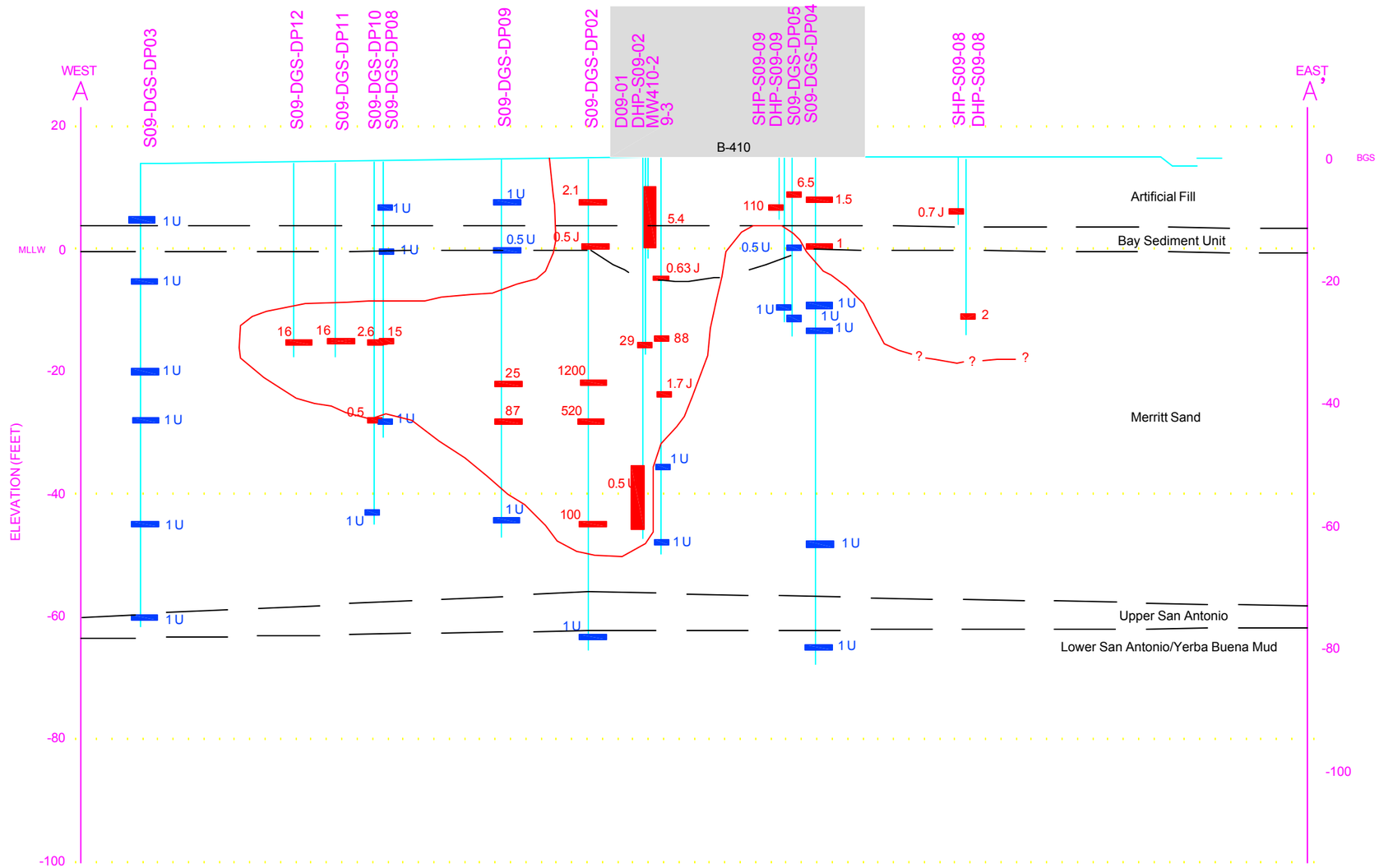
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

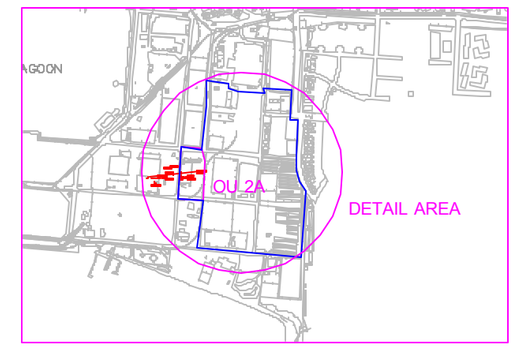
FIGURE 5-8
SITE 9 1,1-DICHLOROETHANE IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2004-12-28 U:\almda_sa\DO028\OU2A\ri\mxd\fig05-08_s09_gw_dca.mxd TtEMI-SA K. Johnson



DETAIL AREA



LOCATION MAP

HORIZONTAL SCALE: 1" = 80'

LEGEND

0.5 U — SAMPLE POINT, CONCENTRATION, AND QUALIFIER

IDEALIZED FORMATION CONTACT

MLLW MEAN LOWER LOW WATER

Note:
Vertical Exaggeration = 4X.

Tetra Tech EM Inc.

ALAMEDA POINT
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 5-9
SITE 9
1,1-DICHLOROETHANE
CROSS SECTION A-A'

OPERABLE UNIT 2A
REMEDIAL INVESTIGATION REPORT

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
CERCLA INVESTIGATIONS													
Phases 1 & 2A Investigation, 1991													
B410-5	B410-5 [0.5-1.0]	07/08/1990	0.5 - 1	X	--	--	--	X	--	--	--	--	--
	B410-5 [1.0-1.5]	07/11/1990	1 - 1.5	--	--	--	--	--	X	--	--	--	--
	B410-5 [2.0-2.5]	07/08/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--
	B410-5 [2.5-3.0]	07/11/1990	2.5 - 3	--	--	--	--	X	X	--	--	--	--
	B410-5 [5.0-5.5]	07/08/1990	5 - 5.5	X	X	--	--	--	--	--	--	--	--
	B410-5 [5.5-6.0]	07/08/1990	5.5 - 6	--	--	--	--	X	--	--	--	--	--
	B410-5 [8.0-8.5]	07/08/1990	8 - 8.5	X	X	--	--	--	--	--	--	--	--
	B410-5 [8.5-9.0]	07/08/1990	8.5 - 9	--	--	--	--	X	--	--	--	--	--
	B410-5 [10.5-11.0]	07/08/1990	10.5 - 11	X	X	--	--	--	--	--	--	--	--
	B410-5 [11.0-11.5]	07/08/1990	11 - 11.5	X	--	--	--	X	--	--	--	--	--
	B410-5 [11.5-12.0]	07/08/1990	11.5 - 12	--	--	--	--	X	--	--	--	--	--
	B410-5 [14.0-14.5]	07/08/1990	14 - 14.5	X	X	--	--	--	--	--	--	--	--
	B410-5 [14.5-15.0]	07/08/1990	14.5 - 15	--	--	--	--	X	--	--	--	--	--
B410-7	B410-7 [1.0-1.5]	07/12/1990	1 - 1.5	X	--	--	--	X	--	--	--	--	--
	B410-7 [2.5-3.0]	07/12/1990	2.5 - 3	X	X	--	--	--	--	--	--	--	--
	B410-7 [3.0-3.5]	07/12/1990	3 - 3.5	--	--	--	--	X	X	--	--	--	--
	B410-7 [4.0-4.5]	07/12/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--
	B410-7 [5.5-6.0]	07/16/1990	5.5 - 6	X	X	--	--	--	X	--	--	--	--
	B410-7 [6.0-6.5]	07/12/1990	6 - 6.5	--	--	--	--	X	--	--	--	--	--
	B410-7 [8.5-9.0]	07/16/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--
	B410-7 [9.0-9.5]	07/12/1990	9 - 9.5	--	--	--	--	X	--	--	--	--	--
	B410-7 [11.0-11.5]	07/16/1990	11 - 11.5	X	X	--	--	--	--	--	--	--	--
	B410-7 [11.5-12.0]	07/12/1990	11.5 - 12	--	--	--	--	X	--	--	--	--	--
	B410-7 [14.5-15.0]	07/16/1990	14.5 - 15	X	X	--	--	--	--	--	--	--	--
	B410-7 [15.0-15.5]	07/12/1990	15 - 15.5	--	--	--	--	X	--	--	--	--	--
B410-8	B410-8 [1.0-1.5]	07/16/1990	1 - 1.5	X	--	--	--	X	--	--	--	--	--
	B410-8 [1.5-2.0]	07/16/1990	1.5 - 2	--	--	--	--	--	X	--	--	--	--
	B410-8 [2.5-3.0]	07/16/1990	2.5 - 3	X	X	--	--	--	--	--	--	--	--
	B410-8 [3.0-3.5]	07/16/1990	3 - 3.5	--	--	--	--	X	X	--	--	--	--
	B410-8 [4.0-4.5]	07/16/1990	4 - 4.5	X	X	--	--	--	--	--	--	--	--
	B410-8 [4.5-5.0]	07/16/1990	4.5 - 5	--	--	--	--	X	--	--	--	--	--
	B410-8 [5.5-6.0]	07/16/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)													
B410-8	B410-8 [6.0-6.5]	07/16/1990	6 - 6.5	--	--	--	--	X	--	--	--	--	--
(Continued)	B410-8 [7.0-7.5]	07/16/1990	7 - 7.5	X	X	--	--	--	--	--	--	--	--
	B410-8 [7.5-8.0]	07/16/1990	7.5 - 8	--	--	--	--	X	--	--	--	--	--
	B410-8 [8.5-9.0]	07/16/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--
	B410-8 [9.0-9.5]	07/16/1990	9 - 9.5	--	--	--	--	X	--	--	--	--	--
B410-9	B410-9 [1.0-1.5]	07/12/1990	1 - 1.5	X	--	--	--	X	--	--	--	--	--
	B410-9 [1.5-2.0]	07/12/1990	1.5 - 2	--	--	--	--	--	X	--	--	--	--
	B410-9 [2.5-3.0]	07/08/1990	2.5 - 3	X	X	--	--	--	--	--	--	--	--
	B410-9 [3.0-3.5]	07/12/1990	3 - 3.5	--	--	--	--	X	X	--	--	--	--
	B410-9 [5.5-6.0]	07/08/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--
	B410-9 [6.0-6.5]	07/12/1990	6 - 6.5	--	--	--	--	X	--	--	--	--	--
	B410-9 [8.5-9.0]	07/08/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--
	B410-9 [9.0-9.5]	07/12/1990	9 - 9.5	--	--	--	--	X	--	--	--	--	--
	B410-9 [11.5-12.0]	07/08/1990	11.5 - 12	X	X	--	--	--	--	--	--	--	--
	B410-9 [12.0-12.5]	07/12/1990	12 - 12.5	--	--	--	--	X	--	--	--	--	--
	B410-9 [14.5-15.0]	07/08/1990	14.5 - 15	X	X	--	--	--	--	--	--	--	--
	B410-9 [15.0-15.5]	07/12/1990	15 - 15.5	--	--	--	--	X	--	--	--	--	--
MW410-1	MW410-1 [0.5-1.0]	07/01/1990	0.5 - 1	X	--	--	--	X	--	--	--	--	--
	MW410-1 [1.0-1.5]	07/11/1990	1 - 1.5	--	--	--	--	--	X	--	--	--	--
	MW410-1 [2.0-2.5]	07/01/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--
	MW410-1 [3.0-3.5]	07/01/1990	3 - 3.5	--	--	--	--	X	X	--	--	--	--
	MW410-1 [5.5-6.0]	07/01/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--
	MW410-1 [6.5-7.0]	07/01/1990	6.5 - 7	--	--	--	--	X	--	--	--	--	--
	MW410-1 [7.0-7.5]	07/01/1990	7 - 7.5	X	X	--	--	--	--	--	--	--	--
	MW410-1 [7.5-8.0]	07/01/1990	7.5 - 8	--	--	--	--	X	--	--	--	--	--
	MW410-1 [8.0-8.5]	07/01/1990	8 - 8.5	--	--	--	--	X	--	--	--	--	--
	MW410-1 [11.0-11.5]	07/01/1990	11 - 11.5	X	X	--	--	--	--	--	--	--	--
	MW410-1 [11.5-12.0]	07/01/1990	11.5 - 12	X	--	--	--	--	--	--	--	--	--
	MW410-1 [12.5-13.0]	07/01/1990	12.5 - 13	--	--	--	--	X	--	--	--	--	--
	MW410-1 [14.0-14.5]	07/01/1990	14 - 14.5	X	X	--	--	--	--	--	--	--	--
	MW410-1 [14.5-15.0]	07/01/1990	14.5 - 15	--	--	--	--	X	--	--	--	--	--
MW410-2	MW410-2 [1.5-2.0]	07/16/1990	1.5 - 2	X	--	--	--	X	--	--	--	--	--
	MW410-2 [2.0-2.5]	07/16/1990	2 - 2.5	--	--	--	--	--	X	--	--	--	--

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)													
MW410-2	MW410-2 [3.0-3.5]	07/16/1990	3 - 3.5	X	X	--	--	--	--	--	--	--	--
(Continued)	MW410-2 [3.5-4.0]	07/16/1990	3.5 - 4	--	--	--	--	X	X	--	--	--	--
	MW410-2 [6.0-6.5]	07/16/1990	6 - 6.5	X	X	--	--	--	--	--	--	--	--
	MW410-2 [6.5-7.0]	07/16/1990	6.5 - 7	--	--	--	--	X	--	--	--	--	--
	MW410-2 [9.0-9.5]	07/16/1990	9 - 9.5	X	X	--	--	--	--	--	--	--	--
	MW410-2 [9.5-10.0]	07/16/1990	9.5 - 10	--	--	--	--	X	--	--	--	--	--
	MW410-2 [12.0-12.5]	07/16/1990	12 - 12.5	X	X	--	--	--	--	--	--	--	--
	MW410-2 [12.5-13.0]	07/16/1990	12.5 - 13	--	--	--	--	X	--	--	--	--	--
	MW410-2 [15.0-15.5]	07/16/1990	15 - 15.5	X	X	--	--	--	--	--	--	--	--
	MW410-2 [15.5-16.0]	07/16/1990	15.5 - 16	--	--	--	--	X	--	--	--	--	--
Follow-on Investigtion, 1994													
CPT-S09-05	280-S09-004	09/08/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-005	09/08/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-006	09/08/1994	4.7 - 5.2	--	X	--	--	X	X	--	--	--	--
CPT-S09-06	280-S09-007	09/08/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-008	09/08/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-009	09/08/1994	4.7 - 5.2	--	X	--	--	X	X	--	--	--	--
CPT-S09-07	280-S09-010	09/07/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-011	09/07/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-012	09/07/1994	5 - 5.5	--	X	--	--	X	X	--	--	--	--

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
Follow-on Investigtion, 1994 (Continued)													
CPT-S09-08	280-S09-013	09/08/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-014	09/08/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-015	09/09/1994	5 - 5.5	--	X	--	--	X	X	--	--	--	--
CPT-S09-09	280-S09-016	09/07/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-017	09/07/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-018	09/07/1994	5	--	X	--	--	X	X	--	--	--	--
CPT-S09-10	280-S09-019	09/09/1994	0 - 0.5	--	X	--	--	X	X	--	--	--	--
	280-S09-020	09/09/1994	2.5 - 3	--	X	--	--	X	X	--	--	--	--
	280-S09-021	09/09/1994	5 - 5.5	--	X	--	--	X	X	--	--	--	--
M09-06	280-S09-167	11/05/1994	1 - 2	--	X	--	--	X	X	--	--	--	--
	280-S09-168	11/05/1994	2.5 - 3.5	--	X	--	--	X	X	--	--	--	--
	280-S09-169	11/05/1994	5.5 - 6.5	--	X	--	--	X	X	--	--	--	--
Chemical Oxidation Removal Action, 2002										--			
9S-CH1	9S-CH1	06/21/2002	5 - 15	--	X	--	--	X	X	--	--	--	--
9S-CH2	9S-CH2	06/21/2002	5 - 15	--	X	--	--	X	X	--	--	--	--
9S-CH3	9S-CH3	06/21/2002	5 - 15	--	X	--	--	X	X	--	--	--	--
PAH Study, 2003													
C3S009B001	C0590525	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590526	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590527	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590528	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B002	C0590529	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590530	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590531	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590532	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B003	C0590533	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590535	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590536	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590537	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B004	C0590538	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590539	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590540	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590541	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
PAH Study, 2003 (Continued)													
C3S009B005	C0590542	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590543	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590545	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590546	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B006	C0590547	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590548	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590549	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590550	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B007	C0591129	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0591130	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0591131	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0591133	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B008	C0590556	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590557	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590558	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590559	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B009	C0590560	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590561	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590562	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590563	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B010	C0590565	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590566	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590567	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590568	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B011	C0590569	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590570	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590571	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590572	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B012	C0590573	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590575	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590576	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590577	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--
C3S009B013	C0590578	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--
	C0590579	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--
	C0590580	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--
	C0590581	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--

TABLE 5-1: SITE 9 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED									
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Organic Lead
ENVIRONMENTAL BASELINE SURVEY													
Phase IIA Environmental Baseline Survey													
153-001-001	153-0001	04/06/1995	3 - 3.5	--	X	--	--	--	X	--	--	--	--
	153-0001M	04/06/1995	0.5 - 1	--		--	--	--	--	X	--	--	--
153-001-002	153-0002	04/06/1995	3 - 3.5	--	X	--	--	--	X	--	--	--	--
	153-0002M	04/06/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--
153-001-003	153-0003	04/06/1995	1 - 1.5	--	--	--	--	--	X	X	--	--	--
	153-0003M	04/06/1995	1 - 1.5	--	--	--	--	--	--	X	--	--	--
153-IW-001	153I-001	01/13/1995	8 - 8.5	X	X	--	X	X	X	X	X	X	X
	153I-001M	01/13/1995	8 - 8.5	--	X	--	--	X	--	--	--	--	--
153-IW-002	153I-002	01/23/1995	7 - 7.5	X	X	--	X	X	X	X	X	--	X
	153I-002M	01/23/1995	7 - 7.5	--	X	--	--	X	--	--	--	--	--
211-IWPS3-00	211P-001	01/30/1995	8.5 - 9	X	X	--	X	X	X	X	X	X	X
	211P-001M	01/30/1995	8.5 - 9	--	X	--	--	X	--	--	--	--	--
211-SS-005	211M-005	05/31/1995	10 - 11	X	--	--	X	--	X	--	--	X	X
	211M-005M	05/31/1995	10 - 11	--	X	--	--	X	--	X	--	--	--
J-2-J	J-2-J-01	12/01/1994		X	X	--	X	X	X	X	X	--	X

Notes:

--	These analyses were not performed.
X	These analyses were performed.
ft bgs	Feet below ground surface
General chemistry	Percent moisture, reactivity, TOC and/or pH
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
SVOC	Semivolatile organic compound
VOC	Volatile organic compound

TABLE 5-2: SITE 9 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH	CERCLA
CERCLA INVESTIGATIONS												
Phases 1 & 2A Investigation, 1991												
MW410-1	MW410-1 [08/21/90]	08/21/1990	--	X	X	X	--	X	--	--	--	
MW410-2	MW410-2 [08/22/90]	08/22/1990	--	X	X	X	--	X	--	--	--	
MW410-3	MW410-3 [08/21/90]	08/21/1990	--	X	X	X	--	X	--	--	--	
Follow-on Investigation, 1994												
D09-01	280-S09-100	12/20/1994		X	X	X	--	X	--	X	--	
	280-S09-107	02/21/1995		X	X	X	--	X	--	--	--	
	280-S09-108	06/22/1995		X	X	X	--	X	--	--	--	
	280-S09-109	09/14/1995		X	X	X	--	X	--	--	--	
DHP-S09-01	280-S09-053	07/28/1994	25.8	X	X	X	--	X	--	--	--	
DHP-S09-02	280-S09-054	07/28/1994	30	X	X	X	--	X	--	--	--	
DHP-S09-03	280-S09-055	07/29/1994	24	X	X	X	--	X	--	--	--	
DHP-S09-05	280-S09-058	08/23/1994	23 - 25	--	X	X	--	X	--	--	--	
DHP-S09-06	280-S09-059	09/08/1994	8 - 11	X	X	X	--	X	--	--	--	
DHP-S09-07	280-S09-062	09/07/1994	21 - 24	X	X	X	--	X	--	--	--	
DHP-S09-08	280-S09-064	09/06/1994	24	X	X	X	--	X	--	--	--	
DHP-S09-09	280-S09-066	09/12/1994	22 - 25	X	X	X	--	X	--	--	--	
DHP-S09-10	280-S09-068	09/09/1994	27 - 30	X	X	X	--	X	--	--	--	
DHP-S09-11	280-S09-094	08/25/1994	20 - 24	X	X	X	--	X	--	--	--	
DHP-S09-12	280-S09-096	08/25/1994	22.5 - 26	X	X	X	--	X	--	--	--	
M09-06	280-S09-049	11/30/1994		X	X	X	--	X	--	X	--	
	280-S09-050	02/21/1995		X	X	X	--	X	--	X	--	
	280-S09-051	06/22/1995		X	X	X	--	X	--	X	--	
	280-S09-052	08/08/1995		X	X	X	--	X	--	X	--	
MW410-1	280-S09-026	10/18/1994		X	X	X	--	X	--	X	--	
	280-S09-028	06/23/1995		X	X	X	X	X	--	X	--	
	280-S09-030	08/08/1995		X	X	X	--	X	--	X	--	
MW410-2	280-S09-031	10/18/1994		X	X	X	--	X	--	X	--	
	280-S09-032	02/21/1995		X	X	X	--	X	--	X	--	
	280-S09-033	06/22/1995		X	X	X	--	X	--	X	--	
	280-S09-034	08/04/1995		X	X	X	--	X	--	X	--	
MW410-3	280-S09-036	10/18/1994		X	X	X	--	X	--	X	--	
	280-S09-037	02/21/1995		X	X	X	--	X	--	X	--	
	280-S09-038	06/22/1995		X	X	X	X	X	--	X	--	
	280-S09-039	08/07/1995		X	X	X	--	X	--	X	--	
SHP-S09-05	280-S09-057	08/24/1994	7 - 10	X	X	X	--	X	--	--	--	

TABLE 5-2: SITE 9 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED							
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH
SHP-S09-07	280-S09-061	09/07/1994	8 - 11	X	X	X	--	X	--	--	--
SHP-S09-08	280-S09-063	09/09/1994	11	X	X	X	--	X	--	--	--
SHP-S09-09	280-S09-065	09/08/1994	8 - 11	X	X	X	--	X	--	--	--
SHP-S09-10	280-S09-067	09/06/1994	11	X	X	X	--	X	--	--	--
SHP-S09-11	280-S09-093	08/25/1994	15	X	X	X	--	X	--	--	--
SHP-S09-12	280-S09-095	08/24/1994	8	X	X	X	--	X	--	--	--
Follow-on Investigation, 1998											
D09-01	108-S09-003	11/11/1997		--	X	X	--	X	--	--	--
	108-S09-004	02/04/1998		--	X	X	--	X	--	--	--
	108-S09-007	05/13/1998		--	X	X	--	X	--	--	--
	108-S09-010	08/06/1998		--	X	--	X	X	--	--	--
M09-06	108-S09-001	11/05/1997		--	X	X	--	X	--	--	--
	108-S09-005	02/05/1998		--	X	X	--	X	--	--	--
	108-S09-009	05/12/1998		--	X	X	--	X	--	--	--
	108-S09-012	08/07/1998		--	X	--	X	X	--	--	--
Supplemental Remedial Investigation Data Gap Sampling, 2001											
3-J	385-S09-036	07/20/2001		X	X	--	--	--	--	--	X
D09-01	385-S09-031	06/26/2001		X	X	--	--	--	--	X	X
M09-06	385-S09-030	06/25/2001		X	X	--	--	--	--	X	X
MW410-1	385-S09-025	06/25/2001		X	X	--	--	--	--	X	X
MW410-2	385-S09-026	06/25/2001		X	X	--	--	--	--	X	X
MW410-3	385-S09-027	06/26/2001		X	X	--	--	--	--	X	X
	385-S09-028	06/26/2001		X	X	--	--	--	--	X	X
S09-DGS-DP01	385-S09-001	07/18/2001	8 - 10	--	X	--	--	--	--	--	--
	385-S09-001A	07/18/2001	8 - 10	X	--	--	--	--	--	--	X
	385-S09-002	07/18/2001	15 - 17	--	X	--	--	--	--	--	--
	385-S09-002A	07/18/2001	15 - 17	X	--	--	--	--	--	--	X
	385-S09-003	07/18/2001	30 - 32	--	X	--	--	--	--	--	--
	385-S09-003A	07/18/2001	30 - 32	X	--	--	--	--	--	--	X
S09-DGS-DP02	385-S09-004	07/28/2001	8	--	X	--	--	--	--	--	--
	385-S09-004A	07/28/2001	8	X	--	--	--	--	--	--	X
	385-S09-005	07/28/2001	15	--	X	--	--	--	--	--	--
	385-S09-005A	07/28/2001	15	X	--	--	--	--	--	--	X
S09-DGS-DP02	385-S09-006	07/28/2001	35	--	X	--	--	--	--	--	--
(Continued)	385-S09-006A	07/28/2001	35	X	--	--	--	--	--	--	X
	385-S09-007	07/28/2001	45	--	X	--	--	--	--	--	--
	385-S09-007A	07/28/2001	45	X	--	--	--	--	--	--	X

TABLE 5-2: SITE 9 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED							
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH
	385-S09-008	07/28/2001	60	--	X	--	--	--	--	--	--
	385-S09-008A	07/28/2001	60	X	--	--	--	--	--	--	X
	385-S09-009	07/28/2001	78	--	X	--	--	--	--	--	--
	385-S09-009A	07/28/2001	78	X	--	--	--	--	--	--	X
S09-DGS-DP03	385-S09-010	07/26/2001	10	--	X	--	--	--	--	--	--
	385-S09-010A	07/26/2001	10	--	--	--	--	--	--	--	X
	385-S09-011	07/26/2001	20	--	X	--	--	--	--	--	--
	385-S09-011A	07/26/2001	20	--	--	--	--	--	--	--	X
	385-S09-012	07/26/2001	35	--	X	--	--	--	--	--	--
	385-S09-012A	07/26/2001	35	--	--	--	--	--	--	--	X
	385-S09-013	07/26/2001	43	--	X	--	--	--	--	--	--
	385-S09-013A	07/26/2001	43	X	--	--	--	--	--	--	X
	385-S09-014	07/26/2001	60	--	X	--	--	--	--	--	--
	385-S09-014A	07/26/2001	60	X	--	--	--	--	--	--	X
	385-S09-015	07/26/2001	74	--	X	--	--	--	--	--	--
	385-S09-015A	07/26/2001	74	X	--	--	--	--	--	--	X
S09-DGS-DP04	385-S09-019	07/25/2001	50	--	X	--	--	--	--	--	--
	385-S09-019A	07/25/2001	50	X	X	--	--	--	--	--	X
	385-S09-020	07/25/2001	65	--	X	--	--	--	--	--	--
	385-S09-020A	07/25/2001	65	X	--	--	--	--	--	--	X
	385-S09-021	07/25/2001	80	--	X	--	--	--	--	--	--
	385-S09-021A	07/25/2001	80	X	--	--	--	--	--	--	X
	385-S09-022	07/18/2001	8 - 10	--	X	--	--	--	--	--	--
	385-S09-022A	07/18/2001	8 - 10	X	--	--	--	--	--	--	X
	385-S09-023	07/18/2001	15 - 17	--	X	--	--	--	--	--	--
	385-S09-023A	07/18/2001	15 - 17	X	--	--	--	--	--	--	X
	385-S09-024	07/18/2001	25 - 27	--	X	--	--	--	--	--	--
	385-S09-024A	07/18/2001	25 - 27	X	--	--	--	--	--	--	X
S09-DGS-DP05	385-S09-016	08/03/2001	7 - 9	--	X	--	--	--	--	--	--
	385-S09-016A	08/03/2001	7 - 9	X	--	--	--	--	--	--	X
	385-S09-017	08/03/2001	15 - 17	--	X	--	--	--	--	--	--
S09-DGS-DP05	385-S09-017A	08/03/2001	15 - 17	X	X	--	--	--	--	--	X
(Continued)	385-S09-018	08/03/2001	25 - 27	--	X	--	--	--	--	--	--
	385-S09-018A	08/03/2001	25 - 27	X	--	--	--	--	--	--	X
S09-DGS-DP07	385-S09-043	08/09/2001	7	--	X	--	--	--	--	--	--
	385-S09-044	08/09/2001	15	--	X	--	--	--	--	--	--
S09-DGS-DP08	385-S09-045	08/15/2001	7	--	X	--	--	--	--	--	--

TABLE 5-2: SITE 9 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED							
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH
	385-S09-046	08/15/2001	15	--	X	--	--	--	--	--	--
	385-S09-047	08/15/2001	30	--	X	--	--	--	--	--	--
	385-S09-048	08/15/2001	45	--	X	--	--	--	--	--	--
S09-DGS-DP09	385-S09-049	08/17/2001	7	--	X	--	--	--	--	--	--
	385-S09-050	08/17/2001	15	--	X	--	--	--	--	--	--
	385-S09-050A	08/17/2001	15	--	X	--	--	--	--	--	--
	385-S09-051	08/17/2001	30	--	X	--	--	--	--	--	--
	385-S09-052	08/17/2001	45	--	X	--	--	--	--	--	--
	385-S09-057	08/22/2001	59	--	X	--	--	--	--	--	--
S09-DGS-DP10	385-S09-054	08/22/2001	30	--	X	--	--	--	--	--	--
	385-S09-055	08/22/2001	45	--	X	--	--	--	--	--	--
	385-S09-055A	08/22/2001	45	--	X	--	--	--	--	--	--
	385-S09-056	08/22/2001	58	--	X	--	--	--	--	--	--
S09-DGS-DP11	385-S09-058	08/30/2001	30 - 32	--	X	--	--	--	--	--	--
S09-DGS-DP12	385-S09-059	09/12/2001	30 - 32	--	X	--	--	--	--	--	--
S09-DGS-SG03	385-S09-040	07/26/2001	1.5	--	X	--	--	--	X	--	--
	385-S09-041	07/26/2001	3.5	--	X	--	--	--	X	--	--
S09-DGS-VE01	385-S09-034	08/07/2001	8.5 - 10	--	X	--	--	--	--	X	--
	385-S09-034A	08/07/2001	8.5 - 10	X	--	--	--	--	--	--	X
Basewide Groundwater Monitoring, 2002											
D09-01	D09-01-A1136	06/28/2002		--	X	X	--	X	X	X	--
	D09-01-A1338	09/05/2002		--	X	--	--	--	--	X	--
	D09-01-A1637	12/16/2002		--	X	X	--	X	X	X	--
	D09-01-A1992	04/10/2003		--	X	--	--	--	--	X	--
MW410-1	MW410-1-A1149	06/18/2002		--	X	X	--	X	X	X	--
	MW410-1-A1343	09/04/2002		--	X	--	--	--	--	X	--
	MW410-1-A1650	12/16/2002		--	X	X	--	X	X	X	--
	MW410-1-A1996	04/09/2003		--	X	--	--	--	--	X	--
MW410-2	MW410-2-A1150	06/18/2002		--	X	--	--	X	X	X	--
	MW410-2-A1344	09/05/2002		--	X	--	--	--	--	X	--
	MW410-2-A1651	12/16/2002		--	X	X	--	X	X	X	--
	MW410-2-A1997	04/09/2003		--	X	--	--	--	--	X	--
Chemical Oxidation Removal Action, 2002											
9-1	9-1-10	06/27/2002	8 - 12	--	X	--	--	--	--	--	--
	9-1-20	06/27/2002	18 - 22	--	X	--	--	--	--	--	--
	9-1-30	06/27/2002	28 - 32	--	X	--	--	--	--	--	--
	9-1-40	06/27/2002	38 - 42	--	X	--	--	--	--	--	--

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SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED							
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH
9-2	9-2-10	06/27/2002	8 - 10	--	X	--	--	--	--	--	--
	9-2-20	06/27/2002	18 - 22	--	X	--	--	--	--	--	--
	9-2-30	06/27/2002	28 - 32	--	X	--	--	--	--	--	--
	9-2-40	06/27/2002	38 - 42	--	X	--	--	--	--	--	--
9-3	9-3-20	06/28/2002	18 - 22	--	X	--	--	--	--	--	--
	9-3-30	06/28/2002	28 - 32	--	X	--	--	--	--	--	--
	9-3-40	06/28/2002	38 - 42	--	X	--	--	--	--	--	--
	9-3-55	07/02/2002	53 - 57	--	X	--	--	--	--	--	--
	9-3-63	07/02/2002	61 - 65	--	X	--	--	--	--	--	--
9S-CH1	9S-CH1-10	06/27/2002	8 - 12	--	X	--	--	--	--	--	--
	9S-CH1-20	06/27/2002	18 - 22	--	X	--	--	--	--	--	--
	9S-CH1-30	06/27/2002	28 - 32	--	X	--	--	--	--	--	--
9S-CH2	9S-CH2-10	06/28/2002	8 - 12	--	X	--	--	--	--	--	--
	9S-CH2-20	06/28/2002	18 - 22	--	X	--	--	--	--	--	--
	9S-CH2-30	06/28/2002	28 - 32	--	X	--	--	--	--	--	--
	9S-CH2-40	06/28/2002	38 - 42	--	X	--	--	--	--	--	--
9S-CH3	9S-CH3-10	06/27/2002	8 - 12	--	X	--	--	--	--	--	--
	9S-CH3-10D	06/27/2002	8 - 22	--	X	--	--	--	--	--	--
	9S-CH3-20	06/27/2002	8 - 12	--	X	--	--	--	--	--	--
	9S-CH3-30	06/28/2002	28 - 32	--	X	--	--	--	--	--	--
	9S-CH3-40	06/28/2002	38 - 42	--	X	--	--	--	--	--	--
9S-CH4	9S-CH4-10	06/28/2002	8 - 12	--	X	--	--	--	--	--	--
	9S-CH4-20	06/28/2002	18 - 22	--	X	--	--	--	--	--	--
	9S-CH4-30	06/28/2002	28 - 32	--	X	--	--	--	--	--	--
	9S-CH4-40	06/28/2002	38 - 42	--	X	--	--	--	--	--	--
P-9-IWS-01	SITE9-020	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-01	SITE9-024	09/11/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-03	SITE9-018	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-04	SITE9-010	09/09/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-05	SITE9-014	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-06	SITE9-008	09/09/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-07	SITE9-017	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-08	SITE9-013	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-09	SITE9-015	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWI-10	SITE9-016	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWS-01	SITE9-022	09/11/2002	--	--	X	--	X	X	--	--	--
P-9-MWS-02	SITE9-025	09/11/2002	--	--	X	--	X	X	--	--	--

TABLE 5-2: SITE 9 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED							
				SVOC	VOC	Dissolved Metals	Total Metals	General Chemistry	Landfill Gases	TPH	PAH
P-9-MWS-03	SITE9-019	09/10/2002	--	--	X	--	X	X	--	--	--
P-9-MWS-04	SITE9-023	09/11/2002	--	--	X	--	X	X	--	--	--
ENVIRONMENTAL BASELINE SURVEY											
Phase IIB Environmental Baseline Survey											
154-006-024	154-0038	10/30/1995	7.5 - 8.5	X	X	X	--	--	--	X	--
154-SN-007	154S-015	10/30/1995	9	--	X	--	--	--	--	X	--
154-SN-008	154S-018	10/30/1995	8 - 9	--	X	--	--	--	--	X	--
154-SN-009	154S-021	10/30/1995	9	--	X	--	--	--	--	X	--

Notes:

--	These analyses were not performed.
X	These analyses were performed.
ft bgs	Feet below ground surface
General chemistry	Acidity, alkalinity, major anions, conductivity, hardness, oxydation, MBAS, pH, TDS, TOC, and/or sulfide
MBAS	Methylene blue active substances (surfactants)
PAH	Polynuclear aromatic hydrocarbon
TDS	Total dissolved solids
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
SVOC	Semivolatile organic compound
VOC	Volatile organic compound

TABLE 5-3: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	29	0	0	--	--	--	5	27	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	29	0	0	--	--	--	5	27	0	0	410
1,1,2-TRICHLOROETHANE	29	0	0	--	--	--	5	27	0	0	730
1,1-DICHLOROETHANE	28	0	0	--	--	--	5	27	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	30	0	0	--	--	--	5	27	0	0	120,000
1,2-DICHLOROBENZENE	29	0	0	--	--	--	5	960	0	0	370,000
1,2-DICHLOROETHANE	29	0	0	--	--	--	5	27	0	0	280
1,2-DICHLOROETHENE (TOTAL)	30	2	7	4	3 J	4 J	5	27	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	29	0	0	--	--	--	5	27	0	0	340
1,3-DICHLOROBENZENE	29	0	0	--	--	--	5	960	0	0	16,000
1,4-DICHLOROBENZENE	29	0	0	--	--	--	5	960	0	0	3,400
2-BUTANONE	29	1	3	9	9 J	9 J	10	14	--	--	NA
2-CHLOROETHYLVINYLETHER	29	0	0	--	--	--	10	55	--	--	NA
2-HEXANONE	29	0	0	--	--	--	10	55	--	--	NA
4-METHYL-2-PENTANONE	29	0	0	--	--	--	10	55	--	--	NA
ACETONE	29	0	0	--	--	--	10	55	0	0	1,600,000
BENZENE	29	0	0	--	--	--	5	27	0	0	600
BROMODICHLOROMETHANE	29	0	0	--	--	--	5	27	0	0	820
BROMOFORM	29	0	0	--	--	--	5	27	0	0	62,000
BROMOMETHANE	29	0	0	--	--	--	10	55	0	0	3,900
CARBON DISULFIDE	29	0	0	--	--	--	5	27	0	0	360,000
CARBON TETRACHLORIDE	29	0	0	--	--	--	5	27	0	0	250
CHLOROBENZENE	29	0	0	--	--	--	5	27	0	0	150,000
CHLOROETHANE	29	0	0	--	--	--	10	55	0	0	3,000
CHLOROFORM	29	0	0	--	--	--	5	27	0	0	940 (CAL-modified)
CHLOROMETHANE	29	0	0	--	--	--	10	55	0	0	1,200
CIS-1,3-DICHLOROPROPENE	29	0	0	--	--	--	5	27	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	29	0	0	--	--	--	5	27	0	0	1,100
ETHYLBENZENE	29	1	3	2	2 J	2 J	5	27	0	0	8,900
METHYLENE CHLORIDE	29	0	0	--	--	--	6	27	0	0	9,100
STYRENE	29	0	0	--	--	--	5	27	0	0	1,700,000
TETRACHLOROETHENE	29	1	3	1	1 J	1 J	5	27	0	0	1,500
TOLUENE	30	29	97	54	2 J	730	6	6	0	0	520,000

TABLE 5-3: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TRANS-1,3-DICHLOROPROPENE	29	0	0	--	--	--	5	27	0	0	780 (not trans)
TRICHLOROETHENE	29	0	0	--	--	--	5	27	0	0	53
TRICHLOROFLUOROMETHANE	29	0	0	--	--	--	5	27	0	0	390,000
VINYL ACETATE	29	0	0	--	--	--	10	55	0	0	430,000
VINYL CHLORIDE	29	0	0	--	--	--	10	55	0	0	79 (child or adult)
XYLENE (TOTAL)	29	1	3	29	29	29	5	27	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	38	0	0	--	--	--	340	1,000	0	0	650,000
1,2-DICHLOROBENZENE	38	0	0	--	--	--	340	1,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	38	0	0	--	--	--	340	**1,000**	0	10	610
1,3-DICHLOROBENZENE	38	0	0	--	--	--	340	1,000	0	0	16,000
1,4-DICHLOROBENZENE	38	0	0	--	--	--	340	1,000	0	0	3,400
2,4,5-TRICHLOROPHENOL	38	0	0	--	--	--	1,600	4,900	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	38	0	0	--	--	--	340	1,000	0	0	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	38	0	0	--	--	--	340	1,000	0	0	180,000
2,4-DIMETHYLPHENOL	38	0	0	--	--	--	340	1,000	0	0	1,200,000
2,4-DINITROPHENOL	38	0	0	--	--	--	1,600	4,900	0	0	120,000
2,4-DINITROTOLUENE	38	0	0	--	--	--	340	1,000	0	0	120,000
2,6-DINITROTOLUENE	38	0	0	--	--	--	340	1,000	0	0	61,000
2-CHLORONAPHTHALENE	38	0	0	--	--	--	340	1,000	--	--	NA
2-CHLOROPHENOL	38	0	0	--	--	--	340	1,000	0	0	63,000
2-METHYLNAPHTHALENE	38	1	3	320	320 J	320 J	340	1,000	--	--	NA
2-METHYLPHENOL	38	0	0	--	--	--	340	1,000	--	--	NA
2-NITROANILINE	38	0	0	--	--	--	1,600	**4,900**	0	28	1,700
2-NITROPHENOL	38	0	0	--	--	--	340	1,000	--	--	NA
3,3'-DICHLOROBENZIDINE	38	0	0	--	--	--	670	**2,000**	0	10	1,100
3-NITROANILINE	38	0	0	--	--	--	1,600	4,900	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	38	0	0	--	--	--	1,600	4,900	--	--	NA
4-BROMOPHENYL-PHENYLETHER	38	0	0	--	--	--	340	1,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	38	1	3	43	43 J	43 J	340	1,000	--	--	NA
4-CHLOROANILINE	38	0	0	--	--	--	340	1,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	38	0	0	--	--	--	340	1,000	--	--	NA

TABLE 5-3: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
4-METHYLPHENOL	38	0	0	--	--	--	340	1,000	0	0	310,000
4-NITROANILINE	38	0	0	--	--	--	1,600	4,900	--	--	NA
4-NITROPHENOL	38	0	0	--	--	--	1,600	4,900	--	--	NA
ACENAPHTHENE	37	0	0	--	--	--	340	1,000	0	0	3,700,000
ACENAPHTHYLENE	38	1	3	130	130 J	130 J	340	1,000	--	--	NA
ANILINE	12	0	0	--	--	--	350	720	0	0	85,000
ANTHRACENE	38	2	5	220	59 J	390 J	340	1,000	0	0	22,000,000
BENZO(A)ANTHRACENE	38	7	18	240	64 J	**1,000**	340	**960**	1	8	620
BENZO(A)PYRENE	38	9	24	**350**	**140 J**	**1,300**	**340**	**960**	9	29	62
BENZO(B)FLUORANTHENE	38	9	24	250	66 J	**760**	340	**960**	1	8	620
BENZO(G,H,I)PERYLENE	38	4	11	380	140 J	950	340	1,000	--	--	NA
BENZO(K)FLUORANTHENE	38	5	13	330	58 J	**1,100**	340	**1,000**	1	22	380 (CAL-modified)
BENZOIC ACID	38	0	0	--	--	--	1,600	4,900	0	0	100,000,000
BENZYL ALCOHOL	38	0	0	--	--	--	340	1,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	38	0	0	--	--	--	340	1,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	38	0	0	--	--	--	**340**	**1,000**	0	38	210
BIS(2-ETHYLHEXYL)PHTHALATE	38	0	0	--	--	--	340	1,000	0	0	35,000
BUTYLBENZYLPHTHALATE	38	0	0	--	--	--	340	1,000	0	0	12,000,000
CHRYSENE	38	10	26	240	69 J	1,300	340	960	0	0	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	38	0	0	--	--	--	340	1,000	--	--	NA
DI-N-OCTYLPHTHALATE	38	0	0	--	--	--	340	1,000	--	--	NA
DIBENZO(A,H)ANTHRACENE	38	1	3	**230**	**230 J**	**230**	**340**	**1,000**	1	37	62
DIBENZOFURAN	38	0	0	--	--	--	340	1,000	0	0	290,000
DIETHYLPHTHALATE	38	0	0	--	--	--	340	1,000	0	0	49,000,000
DIMETHYLPHTHALATE	38	0	0	--	--	--	340	1,000	0	0	100,000,000
FLUORANTHENE	38	9	24	430	95 J	2,000	340	960	0	0	2,300,000
FLUORENE	38	1	3	100	100 J	100 J	340	1,000	0	0	2,700,000
HEXACHLOROBENZENE	38	0	0	--	--	--	**340**	**1,000**	0	38	300
HEXACHLOROBUTADIENE	38	0	0	--	--	--	340	1,000	0	0	6,200
HEXACHLOROCYCLOPENTADIENE	38	0	0	--	--	--	340	1,000	0	0	370,000
HEXACHLOROETHANE	38	0	0	--	--	--	340	1,000	0	0	35,000
INDENO(1,2,3-CD)PYRENE	38	5	13	370	120 J	**930**	340	**1,000**	1	10	620
ISOPHORONE	38	0	0	--	--	--	340	1,000	0	0	510,000

TABLE 5-3: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
N-NITROSO-DI-N-PROPYLAMINE	38	0	0	--	--	--	**340**	**1,000**	0	38	69
N-NITROSODIMETHYLAMINE	12	0	0	--	--	--	**350**	**720**	0	12	10
N-NITROSODIPHENYLAMINE	38	18	47	60	38 J	120 J	340	1,000	0	0	99,000
NAPHTHALENE	38	2	5	36	35 J	36 J	340	1,000	0	0	56,000
NITROBENZENE	38	0	0	--	--	--	340	1,000	0	0	20,000
PENTACHLOROPHENOL	38	1	3	430	430 J	430 J	1,600	**4,900**	0	9	3,000
PHENANTHRENE	38	4	11	540	130 J	1,600	340	960	--	--	NA
PHENOL	38	1	3	42	42 J	42 J	340	1,000	0	0	37,000,000
PYRENE	38	12	32	600	85 J	2,500	340	960	0	0	2,300,000
Metals (mg/kg)											
ALUMINUM	38	38	100	6,310	2,880	28,800	0.0	0.0	0	0	76,000
ANTIMONY	38	0	0	--	--	--	2.0	7.6	0	0	31.0
ARSENIC	38	16	42	**5.0**	**2.2**	**10.0**	**1.9**	**13.0**	16	22	0.39
BARIUM	38	36	95	50.7	16.3 J	198	24.0	25.0	0	0	5,400
BERYLLIUM	38	18	47	0.28	0.090	0.81	0.20	1.3	0	0	150
CADMIUM	38	19	50	0.42	0.19	0.99	0.20	1.3	0	0	37.0
CALCIUM	38	38	100	4,540	1,340	19,200	0.0	0.0	--	--	NA
CHROMIUM	38	38	100	34.7	19.0	107	0.0	0.0	0	0	210
COBALT	38	27	71	7.4	2.9	23.0	5.2	6.3	0	0	900
COPPER	38	38	100	17.1	4.2	89.4	0.0	0.0	0	0	3,100
IRON	38	38	100	10,400	5,090	**39,000**	0.0	0.0	5	0	23,000
LEAD	38	9	24	10.7	7.0	16.2	3.5	6.8	0	0	150 (CAL-modified)
MAGNESIUM	38	37	97	3,120	1,570	10,200	520	520	--	--	NA
MANGANESE	38	38	100	166	62.5	1,060	0.0	0.0	0	0	1,800
MOLYBDENUM	38	0	0	--	--	--	0.31	6.3	0	0	390
NICKEL	38	38	100	31.7	14.6	111	0.0	0.0	0	0	1,600
POTASSIUM	38	34	89	1,070	310	3,740	560	610	--	--	NA
SELENIUM	38	0	0	--	--	--	4.3	13.0	0	0	390
SILVER	38	3	8	0.67	0.44	0.96	0.37	6.3	0	0	390
SODIUM	38	26	68	856	109	3,510	520	630	--	--	NA
THALLIUM	38	1	3	**5.3**	**5.3**	**5.3**	2.7	**13.0**	1	14	5.2
TITANIUM	38	38	100	403	223	1,190	0.0	0.0	--	--	NA

TABLE 5-3: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
VANADIUM	38	38	100	21.7	12.7	70.8	0.0	0.0	0	0	550
ZINC	38	38	100	34.0	12.0	105	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 5-4: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	3	0	0	--	--	--	5	5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	3	0	0	--	--	--	**5**	**5**	0	3	0.06	1
1,1,2-TRICHLOROETHANE	3	0	0	--	--	--	**5**	**5**	0	3	0.2	5
1,1-DICHLOROETHANE	3	0	0	--	--	--	**5**	**5**	0	3	2 (CAL-modified)	5
1,1-DICHLOROETHENE	3	0	0	--	--	--	5	5	0	0	340	6
1,2-DICHLOROETHANE	3	0	0	--	--	--	**5**	**5**	0	3	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	3	0	0	--	--	--	5	5	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	3	0	0	--	--	--	**5**	**5**	0	3	0.2	5
2-BUTANONE	3	0	0	--	--	--	10	10	--	--	NA	NA
2-HEXANONE	3	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYL-2-PENTANONE	3	0	0	--	--	--	10	10	--	--	NA	NA
ACETONE	3	0	0	--	--	--	10	10	0	0	610	NA
BENZENE	3	0	0	--	--	--	**5**	**5**	0	3	0.3	1
BROMODICHLOROMETHANE	3	0	0	--	--	--	**5**	**5**	0	3	0.2	80
BROMOFORM	3	0	0	--	--	--	5	5	0	0	9	80
BROMOMETHANE	3	0	0	--	--	--	**10**	**10**	0	3	9	NA
CARBON DISULFIDE	3	0	0	--	--	--	5	5	0	0	1,000	NA
CARBON TETRACHLORIDE	3	0	0	--	--	--	**5**	**5**	0	3	0.2	0.5
CHLOROBENZENE	3	0	0	--	--	--	5	5	0	0	110	70
CHLOROETHANE	3	0	0	--	--	--	**10**	**10**	0	3	5	NA
CHLOROFORM	3	0	0	--	--	--	**5**	**5**	0	3	0.5 (CAL-modified)	80
CHLOROMETHANE	3	0	0	--	--	--	**10**	**10**	0	3	2	NA
CIS-1,3-DICHLOROPROPENE	3	0	0	--	--	--	**5**	**5**	0	3	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	3	0	0	--	--	--	**5**	**5**	0	3	0.1	80
ETHYLBENZENE	3	0	0	--	--	--	**5**	**5**	0	3	3	300
METHYLENE CHLORIDE	3	0	0	--	--	--	**10**	**11**	0	3	4	NA
STYRENE	3	0	0	--	--	--	5	5	0	0	1,600	100
TETRACHLOROETHENE	3	0	0	--	--	--	**5**	**5**	0	3	0.7	5
TOLUENE	3	0	0	--	--	--	5	5	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	3	0	0	--	--	--	**5**	**5**	0	3	0.4 (not trans)	0.5
TRICHLOROETHENE	3	0	0	--	--	--	**5**	**5**	0	3	0.03	5
VINYL ACETATE	3	0	0	--	--	--	5	5	0	0	410	NA
VINYL CHLORIDE	3	0	0	--	--	--	**10**	**10**	0	3	0.02 (child or adult)	0.5

TABLE 5-4: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
XYLENE (TOTAL)	3	0	0	--	--	--	5	5	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	3	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	3	0	0	--	--	--	10	10	0	0	370	600
1,3-DICHLOROBENZENE	3	0	0	--	--	--	**10**	**10**	0	3	6	NA
1,4-DICHLOROBENZENE	3	0	0	--	--	--	**10**	**10**	0	3	0.5	5
2,4,5-TRICHLOROPHENOL	3	0	0	--	--	--	50	50	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	3	0	0	--	--	--	**10**	**10**	0	3	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	3	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	3	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	3	0	0	--	--	--	50	50	0	0	73	NA
2,4-DINITROTOLUENE	3	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	3	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	3	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	3	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	3	0	0	--	--	--	10	10	--	--	NA	NA
2-METHYLPHENOL	3	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	3	0	0	--	--	--	**50**	**50**	0	3	1	NA
2-NITROPHENOL	3	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	3	0	0	--	--	--	**20**	**20**	0	3	0.2	NA
3-NITROANILINE	3	0	0	--	--	--	50	50	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	3	0	0	--	--	--	50	50	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	3	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	3	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	3	0	0	--	--	--	10	10	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	3	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	3	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	3	0	0	--	--	--	50	50	--	--	NA	NA
4-NITROPHENOL	3	0	0	--	--	--	50	50	--	--	NA	NA
ACENAPHTHENE	3	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	1	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	3	0	0	--	--	--	10	10	0	0	1,800	NA

TABLE 5-4: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
BENZO(A)ANTHRACENE	3	0	0	--	--	--	**10**	**10**	0	3	0.09	0.1
BENZO(A)PYRENE	3	0	0	--	--	--	**10**	**10**	0	3	0.009	0.2
BENZO(B)FLUORANTHENE	3	0	0	--	--	--	**10**	**10**	0	3	0.09	NA
BENZO(G,H,I)PERYLENE	3	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	3	0	0	--	--	--	**10**	**10**	0	3	0.06 (CAL-modified)	NA
BENZOIC ACID	3	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	3	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	3	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	3	0	0	--	--	--	**10**	**10**	0	3	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	3	0	0	--	--	--	**10**	**10**	0	3	5	NA
BUTYLBENZYLPHTHALATE	3	0	0	--	--	--	10	10	0	0	7,300	NA
CHRYSENE	3	0	0	--	--	--	**10**	**10**	0	3	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	3	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	3	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	3	0	0	--	--	--	**10**	**10**	0	3	0.009	NA
DIBENZOFURAN	3	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	3	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	3	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	3	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	3	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	3	0	0	--	--	--	**10**	**10**	0	3	0.04	1
HEXACHLOROBUTADIENE	3	0	0	--	--	--	**10**	**10**	0	3	0.9	NA
HEXACHLOROCYCLOPENTADIENE	3	0	0	--	--	--	10	10	0	0	220	NA
HEXACHLOROETHANE	3	0	0	--	--	--	**10**	**10**	0	3	5	NA
INDENO(1,2,3-CD)PYRENE	3	0	0	--	--	--	**10**	**10**	0	3	0.09	NA
ISOPHORONE	3	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	3	0	0	--	--	--	**10**	**10**	0	3	0.01	NA
N-NITROSODIPHENYLAMINE	3	0	0	--	--	--	10	10	0	0	14	NA
NAPHTHALENE	3	0	0	--	--	--	**10**	**10**	0	3	6	NA
NITROBENZENE	3	0	0	--	--	--	**10**	**10**	0	3	3	NA
PENTACHLOROPHENOL	3	0	0	--	--	--	**50**	**50**	0	3	0.6	1
PHENANTHRENE	3	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	3	0	0	--	--	--	10	10	0	0	22,000	NA

TABLE 5-4: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
PYRENE	3	0	0	--	--	--	10	10	0	0	180	NA
Metals (µg/L)												
Filtered												
ALUMINUM	3	3	100	75,000	**38,000**	**98,000**	0.0	0.0	3	0	36,000	NA
ANTIMONY	3	0	0	--	--	--	**60.0**	**60.0**	0	3	15.0	6.0
ARSENIC	3	2	67	**62.0**	**54.0**	**70.0**	**50.0**	**50.0**	2	1	0.045	10.0
BARIUM	3	3	100	417	300	620	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	3	0	0	--	--	--	5.0	5.0	0	0	73.0	4.0
CADMIUM	3	0	0	--	--	--	5.0	5.0	0	0	18.0	5.0
CALCIUM	3	3	100	56,700	30,000	83,000	0.0	0.0	--	--	NA	NA
CHROMIUM	3	3	100	257	150	350	0.0	0.0	--	--	NA	50.0
COBALT	3	1	33	63.0	63.0	63.0	50.0	50.0	0	0	730	NA
COPPER	3	3	100	111	74.0	140	0.0	0.0	0	0	1,500	1,300
IRON	3	3	100	102,000	**57,000**	**136,000**	0.0	0.0	3	0	11,000	NA
LEAD	3	2	67	89.0	88.0	90.0	50.0	50.0	--	--	NA	15.0
MAGNESIUM	3	3	100	47,000	35,000	65,000	0.0	0.0	--	--	NA	NA
MANGANESE	3	3	100	1,290	870	**1,500**	0.0	0.0	2	0	880	NA
MOLYBDENUM	3	0	0	--	--	--	50.0	50.0	0	0	180	NA
NICKEL	3	3	100	310	170	470	0.0	0.0	0	0	730	100
POTASSIUM	3	3	100	28,000	19,000	39,000	0.0	0.0	--	--	NA	NA
SELENIUM	3	0	0	--	--	--	50.0	50.0	0	0	180	50.0
SILVER	3	1	33	13.0	13.0	13.0	10.0	10.0	0	0	180	NA
SODIUM	3	3	100	180,000	143,000	246,000	0.0	0.0	--	--	NA	NA
THALLIUM	3	0	0	--	--	--	**50.0**	**50.0**	0	3	2.4	2.0
TITANIUM	3	3	100	2,570	1,400	3,900	0.0	0.0	--	--	NA	NA
VANADIUM	3	3	100	207	110	**280**	0.0	0.0	1	0	260	NA
ZINC	3	3	100	273	160	350	0.0	0.0	0	0	11,000	NA

TABLE 5-4: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-5: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	21	0	0	--	--	--	11	120	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	21	0	0	--	--	--	11	120	0	0	410
1,1,2-TRICHLOROETHANE	21	0	0	--	--	--	11	120	0	0	730
1,1-DICHLOROETHANE	21	0	0	--	--	--	11	120	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	21	0	0	--	--	--	11	120	0	0	120,000
1,2-DICHLOROETHANE	21	0	0	--	--	--	11	120	0	0	280
1,2-DICHLOROETHENE (TOTAL)	21	3	14	45	1J	130	11	120	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	21	0	0	--	--	--	11	120	0	0	340
2-BUTANONE	21	0	0	--	--	--	11	120	--	--	NA
2-HEXANONE	21	0	0	--	--	--	11	120	--	--	NA
4-METHYL-2-PENTANONE	21	0	0	--	--	--	11	120	--	--	NA
ACETONE	21	0	0	--	--	--	11	120	0	0	1,600,000
BENZENE	21	0	0	--	--	--	11	120	0	0	600
BROMODICHLOROMETHANE	21	0	0	--	--	--	11	120	0	0	820
BROMOFORM	21	0	0	--	--	--	11	120	0	0	62,000
BROMOMETHANE	21	0	0	--	--	--	11	120	0	0	3,900
CARBON DISULFIDE	21	0	0	--	--	--	11	120	0	0	360,000
CARBON TETRACHLORIDE	21	0	0	--	--	--	11	120	0	0	250
CHLOROBENZENE	21	0	0	--	--	--	11	120	0	0	150,000
CHLOROETHANE	21	0	0	--	--	--	11	120	0	0	3,000
CHLOROFORM	21	0	0	--	--	--	11	120	0	0	940 (CAL-modified)
CHLOROMETHANE	21	0	0	--	--	--	11	120	0	0	1,200
CIS-1,3-DICHLOROPROPENE	21	0	0	--	--	--	11	120	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	21	0	0	--	--	--	11	120	0	0	1,100
ETHYLBENZENE	21	2	10	180	160	200	11	120	0	0	8,900
METHYLENE CHLORIDE	21	0	0	--	--	--	11	120	0	0	9,100
STYRENE	21	0	0	--	--	--	11	120	0	0	1,700,000
TETRACHLOROETHENE	21	0	0	--	--	--	11	120	0	0	1,500
TOLUENE	21	3	14	19	3J	49 J	11	120	0	0	520,000
TRANS-1,3-DICHLOROPROPENE	21	0	0	--	--	--	11	120	0	0	780 (not trans)
TRICHLOROETHENE	21	0	0	--	--	--	11	**120**	0	5	53
VINYL CHLORIDE	21	0	0	--	--	--	11	**120**	0	1	79 (child or adult)
XYLENE (TOTAL)	21	8	38	850	2J	3,100	11	120	0	0	270,000

TABLE 5-5: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
ALUMINUM	21	21	100	4,830	3,300 J	13,900 J	0.0	0.0	0	0	76,000
ANTIMONY	21	2	10	0.84	0.47 J	1.2 J	0.48	1.8	0	0	31.0
ARSENIC	21	6	29	**1.9**	**0.85 J**	**4.0**	**0.55**	**2.2**	6	15	0.39
BARIUM	21	21	100	64.3	17.8 J	266	0.0	0.0	0	0	5,400
BERYLLIUM	21	18	86	0.73	0.36 J	1.5	0.21	0.23	0	0	150
CADMIUM	21	3	14	0.30	0.11 J	0.49 J	0.060	0.19	0	0	37.0
CALCIUM	21	21	100	5,530	1,350	16,800 J	0.0	0.0	--	--	NA
CHROMIUM	21	21	100	46.2	23.4	178	0.0	0.0	0	0	210
COBALT	21	5	24	7.4	4.1 J	11.3 J	4.6	6.5	0	0	900
COPPER	21	17	81	7.0	4.1 J	16.0	5.5	6.1	0	0	3,100
IRON	21	21	100	8,590	6,410	21,500	0.0	0.0	0	0	23,000
LEAD	21	19	90	4.5	1.3	22.2 J	2.1	2.4	0	0	150 (CAL-modified)
MAGNESIUM	21	21	100	2,270	1,740	5,100	0.0	0.0	--	--	NA
MANGANESE	21	21	100	98.3	75.3	182	0.0	0.0	0	0	1,800
MERCURY	21	0	0	--	--	--	0.16	0.36	0	0	23.0
MOLYBDENUM	21	0	0	--	--	--	2.7	6.7	0	0	390
NICKEL	21	21	100	23.8	17.0	50.8	0.0	0.0	0	0	1,600
POTASSIUM	21	21	100	828	567 J	2,170 J	0.0	0.0	--	--	NA
SELENIUM	21	0	0	--	--	--	0.55	1.3	0	0	390
SILVER	21	0	0	--	--	--	0.18	0.81	0	0	390
SODIUM	21	21	100	182	68.0 J	413 J	0.0	0.0	--	--	NA
THALLIUM	21	0	0	--	--	--	0.40	0.96	0	0	5.2
VANADIUM	21	21	100	21.3	15.0	42.3	0.0	0.0	0	0	550
ZINC	21	21	100	22.7	15.7 J	51.3	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	37	1	3	3	3	3	1	100	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	37	0	0	--	--	--	**1**	**100**	0	37	0.06	1
1,1,2-TRICHLOROETHANE	37	0	0	--	--	--	**1**	**100**	0	37	0.2	5
1,1-DICHLOROETHANE	37	9	24	**17**	0.7J	**110**	1	**100**	3	2	2 (CAL-modified)	5
1,1-DICHLOROETHENE	37	0	0	--	--	--	1	100	0	0	340	6
1,2-DICHLOROETHANE	37	2	5	**0.6**	**0.5**	**0.6**	**0.5**	**50**	2	35	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	37	10	27	**290**	1	**2,400**	1	9	2	0	61 (cis)	NA
1,2-DICHLOROPROPANE	37	1	3	**2**	**2**	**2**	**1**	**100**	1	36	0.2	5
2-BUTANONE	8	2	25	61	59J	63J	9	28	--	--	NA	NA
2-HEXANONE	34	0	0	--	--	--	2	200	--	--	NA	NA
4-METHYL-2-PENTANONE	37	2	5	3	0.7J	5J	2	200	--	--	NA	NA
ACETONE	7	1	14	150	150J	150J	2	8	0	0	610	NA
BENZENE	37	3	8	**0.9**	**0.9J**	**1**	**0.5**	**100**	3	34	0.3	1
BROMODICHLOROMETHANE	37	0	0	--	--	--	**1**	**100**	0	37	0.2	80
BROMOFORM	37	0	0	--	--	--	1	**100**	0	3	9	80
BROMOMETHANE	37	0	0	--	--	--	1	**200**	0	3	9	NA
CARBON DISULFIDE	37	5	14	7	0.5J	20J	1	100	0	0	1,000	NA
CARBON TETRACHLORIDE	37	0	0	--	--	--	**0.5**	**50**	0	37	0.2	0.5
CHLOROBENZENE	37	1	3	11	11	11	1	100	0	0	110	70
CHLOROETHANE	37	0	0	--	--	--	2	**200**	0	3	5	NA
CHLOROFORM	37	2	5	**0.9**	**0.7J**	**1**	**1**	**100**	2	35	0.5 (CAL-modified)	80
CHLOROMETHANE	37	0	0	--	--	--	**2**	**200**	0	37	2	NA
CIS-1,3-DICHLOROPROPENE	37	0	0	--	--	--	**0.5**	**50**	0	37	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	37	0	0	--	--	--	**1**	**100**	0	37	0.1	80
ETHYLBENZENE	37	6	16	**42**	**4J**	**120**	1	2	6	0	3	300
METHYLENE CHLORIDE	37	0	0	--	--	--	1	**100**	0	3	4	NA
STYRENE	37	0	0	--	--	--	1	100	0	0	1,600	100
TETRACHLOROETHENE	37	1	3	**0.7**	**0.7J**	**0.7J**	**1**	**100**	1	36	0.7	5
TOLUENE	37	7	19	71	0.2J	230	1	2	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	37	0	0	--	--	--	**0.5**	**50**	0	37	0.4 (not trans)	0.5
TRICHLOROETHENE	37	1	3	**22**	**22**	**22**	**1**	**100**	1	36	0.03	5

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
VINYL ACETATE	2	0	0	--	--	--	2	2	0	0	410	NA
VINYL CHLORIDE	37	2	5	**120**	**18**	**220**	**0.5**	**50**	2	35	0.02 (child or adult)	0.5
XYLENE (TOTAL)	37	6	16	**300**	6J	**1,200**	1	2	2	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	37	0	0	--	--	--	10	**16,000**	0	2	190	5
1,2-DICHLOROBENZENE	37	0	0	--	--	--	5	**8,000**	0	1	370	600
1,3-DICHLOROBENZENE	37	0	0	--	--	--	5	**8,000**	0	5	6	NA
1,4-DICHLOROBENZENE	37	0	0	--	--	--	**5**	**8,000**	0	37	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	37	1	3	0.7	0.7J	0.7J	10	16,000	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	37	0	0	--	--	--	25	**40,000**	0	1	3,600	50
2,4,6-TRICHLOROPHENOL	37	0	0	--	--	--	**10**	**16,000**	0	37	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	37	0	0	--	--	--	10	**16,000**	0	2	110	NA
2,4-DIMETHYLPHENOL	37	4	11	39	2J	140J	10	**16,000**	0	1	730	NA
2,4-DINITROPHENOL	31	0	0	--	--	--	25	**40,000**	0	4	73	NA
2,4-DINITROTOLUENE	37	0	0	--	--	--	10	**16,000**	0	2	73	NA
2,6-DINITROTOLUENE	37	0	0	--	--	--	10	**16,000**	0	4	36	NA
2-CHLORONAPHTHALENE	37	0	0	--	--	--	10	16,000	--	--	NA	NA
2-CHLOROPHENOL	37	0	0	--	--	--	10	**16,000**	0	4	30	NA
2-METHYLNAPHTHALENE	37	4	11	1,600	7J	6,500J	10	250	--	--	NA	NA
2-METHYLPHENOL	37	2	5	25	9J	41J	10	**16,000**	0	1	1,800	NA
2-NITROANILINE	37	0	0	--	--	--	**25**	**40,000**	0	37	1	NA
2-NITROPHENOL	37	0	0	--	--	--	10	16,000	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	37	0	0	--	--	--	**10**	**16,000**	0	37	0.2	NA
3-NITROANILINE	37	0	0	--	--	--	25	40,000	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	37	1	3	25	25J	25J	25	40,000	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	37	0	0	--	--	--	10	16,000	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	37	0	0	--	--	--	10	16,000	--	--	NA	NA
4-CHLOROANILINE	37	0	0	--	--	--	10	**16,000**	0	2	150	NA
4-CHLOROPHENYL-PHENYLETHER	37	0	0	--	--	--	10	16,000	--	--	NA	NA
4-METHYLPHENOL	37	1	3	1,200	**1,200**	**1,200**	10	**16,000**	1	1	180	NA

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-NITROANILINE	37	0	0	--	--	--	25	40,000	--	--	NA	NA
4-NITROPHENOL	37	1	3	6	6J	6J	25	40,000	--	--	NA	NA
ACENAPHTHENE	37	1	3	0.9	0.9J	0.9J	10	**16,000**	0	1	370	NA
ACENAPHTHYLENE	37	0	0	--	--	--	10	16,000	--	--	NA	NA
ANTHRACENE	37	0	0	--	--	--	10	**16,000**	0	1	1,800	NA
BENZO(A)ANTHRACENE	37	2	5	**0.9**	**0.7J**	**1J**	**10**	**16,000**	2	35	0.09	0.1
BENZO(A)PYRENE	37	2	5	**2**	**1J**	**2J**	**10**	**16,000**	2	35	0.009	0.2
BENZO(B)FLUORANTHENE	37	2	5	**2**	**2J**	**2J**	**10**	**16,000**	2	35	0.09	NA
BENZO(G,H,I)PERYLENE	37	2	5	2	1J	2J	10	16,000	--	--	NA	NA
BENZO(K)FLUORANTHENE	37	1	3	**0.8**	**0.8J**	**0.8J**	**10**	**16,000**	1	36	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	37	0	0	--	--	--	10	16,000	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	37	0	0	--	--	--	**10**	**16,000**	0	37	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	37	0	0	--	--	--	4	**6,400**	0	10	5	NA
BUTYLBENZYLPHTHALATE	37	0	0	--	--	--	10	**16,000**	0	1	7,300	NA
CARBAZOLE	37	0	0	--	--	--	**10**	**16,000**	0	37	3	NA
CHRYSENE	37	2	5	**0.9**	**0.8J**	**1J**	**10**	**16,000**	2	35	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	37	0	0	--	--	--	10	16,000	--	--	NA	NA
DI-N-OCTYLPHTHALATE	37	0	0	--	--	--	10	16,000	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	37	0	0	--	--	--	**10**	**16,000**	0	37	0.009	NA
DIBENZOFURAN	37	0	0	--	--	--	10	**16,000**	0	4	24	NA
DIETHYLPHTHALATE	37	0	0	--	--	--	10	16,000	0	0	29,000	NA
DIMETHYLPHTHALATE	37	0	0	--	--	--	10	16,000	0	0	360,000	NA
FLUORANTHENE	37	3	8	2	2J	3J	10	**16,000**	0	1	1,500	NA
FLUORENE	37	1	3	0.8	0.8J	0.8J	10	**16,000**	0	2	240	NA
HEXACHLOROBENZENE	37	0	0	--	--	--	**10**	**16,000**	0	37	0.04	1
HEXACHLOROBUTADIENE	37	0	0	--	--	--	**10**	**16,000**	0	37	0.9	NA
HEXACHLOROCYCLOPENTADIENE	37	0	0	--	--	--	10	**16,000**	0	2	220	NA
HEXACHLOROETHANE	37	0	0	--	--	--	**10**	**16,000**	0	37	5	NA
INDENO(1,2,3-CD)PYRENE	37	2	5	**1**	**0.9J**	**1J**	**10**	**16,000**	2	35	0.09	NA
ISOPHORONE	37	2	5	1	1J	1J	10	**16,000**	0	2	71	NA
N-NITROSO-DI-N-PROPYLAMINE	37	0	0	--	--	--	**10**	**16,000**	0	37	0.01	NA

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
N-NITROSODIPHENYLAMINE	37	0	0	--	--	--	10	**16,000**	0	5	14	NA
NAPHTHALENE	37	7	19	4,200	0.9J	**29,000**	**10**	**50**	5	30	6	NA
NITROBENZENE	37	0	0	--	--	--	**10**	**16,000**	0	37	3	NA
PENTACHLOROPHENOL	37	2	5	**2**	**1J**	**2J**	**25**	**40,000**	2	35	0.6	1
PHENANTHRENE	37	3	8	400	0.9J	1,200J	10	250	--	--	NA	NA
PHENOL	37	4	11	28	7J	50J	10	16,000	0	0	22,000	NA
PYRENE	37	5	14	2	0.5J	4J	10	**16,000**	0	2	180	NA
Metals (µg/L)												
Unfiltered												
ALUMINUM	2	1	50	195	195J	195J	41.2	41.2	0	0	36,000	NA
ANTIMONY	2	0	0	--	--	--	6.4	6.4	0	0	15.0	6.0
ARSENIC	2	1	50	**7.4**	**7.4J**	**7.4J**	**4.0**	**4.0**	1	1	0.045	10.0
BARIUM	2	2	100	78.8	47.6J	110J	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	2	0	0	--	--	--	0.70	0.70	0	0	73.0	4.0
CADMIUM	2	0	0	--	--	--	0.30	0.43	0	0	18.0	5.0
CALCIUM	2	2	100	33,200	24,900	41,400	0.0	0.0	--	--	NA	NA
CHROMIUM	2	0	0	--	--	--	0.70	4.0	--	--	NA	50.0
COBALT	2	0	0	--	--	--	4.6	4.6	0	0	730	NA
COPPER	2	0	0	--	--	--	4.2	8.8	0	0	1,500	1,300
IRON	2	1	50	128	128	128	122	122	0	0	11,000	NA
LEAD	2	0	0	--	--	--	1.3	1.3	--	--	NA	15.0
MAGNESIUM	2	2	100	15,300	11,300	19,200	0.0	0.0	--	--	NA	NA
MANGANESE	2	2	100	93.7	14.3J	173	0.0	0.0	0	0	880	NA
MERCURY	2	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	2	0	0	--	--	--	9.8	9.8	0	0	180	NA
NICKEL	2	0	0	--	--	--	9.3	15.2	0	0	730	100
POTASSIUM	2	2	100	18,000	14,800	21,200	0.0	0.0	--	--	NA	NA
SELENIUM	2	0	0	--	--	--	2.6	2.6	0	0	180	50.0
SILVER	2	0	0	--	--	--	0.90	0.90	0	0	180	NA
SODIUM	2	2	100	101,000	55,200	147,000	0.0	0.0	--	--	NA	NA
THALLIUM	2	0	0	--	--	--	**2.9**	**2.9**	0	2	2.4	2.0

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Unfiltered												
VANADIUM	2	0	0	--	--	--	4.2	7.2	0	0	260	NA
ZINC	2	1	50	13.2	13.2J	13.2J	5.3	5.3	0	0	11,000	NA
Filtered												
ALUMINUM	37	7	19	4,420	88.2J	17,400	15.2	141	0	0	36,000	NA
ANTIMONY	37	4	11	14.0	2.9J	**37.5J**	2.2	**44.0**	1	4	15.0	6.0
ARSENIC	37	18	49	**14.7**	**3.0J**	**33.0**	**2.6**	**100**	18	19	0.045	10.0
BARIUM	37	34	92	162	19.2J	785J	28.0	37.4	0	0	2,600	1,000
BERYLLIUM	37	6	16	3.0	1.1J	4.3J	0.10	5.0	0	0	73.0	4.0
CADMIUM	37	7	19	8.4	0.40J	**24.8J**	0.30	0.60	1	0	18.0	5.0
CALCIUM	37	35	95	210,000	3,540J	1,690,000J	3,430	6,340	--	--	NA	NA
CHROMIUM	37	6	16	48.3	1.9J	206J	0.40	32.0	--	--	NA	50.0
COBALT	37	7	19	26.3	9.8J	48.2J	3.8	38.5	0	0	730	NA
COPPER	37	7	19	12.6	5.4J	28.1	3.2	46.5	0	0	1,500	1,300
IRON	37	16	43	4,980	86.8J	**17,700J**	3.2	**22,500**	4	1	11,000	NA
LEAD	37	3	8	14.6	6.0	28.9J	1.0	20.0	--	--	NA	15.0
MAGNESIUM	37	36	97	215,000	3,520J	1,820,000	8,570	8,570	--	--	NA	NA
MANGANESE	37	35	95	2,030	6.6J	**14,900**	6.1	559	12	0	880	NA
MERCURY	37	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	37	3	8	32.6	12.0J	48.2J	7.9	63.5	0	0	180	NA
NICKEL	37	10	27	90.1	22.6J	157	7.5	139	0	0	730	100
POTASSIUM	37	36	97	27,400	4,580J	88,200	16,100	16,100	--	--	NA	NA
SELENIUM	37	1	3	9.7	9.7J	9.7J	2.4	54.0	0	0	180	50.0
SILVER	36	0	0	--	--	--	0.90	10.0	0	0	180	NA
SODIUM	37	37	100	1,030,000	22,500	6,050,000	0.0	0.0	--	--	NA	NA
THALLIUM	37	1	3	**31.3**	**31.3**	**31.3**	2.0	**76.0**	1	30	2.4	2.0
VANADIUM	37	9	24	34.1	7.5J	102J	3.7	35.0	0	0	260	NA
ZINC	37	12	32	105	6.7J	658	5.3	46.6	0	0	11,000	NA

TABLE 5-6: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-7: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	8	0	0	--	--	--	1	1	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.06	1
1,1,2-TRICHLOROETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	5
1,1-DICHLOROETHANE	8	0	0	--	--	--	1	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	340	6
1,2,4-TRICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	190	5
1,2-DIBROMO-3-CHLOROPROPANE	8	0	0	--	--	--	**1**	**1**	0	8	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	370	600
1,2-DICHLOROETHANE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.1	0.5
1,2-DICHLOROPROPANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	5
1,3-DICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	6	NA
1,4-DICHLOROBENZENE	8	0	0	--	--	--	**1**	**1**	0	8	0.5	5
2-BUTANONE	1	0	0	--	--	--	5	5	--	--	NA	NA
2-HEXANONE	6	0	0	--	--	--	5	5	--	--	NA	NA
4-METHYL-2-PENTANONE	8	0	0	--	--	--	5	5	--	--	NA	NA
BENZENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.3	1
BROMOCHLOROMETHANE	8	0	0	--	--	--	1	1	--	--	NA	NA
BROMODICHLOROMETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	80
BROMOFORM	8	0	0	--	--	--	1	1	0	0	9	80
BROMOMETHANE	8	0	0	--	--	--	1	1	0	0	9	NA
CARBON DISULFIDE	8	0	0	--	--	--	1	1	0	0	1,000	NA
CARBON TETRACHLORIDE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.2	0.5
CHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	110	70
CHLOROETHANE	8	0	0	--	--	--	1	1	0	0	5	NA
CHLOROFORM	8	1	13	**2**	**2 J**	**2J**	**1**	**1**	1	7	0.5 (CAL-modified)	80
CHLOROMETHANE	8	0	0	--	--	--	1	1	0	0	2	NA
CIS-1,2-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.1	80
ETHYLBENZENE	8	0	0	--	--	--	1	1	0	0	3	300
ETHYLENE DIBROMIDE	8	0	0	--	--	--	1	1	--	--	NA	0.05

TABLE 5-7: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
METHYLENE CHLORIDE	8	0	0	--	--	--	2	2	0	0	4	NA
STYRENE	8	0	0	--	--	--	1	1	0	0	1,600	100
TETRACHLOROETHENE	8	0	0	--	--	--	**1**	**1**	0	8	0.7	5
TOLUENE	8	0	0	--	--	--	1	1	0	0	720	150
TRANS-1,2-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.4 (not trans)	0.5
TRICHLOROETHENE	8	0	0	--	--	--	**1**	**1**	0	8	0.03	5
VINYL CHLORIDE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.02 (child or adult)	0.5
XYLENE (TOTAL)	8	0	0	--	--	--	1	1	0	0	210	1,800
Metals (µg/L)												
Unfiltered												
ALUMINUM	2	0	0	--	--	--	7.4	57.9	0	0	36,000	NA
ANTIMONY	2	0	0	--	--	--	1.8	3.4	0	0	15.0	6.0
ARSENIC	2	0	0	--	--	--	**2.1**	**2.1**	0	2	0.045	10.0
BARIUM	2	2	100	55.0	23.6J	86.4J	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	2	0	0	--	--	--	0.20	0.20	0	0	73.0	4.0
CADMIUM	2	1	50	13.7	13.7	13.7	0.30	0.30	0	0	18.0	5.0
CALCIUM	2	2	100	241,000	40,900	442,000	0.0	0.0	--	--	NA	NA
CHROMIUM	2	1	50	1.8	1.8J	1.8J	0.80	0.80	--	--	NA	50.0
COBALT	2	1	50	6.2	6.2J	6.2J	2.5	2.5	0	0	730	NA
COPPER	2	0	0	--	--	--	2.8	2.9	0	0	1,500	1,300
IRON	2	0	0	--	--	--	12.5	12.5	0	0	11,000	NA
LEAD	2	0	0	--	--	--	1.7	1.7	--	--	NA	15.0
MAGNESIUM	2	2	100	257,000	9,340	504,000	0.0	0.0	--	--	NA	NA
MANGANESE	2	2	100	1,400	9.0J	**2,800**	0.0	0.0	1	0	880	NA
MERCURY	2	0	0	--	--	--	0.10	0.10	0	0	11.0	2.0
MOLYBDENUM	2	0	0	--	--	--	1.0	1.0	0	0	180	NA
NICKEL	2	0	0	--	--	--	4.3	5.7	0	0	730	100
POTASSIUM	2	2	100	11,500	4,820J	18,200	0.0	0.0	--	--	NA	NA
SELENIUM	2	0	0	--	--	--	2.2	2.2	0	0	180	50.0
SILVER	2	0	0	--	--	--	0.70	0.70	0	0	180	NA

TABLE 5-7: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Unfiltered												
SODIUM	2	2	100	794,000	18,100	1,570,000	0.0	0.0	--	--	NA	NA
THALLIUM	2	0	0	--	--	--	1.1	1.4	0	0	2.4	2.0
VANADIUM	2	1	50	2.4	2.4 J	2.4 J	0.60	0.60	0	0	260	NA
ZINC	2	2	100	25.7	11.4 J	40.0	0.0	0.0	0	0	11,000	NA
Filtered												
ALUMINUM	6	1	17	244	244	244	6.6	94.8	0	0	36,000	NA
ANTIMONY	6	0	0	--	--	--	0.70	1.3	0	0	15.0	6.0
ARSENIC	6	0	0	--	--	--	**0.80**	**5.2**	0	6	0.045	10.0
BARIUM	6	6	100	159	20.7 J	363	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	6	0	0	--	--	--	0.10	0.30	0	0	73.0	4.0
CADMIUM	6	4	67	8.0	0.50 J	15.4	0.15	0.15	0	0	18.0	5.0
CALCIUM	6	6	100	391,000	51,300	1,690,000	0.0	0.0	--	--	NA	NA
CHROMIUM	6	2	33	2.5	1.9 J	3.0 J	0.20	2.2	--	--	NA	50.0
COBALT	6	5	83	3.1	0.36 J	11.4 J	0.40	0.40	0	0	730	NA
COPPER	6	0	0	--	--	--	0.65	5.4	0	0	1,500	1,300
IRON	6	2	33	635	230	1,040	5.6	8.4	0	0	11,000	NA
LEAD	6	0	0	--	--	--	0.50	65.0	--	--	NA	15.0
MAGNESIUM	6	6	100	400,000	11,500	1,810,000	0.0	0.0	--	--	NA	NA
MANGANESE	6	5	83	4,400	4.8 J	**17,800**	2.3	2.3	3	0	880	NA
MERCURY	6	0	0	--	--	--	0.10	0.10	0	0	11.0	2.0
MOLYBDENUM	6	1	17	0.88	0.88 J	0.88 J	0.25	0.60	0	0	180	NA
NICKEL	6	5	83	6.6	2.5 J	12.0 J	5.2	5.2	0	0	730	100
POTASSIUM	6	6	100	17,900	4,440	38,500	0.0	0.0	--	--	NA	NA
SELENIUM	5	1	20	2.7	2.7 J	2.7 J	0.85	1.0	0	0	180	50.0
SILVER	6	1	17	0.17	0.17 J	0.17 J	0.15	1.6	0	0	180	NA
SODIUM	6	6	100	1,120,000	15,000	4,960,000	0.0	0.0	--	--	NA	NA
THALLIUM	6	0	0	--	--	--	0.90	**18.0**	0	1	2.4	2.0
VANADIUM	6	0	0	--	--	--	0.30	2.7	0	0	260	NA
ZINC	6	3	50	83.1	21.6	136	3.3	21.8	0	0	11,000	NA

TABLE 5-7: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1,2-TETRACHLOROETHANE	41	0	0	--	--	--	**1**	**5**	0	41	0.4	NA
1,1,1-TRICHLOROETHANE	52	1	2	0.7	0.7J	0.7J	1	5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	52	0	0	--	--	--	**1**	**5**	0	52	0.06	1
1,1,2-TRICHLOROETHANE	52	0	0	--	--	--	**1**	**5**	0	52	0.2	5
1,1-DICHLOROETHANE	52	17	33	**120**	0.5J	**1,200**	0.5	1	11	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	52	10	19	5	1J	23	1	5	0	0	340	6
1,1-DICHLOROPROPENE	1	0	0	--	--	--	5	5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	1	0	0	--	--	--	5	5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	1	0	0	--	--	--	**5**	**5**	0	1	0.006	NA
1,2,4-TRICHLOROBENZENE	1	0	0	--	--	--	5	5	0	0	190	5
1,2,4-TRIMETHYLBENZENE	1	0	0	--	--	--	5	5	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	1	0	0	--	--	--	**5**	**5**	0	1	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	52	0	0	--	--	--	1	5	0	0	370	600
1,2-DICHLOROETHANE	52	1	2	**0.7**	**0.7J**	**0.7J**	**0.5**	**5**	1	51	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	11	2	18	12	3	21	2	2	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	12	0	0	--	--	--	**2**	**5**	0	12	0.2	5
1,3,5-TRIMETHYLBENZENE	1	0	0	--	--	--	5	5	0	0	12	NA
1,3-DICHLOROBENZENE	52	0	0	--	--	--	1	5	0	0	6	NA
1,3-DICHLOROPROPANE	1	0	0	--	--	--	5	5	--	--	NA	NA
1,4-DICHLOROBENZENE	52	0	0	--	--	--	**1**	**5**	0	52	0.5	5
2,2-DICHLOROPROPANE	1	0	0	--	--	--	5	5	--	--	NA	NA
2-BUTANONE	12	0	0	--	--	--	2	10	--	--	NA	NA
2-CHLOROTOLUENE	1	0	0	--	--	--	5	5	--	--	NA	NA
2-HEXANONE	12	0	0	--	--	--	2	10	--	--	NA	NA
4-CHLOROTOLUENE	1	0	0	--	--	--	5	5	--	--	NA	NA
4-METHYL-2-PENTANONE	12	0	0	--	--	--	2	10	--	--	NA	NA
ACETONE	12	0	0	--	--	--	3	20	0	0	610	NA
BENZENE	52	6	12	**1**	**0.9**	**2**	**0.5**	**5**	6	46	0.3	1
BROMOBENZENE	1	0	0	--	--	--	5	5	0	0	20	NA
BROMOCHLOROMETHANE	1	0	0	--	--	--	10	10	--	--	NA	NA
BROMODICHLOROMETHANE	12	0	0	--	--	--	**2**	**5**	0	12	0.2	80

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
BROMOFORM	12	0	0	--	--	--	2	5	0	0	9	80
BROMOMETHANE	12	0	0	--	--	--	2	**10**	0	1	9	NA
CARBON DISULFIDE	12	2	17	0.4	0.3J	0.4J	2	5	0	0	1,000	NA
CARBON TETRACHLORIDE	12	0	0	--	--	--	**0.5**	**5**	0	12	0.2	0.5
CHLOROBENZENE	52	2	4	0.5	0.4J	0.6J	1	5	0	0	110	70
CHLOROETHANE	52	2	4	4	3	**5**	1	**10**	1	1	5	NA
CHLOROFORM	12	0	0	--	--	--	**2**	**5**	0	12	0.5 (CAL-modified)	80
CHLOROMETHANE	52	0	0	--	--	--	1	**10**	0	12	2	NA
CIS-1,2-DICHLOROETHENE	41	6	15	9	1	24	1	5	0	0	61	6
CIS-1,3-DICHLOROPROPENE	12	0	0	--	--	--	**0.5**	**5**	0	12	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	12	0	0	--	--	--	**2**	**5**	0	12	0.1	80
DIBROMOMETHANE	1	0	0	--	--	--	5	5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	1	0	0	--	--	--	10	10	0	0	390	NA
ETHYLBENZENE	52	3	6	**19**	0.3J	**55**	1	**5**	1	1	3	300
ETHYLENE DIBROMIDE	1	0	0	--	--	--	5	5	--	--	NA	0.05
HEXACHLOROBUTADIENE	1	0	0	--	--	--	**5**	**5**	0	1	0.9	NA
ISOPROPYLBENZENE	1	0	0	--	--	--	5	5	--	--	NA	NA
M,P-XYLENE	41	4	10	54	1	210	1	5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	52	3	6	**22**	**7**	**40**	1	5	3	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	52	0	0	--	--	--	1	**20**	0	1	4	NA
N-BUTYLBENZENE	1	0	0	--	--	--	5	5	--	--	NA	NA
N-PROPYLBENZENE	1	0	0	--	--	--	5	5	0	0	240	NA
NAPHTHALENE	41	2	5	**72**	4	**140**	1	5	1	0	6	NA
O-XYLENE	41	2	5	42	1	83	1	5	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	1	0	0	--	--	--	5	5	--	--	NA	NA
SEC-BUTYLBENZENE	1	0	0	--	--	--	5	5	0	0	240	NA
STYRENE	12	0	0	--	--	--	2	5	0	0	1,600	100
TERT-BUTYLBENZENE	1	0	0	--	--	--	5	5	0	0	240	NA
TETRACHLOROETHENE	52	1	2	**3**	**3**	**3**	**1**	**5**	1	51	0.7	5
TOLUENE	52	5	10	7	1	20	1	5	0	0	720	150
TRANS-1,2-DICHLOROETHENE	41	0	0	--	--	--	1	5	0	0	120	10

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TRANS-1,3-DICHLOROPROPENE	12	0	0	--	--	--	**0.5**	**5**	0	12	0.4 (not trans)	0.5
TRICHLOROETHENE	52	2	4	**0.8**	**0.7 J**	**0.8J**	**1**	**5**	2	50	0.03	5
TRICHLOROFLUOROMETHANE	1	0	0	--	--	--	5	5	--	--	NA	NA
TRICHLOROTRIFLUOROETHANE	1	0	0	--	--	--	5	5	--	--	NA	NA
VINYL ACETATE	1	0	0	--	--	--	50	50	0	0	410	NA
VINYL CHLORIDE	52	10	19	**4**	**0.5 J**	**11**	**0.5**	**10**	10	42	0.02 (child or adult)	0.5
XYLENE (TOTAL)	11	1	9	2	2	2	2	2	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	29	0	0	--	--	--	10	50	0	0	190	5
1,2-DICHLOROBENZENE	29	0	0	--	--	--	5	25	0	0	370	600
1,3-DICHLOROBENZENE	29	0	0	--	--	--	5	**25**	0	3	6	NA
1,4-DICHLOROBENZENE	29	0	0	--	--	--	**5**	**25**	0	29	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	29	0	0	--	--	--	10	50	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	29	0	0	--	--	--	25	130	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	29	0	0	--	--	--	**10**	**50**	0	29	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	29	0	0	--	--	--	10	50	0	0	110	NA
2,4-DIMETHYLPHENOL	29	1	3	40	40	40	10	50	0	0	730	NA
2,4-DINITROPHENOL	29	0	0	--	--	--	25	**250**	0	3	73	NA
2,4-DINITROTOLUENE	29	0	0	--	--	--	10	50	0	0	73	NA
2,6-DINITROTOLUENE	29	0	0	--	--	--	10	**50**	0	1	36	NA
2-CHLORONAPHTHALENE	29	0	0	--	--	--	10	50	--	--	NA	NA
2-CHLOROPHENOL	29	0	0	--	--	--	10	**50**	0	1	30	NA
2-METHYLNAPHTHALENE	29	0	0	--	--	--	10	50	--	--	NA	NA
2-METHYLPHENOL	29	0	0	--	--	--	10	50	0	0	1,800	NA
2-NITROANILINE	29	0	0	--	--	--	**25**	**130**	0	29	1	NA
2-NITROPHENOL	29	0	0	--	--	--	10	50	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	29	0	0	--	--	--	**12**	**60**	0	29	0.2	NA
3-NITROANILINE	29	0	0	--	--	--	25	130	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	29	0	0	--	--	--	25	130	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	29	0	0	--	--	--	10	50	--	--	NA	NA

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-CHLORO-3-METHYLPHENOL	29	0	0	--	--	--	10	50	--	--	NA	NA
4-CHLOROANILINE	29	0	0	--	--	--	17	85	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	29	0	0	--	--	--	10	50	--	--	NA	NA
4-METHYLPHENOL	29	0	0	--	--	--	10	50	0	0	180	NA
4-NITROANILINE	29	0	0	--	--	--	25	130	--	--	NA	NA
4-NITROPHENOL	29	0	0	--	--	--	25	130	--	--	NA	NA
ACENAPHTHENE	29	0	0	--	--	--	10	50	0	0	370	NA
ACENAPHTHYLENE	29	0	0	--	--	--	10	50	--	--	NA	NA
ANTHRACENE	29	0	0	--	--	--	10	50	0	0	1,800	NA
BENZO(A)ANTHRACENE	29	0	0	--	--	--	**10**	**50**	0	29	0.09	0.1
BENZO(A)PYRENE	29	0	0	--	--	--	**1**	**7**	0	29	0.009	0.2
BENZO(B)FLUORANTHENE	29	0	0	--	--	--	**10**	**50**	0	29	0.09	NA
BENZO(G,H,I)PERYLENE	29	0	0	--	--	--	10	50	--	--	NA	NA
BENZO(K)FLUORANTHENE	29	0	0	--	--	--	**10**	**50**	0	29	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	29	0	0	--	--	--	10	50	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	29	0	0	--	--	--	**10**	**50**	0	29	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	29	0	0	--	--	--	4	**20**	0	4	5	NA
BUTYLBENZYLPHTHALATE	29	0	0	--	--	--	10	50	0	0	7,300	NA
CARBAZOLE	29	0	0	--	--	--	**10**	**50**	0	29	3	NA
CHRYSENE	29	0	0	--	--	--	**10**	**50**	0	29	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	29	0	0	--	--	--	10	50	--	--	NA	NA
DI-N-OCTYLPHTHALATE	29	0	0	--	--	--	10	50	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	29	0	0	--	--	--	**20**	**100**	0	29	0.009	NA
DIBENZOFURAN	29	0	0	--	--	--	10	**50**	0	2	24	NA
DIETHYLPHTHALATE	29	0	0	--	--	--	10	50	0	0	29,000	NA
DIMETHYLPHTHALATE	29	0	0	--	--	--	10	50	0	0	360,000	NA
FLUORANTHENE	29	0	0	--	--	--	10	50	0	0	1,500	NA
FLUORENE	29	0	0	--	--	--	10	50	0	0	240	NA
HEXACHLOROBENZENE	29	0	0	--	--	--	**10**	**50**	0	29	0.04	1
HEXACHLOROBUTADIENE	29	0	0	--	--	--	**10**	**50**	0	29	0.9	NA
HEXACHLOROCYCLOPENTADIENE	29	0	0	--	--	--	11	55	0	0	220	NA

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
HEXACHLOROETHANE	29	0	0	--	--	--	**10**	**50**	0	29	5	NA
INDENO(1,2,3-CD)PYRENE	29	0	0	--	--	--	**10**	**50**	0	29	0.09	NA
ISOPHORONE	29	0	0	--	--	--	10	50	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	29	0	0	--	--	--	**10**	**50**	0	29	0.01	NA
N-NITROSODIPHENYLAMINE	29	0	0	--	--	--	10	**50**	0	21	14	NA
NAPHTHALENE	29	1	3	**85**	**85**	**85**	**10**	**50**	1	28	6	NA
NITROBENZENE	29	0	0	--	--	--	**10**	**50**	0	29	3	NA
PENTACHLOROPHENOL	29	0	0	--	--	--	**25**	**130**	0	29	0.6	1
PHENANTHRENE	29	0	0	--	--	--	10	50	--	--	NA	NA
PHENOL	29	1	3	59	59	59	10	50	0	0	22,000	NA
PYRENE	29	0	0	--	--	--	10	50	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	32	0	0	--	--	--	5	25	0	0	370	NA
ACENAPHTHYLENE	32	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	32	5	16	0.2	0.1J	0.4	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	32	9	28	**0.6**	**0.1J**	**2**	**0.2**	**1**	9	23	0.09	0.1
BENZO(A)PYRENE	32	12	38	**0.5**	**0.1J**	**3**	**0.2**	**1**	12	20	0.009	0.2
BENZO(B)FLUORANTHENE	32	7	22	**0.5**	**0.2**	**2**	**0.2**	**1**	7	25	0.09	NA
BENZO(G,H,I)PERYLENE	32	10	31	0.6	0.2	2	0.2	1	--	--	NA	NA
BENZO(K)FLUORANTHENE	32	3	9	**0.3**	**0.1J**	**0.6**	**0.2**	**1**	3	29	0.06 (CAL-modified)	NA
CHRYSENE	32	7	22	0.5	0.2J	**1**	0.2	**1**	2	2	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	32	9	28	**0.9**	**0.3J**	**2**	**0.5**	**3**	9	23	0.009	NA
FLUORANTHENE	32	12	38	0.8	0.2J	3	0.2	1	0	0	1,500	NA
FLUORENE	32	0	0	--	--	--	1	5	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	32	8	25	**0.5**	**0.1J**	**2**	**0.2**	**1**	8	24	0.09	NA
NAPHTHALENE	32	1	3	**64**	**64**	**64**	5	**25**	1	3	6	NA
PHENANTHRENE	32	5	16	0.9	0.5J	2	1	5	--	--	NA	NA
PYRENE	32	14	44	1	0.2J	5	0.2	1	0	0	180	NA

TABLE 5-8: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-9: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.4	NA
1,1,1-TRICHLOROETHANE	12	0	0	--	--	--	0.5	0.5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.06	1
1,1,2-TRICHLOROETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.2	5
1,1-DICHLOROETHANE	12	4	33	**4**	**3**	**5**	0.5	0.5	4	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	12	0	0	--	--	--	0.5	0.5	0	0	340	6
1,1-DICHLOROPROPENE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	12	1	8	**0.3**	**0.3J**	**0.3J**	**0.5**	**0.5**	1	11	0.006	NA
1,2,4-TRICHLOROBENZENE	12	0	0	--	--	--	0.5	0.5	0	0	190	5
1,2,4-TRIMETHYLBENZENE	12	2	17	0.3	0.3J	0.3J	0.5	0.5	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	12	2	17	0.4	0.3J	0.5J	0.5	0.5	0	0	370	600
1,2-DICHLOROETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.1	0.5
1,2-DICHLOROPROPANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.2	5
1,3,5-TRIMETHYLBENZENE	12	2	17	0.4	0.3J	0.4J	0.5	0.5	0	0	12	NA
1,3-DICHLOROBENZENE	12	0	0	--	--	--	0.5	0.5	0	0	6	NA
1,3-DICHLOROPROPANE	12	4	33	0.7	0.4J	0.9	0.5	0.5	--	--	NA	NA
1,4-DICHLOROBENZENE	12	2	17	0.2	0.1J	0.2J	0.5	0.5	0	0	0.5	5
2,2-DICHLOROPROPANE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-BUTANONE	12	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROTOLUENE	12	1	8	0.1	0.1J	0.1J	0.5	0.5	--	--	NA	NA
2-HEXANONE	12	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROTOLUENE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
4-METHYL-2-PENTANONE	12	0	0	--	--	--	10	10	--	--	NA	NA
ACETONE	12	2	17	2	1J	2J	0.5	10	0	0	610	NA
BENZENE	12	4	33	**1**	**0.9**	**1**	**0.5**	**0.5**	4	8	0.3	1
BROMOBENZENE	12	0	0	--	--	--	0.5	0.5	0	0	20	NA
BROMOCHLOROMETHANE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
BROMODICHLOROMETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.2	80
BROMOFORM	12	0	0	--	--	--	1	1	0	0	9	80

TABLE 5-9: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMOMETHANE	12	0	0	--	--	--	1	1	0	0	9	NA
CARBON DISULFIDE	12	0	0	--	--	--	0.5	0.5	0	0	1,000	NA
CARBON TETRACHLORIDE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.2	0.5
CHLOROBENZENE	12	7	58	1	0.1J	2	0.5	0.5	0	0	110	70
CHLOROETHANE	12	1	8	0.5	0.5J	0.5J	1	1	0	0	5	NA
CHLOROFORM	12	0	0	--	--	--	0.2	0.5	0	0	0.5 (CAL-modified)	80
CHLOROMETHANE	12	0	0	--	--	--	1	1	0	0	2	NA
CIS-1,2-DICHLOROETHENE	12	4	33	8	7	10	0.5	0.5	0	0	61	6
DIBROMOCHLOROMETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.1	80
DIBROMOMETHANE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	12	0	0	--	--	--	1	1	0	0	390	NA
DIISOPROPYL ETHER	12	4	33	1	0.8J	2	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	12	4	33	**4**	0.5J	**10**	0.5	0.5	2	0	3	300
ETHYLENE DIBROMIDE	12	0	0	--	--	--	0.5	0.5	--	--	NA	0.05
HEXACHLOROBUTADIENE	12	0	0	--	--	--	0.5	0.5	0	0	0.9	NA
ISOPROPYLBENZENE	12	3	25	1	0.3J	3	0.5	0.5	--	--	NA	NA
M,P-XYLENE	12	3	25	11	0.3J	30	0.5	0.5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	12	4	33	**9**	4	**14**	0.1	0.5	3	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	12	0	0	--	--	--	0.1	**5**	0	8	4	NA
N-BUTYLBENZENE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	12	3	25	0.8	0.5J	1	0.5	0.5	0	0	240	NA
NAPHTHALENE	12	3	25	0.8	0.3J	2J	2	2	0	0	6	NA
O-XYLENE	12	3	25	5	0.5J	12	0.5	0.5	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
SEC-BUTYLBENZENE	12	3	25	1	0.5J	2	0.5	0.5	0	0	240	NA
STYRENE	12	0	0	--	--	--	0.5	0.5	0	0	1,600	100
TERT-AMYL METHYL ETHER	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	12	3	25	21	15J	25	10	20	--	--	NA	NA
TERT-BUTYLBENZENE	12	4	33	0.6	0.4J	0.9	0.5	0.5	0	0	240	NA
TETRACHLOROETHENE	12	0	0	--	--	--	0.5	0.5	0	0	0.7	5

TABLE 5-9: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TOLUENE	12	3	25	0.4	0.2 J	0.6	0.5	0.5	0	0	720	150
TRANS-1,2-DICHLOROETHENE	12	4	33	0.7	0.5	0.9	0.5	0.5	0	0	120	10
TRICHLOROETHENE	12	1	8	**0.1**	**0.1 J**	**0.1 J**	**0.5**	**0.5**	1	11	0.03	5
TRICHLOROFLUOROMETHANE	12	0	0	--	--	--	1	1	--	--	NA	NA
VINYL CHLORIDE	12	4	33	**13**	**10**	**20**	**0.5**	**0.5**	4	8	0.02 (child or adult)	0.5
Metals (µg/L)												
Filtered												
ALUMINUM	6	0	0	--	--	--	4.3	100	0	0	36,000	NA
ANTIMONY	6	2	33	0.12	0.12 J	0.12 J	0.12	0.20	0	0	15.0	6.0
ARSENIC	6	4	67	**20.5**	**8.4**	**37.0**	**5.0**	**5.0**	4	2	0.045	10.0
BARIUM	6	6	100	136	56.0	290	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	6	0	0	--	--	--	2.0	2.0	0	0	73.0	4.0
CADMIUM	6	3	50	0.71	0.055 J	2.0 J	5.0	5.0	0	0	18.0	5.0
CALCIUM	6	6	100	522,000	21,000	1,600,000	0.0	0.0	--	--	NA	NA
CHROMIUM	6	6	100	3.5	0.51 J	7.5 J	0.0	0.0	--	--	NA	50.0
COBALT	6	6	100	5.4	0.11 J	15.0	0.0	0.0	0	0	730	NA
COPPER	6	6	100	3.0	0.59 J	7.7 J	0.0	0.0	0	0	1,500	1,300
IRON	6	5	83	3,250	140	5,500	200	200	0	0	11,000	NA
LEAD	6	2	33	0.57	0.043 J	1.1 J	0.37	3.0	--	--	NA	15.0
MAGNESIUM	6	6	100	587,000	12,000	1,900,000	0.0	0.0	--	--	NA	NA
MANGANESE	6	6	100	5,430	160	**16,000**	0.0	0.0	4	0	880	NA
MERCURY	6	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	6	3	50	1.0	0.49 J	1.7 J	0.42	1.5	0	0	180	NA
NICKEL	6	3	50	15.9	0.76 J	31.0	18.0	20.0	0	0	730	100
POTASSIUM	6	6	100	16,800	11,000	23,000	0.0	0.0	--	--	NA	NA
SELENIUM	6	1	17	0.85	0.85 J	0.85 J	5.0	5.0	0	0	180	50.0
SILVER	6	2	33	0.14	0.038 J	0.24 J	5.0	5.0	0	0	180	NA
SODIUM	6	6	100	2,100,000	150,000	6,500,000	0.0	0.0	--	--	NA	NA
THALLIUM	6	0	0	--	--	--	0.019	**2.6**	0	1	2.4	2.0
VANADIUM	6	3	50	3.1	2.6 J	3.8 J	1.2	10.0	0	0	260	NA
ZINC	6	3	50	31.0	1.4 J	89.0 J	20.0	100	0	0	11,000	NA

TABLE 5-9: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-10: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES

Basewide Polynuclear Aromatic Hydrocarbon Investigation, 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	52	26	50	180	0.2 J	2,800	0.006	7	--	--	NA
ACENAPHTHENE	52	9	17	27	0.4 J	140	0.006	7	0	0	3,700,000
ACENAPHTHYLENE	52	8	15	0.6	0.2 J	3 J	0.006	24	--	--	NA
ANTHRACENE	52	18	35	6	0.2 J	43	0.006	7	0	0	22,000,000
BENZ(A)ANTHRACENE	52	32	62	4	0.004 J	19	0.006	6	--	--	NA
BENZO(A)PYRENE	52	40	77	4	0.002 J	39	0.01	6	0	0	62
BENZO(B)FLUORANTHENE	52	38	73	5	0.002 J	54	0.01	6	0	0	620
BENZO(G,H,I)PERYLENE	52	45	87	11	0.002 J	110	0.01	5	--	--	NA
BENZO(K)FLUORANTHENE	52	28	54	3	0.2 J	21	0.006	6	0	0	380 (CAL-modified)
CHRYSENE	52	38	73	11	0.005 J	150	0.006	6	0	0	3,800 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	52	26	50	4	0.3 J	34 J	0.006	6	--	--	NA
FLUORANTHENE	52	39	75	7	0.004 J	60	0.01	6	0	0	2,300,000
FLUORENE	52	18	35	35	0.2 J	380	0.006	7	0	0	2,700,000
INDENO(1,2,3-CD)PYRENE	52	36	69	4	0.2 J	39	0.006	6	0	0	620
NAPHTHALENE	52	21	40	280	0.3 J	4,300	0.006	7	0	0	56,000
PHENANTHRENE	52	39	75	36	0.2 J	640	0.006	6	--	--	NA
PYRENE	52	42	81	9	0.004 J	110	0.01	6	0	0	2,300,000

NOTES:

Bold denotes values elevated above the PRG

J Estimated value

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 5-11: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	3	0	0	--	--	--	6	11	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	3	0	0	--	--	--	6	11	0	0	410
1,1,2-TRICHLOROETHANE	3	0	0	--	--	--	6	11	0	0	730
1,1-DICHLOROETHANE	3	0	0	--	--	--	6	11	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	3	0	0	--	--	--	6	11	0	0	120,000
1,2-DICHLOROETHANE	3	0	0	--	--	--	6	11	0	0	280
1,2-DICHLOROETHENE (TOTAL)	2	0	0	--	--	--	11	11	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	3	0	0	--	--	--	6	11	0	0	340
2-BUTANONE	3	0	0	--	--	--	11	11	--	--	NA
2-HEXANONE	3	0	0	--	--	--	6	11	--	--	NA
4-METHYL-2-PENTANONE	3	0	0	--	--	--	11	11	--	--	NA
ACETONE	3	0	0	--	--	--	11	23	0	0	1,600,000
BENZENE	3	0	0	--	--	--	6	11	0	0	600
BROMODICHLOROMETHANE	3	0	0	--	--	--	6	11	0	0	820
BROMOFORM	3	0	0	--	--	--	6	11	0	0	62,000
BROMOMETHANE	3	0	0	--	--	--	11	11	0	0	3,900
CARBON DISULFIDE	3	0	0	--	--	--	6	11	0	0	360,000
CARBON TETRACHLORIDE	3	0	0	--	--	--	6	11	0	0	250
CHLOROBENZENE	3	0	0	--	--	--	6	11	0	0	150,000
CHLOROETHANE	3	0	0	--	--	--	11	11	0	0	3,000
CHLOROFORM	3	0	0	--	--	--	6	11	0	0	940 (CAL-modified)
CHLOROMETHANE	3	0	0	--	--	--	11	11	0	0	1,200
CIS-1,2-DICHLOROETHENE	1	0	0	--	--	--	6	6	0	0	43,000
CIS-1,3-DICHLOROPROPENE	3	0	0	--	--	--	6	11	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	3	0	0	--	--	--	6	11	0	0	1,100
ETHYLBENZENE	3	0	0	--	--	--	6	11	0	0	8,900
HEXANE	1	0	0	--	--	--	6	6	0	0	110,000 (n-hexane)
METHYLENE CHLORIDE	3	0	0	--	--	--	11	23	0	0	9,100
O-XYLENE	1	0	0	--	--	--	6	6	0	0	270,000 (xylenes)
STYRENE	3	0	0	--	--	--	6	11	0	0	1,700,000
TETRACHLOROETHENE	3	1	33	2	2 J	2 J	6	11	0	0	1,500
TOLUENE	3	0	0	--	--	--	6	11	0	0	520,000
TRANS-1,2-DICHLOROETHENE	1	0	0	--	--	--	6	6	0	0	69,000

TABLE 5-11: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TRANS-1,3-DICHLOROPROPENE	3	0	0	--	--	--	6	11	0	0	780 (not trans)
TRICHLOROETHENE	3	0	0	--	--	--	6	11	0	0	53
TRICHLOROFLUOROMETHANE	1	0	0	--	--	--	6	6	0	0	390,000
VINYL ACETATE	1	0	0	--	--	--	57	57	0	0	430,000
VINYL CHLORIDE	3	0	0	--	--	--	11	11	0	0	79 (child or adult)
XYLENE (TOTAL)	3	0	0	--	--	--	6	11	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	650,000
1,2-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	370,000
1,3-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	16,000
1,4-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	1	0	0	--	--	--	390	390	--	--	NA
2,4,5-TRICHLOROPHENOL	1	0	0	--	--	--	940	940	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	180,000
2,4-DIMETHYLPHENOL	1	0	0	--	--	--	390	390	0	0	1,200,000
2,4-DINITROPHENOL	1	0	0	--	--	--	940	940	0	0	120,000
2,4-DINITROTOLUENE	1	0	0	--	--	--	390	390	0	0	120,000
2,6-DINITROTOLUENE	1	0	0	--	--	--	390	390	0	0	61,000
2-CHLORONAPHTHALENE	1	0	0	--	--	--	390	390	--	--	NA
2-CHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	63,000
2-METHYLNAPHTHALENE	1	0	0	--	--	--	390	390	--	--	NA
2-METHYLPHENOL	1	0	0	--	--	--	390	390	--	--	NA
2-NITROANILINE	1	0	0	--	--	--	940	940	0	0	1,700
2-NITROPHENOL	1	0	0	--	--	--	390	390	--	--	NA
3,3'-DICHLOROBENZIDINE	1	0	0	--	--	--	390	390	0	0	1,100
3-NITROANILINE	1	0	0	--	--	--	940	940	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	1	0	0	--	--	--	940	940	--	--	NA
4-BROMOPHENYL-PHENYLETHER	1	0	0	--	--	--	390	390	--	--	NA
4-CHLORO-3-METHYLPHENOL	1	0	0	--	--	--	390	390	--	--	NA
4-CHLOROANILINE	1	0	0	--	--	--	390	390	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	1	0	0	--	--	--	390	390	--	--	NA

TABLE 5-11: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
4-METHYLPHENOL	1	0	0	--	--	--	390	390	0	0	310,000
4-NITROANILINE	1	0	0	--	--	--	940	940	--	--	NA
4-NITROPHENOL	1	0	0	--	--	--	940	940	--	--	NA
ACENAPHTHENE	1	0	0	--	--	--	390	390	0	0	3,700,000
ACENAPHTHYLENE	1	0	0	--	--	--	390	390	--	--	NA
ANTHRACENE	1	0	0	--	--	--	390	390	0	0	22,000,000
BENZO(A)ANTHRACENE	1	0	0	--	--	--	390	390	0	0	620
BENZO(A)PYRENE	1	0	0	--	--	--	**390**	**390**	0	1	62
BENZO(B)FLUORANTHENE	1	0	0	--	--	--	390	390	0	0	620
BENZO(G,H,I)PERYLENE	1	0	0	--	--	--	390	390	--	--	NA
BENZO(K)FLUORANTHENE	1	0	0	--	--	--	**390**	**390**	0	1	380 (CAL-modified)
BIS(2-CHLOROETHOXY)METHANE	1	0	0	--	--	--	390	390	--	--	NA
BIS(2-CHLOROETHYL)ETHER	1	0	0	--	--	--	**390**	**390**	0	1	210
BIS(2-ETHYLHEXYL)PHTHALATE	1	1	100	25	25J	25 J	0.0	0.0	0	0	35,000
BUTYLBENZYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	12,000,000
CARBAZOLE	1	0	0	--	--	--	390	390	0	0	24,000
CHRYSENE	1	0	0	--	--	--	390	390	0	0	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	1	1	100	170	170J	170 J	0.0	0.0	--	--	NA
DI-N-OCTYLPHTHALATE	1	0	0	--	--	--	390	390	--	--	NA
DIBENZO(A,H)ANTHRACENE	1	0	0	--	--	--	**390**	**390**	0	1	62
DIBENZOFURAN	1	0	0	--	--	--	390	390	0	0	290,000
DIETHYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	49,000,000
DIMETHYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	100,000,000
FLUORANTHENE	1	0	0	--	--	--	390	390	0	0	2,300,000
FLUORENE	1	0	0	--	--	--	390	390	0	0	2,700,000
HEXACHLOROBENZENE	1	0	0	--	--	--	**390**	**390**	0	1	300
HEXACHLOROBUTADIENE	1	0	0	--	--	--	390	390	0	0	6,200
HEXACHLOROCYCLOPENTADIENE	1	0	0	--	--	--	390	390	0	0	370,000
HEXACHLOROETHANE	1	0	0	--	--	--	390	390	0	0	35,000
INDENO(1,2,3-CD)PYRENE	1	0	0	--	--	--	390	390	0	0	620
ISOPHORONE	1	0	0	--	--	--	390	390	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	1	0	0	--	--	--	**390**	**390**	0	1	69
N-NITROSODIPHENYLAMINE	1	0	0	--	--	--	390	390	0	0	99,000

TABLE 5-11: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
NAPHTHALENE	1	0	0	--	--	--	390	390	0	0	56,000
NITROBENZENE	1	0	0	--	--	--	390	390	0	0	20,000
PENTACHLOROPHENOL	1	0	0	--	--	--	940	940	0	0	3,000
PHENANTHRENE	1	0	0	--	--	--	390	390	--	--	NA
PHENOL	1	0	0	--	--	--	390	390	0	0	37,000,000
PYRENE	1	0	0	--	--	--	390	390	0	0	2,300,000
PCBs/Pesticides (µg/kg)											
AROCLOR-1016	1	0	0	--	--	--	39	39	0	0	3,900
AROCLOR-1221	1	0	0	--	--	--	79	79	0	0	220
AROCLOR-1232	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1242	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1248	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1254	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1260	1	0	0	--	--	--	39	39	0	0	220

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

NA No PRG available

PCB Polychlorinated biphenyl

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 5-12: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Environmental Baseline Survey Phase 2B

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1-TRICHLOROETHANE	4	0	0	--	--	--	1	1	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.06	1
1,1,2-TRICHLOROETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	5
1,1-DICHLOROETHANE	4	0	0	--	--	--	1	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	4	0	0	--	--	--	1	1	0	0	340	6
1,2-DICHLOROETHANE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	4	0	0	--	--	--	1	1	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	5
2-BUTANONE	4	0	0	--	--	--	2	2	--	--	NA	NA
2-HEXANONE	4	0	0	--	--	--	2	2	--	--	NA	NA
4-METHYL-2-PENTANONE	4	0	0	--	--	--	2	2	--	--	NA	NA
ACETONE	4	0	0	--	--	--	2	2	0	0	610	NA
BENZENE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.3	1
BROMODICHLOROMETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	80
BROMOFORM	4	0	0	--	--	--	1	1	0	0	9	80
BROMOMETHANE	4	0	0	--	--	--	1	1	0	0	9	NA
CARBON DISULFIDE	4	0	0	--	--	--	1	1	0	0	1,000	NA
CARBON TETRACHLORIDE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.2	0.5
CHLOROBENZENE	4	0	0	--	--	--	1	1	0	0	110	70
CHLOROETHANE	4	0	0	--	--	--	2	2	0	0	5	NA
CHLOROFORM	4	1	25	**9**	**9 J**	**9J**	**1**	**1**	1	3	0.5 (CAL-modified)	80
CHLOROMETHANE	4	1	25	**2**	**2 J**	**2J**	**2**	**2**	1	3	2	NA
CIS-1,3-DICHLOROPROPENE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.1	80
ETHYLBENZENE	4	0	0	--	--	--	1	1	0	0	3	300
METHYLENE CHLORIDE	4	0	0	--	--	--	1	1	0	0	4	NA
STYRENE	4	0	0	--	--	--	1	1	0	0	1,600	100
TETRACHLOROETHENE	4	0	0	--	--	--	**1**	**1**	0	4	0.7	5
TOLUENE	4	0	0	--	--	--	1	1	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.4 (not trans)	0.5
TRICHLOROETHENE	4	0	0	--	--	--	**1**	**1**	0	4	0.03	5

TABLE 5-12: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Environmental Baseline Survey Phase 2B

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
VINYL CHLORIDE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.02 (child or adult)	0.5
XYLENE (TOTAL)	4	0	0	--	--	--	1	1	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	1	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	1	0	0	--	--	--	10	10	0	0	370	600
1,3-DICHLOROBENZENE	1	0	0	--	--	--	**10**	**10**	0	1	6	NA
1,4-DICHLOROBENZENE	1	0	0	--	--	--	**10**	**10**	0	1	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	1	0	0	--	--	--	10	10	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	1	0	0	--	--	--	25	25	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	1	0	0	--	--	--	**10**	**10**	0	1	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	1	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	1	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	1	0	0	--	--	--	25	25	0	0	73	NA
2,4-DINITROTOLUENE	1	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	1	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	1	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	1	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	1	0	0	--	--	--	10	10	--	--	NA	NA
2-METHYLPHENOL	1	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	1	0	0	--	--	--	**25**	**25**	0	1	1	NA
2-NITROPHENOL	1	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	1	0	0	--	--	--	**10**	**10**	0	1	0.2	NA
3-NITROANILINE	1	0	0	--	--	--	25	25	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	1	0	0	--	--	--	25	25	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	1	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	1	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	1	0	0	--	--	--	10	10	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	1	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	1	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	1	0	0	--	--	--	25	25	--	--	NA	NA

TABLE 5-12: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Environmental Baseline Survey Phase 2B

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (ug/L)												
4-NITROPHENOL	1	0	0	--	--	--	25	25	--	--	NA	NA
ACENAPHTHENE	1	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	1	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	1	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	1	0	0	--	--	--	**10**	**10**	0	1	0.09	0.1
BENZO(A)PYRENE	1	0	0	--	--	--	**10**	**10**	0	1	0.009	0.2
BENZO(B)FLUORANTHENE	1	0	0	--	--	--	**10**	**10**	0	1	0.09	NA
BENZO(G,H,I)PERYLENE	1	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	1	0	0	--	--	--	**10**	**10**	0	1	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	1	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	1	0	0	--	--	--	**10**	**10**	0	1	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	1	0	0	--	--	--	**10**	**10**	0	1	5	NA
BUTYLBENZYLPHTHALATE	1	0	0	--	--	--	10	10	0	0	7,300	NA
CARBAZOLE	1	0	0	--	--	--	**10**	**10**	0	1	3	NA
CHRYSENE	1	0	0	--	--	--	**10**	**10**	0	1	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	1	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	1	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	1	0	0	--	--	--	**10**	**10**	0	1	0.009	NA
DIBENZOFURAN	1	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	1	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	1	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	1	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	1	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	1	0	0	--	--	--	**10**	**10**	0	1	0.04	1
HEXACHLOROBUTADIENE	1	0	0	--	--	--	**10**	**10**	0	1	0.9	NA
HEXACHLOROCYCLOPENTADIENE	1	0	0	--	--	--	10	10	0	0	220	NA
HEXACHLOROETHANE	1	0	0	--	--	--	**10**	**10**	0	1	5	NA
INDENO(1,2,3-CD)PYRENE	1	0	0	--	--	--	**10**	**10**	0	1	0.09	NA
ISOPHORONE	1	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	1	0	0	--	--	--	**10**	**10**	0	1	0.01	NA
N-NITROSODIPHENYLAMINE	1	0	0	--	--	--	10	10	0	0	14	NA

TABLE 5-12: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Environmental Baseline Survey Phase 2B

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
NAPHTHALENE	1	0	0	--	--	--	**10**	**10**	0	1	6	NA
NITROBENZENE	1	0	0	--	--	--	**10**	**10**	0	1	3	NA
PENTACHLOROPHENOL	1	0	0	--	--	--	**25**	**25**	0	1	0.6	1
PHENANTHRENE	1	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	1	0	0	--	--	--	10	10	0	0	22,000	NA
PYRENE	1	0	0	--	--	--	10	10	0	0	180	NA
Metals (µg/L)												
Unfiltered												
ALUMINUM	1	1	100	376	376	376	0.0	0.0	0	0	36,000	NA
ANTIMONY	1	0	0	--	--	--	1.6	1.6	0	0	15.0	6.0
ARSENIC	1	1	100	**3.6**	**3.6**	**3.6**	0.0	0.0	1	0	0.045	10.0
BARIUM	1	1	100	65.2	65.2	65.2	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	1	0	0	--	--	--	0.50	0.50	0	0	73.0	4.0
CADMIUM	1	1	100	2.4	2.4	2.4	0.0	0.0	0	0	18.0	5.0
CALCIUM	1	1	100	23,400	23,400	23,400	0.0	0.0	--	--	NA	NA
CHROMIUM	1	1	100	9.7	9.7	9.7	0.0	0.0	--	--	NA	50.0
COBALT	1	0	0	--	--	--	5.2	5.2	0	0	730	NA
COPPER	1	0	0	--	--	--	3.4	3.4	0	0	1,500	1,300
IRON	1	1	100	714	714	714	0.0	0.0	0	0	11,000	NA
LEAD	1	0	0	--	--	--	1.3	1.3	--	--	NA	15.0
MAGNESIUM	1	1	100	5,240	5,240	5,240	0.0	0.0	--	--	NA	NA
MANGANESE	1	1	100	9.6	9.6	9.6	0.0	0.0	0	0	880	NA
MERCURY	1	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	1	0	0	--	--	--	3.4	3.4	0	0	180	NA
NICKEL	1	0	0	--	--	--	3.9	3.9	0	0	730	100
POTASSIUM	1	1	100	6,220	6,220	6,220	0.0	0.0	--	--	NA	NA
SELENIUM	1	0	0	--	--	--	2.1	2.1	0	0	180	50.0
SILVER	1	0	0	--	--	--	1.5	1.5	0	0	180	NA
SODIUM	1	1	100	41,000	41,000	41,000	0.0	0.0	--	--	NA	NA
THALLIUM	1	0	0	--	--	--	1.3	1.3	0	0	2.4	2.0
VANADIUM	1	1	100	10.8	10.8	10.8	0.0	0.0	0	0	260	NA

TABLE 5-12: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Environmental Baseline Survey Phase 2B

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Unfiltered												
ZINC	1	0	0	--	--	--	4.7	4.7	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-13: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Pilot Test Design Data Collection, 2002

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	43	0	0	--	--	--	**1**	**2**	0	43	0.4	NA
1,1,1-TRICHLOROETHANE	43	0	0	--	--	--	1	2	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	43	0	0	--	--	--	**1**	**2**	0	43	0.06	1
1,1,2-TRICHLOROETHANE	43	1	2	**3**	**3**	**3**	**1**	**2**	1	42	0.2	5
1,1-DICHLOROETHANE	42	15	36	**130**	0.6J	**1,200**	1	2	7	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	43	8	19	11	1J	38	1	2	0	0	340	6
1,1-DICHLOROPROPENE	43	0	0	--	--	--	1	2	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	43	0	0	--	--	--	1	2	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	43	0	0	--	--	--	**1**	**2**	0	43	0.006	NA
1,2,4-TRICHLOROBENZENE	43	0	0	--	--	--	1	2	0	0	190	5
1,2,4-TRIMETHYLBENZENE	43	23	53	**58**	0.8J	**370**	1	2	17	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	43	0	0	--	--	--	**1**	**2**	0	43	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	43	0	0	--	--	--	1	2	0	0	370	600
1,2-DICHLOROETHANE	43	0	0	--	--	--	**1**	**2**	0	43	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	9	3	33	1	0.9J	2	1	1	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	43	0	0	--	--	--	**1**	**2**	0	43	0.2	5
1,3,5-TRIMETHYLBENZENE	43	22	51	**48**	2	**300**	1	2	12	0	12	NA
1,3-DICHLOROBENZENE	43	0	0	--	--	--	1	2	0	0	6	NA
1,3-DICHLOROPROPANE	43	0	0	--	--	--	1	2	--	--	NA	NA
1,4-DICHLOROBENZENE	43	0	0	--	--	--	**1**	**2**	0	43	0.5	5
2,2-DICHLOROPROPANE	43	0	0	--	--	--	1	2	--	--	NA	NA
2-BUTANONE	43	7	16	10	3J	33	5	10	--	--	NA	NA
2-CHLOROTOLUENE	43	0	0	--	--	--	1	2	--	--	NA	NA
2-HEXANONE	43	0	0	--	--	--	5	10	--	--	NA	NA
4-CHLOROTOLUENE	43	0	0	--	--	--	1	2	--	--	NA	NA
4-METHYL-2-PENTANONE	43	0	0	--	--	--	5	10	--	--	NA	NA
ACETONE	43	27	63	12	4J	35	5	5	0	0	610	NA
BENZENE	43	13	30	**2**	**0.6J**	**6**	**1**	**2**	13	30	0.3	1
BROMOBENZENE	43	0	0	--	--	--	1	2	0	0	20	NA
BROMOCHLOROMETHANE	43	0	0	--	--	--	1	2	--	--	NA	NA
BROMODICHLOROMETHANE	43	0	0	--	--	--	**1**	**2**	0	43	0.2	80

TABLE 5-13: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Pilot Test Design Data Collection, 2002

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMOFORM	43	0	0	--	--	--	1	2	0	0	9	80
BROMOMETHANE	43	0	0	--	--	--	1	2	0	0	9	NA
CARBON TETRACHLORIDE	43	0	0	--	--	--	**1**	**2**	0	43	0.2	0.5
CHLOROBENZENE	43	0	0	--	--	--	1	2	0	0	110	70
CHLOROETHANE	43	0	0	--	--	--	1	2	0	0	5	NA
CHLOROFORM	43	1	2	**0.8**	**0.8J**	**0.8J**	**1**	**2**	1	42	0.5 (CAL-modified)	80
CHLOROMETHANE	43	2	5	**3**	1	**5**	1	**2**	1	2	2	NA
CIS-1,2-DICHLOROETHENE	43	25	58	8	0.6J	39	1	2	0	0	61	6
DIBROMOCHLOROMETHANE	43	0	0	--	--	--	**1**	**2**	0	43	0.1	80
DIBROMOMETHANE	43	0	0	--	--	--	1	2	--	--	NA	NA
DICHLORODIFLUOROMETHANE	43	0	0	--	--	--	1	2	0	0	390	NA
ETHYLBENZENE	43	18	42	**25**	0.5J	**150**	1	2	9	0	3	300
ETHYLENE DIBROMIDE	43	0	0	--	--	--	1	2	--	--	NA	0.05
HEXACHLOROBUTADIENE	43	0	0	--	--	--	**1**	**2**	0	43	0.9	NA
ISOPROPYLBENZENE	43	23	53	20	0.7J	120	1	2	--	--	NA	NA
M,P-XYLENE	43	21	49	7	1	34	1	2	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	43	0	0	--	--	--	1	2	0	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	43	40	93	1	0.6J	**7**	1	1	2	0	4	NA
N-BUTYLBENZENE	43	23	53	15	1	55	1	2	--	--	NA	NA
N-PROPYLBENZENE	43	24	56	45	1	**280**	1	2	2	0	240	NA
NAPHTHALENE	43	27	63	**47**	1	**390**	1	2	15	0	6	NA
O-XYLENE	43	14	33	5	0.8J	29	1	2	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	43	25	58	21	1	57	1	2	--	--	NA	NA
SEC-BUTYLBENZENE	43	24	56	21	0.9J	110	1	2	0	0	240	NA
STYRENE	43	0	0	--	--	--	1	2	0	0	1,600	100
TERT-BUTYLBENZENE	43	4	9	5	1	11	1	2	0	0	240	NA
TETRACHLOROETHENE	43	0	0	--	--	--	**1**	**2**	0	43	0.7	5
TOLUENE	43	20	47	1	0.5J	5	1	2	0	0	720	150
TRANS-1,2-DICHLOROETHENE	43	0	0	--	--	--	1	2	0	0	120	10
TRICHLOROETHENE	43	0	0	--	--	--	**1**	**2**	0	43	0.03	5
TRICHLOROFLUOROMETHANE	43	0	0	--	--	--	1	2	--	--	NA	NA

TABLE 5-13: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Pilot Test Design Data Collection, 2002

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
VINYL CHLORIDE	43	22	51	**25**	**0.6 J**	**280**	**1**	**2**	22	21	0.02 (child or adult)	0.5
Metals (µg/L)												
Unfiltered												
ALUMINUM	14	14	100	884	115	4,440	0.0	0.0	0	0	36,000	NA
ANTIMONY	14	0	0	--	--	--	**20.0**	**200**	0	14	15.0	6.0
ARSENIC	14	11	79	**13.6**	**3.7**	**36.2**	**20.0**	**200**	11	3	0.045	10.0
BARIUM	14	14	100	84.4	12.5	234	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	14	11	79	0.33	0.14	1.7	2.0	2.0	0	0	73.0	4.0
CADMIUM	14	0	0	--	--	--	6.0	**60.0**	0	1	18.0	5.0
CALCIUM	14	14	100	148,000	3,440	1,590,000	0.0	0.0	--	--	NA	NA
CHROMIUM	14	12	86	4.9	1.7	19.4	5.0	50.0	--	--	NA	50.0
COBALT	14	14	100	3.3	0.60	12.4	0.0	0.0	0	0	730	NA
COPPER	14	13	93	2.7	1.2	6.3	100	100	0	0	1,500	1,300
IRON	14	13	93	1,880	227	6,690	150	150	0	0	11,000	NA
LEAD	14	9	64	2.4	1.9	3.0	10.0	100	--	--	NA	15.0
MAGNESIUM	14	14	100	172,000	2,730	1,810,000	0.0	0.0	--	--	NA	NA
MANGANESE	14	14	100	1,820	26.9	**18,600**	0.0	0.0	5	0	880	NA
MERCURY	14	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	14	13	93	5.2	1.6	12.4	50.0	50.0	0	0	180	NA
NICKEL	14	14	100	30.0	6.5	106	0.0	0.0	0	0	730	100
POTASSIUM	14	14	100	21,700	6,290	41,700	0.0	0.0	--	--	NA	NA
SELENIUM	14	0	0	--	--	--	20.0	**200**	0	1	180	50.0
SILVER	14	2	14	5.4	0.83	10.0	3.0	30.0	0	0	180	NA
SODIUM	14	14	100	1,020,000	235,000	5,170,000	0.0	0.0	--	--	NA	NA
THALLIUM	14	0	0	--	--	--	**30.0**	**300**	0	14	2.4	2.0
VANADIUM	14	13	93	5.4	1.9	16.9	100	100	0	0	260	NA
ZINC	14	13	93	45.9	4.1	155	200	200	0	0	11,000	NA

TABLE 5-13: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Pilot Test Design Data Collection, 2002

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1,2-TETRACHLOROETHANE	3	0	0	--	--	--	5	7	--	--	NA
1,1,1-TRICHLOROETHANE	56	0	0	--	--	--	5	120	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	56	0	0	--	--	--	5	120	0	0	410
1,1,2-TRICHLOROETHANE	56	0	0	--	--	--	5	120	0	0	730
1,1-DICHLOROETHANE	55	0	0	--	--	--	5	120	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	57	0	0	--	--	--	5	120	0	0	120,000
1,1-DICHLOROPROPENE	3	0	0	--	--	--	5	7	--	--	NA
1,2,3-TRICHLOROBENZENE	3	0	0	--	--	--	5	7	--	--	NA
1,2,3-TRICHLOROPROPANE	3	0	0	--	--	--	5	7	--	--	NA
1,2,4-TRICHLOROBENZENE	3	0	0	--	--	--	5	7	0	0	650,000
1,2,4-TRIMETHYLBENZENE	3	2	67	14,000	25	28,000	5	5	0	0	52,000
1,2-DIBROMO-3-CHLOROPROPANE	3	0	0	--	--	--	5	7	--	--	NA
1,2-DICHLOROBENZENE	32	0	0	--	--	--	5	960	0	0	370,000
1,2-DICHLOROETHANE	56	0	0	--	--	--	5	120	0	0	280
1,2-DICHLOROETHENE (TOTAL)	53	5	9	28	1 J	130	5	120	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	56	0	0	--	--	--	5	120	0	0	340
1,3,5-TRIMETHYLBENZENE	3	1	33	2,400	2,400	2,400	5	5	0	0	21,000
1,3-DICHLOROBENZENE	32	0	0	--	--	--	5	960	0	0	16,000
1,3-DICHLOROPROPANE	3	0	0	--	--	--	5	7	--	--	NA
1,4-DICHLOROBENZENE	32	0	0	--	--	--	5	960	0	0	3,400
2,2-DICHLOROPROPANE	3	0	0	--	--	--	5	7	--	--	NA
2-BUTANONE	56	1	2	9	9 J	9 J	10	120	--	--	NA
2-CHLOROETHYLVINYLETHER	29	0	0	--	--	--	10	55	--	--	NA
2-CHLOROTOLUENE	3	0	0	--	--	--	5	7	--	--	NA
2-HEXANONE	56	0	0	--	--	--	6	120	--	--	NA
4-CHLOROTOLUENE	3	0	0	--	--	--	5	7	--	--	NA
4-METHYL-2-PENTANONE	56	0	0	--	--	--	10	120	--	--	NA
ACETONE	56	3	5	33	24	52	10	120	0	0	1,600,000
BENZENE	56	0	0	--	--	--	5	120	0	0	600
BROMOBENZENE	3	0	0	--	--	--	5	7	--	--	NA
BROMOCHLOROMETHANE	3	0	0	--	--	--	5	7	--	--	NA

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
BROMODICHLOROMETHANE	56	0	0	--	--	--	5	120	0	0	820
BROMOFORM	56	0	0	--	--	--	5	120	0	0	62,000
BROMOMETHANE	56	0	0	--	--	--	10	120	0	0	3,900
CARBON DISULFIDE	53	0	0	--	--	--	5	120	0	0	360,000
CARBON TETRACHLORIDE	56	0	0	--	--	--	5	120	0	0	250
CHLOROBENZENE	56	0	0	--	--	--	5	120	0	0	150,000
CHLOROETHANE	56	0	0	--	--	--	10	120	0	0	3,000
CHLOROFORM	56	0	0	--	--	--	5	120	0	0	940 (CAL-modified)
CHLOROMETHANE	56	0	0	--	--	--	10	120	0	0	1,200
CIS-1,2-DICHLOROETHENE	4	1	25	23	23	23	5	6	0	0	43,000
CIS-1,3-DICHLOROPROPENE	53	0	0	--	--	--	5	120	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	56	0	0	--	--	--	5	120	0	0	1,100
DIBROMOMETHANE	3	0	0	--	--	--	5	7	--	--	NA
DICHLORODIFLUOROMETHANE	3	0	0	--	--	--	5	7	--	--	NA
ETHYLBENZENE	56	4	7	120	2 J	200	5	120	0	0	8,900
ETHYLENE DIBROMIDE	3	0	0	--	--	--	5	7	--	--	NA
HEXACHLOROBUTADIENE	3	0	0	--	--	--	5	7	0	0	6,200
HEXANE	1	0	0	--	--	--	6	6	0	0	110,000 (n-hexane)
ISOPROPYLBENZENE	3	3	100	37	2 J	100	0.0	0.0	--	--	NA
M,P-XYLENE	3	1	33	320	320	320	5	5	0	0	270,000 (xylenes)
METHYL-T-BUTYL ETHER	3	0	0	--	--	--	5	7	0	0	17,000 (CAL-modified)
METHYLENE CHLORIDE	56	3	5	7	6 J	8 J	6	120	0	0	9,100
N-BUTYLBENZENE	3	1	33	150	150	150	5	5	--	--	NA
N-PROPYLBENZENE	3	1	33	240	240	240	5	5	--	--	NA
NAPHTHALENE	3	3	100	74	13	170	0.0	0.0	0	0	56,000
O-XYLENE	4	1	25	47	47	47	5	6	0	0	270,000 (xylenes)
P-ISOPROPYLTOLUENE	3	0	0	--	--	--	5	7	--	--	NA
SEC-BUTYLBENZENE	3	1	33	110	110	110	5	5	--	--	NA
STYRENE	56	0	0	--	--	--	5	120	0	0	1,700,000
TERT-BUTYLBENZENE	3	1	33	150	150	150	5	5	--	--	NA
TETRACHLOROETHENE	56	2	4	2	1 J	2 J	5	120	0	0	1,500

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TOLUENE	57	33	58	49	2J	730	5	120	0	0	520,000
TRANS-1,2-DICHLOROETHENE	4	0	0	--	--	--	5	7	0	0	69,000
TRANS-1,3-DICHLOROPROPENE	53	0	0	--	--	--	5	120	0	0	780 (not trans)
TRICHLOROETHENE	56	0	0	--	--	--	5	**120**	0	5	53
TRICHLOROFLUOROMETHANE	33	0	0	--	--	--	5	27	0	0	390,000
VINYL ACETATE	30	0	0	--	--	--	10	57	0	0	430,000
VINYL CHLORIDE	56	0	0	--	--	--	10	**120**	0	1	79 (child or adult)
XYLENE (TOTAL)	53	9	17	760	2J	3,100	5	120	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	39	0	0	--	--	--	340	1,000	0	0	650,000
1,2-DICHLOROBENZENE	39	0	0	--	--	--	340	1,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	38	0	0	--	--	--	340	**1,000**	0	10	610
1,3-DICHLOROBENZENE	39	0	0	--	--	--	340	1,000	0	0	16,000
1,4-DICHLOROBENZENE	39	0	0	--	--	--	340	1,000	0	0	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	1	0	0	--	--	--	390	390	--	--	NA
2,4,5-TRICHLOROPHENOL	39	0	0	--	--	--	940	4,900	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	39	0	0	--	--	--	340	1,000	0	0	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	39	0	0	--	--	--	340	1,000	0	0	180,000
2,4-DIMETHYLPHENOL	39	0	0	--	--	--	340	1,000	0	0	1,200,000
2,4-DINITROPHENOL	39	0	0	--	--	--	940	4,900	0	0	120,000
2,4-DINITROTOLUENE	39	0	0	--	--	--	340	1,000	0	0	120,000
2,6-DINITROTOLUENE	39	0	0	--	--	--	340	1,000	0	0	61,000
2-CHLORONAPHTHALENE	39	0	0	--	--	--	340	1,000	--	--	NA
2-CHLOROPHENOL	39	0	0	--	--	--	340	1,000	0	0	63,000
2-METHYLPHENOL	39	0	0	--	--	--	340	1,000	--	--	NA
2-NITROANILINE	39	0	0	--	--	--	940	**4,900**	0	28	1,700
2-NITROPHENOL	39	0	0	--	--	--	340	1,000	--	--	NA
3,3'-DICHLOROBENZIDINE	39	0	0	--	--	--	390	**2,000**	0	10	1,100
3-NITROANILINE	39	0	0	--	--	--	940	4,900	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	39	0	0	--	--	--	940	4,900	--	--	NA

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
4-BROMOPHENYL-PHENYLETHER	39	0	0	--	--	--	340	1,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	39	1	3	43	43 J	43 J	340	1,000	--	--	NA
4-CHLOROANILINE	39	0	0	--	--	--	340	1,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	39	0	0	--	--	--	340	1,000	--	--	NA
4-METHYLPHENOL	39	0	0	--	--	--	340	1,000	0	0	310,000
4-NITROANILINE	39	0	0	--	--	--	940	4,900	--	--	NA
4-NITROPHENOL	39	0	0	--	--	--	940	4,900	--	--	NA
ANILINE	12	0	0	--	--	--	350	720	0	0	85,000
BENZOIC ACID	38	0	0	--	--	--	1,600	4,900	0	0	100,000,000
BENZYL ALCOHOL	38	0	0	--	--	--	340	1,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	39	0	0	--	--	--	340	1,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	39	0	0	--	--	--	**340**	**1,000**	0	39	210
BIS(2-ETHYLHEXYL)PHTHALATE	39	1	3	25	25 J	25 J	340	1,000	0	0	35,000
BUTYLBENZYLPHTHALATE	39	0	0	--	--	--	340	1,000	0	0	12,000,000
CARBAZOLE	1	0	0	--	--	--	390	390	0	0	24,000
DI-N-BUTYLPHTHALATE	39	1	3	170	170 J	170 J	340	1,000	--	--	NA
DI-N-OCTYLPHTHALATE	39	0	0	--	--	--	340	1,000	--	--	NA
DIBENZOFURAN	39	0	0	--	--	--	340	1,000	0	0	290,000
DIETHYLPHTHALATE	39	0	0	--	--	--	340	1,000	0	0	49,000,000
DIMETHYLPHTHALATE	39	0	0	--	--	--	340	1,000	0	0	100,000,000
HEXACHLOROBENZENE	39	0	0	--	--	--	**340**	**1,000**	0	39	300
HEXACHLOROBUTADIENE	39	0	0	--	--	--	340	1,000	0	0	6,200
HEXACHLOROCYCLOPENTADIENE	39	0	0	--	--	--	340	1,000	0	0	370,000
HEXACHLOROETHANE	39	0	0	--	--	--	340	1,000	0	0	35,000
ISOPHORONE	39	0	0	--	--	--	340	1,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	39	0	0	--	--	--	**340**	**1,000**	0	39	69
N-NITROSODIMETHYLAMINE	12	0	0	--	--	--	**350**	**720**	0	12	10
N-NITROSODIPHENYLAMINE	39	18	46	60	38 J	120 J	340	1,000	0	0	99,000
NITROBENZENE	39	0	0	--	--	--	340	1,000	0	0	20,000
PENTACHLOROPHENOL	39	1	3	430	430 J	430 J	940	**4,900**	0	9	3,000
PHENOL	39	1	3	42	42 J	42 J	340	1,000	0	0	37,000,000

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	52	26	50	180	0.2 J	2,800	0.006	7	--	--	NA
ACENAPHTHENE	52	9	17	27	0.4 J	140	0.006	7	0	0	3,700,000
ACENAPHTHYLENE	52	8	15	0.6	0.2 J	3 J	0.006	24	--	--	NA
ANTHRACENE	52	18	35	6	0.2 J	43	0.006	7	0	0	22,000,000
BENZ(A)ANTHRACENE	52	32	62	4	0.004 J	19	0.006	6	--	--	NA
BENZO(A)PYRENE	52	40	77	4	0.002 J	39	0.01	6	0	0	62
BENZO(B)FLUORANTHENE	52	38	73	5	0.002 J	54	0.01	6	0	0	620
BENZO(G,H,I)PERYLENE	52	45	87	11	0.002 J	110	0.01	5	--	--	NA
BENZO(K)FLUORANTHENE	52	28	54	3	0.2 J	21	0.006	6	0	0	380 (CAL-modified)
CHRYSENE	52	38	73	11	0.005 J	150	0.006	6	0	0	3,800 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	52	26	50	4	0.3 J	34 J	0.006	6	--	--	NA
FLUORANTHENE	52	39	75	7	0.004 J	60	0.01	6	0	0	2,300,000
FLUORENE	52	18	35	35	0.2 J	380	0.006	7	0	0	2,700,000
INDENO(1,2,3-CD)PYRENE	52	36	69	4	0.2 J	39	0.006	6	0	0	620
NAPHTHALENE	52	21	40	280	0.3 J	4,300	0.006	7	0	0	56,000
PHENANTHRENE	52	39	75	36	0.2 J	640	0.006	6	--	--	NA
PYRENE	52	42	81	9	0.004 J	110	0.01	6	0	0	2,300,000
PCBs/Pesticides (µg/kg)											
AROCLOR-1016	1	0	0	--	--	--	39	39	0	0	3,900
AROCLOR-1221	1	0	0	--	--	--	79	79	0	0	220
AROCLOR-1232	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1242	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1248	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1254	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1260	1	0	0	--	--	--	39	39	0	0	220
Metals (mg/kg)											
ALUMINUM	62	62	100	6,030	2,880	28,800	0.0	0.0	0	0	76,000
ANTIMONY	62	4	6	0.58	0.31	1.2 J	0.48	7.6	0	0	31.0
ARSENIC	62	25	40	**4.0**	**0.85 J**	**10.0**	**0.55**	**13.0**	25	37	0.39

TABLE 5-14: SITE 9 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
BARIUM	62	60	97	58.2	16.3 J	266	24.0	25.0	0	0	5,400
BERYLLIUM	62	39	63	0.49	0.090	1.5	0.20	1.3	0	0	150
CADMIUM	62	25	40	0.37	0.10	0.99	0.060	1.3	0	0	37.0
CALCIUM	62	62	100	4,840	1,340	19,200	0.0	0.0	--	--	NA
CHROMIUM	62	62	100	39.3	19.0	178	0.0	0.0	0	0	210
COBALT	62	35	56	7.4	2.9	23.0	4.6	6.5	0	0	900
COPPER	62	58	94	14.0	4.1 J	89.4	5.5	6.1	0	0	3,100
IRON	62	62	100	10,100	5,090	**39,000**	0.0	0.0	6	0	23,000
LEAD	62	31	50	7.6	1.3	44.6	2.1	6.8	0	0	150 (CAL-modified)
MAGNESIUM	62	61	98	2,870	1,570	10,200	520	520	--	--	NA
MANGANESE	62	62	100	143	62.5	1,060	0.0	0.0	0	0	1,800
MERCURY	24	2	8	0.055	0.010	0.10	0.030	0.36	0	0	23.0
MOLYBDENUM	62	3	5	0.44	0.13	0.86	0.31	6.7	0	0	390
NICKEL	62	62	100	29.6	14.6	111	0.0	0.0	0	0	1,600
POTASSIUM	62	58	94	999	310	3,740	560	610	--	--	NA
SELENIUM	62	0	0	--	--	--	0.55	13.0	0	0	390
SILVER	62	3	5	0.67	0.44	0.96	0.18	6.3	0	0	390
SODIUM	62	50	81	562	68.0 J	3,510	520	630	--	--	NA
THALLIUM	62	1	2	**5.3**	**5.3**	**5.3**	0.40	**13.0**	1	14	5.2
TITANIUM	38	38	100	403	223	1,190	0.0	0.0	--	--	NA
VANADIUM	62	62	100	22.3	12.7	70.8	0.0	0.0	0	0	550
ZINC	62	62	100	30.2	12.0	105	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PCB Polychlorinated biphenyl

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	96	0	0	--	--	--	**0.5**	**5**	0	96	0.4	NA
1,1,1-TRICHLOROETHANE	159	2	1	2	0.7J	3	0.5	100	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	159	0	0	--	--	--	**0.5**	**100**	0	159	0.06	1
1,1,2-TRICHLOROETHANE	159	1	1	**3**	**3**	**3**	**0.5**	**100**	1	158	0.2	5
1,1-DICHLOROETHANE	158	45	28	**92**	0.5J	**1,200**	0.5	**100**	25	5	2 (CAL-modified)	5
1,1-DICHLOROETHENE	159	18	11	7	1J	38	0.5	100	0	0	340	6
1,1-DICHLOROPROPENE	56	0	0	--	--	--	0.5	5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	56	0	0	--	--	--	0.5	5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	56	1	2	**0.3**	**0.3J**	**0.3J**	**0.5**	**5**	1	55	0.006	NA
1,2,4-TRICHLOROBENZENE	64	0	0	--	--	--	0.5	5	0	0	190	5
1,2,4-TRIMETHYLBENZENE	56	25	45	**53**	0.3J	**370**	0.5	5	17	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	64	0	0	--	--	--	**0.5**	**5**	0	64	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	115	2	2	0.4	0.3J	0.5J	0.5	5	0	0	370	600
1,2-DICHLOROETHANE	159	3	2	**0.6**	**0.5**	**0.7J**	**0.5**	**50**	3	156	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	64	15	23	**200**	0.9J	**2,400**	1	9	2	0	61 (cis)	NA
1,2-DICHLOROPROPANE	119	1	1	**2**	**2**	**2**	**0.5**	**100**	1	118	0.2	5
1,3,5-TRIMETHYLBENZENE	56	24	43	**44**	0.3J	**300**	0.5	5	12	0	12	NA
1,3-DICHLOROBENZENE	115	0	0	--	--	--	0.5	5	0	0	6	NA
1,3-DICHLOROPROPANE	56	4	7	0.7	0.4J	0.9	0.5	5	--	--	NA	NA
1,4-DICHLOROBENZENE	115	2	2	0.2	0.1J	0.2J	0.5	**5**	0	103	0.5	5
2,2-DICHLOROPROPANE	56	0	0	--	--	--	0.5	5	--	--	NA	NA
2-BUTANONE	83	9	11	21	3J	63J	2	28	--	--	NA	NA
2-CHLOROTOLUENE	56	1	2	0.1	0.1J	0.1J	0.5	5	--	--	NA	NA
2-HEXANONE	114	0	0	--	--	--	2	200	--	--	NA	NA
4-CHLOROTOLUENE	56	0	0	--	--	--	0.5	5	--	--	NA	NA
4-METHYL-2-PENTANONE	119	2	2	3	0.7J	5J	2	200	--	--	NA	NA
ACETONE	81	30	37	16	1J	150J	0.5	20	0	0	610	NA
BENZENE	159	26	16	**2**	**0.6J**	**6**	**0.5**	**100**	26	133	0.3	1
BROMOBENZENE	56	0	0	--	--	--	0.5	5	0	0	20	NA
BROMOCHLOROMETHANE	64	0	0	--	--	--	0.5	10	--	--	NA	NA
BROMODICHLOROMETHANE	119	0	0	--	--	--	**0.5**	**100**	0	119	0.2	80

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMOFORM	119	0	0	--	--	--	1	**100**	0	3	9	80
BROMOMETHANE	119	0	0	--	--	--	1	**200**	0	7	9	NA
CARBON DISULFIDE	76	7	9	5	0.3J	20J	0.5	100	0	0	1,000	NA
CARBON TETRACHLORIDE	119	0	0	--	--	--	**0.5**	**50**	0	119	0.2	0.5
CHLOROBENZENE	159	10	6	2	0.1J	11	0.5	100	0	0	110	70
CHLOROETHANE	159	3	2	3	0.5J	**5**	1	**200**	1	7	5	NA
CHLOROFORM	119	5	4	**3**	**0.7J**	**9J**	0.2	**100**	5	102	0.5 (CAL-modified)	80
CHLOROMETHANE	159	3	2	**3**	1	**5**	1	**200**	2	57	2	NA
CIS-1,2-DICHLOROETHENE	104	35	34	8	0.6J	39	0.5	5	0	0	61	6
CIS-1,3-DICHLOROPROPENE	64	0	0	--	--	--	**0.5**	**50**	0	64	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	119	0	0	--	--	--	**0.5**	**100**	0	119	0.1	80
DIBROMOMETHANE	56	0	0	--	--	--	0.5	5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	56	0	0	--	--	--	1	10	0	0	390	NA
DIISOPROPYL ETHER	12	4	33	1	0.8J	2	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	159	31	19	**25**	0.3J	**150**	0.5	**5**	18	4	3	300
ETHYLENE DIBROMIDE	64	0	0	--	--	--	0.5	5	--	--	NA	0.05
HEXACHLOROBUTADIENE	56	0	0	--	--	--	0.5	**5**	0	44	0.9	NA
ISOPROPYLBENZENE	56	26	46	17	0.3J	120	0.5	5	--	--	NA	NA
M,P-XYLENE	96	28	29	14	0.3J	210	0.5	5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	107	7	7	**15**	4	**40**	0.1	5	6	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	159	40	25	1	0.6J	**7**	0.1	**100**	2	15	4	NA
N-BUTYLBENZENE	56	23	41	15	1	55	0.5	5	--	--	NA	NA
N-PROPYLBENZENE	56	27	48	40	0.5J	**280**	0.5	5	2	0	240	NA
NAPHTHALENE	96	32	33	**44**	0.3J	**390**	1	5	16	0	6	NA
O-XYLENE	96	19	20	9	0.5J	83	0.5	5	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	56	25	45	21	1	57	0.5	5	--	--	NA	NA
SEC-BUTYLBENZENE	56	27	48	18	0.5J	110	0.5	5	0	0	240	NA
STYRENE	119	0	0	--	--	--	0.5	100	0	0	1,600	100
TERT-AMYL METHYL ETHER	12	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	12	3	25	21	15J	25	10	20	--	--	NA	NA

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TERT-BUTYLBENZENE	56	8	14	3	0.4 J	11	0.5	5	0	0	240	NA
TETRACHLOROETHENE	159	2	1	**2**	**0.7 J**	**3**	0.5	**100**	2	145	0.7	5
TOLUENE	159	35	22	16	0.2 J	230	0.5	5	0	0	720	150
TRANS-1,2-DICHLOROETHENE	104	4	4	0.7	0.5	0.9	0.5	5	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	64	0	0	--	--	--	**0.5**	**50**	0	64	0.4 (not trans)	0.5
TRICHLOROETHENE	159	4	3	**6**	**0.1 J**	**22**	**0.5**	**100**	4	155	0.03	5
TRICHLOROFLUOROMETHANE	56	0	0	--	--	--	1	5	--	--	NA	NA
TRICHLOROTRIFLUOROETHANE	1	0	0	--	--	--	5	5	--	--	NA	NA
VINYL ACETATE	6	0	0	--	--	--	2	50	0	0	410	NA
VINYL CHLORIDE	159	38	24	**23**	**0.5 J**	**280**	**0.5**	**50**	38	121	0.02 (child or adult)	0.5
XYLENE (TOTAL)	63	7	11	**260**	2	**1,200**	1	5	2	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	70	0	0	--	--	--	10	**16,000**	0	2	190	5
1,2-DICHLOROBENZENE	70	0	0	--	--	--	5	**8,000**	0	1	370	600
1,3-DICHLOROBENZENE	70	0	0	--	--	--	5	**8,000**	0	12	6	NA
1,4-DICHLOROBENZENE	70	0	0	--	--	--	**5**	**8,000**	0	70	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	67	1	1	0.7	0.7 J	0.7 J	10	16,000	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	70	0	0	--	--	--	25	**40,000**	0	1	3,600	50
2,4,6-TRICHLOROPHENOL	70	0	0	--	--	--	**10**	**16,000**	0	70	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	70	0	0	--	--	--	10	**16,000**	0	2	110	NA
2,4-DIMETHYLPHENOL	70	5	7	39	2 J	140 J	10	**16,000**	0	1	730	NA
2,4-DINITROPHENOL	64	0	0	--	--	--	25	**40,000**	0	7	73	NA
2,4-DINITROTOLUENE	70	0	0	--	--	--	10	**16,000**	0	2	73	NA
2,6-DINITROTOLUENE	70	0	0	--	--	--	10	**16,000**	0	5	36	NA
2-CHLORONAPHTHALENE	70	0	0	--	--	--	10	16,000	--	--	NA	NA
2-CHLOROPHENOL	70	0	0	--	--	--	10	**16,000**	0	5	30	NA
2-METHYLNAPHTHALENE	70	4	6	1,600	7 J	6,500 J	10	250	--	--	NA	NA
2-METHYLPHENOL	70	2	3	25	9 J	41 J	10	**16,000**	0	1	1,800	NA
2-NITROANILINE	70	0	0	--	--	--	**25**	**40,000**	0	70	1	NA
2-NITROPHENOL	70	0	0	--	--	--	10	16,000	--	--	NA	NA

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (ug/L)												
3,3'-DICHLOROBENZIDINE	70	0	0	--	--	--	**10**	**16,000**	0	70	0.2	NA
3-NITROANILINE	70	0	0	--	--	--	25	40,000	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	70	1	1	25	25J	25J	25	40,000	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	70	0	0	--	--	--	10	16,000	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	70	0	0	--	--	--	10	16,000	--	--	NA	NA
4-CHLOROANILINE	70	0	0	--	--	--	10	**16,000**	0	2	150	NA
4-CHLOROPHENYL-PHENYLETHER	70	0	0	--	--	--	10	16,000	--	--	NA	NA
4-METHYLPHENOL	70	1	1	1,200	**1,200**	**1,200**	10	**16,000**	1	1	180	NA
4-NITROANILINE	70	0	0	--	--	--	25	40,000	--	--	NA	NA
4-NITROPHENOL	70	1	1	6	6J	6J	25	40,000	--	--	NA	NA
ACENAPHTHENE	70	1	1	0.9	0.9J	0.9J	10	**16,000**	0	1	370	NA
ACENAPHTHYLENE	68	0	0	--	--	--	10	16,000	--	--	NA	NA
ANTHRACENE	70	0	0	--	--	--	10	**16,000**	0	1	1,800	NA
BENZO(A)ANTHRACENE	70	2	3	**0.9**	**0.7J**	**1J**	**10**	**16,000**	2	68	0.09	0.1
BENZO(A)PYRENE	70	2	3	**2**	**1J**	**2J**	**1**	**16,000**	2	68	0.009	0.2
BENZO(B)FLUORANTHENE	70	2	3	**2**	**2J**	**2J**	**10**	**16,000**	2	68	0.09	NA
BENZO(G,H,I)PERYLENE	70	2	3	2	1J	2J	10	16,000	--	--	NA	NA
BENZO(K)FLUORANTHENE	70	1	1	**0.8**	**0.8J**	**0.8J**	**10**	**16,000**	1	69	0.06 (CAL-modified)	NA
BENZOIC ACID	3	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	3	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	70	0	0	--	--	--	10	16,000	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	70	0	0	--	--	--	**10**	**16,000**	0	70	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	70	0	0	--	--	--	4	**6,400**	0	18	5	NA
BUTYLBENZYLPHTHALATE	70	0	0	--	--	--	10	**16,000**	0	1	7,300	NA
CARBAZOLE	67	0	0	--	--	--	**10**	**16,000**	0	67	3	NA
CHRYSENE	70	2	3	**0.9**	**0.8J**	**1J**	**10**	**16,000**	2	68	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	70	0	0	--	--	--	10	16,000	--	--	NA	NA
DI-N-OCTYLPHTHALATE	70	0	0	--	--	--	10	16,000	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	70	0	0	--	--	--	**10**	**16,000**	0	70	0.009	NA
DIBENZOFURAN	70	0	0	--	--	--	10	**16,000**	0	6	24	NA
DIETHYLPHTHALATE	70	0	0	--	--	--	10	16,000	0	0	29,000	NA

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
DIMETHYLPHTHALATE	70	0	0	--	--	--	10	16,000	0	0	360,000	NA
FLUORANTHENE	70	3	4	2	2J	3J	10	**16,000**	0	1	1,500	NA
FLUORENE	70	1	1	0.8	0.8J	0.8J	10	**16,000**	0	2	240	NA
HEXACHLOROBENZENE	70	0	0	--	--	--	**10**	**16,000**	0	70	0.04	1
HEXACHLOROBUTADIENE	70	0	0	--	--	--	**10**	**16,000**	0	70	0.9	NA
HEXACHLOROCYCLOPENTADIENE	70	0	0	--	--	--	10	**16,000**	0	2	220	NA
HEXACHLOROETHANE	70	0	0	--	--	--	**10**	**16,000**	0	70	5	NA
INDENO(1,2,3-CD)PYRENE	70	2	3	**1**	**0.9J**	**1J**	**10**	**16,000**	2	68	0.09	NA
ISOPHORONE	70	2	3	1	1J	1J	10	**16,000**	0	2	71	NA
N-NITROSO-DI-N-PROPYLAMINE	70	0	0	--	--	--	**10**	**16,000**	0	70	0.01	NA
N-NITROSODIPHENYLAMINE	70	0	0	--	--	--	10	**16,000**	0	26	14	NA
NAPHTHALENE	70	8	11	3,700	0.9J	**29,000**	**10**	**50**	6	62	6	NA
NITROBENZENE	70	0	0	--	--	--	**10**	**16,000**	0	70	3	NA
PENTACHLOROPHENOL	70	2	3	**2**	**1J**	**2J**	**25**	**40,000**	2	68	0.6	1
PHENANTHRENE	70	3	4	400	0.9J	1,200J	10	250	--	--	NA	NA
PHENOL	70	5	7	34	7J	59	10	16,000	0	0	22,000	NA
PYRENE	70	5	7	2	0.5J	4J	10	**16,000**	0	2	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	32	0	0	--	--	--	5	25	0	0	370	NA
ACENAPHTHYLENE	32	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	32	5	16	0.2	0.1J	0.4	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	32	9	28	**0.6**	**0.1J**	**2**	**0.2**	**1**	9	23	0.09	0.1
BENZO(A)PYRENE	32	12	38	**0.5**	**0.1J**	**3**	**0.2**	**1**	12	20	0.009	0.2
BENZO(B)FLUORANTHENE	32	7	22	**0.5**	**0.2**	**2**	**0.2**	**1**	7	25	0.09	NA
BENZO(G,H,I)PERYLENE	32	10	31	0.6	0.2	2	0.2	1	--	--	NA	NA
BENZO(K)FLUORANTHENE	32	3	9	**0.3**	**0.1J**	**0.6**	**0.2**	**1**	3	29	0.06 (CAL-modified)	NA
CHRYSENE	32	7	22	0.5	0.2J	**1**	0.2	**1**	2	2	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	32	9	28	**0.9**	**0.3J**	**2**	**0.5**	**3**	9	23	0.009	NA
FLUORANTHENE	32	12	38	0.8	0.2J	3	0.2	1	0	0	1,500	NA
FLUORENE	32	0	0	--	--	--	1	5	0	0	240	NA

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Polynuclear Aromatic Hydrocarbons (ug/L)												
INDENO(1,2,3-CD)PYRENE	32	8	25	**0.5**	**0.1 J**	**2**	**0.2**	**1**	8	24	0.09	NA
NAPHTHALENE	32	1	3	**64**	**64**	**64**	5	**25**	1	3	6	NA
PHENANTHRENE	32	5	16	0.9	0.5 J	2	1	5	--	--	NA	NA
PYRENE	32	14	44	1	0.2 J	5	0.2	1	0	0	180	NA
Metals (µg/L)												
Unfiltered												
ALUMINUM	19	16	84	809	115	4,440	7.4	57.9	0	0	36,000	NA
ANTIMONY	19	0	0	--	--	--	1.6	**200**	0	14	15.0	6.0
ARSENIC	19	13	68	**12.3**	**3.6**	**36.2**	**2.1**	**200**	13	6	0.045	10.0
BARIUM	19	19	100	79.7	12.5	234	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	19	11	58	0.33	0.14	1.7	0.20	2.0	0	0	73.0	4.0
CADMIUM	19	2	11	8.1	2.4	13.7	0.30	**60.0**	0	1	18.0	5.0
CALCIUM	19	19	100	140,000	3,440	1,590,000	0.0	0.0	--	--	NA	NA
CHROMIUM	19	14	74	5.0	1.7	19.4	0.70	50.0	--	--	NA	50.0
COBALT	19	15	79	3.5	0.60	12.4	2.5	5.2	0	0	730	NA
COPPER	19	13	68	2.7	1.2	6.3	2.8	100	0	0	1,500	1,300
IRON	19	15	79	1,690	128	6,690	12.5	150	0	0	11,000	NA
LEAD	19	9	47	2.4	1.9	3.0	1.3	100	--	--	NA	15.0
MAGNESIUM	19	19	100	155,000	2,730	1,810,000	0.0	0.0	--	--	NA	NA
MANGANESE	19	19	100	1,500	9.0 J	**18,600**	0.0	0.0	6	0	880	NA
MERCURY	19	0	0	--	--	--	0.10	0.20	0	0	11.0	2.0
MOLYBDENUM	19	13	68	5.2	1.6	12.4	1.0	50.0	0	0	180	NA
NICKEL	19	14	74	30.0	6.5	106	3.9	15.2	0	0	730	100
POTASSIUM	19	19	100	19,500	4,820 J	41,700	0.0	0.0	--	--	NA	NA
SELENIUM	19	0	0	--	--	--	2.1	**200**	0	1	180	50.0
SILVER	19	2	11	5.4	0.83	10.0	0.70	30.0	0	0	180	NA
SODIUM	19	19	100	851,000	18,100	5,170,000	0.0	0.0	--	--	NA	NA
THALLIUM	19	0	0	--	--	--	1.1	**300**	0	16	2.4	2.0
VANADIUM	19	15	79	5.6	1.9	16.9	0.60	100	0	0	260	NA
ZINC	19	16	84	41.3	4.1	155	4.7	200	0	0	11,000	NA
Filtered												
ALUMINUM	52	11	21	23,300	88.2 J	**98,000**	4.3	141	3	0	36,000	NA

TABLE 5-15: SITE 9 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
ANTIMONY	52	6	12	9.4	0.12J	**37.5J**	0.12	**60.0**	1	7	15.0	6.0
ARSENIC	52	24	46	**19.6**	**3.0J**	**70.0**	**0.80**	**100**	24	28	0.045	10.0
BARIUM	52	49	94	174	19.2J	785J	28.0	37.4	0	0	2,600	1,000
BERYLLIUM	52	6	12	3.0	1.1J	4.3J	0.10	5.0	0	0	73.0	4.0
CADMIUM	52	14	27	6.6	0.055J	**24.8J**	0.15	5.0	1	0	18.0	5.0
CALCIUM	52	50	96	260,000	3,540J	1,690,000	3,430	6,340	--	--	NA	NA
CHROMIUM	52	17	33	63.9	0.51J	350	0.20	32.0	--	--	NA	50.0
COBALT	52	19	37	15.5	0.11J	63.0	0.40	50.0	0	0	730	NA
COPPER	52	16	31	27.5	0.59J	140	0.65	46.5	0	0	1,500	1,300
IRON	52	26	50	15,500	86.8J	**136,000**	3.2	**22,500**	7	1	11,000	NA
LEAD	52	7	13	31.9	0.043J	90.0	0.37	65.0	--	--	NA	15.0
MAGNESIUM	52	51	98	271,000	3,520J	1,900,000	8,570	8,570	--	--	NA	NA
MANGANESE	52	49	94	2,640	4.8J	**17,800**	2.3	559	21	0	880	NA
MERCURY	49	0	0	--	--	--	0.10	0.20	0	0	11.0	2.0
MOLYBDENUM	52	7	13	14.6	0.49J	48.2J	0.25	63.5	0	0	180	NA
NICKEL	52	21	40	91.0	0.76J	470	5.2	139	0	0	730	100
POTASSIUM	52	51	98	25,100	4,440	88,200	16,100	16,100	--	--	NA	NA
SELENIUM	51	3	6	4.4	0.85J	9.7J	0.85	54.0	0	0	180	50.0
SILVER	51	4	8	3.4	0.038J	13.0	0.15	10.0	0	0	180	NA
SODIUM	52	52	100	1,110,000	15,000	6,500,000	0.0	0.0	--	--	NA	NA
THALLIUM	52	1	2	**31.3**	**31.3**	**31.3**	0.019	**76.0**	1	35	2.4	2.0
TITANIUM	3	3	100	2,570	1,400	3,900	0.0	0.0	--	--	NA	NA
VANADIUM	52	15	29	62.4	2.6J	**280**	0.30	35.0	1	0	260	NA
ZINC	52	21	40	115	1.4J	658	3.3	100	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

MC Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Micrograms per liter

TABLE 5-16: SITE 9 STATISTICAL SUMMARY OF SOIL GAS ANALYSES

Supplemental RI Data Gap Sampling, 2001
Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentrations	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Limits Over PRG	Ambient Air PRG
Volatile Organic Compounds (µg/m^3)										
1,1,1-TRICHLOROETHANE	2	0	0	--	--	--	69.86	73.24	0	2,300
1,1,2,2-TETRACHLOROETHANE	2	0	0	--	--	--	**87.89**	**92.15**	2	0.033
1,1,2-TRICHLOROETHANE	2	1	50	**593.13**	**593.13**	**593.13**	**69.86**	**69.86**	1	0.12
1,1-DICHLOROETHANE	2	1	50	**78.44**	**78.44**	**78.44**	**51.82**	**51.82**	1	1.2 (CAL-modified)
1,1-DICHLOROETHENE	2	0	0	--	--	--	50.76	53.22	0	210
1,2-DICHLOROBENZENE	2	0	0	--	--	--	76.98	80.7	0	210
1,2-DICHLOROETHANE	2	0	0	--	--	--	**51.82**	**54.33**	2	0.074
1,3-DICHLOROBENZENE	2	0	0	--	--	--	**76.98**	**80.7**	2	3.3
1,4-DICHLOROBENZENE	2	0	0	--	--	--	**76.98**	**80.7**	2	0.31
BENZENE	2	2	100	**662.19**	**122.88**	**1,201.5**	--	--	--	0.23
CHLOROETHANE	2	0	0	--	--	--	**33.79**	**35.42**	2	2.3
CHLOROMETHANE	2	0	0	--	--	--	**26.44**	**27.72**	2	1.1
CIS-1,2-DICHLOROETHENE	2	0	0	--	--	--	**50.76**	**53.22**	2	37
ETHYLBENZENE	2	2	100	**3,100.31**	**308.88**	**5,891.73**	--	--	--	1.7
M-XYLENE	2	2	100	**13,936.33**	**1,077.17**	**26,795.5**	--	--	--	110
NAPHTHALENE	2	0	0	--	--	--	671.16	703.64	--	NA
O-XYLENE	2	2	100	**2,722.23**	**181.97**	**5,262.49**	--	--	--	110
TETRACHLOROETHENE	2	0	0	--	--	--	**87.36**	**91.59**	2	0.67
TOLUENE	2	2	100	**4,636.66**	**487.39**	**8,785.93**	--	--	--	400
TRANS-1,2-DICHLOROETHENE	2	0	0	--	--	--	50.76	53.22	0	73
TRICHLOROETHENE	2	0	0	--	--	--	**68.8**	**72.13**	2	0.017
VINYL CHLORIDE	2	0	0	--	--	--	**32.73**	**34.31**	2	0.11

NOTES:

Bold denotes value elevated above the PRG

-- Not detected

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/m^3 Micrograms per cubic meter

TABLE 5-17: SITE 9 1,1-DICHLOROETHANE IN GROUNDWATER ANALYTICAL DATA

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Point Name	Sample Identification	Sample Date	Sample Depth (ft bgs)	1,1-Dichloroethane (µg/L)	Qualifier
154-006-024	154-0038	10/30/1995	7.5 - 8.5	1	UJ
154-SN-007	154S-015	10/30/1995	9 - 9	1	UJ
154-SN-008	154S-018	10/30/1995	8 - 9	1	UJ
154-SN-009	154S-021	10/30/1995	9 - 9	1	UJ
3-J	385-S09-036	07/20/2001	0	0.8	
9-1	9-1-10	06/27/2002	8 - 12	1.8	
9-1	9-1-20	06/27/2002	18 - 22	1	U
9-1	9-1-30	06/27/2002	28 - 32	1	U
9-1	9-1-40	06/27/2002	38 - 42	1	U
9-2	9-2-10	06/27/2002	8 - 10	1	U
9-2	9-2-20	06/27/2002	18 - 22	1.2	
9-2	9-2-30	06/27/2002	28 - 32	1	U
9-2	9-2-40	06/27/2002	38 - 42	1	U
9-3	9-3-20	06/28/2002	18 - 22	0.63	J
9-3	9-3-30	06/28/2002	28 - 32	88	
9-3	9-3-40	06/28/2002	38 - 42	1.7	J
9-3	9-3-55	07/02/2002	53 - 57	1	U
9-3	9-3-63	07/02/2002	61 - 65	1	U
9S-CH1	9S-CH1-10	06/27/2002	8 - 12	0.57	J
9S-CH1	9S-CH1-20	06/27/2002	18 - 22	1	U
9S-CH1	9S-CH1-30	06/27/2002	28 - 32	1	U
9S-CH2	9S-CH2-10	06/28/2002	8 - 12	1.8	
9S-CH2	9S-CH2-20	06/28/2002	18 - 22	1	U
9S-CH2	9S-CH2-30	06/28/2002	28 - 32	1	U
9S-CH2	9S-CH2-40	06/28/2002	38 - 42	2	U
9S-CH3	9S-CH3-10	06/27/2002	8 - 22	1	U
9S-CH3	9S-CH3-10D	06/27/2002	8 - 12	1	U
9S-CH3	9S-CH3-20	06/27/2002	8 - 12	1	U
9S-CH3	9S-CH3-30	06/28/2002	28 - 32	1	U
9S-CH3	9S-CH3-40	06/28/2002	38 - 42	1	U
9S-CH4	9S-CH4-10	06/28/2002	8 - 12	1	U
9S-CH4	9S-CH4-20	06/28/2002	18 - 22	1	U
9S-CH4	9S-CH4-30	06/28/2002	28 - 32	1	U
9S-CH4	9S-CH4-40	06/28/2002	38 - 42	1	U
D09-01	280-S09-100	12/20/1994	46.6 - 61	1	U
D09-01	280-S09-107	02/21/1995	46.6 - 61	1	U
D09-01	280-S09-108	06/22/1995	46.6 - 61	1	U
D09-01	280-S09-109	09/14/1995	46.6 - 61	1	U
D09-01	108-S09-003	11/11/1997	46.6 - 61	1	UJ
D09-01	108-S09-004	02/04/1998	46.6 - 61	1	U
D09-01	108-S09-007	05/13/1998	46.6 - 61	1	U
D09-01	108-S09-010	08/06/1998	46.6 - 61	1	UJ
D09-01	385-S09-031	06/26/2001	46.6 - 61	0.5	U
D09-01	D09-01-A1136	06/28/2002	46.6 - 61	0.5	U
D09-01	D09-01-A1338	09/05/2002	46.6 - 61	0.5	U
D09-01	D09-01-A1637	12/16/2002	46.6 - 61	0.5	U
D09-01	D09-01-A1992	04/10/2003	46.6 - 61	0.5	U
DHP-S09-01	280-S09-053	07/28/1994	25.8	1	U
DHP-S09-02	280-S09-054	07/28/1994	30	29	
DHP-S09-03	280-S09-055	07/29/1994	24	1	U
DHP-S09-05	280-S09-058	08/23/1994	23 - 26	2	U

TABLE 5-17: SITE 9 1,1-DICHLOROETHANE IN GROUNDWATER ANALYTICAL DATA

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Point Name	Sample Identification	Sample Date	Sample Depth (ft bgs)	1,1-Dichloroethane (µg/L)	Qualifier
DHP-S09-06	280-S09-059	09/08/1994	8 - 11	10	U
DHP-S09-07	280-S09-062	09/07/1994	21 - 24	1	U
DHP-S09-08	280-S09-064	09/06/1994	24	2	
DHP-S09-09	280-S09-066	09/12/1994	22 - 25	1	U
DHP-S09-10	280-S09-068	09/09/1994	27 - 30	2	
DHP-S09-11	280-S09-094	08/25/1994	20 - 24	2	U
DHP-S09-12	280-S09-096	08/25/1994	22.5 - 26	2	U
M09-06	280-S09-049	11/30/1994	3.5 - 14	1	U
M09-06	280-S09-050	02/21/1995	3.5 - 14	1	U
M09-06	280-S09-051	06/22/1995	3.5 - 14	1	U
M09-06	280-S09-052	08/08/1995	3.5 - 14	1	U
M09-06	108-S09-001	11/05/1997	3.5 - 14	1	U
M09-06	108-S09-005	02/05/1998	3.5 - 14	1	U
M09-06	108-S09-009	05/12/1998	3.5 - 14	1	U
M09-06	108-S09-012	08/07/1998	3.5 - 14	1	UJ
M09-06	385-S09-030	06/25/2001	3.5 - 14	0.5	U
MW410-1	MW410-1 [08/21/90]	08/21/1990	4.5 - 15	5	U
MW410-1	280-S09-026	10/18/1994	4.5 - 15	1	U
MW410-1	280-S09-028	06/23/1995	4.5 - 15	1	U
MW410-1	280-S09-030	08/08/1995	4.5 - 15	1	U
MW410-1	385-S09-025	06/25/2001	4.5 - 15	0.5	U
MW410-1	MW410-1-A1149	06/18/2002	4.5 - 15	0.5	U
MW410-1	MW410-1-A1343	09/04/2002	4.5 - 15	0.5	U
MW410-1	MW410-1-A1650	12/16/2002	4.5 - 15	0.5	U
MW410-1	MW410-1-A1996	04/09/2003	4.5 - 15	0.5	U
MW410-2	MW410-2 [08/22/90]	08/22/1990	4.5 - 15	5	U
MW410-2	280-S09-031	10/18/1994	4.5 - 15	1	U
MW410-2	280-S09-032	02/21/1995	4.5 - 15	1	U
MW410-2	280-S09-033	06/22/1995	4.5 - 15	1	
MW410-2	280-S09-034	08/04/1995	4.5 - 15	1	
MW410-2	385-S09-026	06/25/2001	4.5 - 15	2	
MW410-2	MW410-2-A1150	06/18/2002	4.5 - 15	2.5	
MW410-2	MW410-2-A1344	09/05/2002	4.5 - 15	3.8	
MW410-2	MW410-2-A1651	12/16/2002	4.5 - 15	5.4	
MW410-2	MW410-2-A1997	04/09/2003	4.5 - 15	2.5	
MW410-3	MW410-3 [08/21/90]	08/21/1990	4.5 - 15	5	U
MW410-3	280-S09-036	10/18/1994	4.5 - 15	1	U
MW410-3	280-S09-037	02/21/1995	4.5 - 15	1	U
MW410-3	280-S09-038	06/22/1995	4.5 - 15	1	U
MW410-3	280-S09-039	08/07/1995	4.5 - 15	1	U
MW410-3	385-S09-027	06/26/2001	4.5 - 15	0.5	U
MW410-3	385-S09-028	06/26/2001	4.5 - 15	0.5	U
P-9-IWS-01	SITE9-020	09/10/2002	--	1	U
P-9-MWI-01	SITE9-024	09/11/2002	--	1	U
P-9-MWI-03	SITE9-018	09/10/2002	--	99	
P-9-MWI-04	SITE9-010	09/09/2002	--	6.5	
P-9-MWI-05	SITE9-014	09/10/2002	--	350	
P-9-MWI-07	SITE9-017	09/10/2002	--	1.6	
P-9-MWI-08	SITE9-013	09/10/2002	--	180	
P-9-MWI-09	SITE9-015	09/10/2002	--	1200	
P-9-MWI-10	SITE9-016	09/10/2002	--	31	

TABLE 5-17: SITE 9 1,1-DICHLOROETHANE IN GROUNDWATER ANALYTICAL DATA

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Point Name	Sample Identification	Sample Date	Sample Depth (ft bgs)	1,1-Dichloroethane (µg/L)	Qualifier
P-9-MWS-01	SITE9-022	09/11/2002	--	1	U
P-9-MWS-02	SITE9-025	09/11/2002	--	1	U
P-9-MWS-03	SITE9-019	09/10/2002	--	1	U
P-9-MWS-04	SITE9-023	09/11/2002	--	0.59	J
S09-DGS-DP01	385-S09-001	07/18/2001	8 - 10	1.2	
S09-DGS-DP01	385-S09-002	07/18/2001	15 - 17	1	U
S09-DGS-DP01	385-S09-003	07/18/2001	30 - 32	1	U
S09-DGS-DP02	385-S09-004	07/28/2001	8 - 10	2.1	
S09-DGS-DP02	385-S09-005	07/28/2001	15	0.5	J
S09-DGS-DP02	385-S09-006	07/28/2001	35	1200	
S09-DGS-DP02	385-S09-007	07/28/2001	45	520	
S09-DGS-DP02	385-S09-008	07/28/2001	60	100	
S09-DGS-DP02	385-S09-009	07/28/2001	78	1	U
S09-DGS-DP03	385-S09-010	07/26/2001	10	1	U
S09-DGS-DP03	385-S09-011	07/26/2001	20	1	U
S09-DGS-DP03	385-S09-012	07/26/2001	35	1	U
S09-DGS-DP03	385-S09-013	07/26/2001	43	1	U
S09-DGS-DP03	385-S09-014	07/26/2001	60	1	U
S09-DGS-DP03	385-S09-015	07/26/2001	74	1	U
S09-DGS-DP04	385-S09-022	07/18/2001	8 - 10	1.5	
S09-DGS-DP04	385-S09-023	07/18/2001	15 - 17	1	
S09-DGS-DP04	385-S09-024	07/18/2001	25 - 27	1	U
S09-DGS-DP04	385-S09-019	07/25/2001	50	1	U
S09-DGS-DP04	385-S09-019A	07/25/2001	50	0.5	U
S09-DGS-DP04	385-S09-020	07/25/2001	65	1	U
S09-DGS-DP04	385-S09-021	07/25/2001	80	1	U
S09-DGS-DP05	385-S09-016	08/03/2001	7 - 9	6.2	
S09-DGS-DP05	385-S09-017	08/03/2001	15 - 17	1	U
S09-DGS-DP05	385-S09-017A	08/03/2001	15 - 17	0.5	U
S09-DGS-DP05	385-S09-018	08/03/2001	25 - 27	1	U
S09-DGS-DP07	385-S09-043	08/09/2001	7	1	U
S09-DGS-DP07	385-S09-044	08/09/2001	15	1	U
S09-DGS-DP08	385-S09-045	08/15/2001	7	1	U
S09-DGS-DP08	385-S09-046	08/15/2001	15	1	U
S09-DGS-DP08	385-S09-047	08/15/2001	30	2.6	
S09-DGS-DP08	385-S09-048	08/15/2001	45	1	U
S09-DGS-DP09	385-S09-049	08/17/2001	7	1	U
S09-DGS-DP09	385-S09-050	08/17/2001	15	1	U
S09-DGS-DP09	385-S09-050A	08/17/2001	15	0.5	U
S09-DGS-DP09	385-S09-051	08/17/2001	30	25	
S09-DGS-DP09	385-S09-052	08/17/2001	45	87	
S09-DGS-DP09	385-S09-057	08/22/2001	59	1	U
S09-DGS-DP10	385-S09-054	08/22/2001	30	15	
S09-DGS-DP10	385-S09-055	08/22/2001	45	1	U
S09-DGS-DP10	385-S09-055A	08/22/2001	45	0.5	U
S09-DGS-DP10	385-S09-056	08/22/2001	58	1	U
S09-DGS-DP11	385-S09-058	08/30/2001	30 - 32	16	
S09-DGS-DP12	385-S09-059	09/12/2001	30 - 32	16	
S09-DGS-VE01	385-S09-034	08/07/2001	8.5 - 10	1	U
SHP-S09-05	280-S09-057	08/24/1994	7 - 10	2	U
SHP-S09-07	280-S09-061	09/07/1994	8 - 11	5	

TABLE 5-17: SITE 9 1,1-DICHLOROETHANE IN GROUNDWATER ANALYTICAL DATA

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Point Name	Sample Identification	Sample Date	Sample Depth (ft bgs)	1,1-Dichloroethane (µg/L)	Qualifier
SHP-S09-08	280-S09-063	09/09/1994	11	0.7	J
SHP-S09-09	280-S09-065	09/08/1994	8 - 11	110	
SHP-S09-10	280-S09-067	09/06/1994	11	100	U
SHP-S09-11	280-S09-093	08/25/1994	15	2	U
SHP-S09-12	280-S09-095	08/24/1994	8	1	J

Notes:

--	Chemical not detected at site
ft bgs	Feet below ground surface
J	Indicates an estimated concentration value
U	Indicates compound was analyzed for but not detected above the concentration listed
µg/L	Microgram per liter
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
18	IR Site 9 soil	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.1, page 3-6 and Table 3-3. Oneida Total Integrated Enterprises LLC 2011.

(gpm). The existence of these wells, in addition to the classification of the aquifer as Class II, makes the groundwater in this area a potential and possibly current drinking water source (Tetra Tech 2000).

3.2 Nature and Extent of Impacted Soil

3.2.1 IR Site 9

3.2.1.1 Sources and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 9 are consistent with historical activities (such as paint stripping and defueling) that occurred at the site. Physical features of IR Site 9, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results were evaluated. Of the potential sources, the following physical features and site activities were considered likely sources at IR Site 9:

- Paint stripping within Building 410,
- Releases of petroleum fuel from storage and defueling activities near Building 410, and
- Fill material containing PAHs.

3.2.1.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 9:

- Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)
- Follow-on Investigation in 1994 (PRC and JMM 1995)
- Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech 2002)
- Basewide PAH Investigation (Bechtel 2003)
- Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, semivolatile organic compounds (SVOCs), pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech EC 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA Regional Screening Levels (RSLs) or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs, expressed as benzo(a)pyrene (B[a]P) equivalent concentrations, which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels in soil from 0 feet to 8 feet bgs are summarized in Table 3-3.

These results indicated the following:

- None of the reported concentrations of VOCs, SVOCs, pesticides, PAHs, PCBs, and metals in IR Site 9 soil exceeded screening criteria (USEPA RSL, DTSC Lead Spreadsheet 7 or background for metals and PAHs).

Table 3-3: Summary of Chemicals in IR Site 9 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
None							

Notes:
mg/kg = milligrams per kilogram

Table 3-4: Summary of Chemicals in IR Site 13 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Volatile Organic Compounds (VOCs) (mg/kg)							
Benzene	1.1	24/137	1	AP13-148	04-Dec-07	5.5-7	1.9
Ethylbenzene	5.7	27/137	1	AP13-148	04-Dec-07	5.5-7	6.4
Metals (mg/kg)							
Arsenic	16.55	151/192	4	S13-B18	13-Sep-07	4-4.5	20.3
Chromium	280	192/192	1	B13-30	09-Dec-94	1-2	337
Cobalt	23	165/192	1	S13-B30	04-Oct-07	0.5-1	28.9
Iron	55,000	112/112	1	B13-32	12-Aug-94	0.5-1.5	74,800
Lead	207	180/215	7	S13-B12	11-Sep-07	4.7-5.2	815
Vanadium	550	192/192	1	MWOR-4	19-Jul-90	7-7.5	1,780
PAHs (mg/kg)							
B(a)P equivalents	0.62	237/382	13	C3S0133B051	30-Jul-03	4-8	7.6

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-5: Summary of Chemicals in IR Site 19 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	53/78	2	S19-B07	03-Oct-07	4.5-5	1.1
Metals (mg/kg)							
Lead	207	28/51	1	BD13-13	11-July-90	2-2.5	303

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
19	IR Site 9 groundwater	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.1, pages 3-13 through 3-16, Figures 2-4 and 3-9 through 3-13, Tables 3-8 and 3-9. Oneida Total Integrated Enterprises LLC 2011.

arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels from 0 feet to 8 feet bgs are summarized in Table 3-7.

These results indicated the following:

- None of the reported concentrations of VOCs, SVOCs, PCBs, and metals in IR Site 23 soil exceeded screening levels.
- Toxaphene was reported above the laboratory reporting limit in one of the 21 samples analyzed at a concentration of 1.4 mg/kg in soil sample (6 feet to 6.5 feet bgs) collected at location BOR-26, southeast of IR Site 23. Toxaphene concentration at this location was greater than its screening level. The shallow soil samples collected at this location at 1 foot to 1.5 feet bgs and 2.5 feet to 3 feet bgs were non-detect.
- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a reported value of 3.2 mg/kg in IR Site 23 soil. The reasonable maximum EPC of the 240 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.17 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The exceedances of PAHs, expressed as B(a)P equivalent concentrations, are localized in two regions, west of Building 530 within the plane defueling area near a TPH plume and east of Building 530 (see Figure 3-8). These exceedances mainly occur at depths greater than 4 feet which may be associated with the use of artificial fill material to construct the island. These exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg.

3.3 Nature and Extent of Impacted Groundwater

3.3.1 IR Site 9

3.3.1.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of potential sources of impacted soil and groundwater at IR Site 9 based on past investigations. In addition, the Data Gap Study included an assessment whether OWS 410A and OWS 410B, and the Wash Rack Area (WRA) south of Building 410 (see Figure 2-4) constitute potential sources of impacted soil and groundwater (see Section 3.3.1.2 for details). Based on the RI (Sul Tech 2005b) and results of the Data Gap Study (Tetra Tech EC 2009), the likely sources of impacted groundwater at IR Site 9 include:

Paint stripping within Building 410, and

Releases of petroleum fuel from storage and defueling activities near Building 410

3.3.1.2 Nature and Extent of Impact

The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 9 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and Uribe and Associates, Inc. [U&A] 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech 2002)

Phase 2B Environmental Baseline Survey (IT 2001)

Basewide groundwater sampling (ITSI 2009a and ITSI 2009b)

Data Gap Study in 2008 (Tetra Tech EC 2009)

Supplemental Data Gap Investigation (DGI) at OU-2A and OU-2B (August 2009 to February 2010) (Tetra Tech 2010)

These investigations included collection of groundwater samples from monitoring wells and hydropunch locations and analyses for VOCs, SVOCs, dissolved and total metals, general chemistry, TPH and/or PAHs. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). A summary of reported constituents in groundwater during investigations conducted from 2002 to Fall 2008 at IR Site 9 is presented in Table 3-8. A summary of the pilot studies and removal actions conducted for groundwater at IR Site 9 is provided in Section 2.4.

The most recent sampling (at the time of issuance of the Draft Final FS) to assess distribution of VOCs in groundwater at IR Site 9 following pilot studies and removal actions was conducted as part of following investigations:

Data Gap Study conducted at OU-2A and OU-2B in 2007/2008 (Tetra Tech EC 2009). The following data gaps pertaining to IR Site 9 groundwater were addressed by the Data Gap Study:

Two SWMUs, OWS 410A and OWS 410B, and the WRA south of Building 410, were investigated to assess whether they constitute potential sources of impacted soil and groundwater (see Figure 2-4).

The lateral and vertical extent of previously identified VOCs were assessed in groundwater.

An assessment of whether subsurface features such as sewers and storm drains are providing a conduit for the migration of COCs.

Groundwater sampling at OU-2A conducted as part of Basewide groundwater monitoring events conducted in Spring and Fall 2008 (ITSI 2009a and ITSI 2009b).

Sampling conducted as part of Supplemental DGI from August 2009 to February 2010 (Tetra Tech 2010).

Figures 3-9 through 3-13 present the sampling locations for the Data Gap Study, Basewide groundwater sampling events, and Supplemental DGI at IR Site 9. A brief summary of findings from these investigations is presented in the subsections below.

SWMU and Wash Rack Area Investigation Results

Based on the soil sampling results, it was concluded that OWS 410A, OWS 410B, and WRA south of Building 410 do not appear to have released COCs at concentrations above screening levels (USEPA Region 9 residential preliminary remedial goals [PRGs], California-modified PRGs, or established background concentration for arsenic) to the environment/groundwater.

Groundwater Investigation Results

Table 3-9 presents a summary of the constituents reported in IR Site 9 groundwater above their respective screening levels during the Data Gap Study (Tetra Tech EC 2009), Spring/Fall 2008 Basewide groundwater sampling events (ITSI 2009a and ITSI 2009b), and Supplemental DGI (Tetra Tech 2010). The screening levels for VOCs and metals are Federal or State MCLs, whichever is less. There are no CERCLA screening criteria for petroleum hydrocarbons, which are addressed as part of the

Petroleum Program. Preliminary remediation criteria (PRCs) for petroleum-impacted sites are provided for informational purposes (DON 2009). TPH-diesel range (TPH-d) and free-phase fuel hydrocarbons were reported in IR Site 9 groundwater during Data Gap Study (see Figure 3-9). The free-phase fuel hydrocarbons and TPH-d appear to be unrelated to the TRW identified at IR Site 13 and will be addressed as part of Petroleum Program and are not addressed in this FS (Richard Brady & Associates 2008).

Figures 3-9 through 3-13 present the locations of detections of constituents above their respective screening criteria at depths ranging from 5 feet to 50 feet bgs. The VOC plumes depicted on these figures are based on the latest available data for each sampling location from the following investigations: Data Gap Study (Tetra Tech EC 2009), Spring/Fall 2008 Basewide groundwater sampling events (ITSI 2009a and ITSI 2009b), and Supplemental DGI (Tetra Tech 2010).

As documented in the Data Gap Study Technical Memorandum (Tetra Tech EC 2009), the lateral extent of VOCs in the shallow groundwater/FWBZ (5 feet to 15 feet bgs) is complete based on the results of the Data Gap Study and Basewide groundwater sampling (Spring and Fall 2008) (see Figure 3-9). The VOCs that exceeded their respective MCLs in the shallow groundwater/FWBZ (5 to 20 feet bgs) included:

VC

Benzene

cis-1,2-DCE

VC was reported relatively consistently in monitoring well, MW410-2 at concentrations exceeding its MCL of 0.5 micrograms per liter (µg/L) during Basewide groundwater sampling conducted from Summer 2002 to Fall 2007 (ITSI 2009a). However, VC was reported at 0.2 (estimated) µg/L (less than its MCL) during the latest Basewide sampling of MW410-2 conducted in Fall 2008.

In addition to VOCs, arsenic was reported at concentrations exceeding its MCL at two locations (S9-B04 and S9-TT-MW01) in shallow groundwater. Free-phase fuel hydrocarbons were observed at two locations east of Building 410 during the Data Gap Study (Tetra Tech EC 2009) and Supplemental DGI (Tetra Tech 2010). The source of the impacted fuel hydrocarbons may have been former aircraft defueling activities that took place west of Building 530 (east of Building 410) or former activities associated with Building 410 and resulting waste discharged to the storm sewer system. Petroleum hydrocarbons in the diesel range were reported above the PRC for total TPH (1.4 mg/L) at concentrations of 8.5 mg/L and 8.8 mg/L in S9-HP06.

1,2,3-trichloropropane (1,2,3-TCP) was reported at concentrations ranging from 0.1 to 0.5 µg/L in samples collected from monitoring wells, MW410-2 and MW410-3 (see Figure 3-9) during groundwater monitoring conducted from 2007 to 2008. Higher concentrations (up to 31 µg/L) of 1,2,3-TCP were detected in wells southeast of Building 166 in monitoring wells, 9IF-MW08U (21 to 31 feet bgs), 9IF-MW10U (22 to 32 feet bgs), 9IF-MW07L (31 to 41 feet bgs), and 9IF-MW08L (31 to 41 feet bgs) (see Figures 3-11 and 3-12) during the sampling conducted as part of ISCO removal action in 2005.

The following VOCs were reported at concentrations exceeding their respective MCLs in the intermediate and deep groundwater zone/SWBZ (20 feet to 50 feet bgs) (see Figures 3-10 through 3-13):

1,1-DCA

1,1-DCE

cis-1,2-DCE

VC

Methyl tert-butyl ether

In addition, arsenic was reported at concentrations exceeding its MCL in monitoring well S9-TT-MW02 located east of Building 410. Although, there is some uncertainty with respect to the extents of VOCs in IR Site 9 groundwater, the current definitions of extents are adequate for conducting the FS.

3.3.2 IR Site 13

3.3.2.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of potential sources of impacted soil and groundwater at IR Site 13 based on past investigations. This analysis was refined by subsequent studies conducted at IR Site 13 including TRW investigation conducted in 2007 and 2008 (Richard Brady & Associates 2008). Benzene has been reported at concentrations exceeding its MCL under the mini-storage units in the southeastern portion of IR Site 13 (see Section 3.3.2.2). This area is located east of the currently defined extent of TRW (Richard Brady & Associates 2008) (see Figure 3-13). Based on the SCAPS LIF investigation (Richard Brady & Associates 2008), the VOCs and TPH reported in groundwater at IR Site 13 to the east of the TRW boundary defined by SCAPS LIF investigation appear to be unrelated to TRW, and contain compounds normally associated with fuel releases. The TRW has been shown to contain very low volatile or semi-volatile fraction as expected from refinery waste that has been in-place for over 100 years (Richard Brady & Associates 2008). The VOCs reported in IR Site 13 groundwater appear to be associated with damaged storm sewer line identified in the RI (SulTech 2005b).

3.3.2.2 Nature and Extent of Impact

The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 13 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and U&A 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech EC 2002)

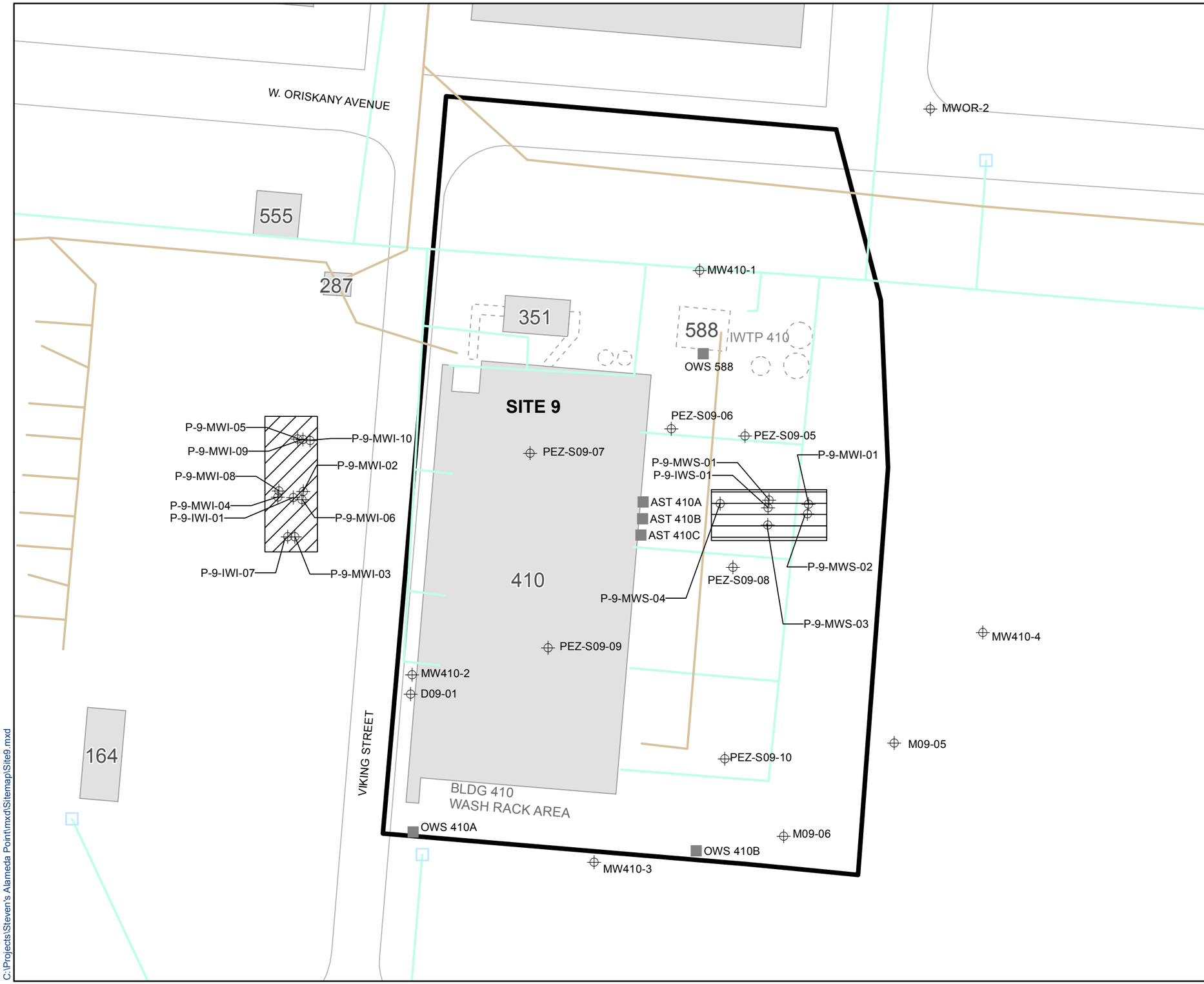
Petroleum Program Investigations and Removal Action (Tetra Tech 2001, DON 1993, Tetra Tech and R&M 2000)

Basewide Groundwater Sampling (ITSI 2009a and ITSI 2009b)

Data Gap Study in 2008 (Tetra Tech EC 2009)

Supplemental DGI (Tetra Tech EC 2010)

These investigations included collection of groundwater samples from monitoring wells and hydropunch locations and analyses for VOCs, SVOCs, dissolved and total metals, general chemistry, TPH and/or PAHs. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). A summary of reported constituents in groundwater during investigations conducted from 2002 to Fall 2008 at IR Site 13 is presented in Table 3-10. It should be noted that portions of IR Site 13, including areas in the vicinity of Building 397, are being investigated and remediated under the Petroleum Program.



Legend

- Groundwater Monitoring Well
- Solid Waste Management Unit
- Catch Basin
- Shallow Zone Pilot Test Location
- Intermediate Zone Pilot Test Location
- Sanitary Sewer Line
- Storm Sewer Line
- Site Boundary
- Former Building and Building Number
- 588 Building and Building Number
- 410 Road

ABBREVIATIONS AND ACRONYMS:

AST - ABOVEGROUND STORAGE TANK
BLDG - BLDG
FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
IWTP- INDUTRIAL WASTE TREAMENT PLANT
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR

SOURCE:

TETRA TECH EC 2007

N

0 15 30 60 Feet

1 inch = 60 feet

OU-2A FS

Final

Plan - IR Site 9

Alameda, CA

Date: 06-11	Project No. 106687	Figure 2-4

OTIE Oneida Total Integrated Enterprises

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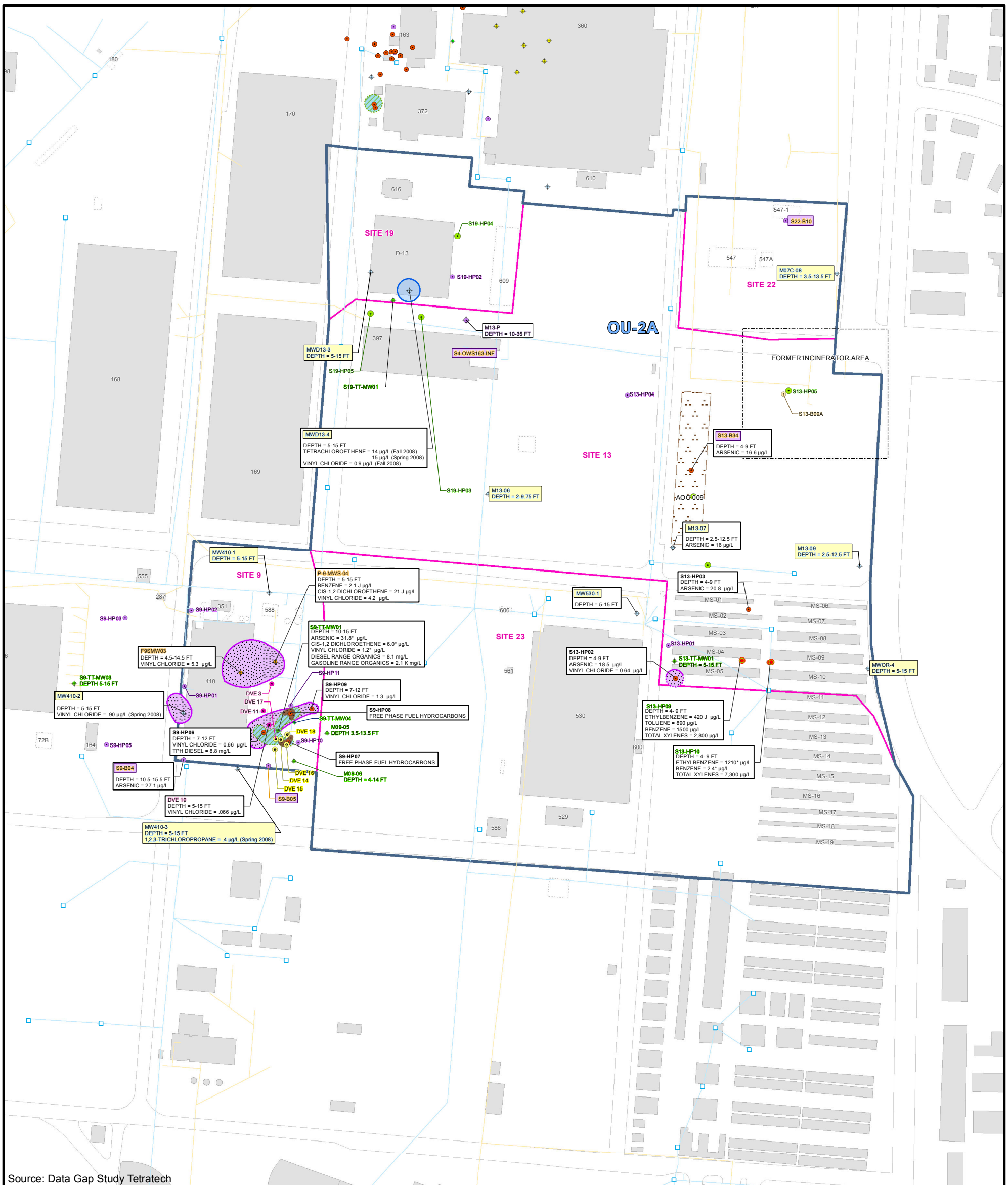

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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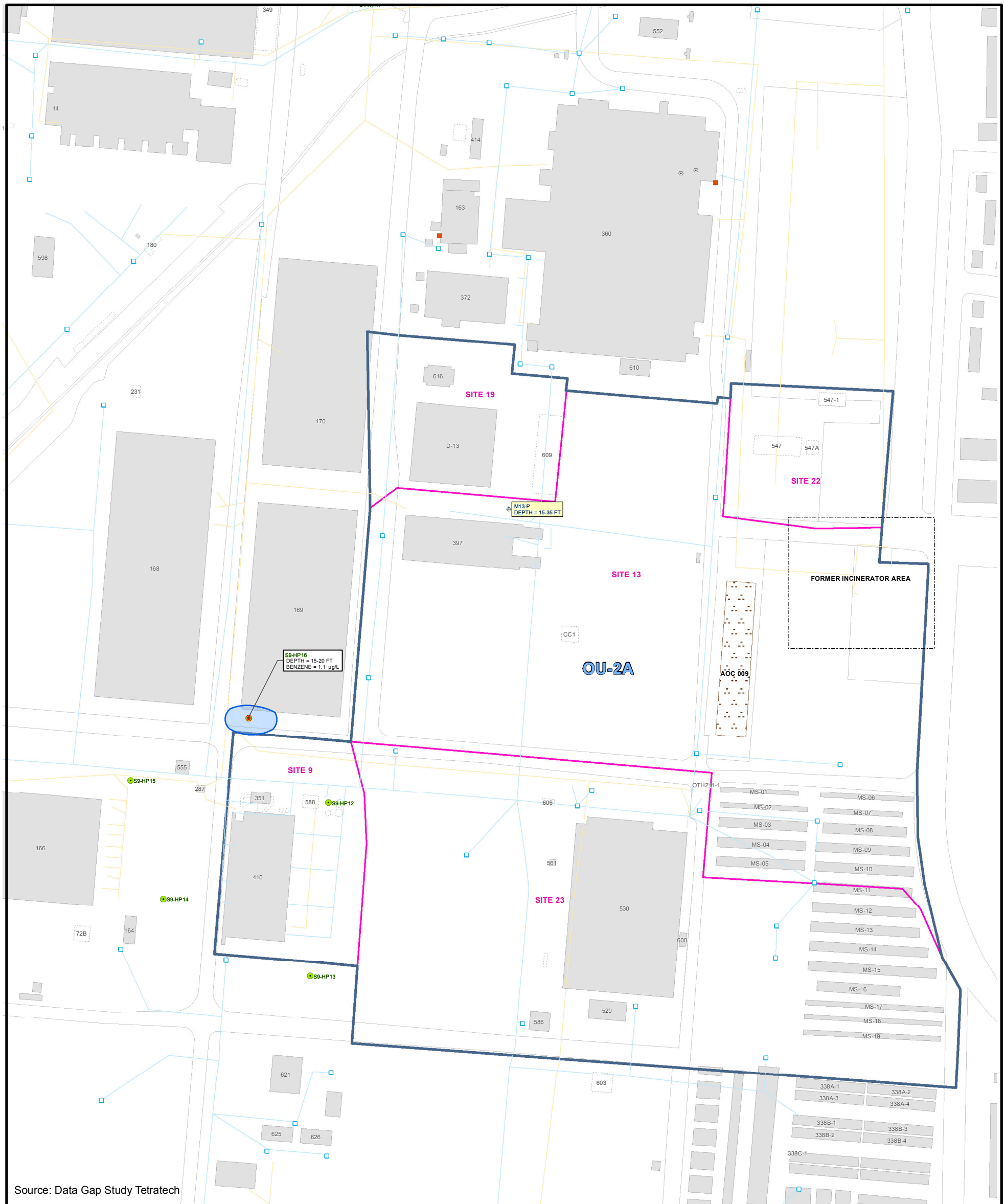

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
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FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (15 - 20 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-10

OTIE Oneida Total Integrated Enterprises

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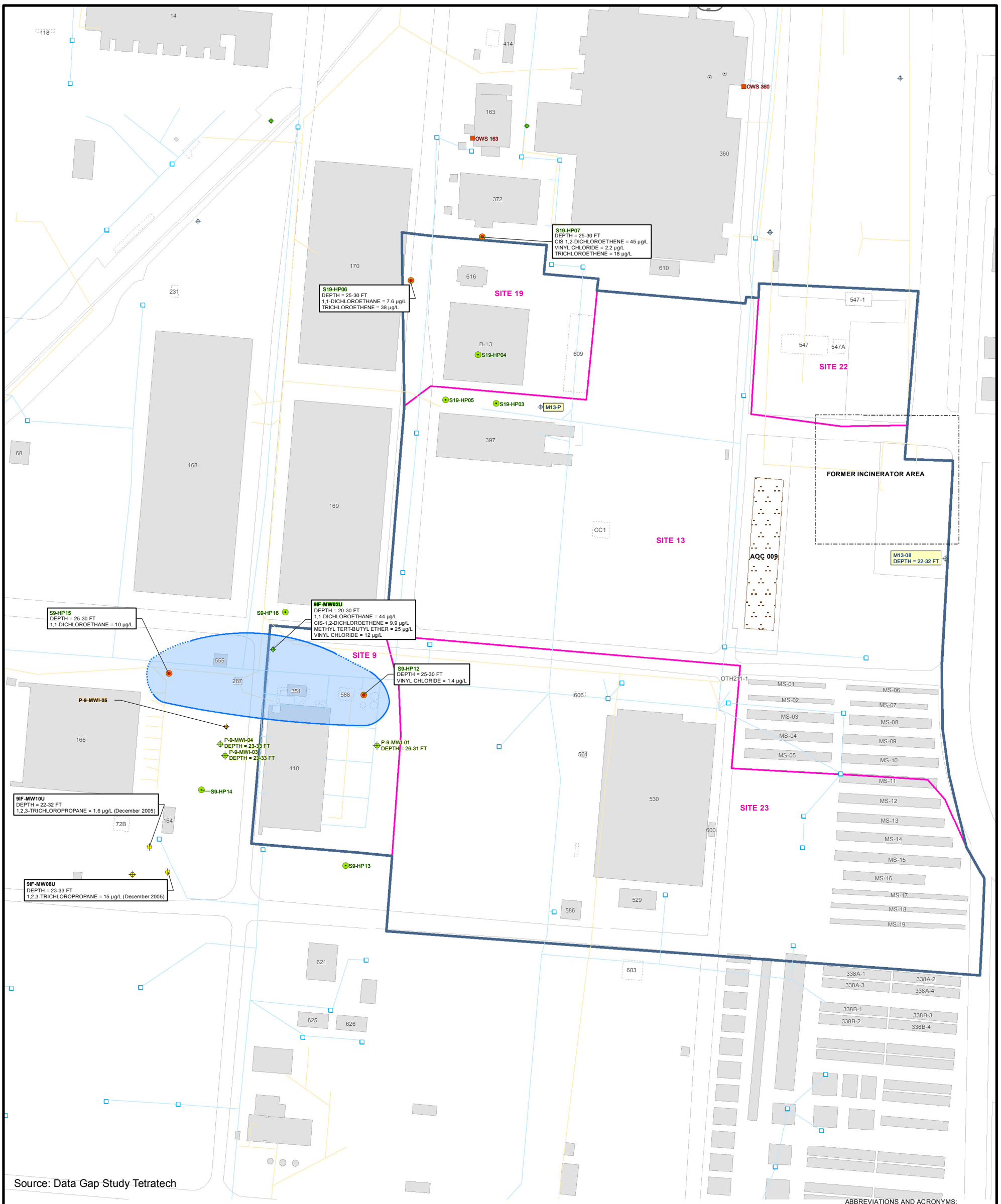

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-08 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS

Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (20 - 30 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-11

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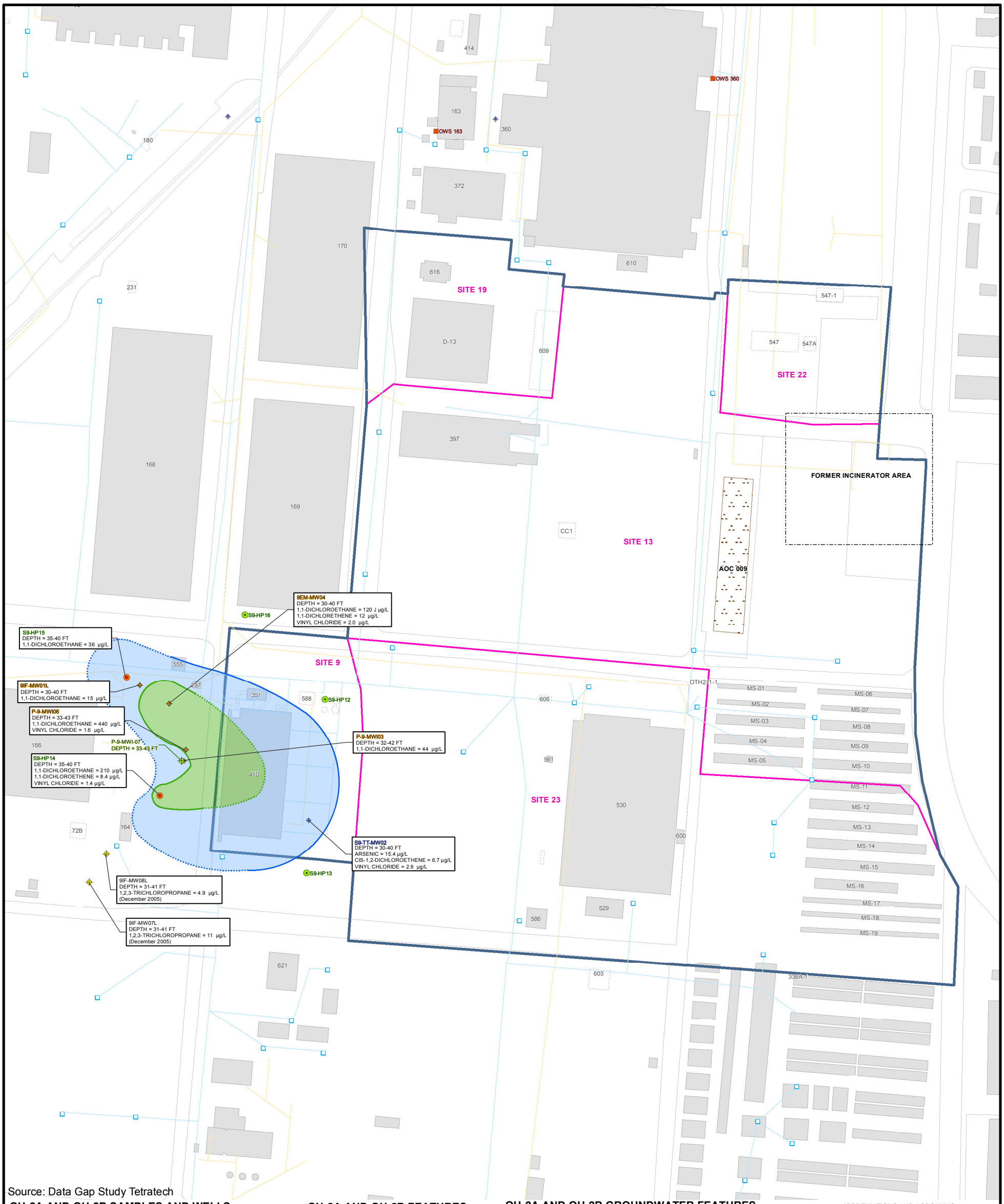

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
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- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (30 - 40 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-12

OTIE Oneida Total Integrated Enterprises

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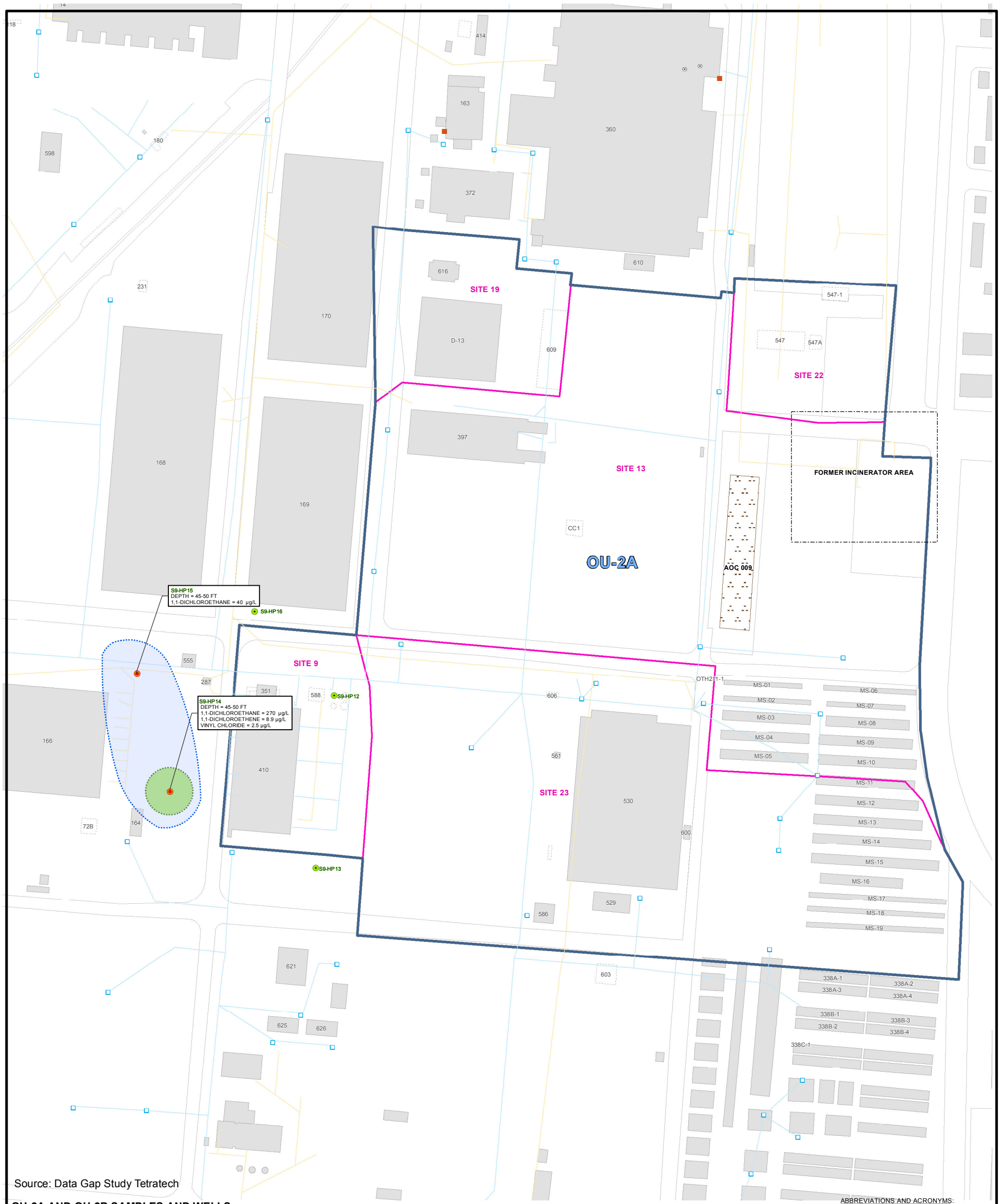

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (40 - 50 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-13

OTIE Oneida Total Integrated Enterprises

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Table 3-8: Summary of Detected Groundwater Analytes at IR Site 9 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Volatile Organic Compounds												
1,1,1-Trichloroethane	71-55-6	214	3	1.4%	0.7	5.9	MW410-2	12/10/2003	200	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	104	4	3.8%	0.24	2.6	9IF-MW03U	4/5/2005	--	--	--	--
1,1,2-Trichloroethane	79-00-5	214	1	0.5%	2.7	2.7	9S-CH3	6/28/2002	5	--	--	--
1,1-Dichloroethane[b]	75-34-3	214	121	56.5%	0.1	730	P-9-MWI06	4/5/2005	5	46	--	--
1,1-Dichloroethene	75-35-4	214	52	24.3%	0.24	34	P-9-MWI06	4/5/2005	6	16	--	--
1,2,3-Trichloropropane	96-18-4	185	30	16.2%	0.1	31	9IF-MW07L	4/7/2005	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	185	27	14.6%	0.25	780	F9SMW04	12/20/2005	--	--	--	--
1,2-Dichlorobenzene	95-50-1	195	5	2.6%	0.2	0.5	MW410-1	9/4/2002	600	--	--	--
1,2-Dichloroethane	107-06-2	214	4	1.9%	0.27	0.41	9IF-MW04L	4/6/2005	0.5	--	--	--
1,2-Dichloropropane	78-87-5	214	10	4.7%	0.23	4	9IF-MW07L	4/7/2005	5	--	--	--
1,3,5-Trimethylbenzene	108-67-8	185	23	12.4%	0.3	150	F9SMW04	12/20/2005	--	--	--	--
1,3-Dichloropropane	142-28-9	81	31	38.3%	0.06	0.9	MW410-2	12/16/2002	--	--	--	--
1,4-Dichlorobenzene	106-46-7	214	2	0.9%	0.2	0.2	MW410-1	9/4/2002	5	--	--	--
2-Butanone	78-93-3	214	8	3.7%	5.8	750	F9SMW04	12/20/2005	--	--	--	--
2-Chlorotoluene	95-49-8	81	2	2.5%	0.1	0.1	MW410-2	9/5/2002	--	--	--	--
2-Hexanone	591-78-6	214	1	0.5%	6	6	P-9-MWS04	6/8/2006	--	--	--	--
4-Methyl-2-pentanone	108-10-1	214	3	1.4%	3.5	5.9	F9SMW04	6/8/2006	--	--	--	--
Acetone	67-64-1	214	48	22.4%	1.3	220	F9SMW04	12/20/2005	--	--	--	--
Benzene	71-43-2	214	63	29.4%	0.05	5.4	9S-CH3	6/27/2002	1	15	--	--
Bromodichloromethane	75-27-4	214	9	4.2%	0.3	2.6	9IF-MW02L	4/6/2005	80	--	--	--
Bromoform	75-25-2	214	12	5.6%	0.1	7.7	9IF-MW02L	4/6/2005	80	--	--	--
Carbon disulfide	75-15-0	72	2	2.8%	0.2	0.66	MW410-3	9/18/2003	--	--	--	--
Chlorobenzene	108-90-7	214	42	19.6%	0.1	35	9IF-MW08U	1/3/2006	70	--	--	--
Chloroethane	75-00-3	214	6	2.8%	0.27	0.53	9IF-MW01S	6/9/2006		--	--	--
Chloroform	67-66-3	214	58	27.1%	0.09	8.8	P-9-MWI06	1/3/2006	80	--	--	--
Chloromethane	74-87-3	214	2	0.9%	0.2	0.9	MW410-2	10/16/2006	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	214	123	57.5%	0.2	60	DVE-17	12/21/2005	6	39	--	--
Dibromochloromethane	124-48-1	214	8	3.7%	0.2	3.9	9IF-MW02L	4/6/2005	80	--	--	--
Dichlorodifluoromethane	75-71-8	185	2	1.1%	3.7	16	9IF-MW02U	4/5/2005	--	--	--	--
Ethylbenzene	100-41-4	214	32	15.0%	0.27	120	9S-CH3	6/27/2002	300	--	--	--
Isopropyl Ether	108-20-3	176	41	23.3%	0.09	56	P-9-MWS04	12/20/2005	--	--	--	--
Isopropylbenzene	98-82-8	185	29	15.7%	0.22	93	9S-CH3	6/27/2002	--	--	--	--
Methyl Tert-Butyl Ether	1634-04-4	214	59	27.6%	0.1	450	9EMW01	12/29/2005	13	4	--	--
Methylene chloride	75-09-2	214	15	7.0%	0.1	2.8	9-3□'P-9-MWS01/28/2002□6/8/200		5	--	--	--
N-Butylbenzene	104-51-8	185	8	4.3%	1.1	50	9S-CH3	6/27/2002	--	--	--	--
N-Propylbenzene	103-65-1	185	28	15.1%	0.23	190	9S-CH3	6/27/2002	--	--	--	--
o-Xylene	95-47-6	81	10	12.3%	0.5	15	9-2	6/27/2002	1750	--	--	--
p-Isopropyltoluene	99-87-6	81	7	8.6%	1.9	57	9S-CH3	6/27/2002	--	--	--	--
Sec-Butylbenzene	135-98-8	185	34	18.4%	0.21	87	9S-CH3	6/27/2002	--	--	--	--
T-Butylbenzene	98-06-6	185	36	19.5%	0.09	24	DVE-19	12/21/2005	--	--	--	--
Tert-Amyl Methyl Ether	994-05-8	176	2	1.1%	0.8	0.94	9IF-MW12U	12/29/2005	--	--	--	--
Tert-Butyl Alcohol	75-65-0	176	29	16.5%	3.6	200	F9SMW04	12/20/2005	--	--	--	--
Tetrachloroethene	127-18-4	214	34	15.9%	0.21	6.1	MW410-3	9/5/2002	5	2	--	--
Toluene	108-88-3	214	32	15.0%	0.2	28	DVE-17	12/21/2005	150	--	--	--
trans-1,2-Dichloroethene	156-60-5	214	33	15.4%	0.2	1	DVE-17	12/21/2005	10	--	--	--
Trichloroethene	79-01-6	214	49	22.9%	0.1	4.8	9IF-MW02U	5/6/2008	5	--	--	--
Trichlorofluoromethane	75-69-4	185	1	0.5%	0.24	0.24	MW410-3	12/11/2003	150	--	--	--
Vinyl chloride	75-01-4	214	95	44.4%	0.2	280	9-1	6/27/2002	0.5	91	--	--

Table 3-8: Summary of Detected Groundwater Analytes at IR Site 9 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Xylenes (total)	1330-20-7	133	16	12.0%	0.6	380	F9SMW04	12/20/2005	1750	--	--	--
Xylenes, m & p	7816-60-0	81	12	14.8%	0.3	30	MW410-2	9/5/2002	1750	--	--	--
Metals												
Antimony	7440-36-0	18	4	22.2%	0.506	1.47	S9-B05	11/9/2007	6	--	37.5	
Arsenic	7440-38-2	14	14	100.0%	0.526	35.3	S9-TT-MW02	5/7/2008	10	4	20.72	2
Barium	7440-39-3	14	14	100.0%	31.3	309	S9-TT-MW01	5/7/2008	1000	--	569.5	--
Cadmium	7440-43-9	14	1	7.1%	0.503	0.503	S9-HP01	10/16/2007	5	--	--	--
Chromium, Hexavalent	18540-29-9	95	1	1.1%	20	20	9IF-MW08L	1/3/2006		--	--	--
Chromium, Total	7440-47-3	14	8	57.1%	0.545	3.04	S9-HP09	10/15/2007	50	--	12.45	--
Cobalt	7440-48-4	14	11	78.6%	0.566	9.86	S9-HP09	10/15/2007		--	--	--
Copper	7440-50-8	14	3	21.4%	1.04	1.78	S9-HP09	10/15/2007	1300	--	24.03	--
Lead	7439-92-1	14	1	7.1%	0.513	0.513	S9-HP09	10/15/2007	15	--	11.45	--
Molybdenum	7439-98-7	14	11	78.6%	1.06	14.5	S9-HP09	10/15/2007		--	--	--
Nickel	7440-02-0	14	13	92.9%	0.915	39.9	S9-HP01	10/16/2007	100	--	--	--
Selenium	7782-49-2	14	4	28.6%	0.581	2.18	S9-HP05	10/19/2007	50	--	8.58	--
Vanadium	7440-62-2	14	11	78.6%	1.22	6.11	S9-HP09	10/15/2007		--	26.27	--
Zinc	7440-66-6	14	10	71.4%	5.08	21	S9-TT-MW03	5/6/2008	5000	--	36.39	--
Dissolved Metals												
Aluminum, dissolved	7429-90-5	131	10	7.6%	2.9	170	9EMW03	4/4/2005	200	--	1070	--
Antimony, dissolved	7440-36-0	133	20	15.0%	0.079	0.87	MW410-2	11/11/2004	6	--	37.5	--
Arsenic, dissolved	7440-38-2	137	106	77.4%	0.77	81.2	F9SMW04	6/8/2006	10	53	20.72	32
Barium, dissolved	7440-39-3	131	131	100.0%	3.09	350	MW410-2	3/26/2008	1000	--	569.5	--
Beryllium, dissolved	7440-41-7	137	1	0.7%	0.28	0.28	MW410-1	3/27/2008	4	--	2.5	--
Cadmium, dissolved	7440-43-9	137	29	21.2%	0.055	125	9IF-MW10U	1/3/2006	5	13	--	--
Calciuim, dissolved	7440-70-2	131	131	100.0%	2030	518000	9IF-MW02L	12/29/2005		--	--	--
Chromium, dissolved	7440-47-3	137	61	44.5%	0.21	151	9EMW03	12/28/2005	50	3	12.45	11
Cobalt, dissolved	7440-48-4	131	76	58.0%	0.074	1070	9EMW04	12/29/2005		--	--	--
Copper, dissolved	7440-50-8	137	61	44.5%	0.54	885	9IF-MW10U	1/3/2006	1300	--	24.03	23
Iron, dissolved	7439-89-6	131	89	67.9%	27	267000	P-9-MWI06	1/3/2006	300	59	6585.5	26
Lead, dissolved	7439-92-1	137	34	24.8%	0.043	158	9EMW04	12/29/2005	15	13	11.45	16
Magnesium, dissolved	7439-95-4	131	131	100.0%	1740	644000	9IF-MW02L	12/29/2005		--	--	--
Manganese, dissolved	7439-96-5	131	129	98.5%	4.37	11200	9EMW04	12/29/2005	50	109	1741	27
Molybdenum, dissolved	7439-98-7	131	66	50.4%	0.49	48.5	9EMW01	12/29/2005		--	--	--
Nickel, dissolved	7440-02-0	137	107	78.1%	0.62	1890	9IF-MW10U	1/3/2006	100	38	--	--
Potassium, dissolved	7440-09-7	131	131	100.0%	3520	136000	9IF-MW08U	1/3/2006		--	--	--
Selenium, dissolved	7782-49-2	137	14	10.2%	0.17	13.6	DVE-19	6/9/2006	50	--	8.58	1
Silver, dissolved	7440-22-4	137	10	7.3%	0.26	7.6	9IF-MW05U	4/5/2005	100	--	--	--
Sodium, dissolved	7440-23-5	131	131	100.0%	11800	3480000	F9SMW02	6/7/2006		--	--	--
Thallium, dissolved	7440-28-0	128	9	7.0%	0.25	7.79	P-9-MWI05	4/4/2005	2	8	16.15	--
Vanadium, dissolved	7440-62-2	131	84	64.1%	0.76	250	F9SMW04	6/8/2006		--	26.27	20
Zinc, dissolved	7440-66-6	137	97	70.8%	1.4	925	P-9-MWI06	1/3/2006	5000	--	36.39	29
Polycylclic Aromatic Hydrocarbons												
2-Methylnaphthalene	91-57-6	95	2	2.1%	7.5	16	F9SMW04	12/20/2005	--	--	--	--
Naphthalene	91-20-3	195	26	13.3%	0.3	250	9S-CH3	6/27/2002	--	--	--	--
Semi-volatile Organic Compounds												
1,4-Dioxane (P-Dioxane)	123-91-1	19	3	15.8%	0.48	4.4	S9-HP01	10/16/2007	--	--	--	--
2,4-Dimethylphenol	105-67-9	105	4	3.8%	5.6	26	F9SMW04	12/20/2005	--	--	--	--
2-Methylphenol (O-Cresol)	95-48-7	105	1	1.0%	12	12	DVE-23	6/8/2006	--	--	--	--

Table 3-8: Summary of Detected Groundwater Analytes at IR Site 9 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
4-Methylphenol (P-Cresol)	106-44-5	105	4	3.8%	17	500	F9SMW04	6/8/2006	--	--	--	--
Benzoic Acid	65-85-0	95	2	2.1%	10	11	9IF-MW02U	4/5/2005	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	117-81-7	105	6	5.7%	11	34	DVE-9	12/20/2005	4	6	--	--
Phenol	108-95-2	105	2	1.9%	60	87	DVE-23	6/8/2006	--	--	--	--
Styrene	100-42-5	214	2	0.9%	0.24	0.33	9IF-MW04U	4/6/2005	100	--	--	--

Notes

[a] The lesser of Federal primary MCL and State (primary or secondary) MCL.

[b] Highlighted cells indicate analytes exceeding MCLs.

Table 3-9: Summary of the Analytes Exceeding Federal/State MCLs at IR Site 9 – Data Gap Study, Spring/Fall 2008 Basewide Groundwater Monitoring, and Supplemental DGI

Analytes Exceeding MCL/Screening Level	Federal/State MCL (µg/L)	Other Project-Specific Screening Level (µg/L)	Minimum Concentration Exceeding MCL/Screening Level (µg/L)	Maximum Concentration Exceeding MCL/Screening Levels (µg/L)	Depth Range for Detection Above MCL/Screening Level (feet bgs)
Vinyl Chloride	0.5[a]	--	0.57	12	7 – 40
1,1-DCA	5[a]	--	10	440 J	20 – 40
1,1-DCE	6[a]	--	8.4	12	20 – 40
cis-1,2-DCE	6[a]	--	6.1	21 J	5 – 30
Benzene	1[a]	--	1.1	2.1 J	5 – 15
Methyl tert-butyl Ether	13[a]	--	25	25	20 - 30
Arsenic	10	--	19.4	35.3	10 – 40
TPH-diesel range	--	1,400[b]	8,500	8,800	7 – 12
1,2,3-TCP	--	0.005[c]	0.1	0.4	5 – 15

Notes:

Project screening levels for groundwater are Federal or State MCLs, whichever is less. There are no CERCLA screening criteria for petroleum hydrocarbons. Preliminary remediation criteria (PRC) for petroleum-contaminated sites are provided for informational purposes (DON 2009). There are no specific PRCs for TPH reported as diesel, motor oil, JP-5, or gasoline for groundwater; thus, the PRC for total TPH was used for TPH in groundwater.

[a] California MCL

[b] petroleum hydrocarbon PRC

[c] Notification level established by the California Department of Public Health.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
20	pilot study	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.1, Pages 2-7 through 2-8. Oneida Total Integrated Enterprises LLC 2011.

Lead Removal, 1993. As part of a plan to construct a two-building intermediate maintenance facility (IMF) at IR Site 13, the Navy conducted a geotechnical investigation in 1989. Free hydrocarbon product and hydrocarbon stains or odors were identified in selected borings. The boring with the highest concentrations of TPH as gasoline, oil and grease, and lead and the lowest negative logarithm of hydrogen ion concentration (pH) was located in the central portion of a former oil refinery, adjacent to the previous lubricating building and close to former bleaching tanks and activators. It is believed that these units were the source of the high TPH and high lead and low pH found in the boring. The Navy was directed by DTSC to initiate soil removal activities in the vicinity of the boring. Following three phases of additional characterization sampling near the boring, a removal action was eventually conducted in 1993 and finally completed in December 1994 (see Figure 2-5). The final excavation area measured about 25 feet by 30 feet and had a maximum depth of 7 feet bgs (PRC and JMM 1995). Approximately 120 cubic yards of impacted soil was excavated and shipped to a Class I landfill.

Time-Critical Removal Action. A TCRA was conducted at IR Site 13 in April 2004 within the former oil refinery to prevent human exposure to TRW (DON 2005). The area is bounded by West Pacific Avenue on the north, Skyhawk Street on the east, Oriskany Avenue on the south, and an empty lot on the west. A 6-foot tall chain-link fence was installed during the TCRA around the area where the tarry waste has been found to deter and prevent public access to the area, thereby eliminating the potential for direct contact with or incidental ingestion of the material. The fence was to be in place for a minimum of 3 years, with quarterly inspections (SulTech 2005a).

2.4 Treatability/Pilot Studies and Response Actions for Groundwater at OU-2A

The major treatability/pilot studies and response actions for groundwater at OU-2A include:

- Pilot test for in-situ chemical oxidation (ISCO) to remediate VOCs in IR Site 9 groundwater.
- Non-time critical removal action (NTCRA) for VOCs in IR Site 9 groundwater.
- Dual vacuum extraction (DVE) and biosparging conducted within the boundary of IR Site 23 as part of corrective action to address petroleum hydrocarbon compounds at CAA-13.
- Treatability study to evaluate intrinsic bioremediation of petroleum hydrocarbons at IR Site 13.

2.4.1 IR Site 9 Pilot Studies

Pilot studies were conducted to assess the feasibility of ISCO for remediation of VOCs in IR Site 9 groundwater in the shallow (5 feet to 15 feet bgs) and intermediate (23 feet to 43 feet bgs) zone in November 2002 (Shaw 2003b). These pilot studies included testing of the process referred to as In-situ Oxidative Technologies, Inc. (ISOTEC) process. The ISOTEC process is an in-situ remedial technology that destroys organic contamination using Fenton's reagent-based oxidation chemistry. The ISOTEC process consists of injecting stabilized hydrogen peroxide and complexed iron catalysts into impacted aquifers or vadose zones.

As part of pilot tests, injection and observation/monitoring wells were installed in the shallow and intermediate groundwater zones, and chemical oxidant was injected into injection wells. For the shallow zone, significant reductions in contaminant concentrations (e.g. 1,2,4-trimethylbenzene, vinyl chloride [VC], 1,1-dichloroethane [1,1-DCA], dichloroethene [DCE], and benzene) were observed in a monitoring well located approximately 23 feet from the injection well, following oxidant injection. The effective radius of influence of the injected oxidant in the shallow zone was estimated to be 20 feet to 25 feet.

For the intermediate zone, some wells showed decrease in 1,1-DCA concentrations (primary contaminant) while some showed an increase. Surfacing of reagent was observed during injection into the intermediate zone; therefore, it was concluded that an insufficient quantity of ISOTEC reagents appeared to have been introduced into the subsurface. Based on this, additional pilot testing was recommended 25 feet to 35 feet away from the previous injection well.

2.4.2 IR Site 9 Removal Action

Removal actions were performed using an ISCO process to treat VOCs (primarily cis-1,2-dichloroethene [cis-1,2-DCE] and VC) in the shallow groundwater zone (between 8 feet and 15 feet bgs) east of Building 410 (Shaw 2006a), and VOCs (primarily 1,1-DCA and VC) in the intermediate zone between 20 feet and 40 feet bgs primarily northwest, west, and southwest of Building 410 (Shaw 2006b). The primary objective of the removal actions was to achieve mass reduction of contaminants within the saturated zone to reduce the dissolved-phase contaminant concentrations to below their respective maximum contaminant levels or to levels that are technically or economically feasible.

Three oxidant injection events were conducted between January and May 2006 for the first water-bearing zone (FWBZ). Three injection events were conducted between May and December 2005 for the second water-bearing zone (SWBZ). After three injection events, the number of shallow zone monitoring wells with concentrations of cis-1,2-DCE and VC above maximum contaminant levels (MCLs) was reduced; however, concentrations above MCLs were still reported. In intermediate zone wells, 1,1-DCA concentrations increased and decreased in various wells. VC concentrations generally decreased. However, both 1,1-DCA and VC were reported at concentrations above MCLs.

No additional injection of oxidant was conducted following third injection event and performance monitoring as part of removal actions for the FWBZ and SWBZ at IR Site 9. It was recommended that several quarters of groundwater monitoring be conducted to assess if elevated contaminant concentrations following third round of injection decrease with time. It was further recommended that the decision on the need for additional ISCO treatment be made following at least three quarters of additional groundwater sampling.

2.4.3 Pilot Studies/Corrective Actions – CAA-13

Corrective action in the form of DVE and biosparging was implemented at CAA-13 west of Building 530 between February 2002 and August 2006 as part of Petroleum Program (see Figures 2-2 and Figure 2-8). Both DVE and biosparge remediation systems were implemented to address separate-phase and dissolved-phase hydrocarbons in groundwater and the vadose zone. A pilot-scale DVE system was installed and began operations in October 2002. The pilot-scale DVE system operated until May 30, 2003. The full-scale DVE system began operations in June 2003 on 31 wells, with an additional eight wells being added to the system over the period of full-scale operations.

A biosparging pilot test began in October 2002, and was terminated in November 2002 when separate-phase hydrocarbon was observed in the test area. A second biosparging pilot test area was selected at the southern end of the site and began operations in November 2003. The biosparge pilot test system was expanded to full-scale with the addition of 27 wells in February 2004.

DVE and biosparging activities ceased in September 2004 when the DVE system mass extraction rate remained at less than 10 pounds per day, and the monthly groundwater monitoring samples for August 2004 showed only one well exceeding 20 mg/L, the preliminary remediation criteria (PRC) in the *Preliminary Remediation Criteria and Closure Strategy for Petroleum-Contaminated Sites at Alameda Point* (TPH Strategy) (DON 2001b) taken to be indicative of free product. Approximately 55,800 pounds of hydrocarbons were removed during pilot-scale and full-scale operations of the DVE, of which nearly 40,000 pounds were recovered as separate-phase. Hydrocarbon mass reduction resulting from the

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
21	removal actions	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.1, Page 2-8. Oneida Total Integrated Enterprises LLC 2011.

For the intermediate zone, some wells showed decrease in 1,1-DCA concentrations (primary contaminant) while some showed an increase. Surfacing of reagent was observed during injection into the intermediate zone; therefore, it was concluded that an insufficient quantity of ISOTEC reagents appeared to have been introduced into the subsurface. Based on this, additional pilot testing was recommended 25 feet to 35 feet away from the previous injection well.

2.4.2 IR Site 9 Removal Action

Removal actions were performed using an ISCO process to treat VOCs (primarily cis-1,2-dichloroethene [cis-1,2-DCE] and VC) in the shallow groundwater zone (between 8 feet and 15 feet bgs) east of Building 410 (Shaw 2006a), and VOCs (primarily 1,1-DCA and VC) in the intermediate zone between 20 feet and 40 feet bgs primarily northwest, west, and southwest of Building 410 (Shaw 2006b). The primary objective of the removal actions was to achieve mass reduction of contaminants within the saturated zone to reduce the dissolved-phase contaminant concentrations to below their respective maximum contaminant levels or to levels that are technically or economically feasible.

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No additional injection of oxidant was conducted following third injection event and performance monitoring as part of removal actions for the FWBZ and SWBZ at IR Site 9. It was recommended that several quarters of groundwater monitoring be conducted to assess if elevated contaminant concentrations following third round of injection decrease with time. It was further recommended that the decision on the need for additional ISCO treatment be made following at least three quarters of additional groundwater sampling.

2.4.3 Pilot Studies/Corrective Actions – CAA-13

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
22	RI Report for IR Site 13	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.2 through 6.4, Pages 6-6 through 6-40, Figures 6-1 through 6-17; Tables 6-1 through 6-17. SulTech 2005.

remove JP-5 free product. Remediation activities at Building 397 were suspended on September 17, 2003, after 1,148 pounds of TPH was removed.

6.2 SITE 13 ENVIRONMENTAL INVESTIGATIONS

This section describes the environmental investigations conducted at Site 13, which include investigations conducted before the IRP, under CERCLA, under the EBS and TPH Programs, and during removal actions and treatability studies.

Tables 6-1 and 6-2 summarize the soil and groundwater samples collected by the environmental investigations conducted at Site 13 and the types of analyses conducted. Sampling locations are shown on Figure 6-3 and are categorized by investigation. Results for each of the investigations are presented in Tables 6-3 through 6-14. The tables are organized by analytical group and detail the number and percent of detections; the minimum, average, and maximum detected concentration; the minimum and maximum detection limit; the number of detections exceeding either the residential (for soil) or tap water (for groundwater) PRGs (EPA 2002a); the number of detection limits for nondetected samples exceeding the PRG; and the PRG.

The following subsections summarize investigations conducted at Site 13 prior to the IRP (Section 6.2.1), under the CERCLA (Section 6.2.2), EBS (Section 6.2.3), and TPH programs (Section 6.2.4), and as a part of removal actions and treatability studies (Sections 6.2.5 and 6.2.6, respectively).

6.2.1 Investigations Conducted Before the IRP

Investigations conducted at Site 13 before the IRP include the IAS in 1983, the soil and groundwater investigation in 1989, and the Phase I, II, and III soil investigation conducted in 1991. The subsections below summarize activities conducted under each investigation.

6.2.1.1 IAS, 1983

The Navy initiated the NACIP in 1982 to identify, assess, and control contamination of the environment resulting from base activities. The 1983 IAS (E&E 1983) identified several areas for further investigation. In addition, information from several active portions of NAS Alameda was documented in IAS. These findings provide much of the operational and historical information presented in this document and set the stage for much of the Navy's subsequent investigations at Alameda Point. The IAS report discusses activities conducted at the base and identified the former oil refinery as a potential concern. The Navy began investigation activities at Site 13 to evaluate whether the property had been part of the former oil refinery identified by DTSC in a 1988 Remedial Action Order (DTSC 1988).

6.2.1.2 Soil and Groundwater Investigation, 1989

In 1989, the Navy conducted a geotechnical investigation in preparation for construction of the Intermediate Maintenance Facility (IMF) (Harding Lawson Associates [HLA] 1989). The planned location for the IMF was south of Building 397 at Site 13. Initially, three soil borings (B-1 through B-3) were drilled at this location at which black stained soil and the smell of hydrocarbons was observed. Subsequently, 15 soil borings (B-4 through B-18) were drilled and 1 boring as a groundwater monitoring well (MW-1) was installed at Site 13. Results of the investigation indicated the presence of free-floating petroleum hydrocarbon products in 1 boring and hydrocarbon stains or odors were noted in 9 of the 18 soil borings (HLA 1989). Eleven soil samples contained detectable concentrations of TPH as well as oil and grease. A sample from one boring contained an elevated lead concentration of 13,000 mg/kg and a pH below 2. Sampling locations are shown on Figure 6-3. A list of soil samples and analyses are presented in Table 6-1.

6.2.1.3 Phases I, II, and III, 1991

Based on the results of the 1989 HLA investigation, DTSC requested that the Navy initiate soil removal in the center of Site 13, near soil boring B-7. The Navy performed a Phase I assessment on the extent of lead contamination and low pH soils around soil boring B-7 in 1991. Eight soil borings (B-IMF-01 through B-IMF-08) were drilled, and one groundwater monitoring well was installed (M-IMF-01). Soil samples were collected in each boring and screened in the field for pH. Hydrocarbon stains and odors were noted in all borings, and a 0.7-foot layer of free hydrocarbon product accumulated in the newly installed monitoring well. Although the focus of this investigation was to determine the extent of elevated lead concentrations, seven soil samples were analyzed for total recoverable petroleum hydrocarbons (TRPH), three samples were analyzed for VOCs, and three samples were analyzed for SVOCs. Sampling locations are shown on Figure 6-3.

Because of discrepancies between field pH screening results and laboratory results for two of the samples collected in the Phase I assessment, DTSC requested additional pH sampling. Phase II field investigation samples were collected from surface soils immediately adjacent to each of the eight Phase I soil borings. Subsurface soil samples were collected immediately adjacent to soil borings B-IMF-04, B-IMF-06, and B-7. Two samples were collected from each location; one sample was submitted for laboratory analysis of pH by EPA Method 9040, and the other sample was field screened for pH using four different procedures (PRC and JMM 1996). Laboratory and field pH measurements were generally consistent.

The Phase II investigation confirmed the low pH near soil boring B-7, but did not fully characterize the extent of the low pH levels. Subsequently, an additional soil and groundwater investigation (Phase III) was performed at the proposed IMF site. The focus of the Phase III investigation was to further evaluate pH and the extent of lead in the immediate vicinity of soil boring B-7. For the Phase III investigation, three soil borings were advanced (B-IMF-09 through B-IMF-11), and one additional groundwater monitoring well (M-IMF-02) was installed. The Phase III investigation concluded that low pH (less than 2) and high concentrations of lead in

soils were common within a 6-foot radius of boring B-7. In general, the low pH and high lead concentrations correlated with the presence of the black, stained material.

6.2.2 CERCLA Investigations

The following subsections summarize investigations conducted at Site 13 under CERCLA. These investigations include the Phase 1 and 2A investigation performed in 1991, the follow-on investigations conducted in 1994 and 1998, the storm sewer investigation in 2000, the supplemental RI data gaps sampling performed in 2001, the basewide groundwater monitoring conducted in 2002 and 2003, and the PAH study in 2003.

Boring logs for all investigations are presented in Appendix B.

6.2.2.1 Phase 1 and 2A Investigation, 1991

The Navy contracted with Canonie to conduct an investigation at Site 13 to determine whether contamination from oil refinery operations was leaching into the groundwater (Canonie 1989). At the time of this investigation, the site boundaries for Site 13 included the location of the former oil refinery. Site 23 originally consisted only of Building 530, a small area now located within the boundaries of Site 23. Subsequently, in October 2000, the boundaries for Site 13 and Site 23 were redefined to the existing boundaries based on locations of groundwater plumes. This section addresses investigation activity conducted within the current Site 13 boundaries.

Soil

Twenty-seven soil borings were drilled (BOR-1 through BOR-27), and 5 of the 27 borings were completed as monitoring wells and renamed (MWOR-1 through MWOR-5). Of these, 15 soil borings (BOR-6 through BOR-11, BOR-13 through BOR-19, BOR-21, BOR-24) and four groundwater monitoring wells (MWOR-1 through MWOR-4) were located within the current Site 13 boundary. Figure 6-3 presents the sampling locations. Within the current Site 13 boundaries, 165 soil samples were collected from soil borings and analyzed for VOCs, SVOCs, pesticide and PCBs, TRPH, TOC, metals, cations and anions, pH, cyanide, and general chemical characteristics (PRC and MW 1993a) (see Table 6-3). The table below summarizes chemicals detected at concentrations exceeding the PRG and the sampling location with the highest detected concentration for each chemical.

SITE 13 1991 PHASE 1 AND 2A INVESTIGATION SOIL SUMMARY		
ANALYTICAL GROUP	**DETECTED CHEMICAL EXCEEDING 2002 RESIDENTIAL PRG**	**LOCATION OF HIGHEST CONCENTRATION**
VOCS	BENZENE	BOR-9
SVOCS	NONE	N/A
PAHS	BENZO(A)PYRENE, BENZO(B)FLUORANTHENE, BENZO(K)FLUORANTHENE, AND INDENO(1,2,3-CD)PYRENE	MWOR-2
PESTICIDES AND PCBS	NONE	NOT APPLICABLE
METALS	ARSENIC	BOR-18
	IRON	BOR-15
	LEAD	BOR-16
	VANADIUM	MWOR-4

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

The VOC benzene was detected in soil above the residential PRG in a sample collected from BOR-9 at 6.5 to 7.0 feet bgs.

No SVOCs were detected in soil above their respective residential PRGs.

PAHs were detected exceeding the 2002 residential PRG in the SVOC analytical run in borings BOR-10 (0.5 to 1.0 feet bgs), BOR-8 (11.0 to 11.5 feet bgs), BOR-11 (11.0 to 11.5 feet bgs), BOR-21 (0.5 to 1.0 feet bgs), BOR-7 (2.5 to 3.0 feet bgs), and MWOR-2 (12.0 to 12.5 feet bgs). It was noted that several borings had PAHs detected in the saturated zone (beneath approximately 6 feet bgs) (PRC and JMM 1992). The investigation report concluded that naphthalene was detected in laboratory blanks and was suspected to be a laboratory contaminant (PRC and JMM 1992).

No PCBs or pesticides were detected in soil above their respective residential PRGs.

Arsenic (BOR-10, MWOR-02, MWOR-03, MWOR-04, BOR-17, BOR-15, BOR-18, BOR-19, BOR-11, BOR-21, and BOR-24), iron (BOR-15 and MWOR-2), lead (BOR-16), and vanadium (MWOR-4) were detected at concentrations exceeding 2002 residential PRGs.

TRPH were detected in some soil samples and are discussed in Section 6.4.1 and Appendix F under the TPH program.

Groundwater

Four groundwater samples, one from each monitoring well (MWOR-1, MWOR-2, MWOR-3, and MWOR-4), were analyzed for VOCs, SVOCs, pesticides and PCBs, metals, TRPH, and

general chemistry characteristics. MWOR-1 was installed east of Building 397, MWOR-2 was located in the southwest corner of Site 13, MWOR-3 was installed near the center of Site 13 near the former location of AST 326, and MWOR-4 was installed in the southeast corner of the site (see Table 6-4). The table below summarizes chemicals detected at concentrations greater then the tap water PRG and the sampling location with the highest detected concentrations of each chemical.

Site 13 1991 Phase 1 and 2A Investigation Groundwater Summary

Analytical Group	Detected Chemical Exceeding 2002 Residential PRG	Location of Highest Concentration
VOCs	Benzene and ethylbenzene	MW-1
SVOCs	None	NA
PAHS	naphthalene	MW-1
Pesticides and PCBs	None	NA
Metals	Aluminum	MWOR-4
	Iron	MWOR-4
	manganese	MWOR-4
	Nickel	MWOR-4
	Vanadium	MWOR-4

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

Petroleum-related VOCs benzene and ethylbenzene were detected at concentrations exceeding the 2002 tap water PRG at one sample from monitoring well, MW-1.

No SVOCs were detected in groundwater above the 2002 tap water PRGs.

The PAH naphthalene was detected in groundwater at a concentration exceeding the 2002 tap water PRG in one sample from well MW-1.

No PCBs or pesticides were detected in groundwater at concentrations exceeding the 2002 tap water PRGs.

Various metals from the four monitoring wells detected in groundwater were within the background ranges for metals at Site 13 (PRC and JMM 1992). Aluminum, iron, manganese, nickel, and vanadium were detected in well MWOR-4 at concentrations exceeding the 2002 tap water PRG.

Analytical detection limits of numerous VOCs, SVOCs, and metals in soil and groundwater exceeded the 2002 residential tap water PRGs. Furthermore, QA/QC information was not

available for data validation at the time the investigation report was prepared. Groundwater and soil data were used for qualitative purposes only for the investigation report; however, the Navy and agencies consider the data acceptable for inclusion in the risk assessments.

The investigation report concluded that additional soil data were necessary to further evaluate TRPH and BTEX around boring locations BOR-9, BOR-15, BOR-17, BOR-19, and the IMF (PRC and JMM 1992). In addition, more pesticides data were required around soil boring BOR-26. The report concluded that, except for TRPH and BTEX, sufficient VOCs, SVOCs, PCBs, and metals data were collected in soil from Site 13.

The investigation report concluded that additional groundwater data were necessary to evaluate tidal influence on the shallow and deep water-bearing zone; characterize the extent of VOCs, SVOCs, pesticides, TRPH, and metals in groundwater; and evaluate whether groundwater beneath Site 13 is considered a potential drinking water source (PRC and JMM 1992).

6.2.2.2 Follow-On Investigation, 1994

Based on the recommendations of the 1991 investigation, and discussions with the regulatory agencies, a follow-on field investigation was conducted to provide additional lithologic, chemical, and hydrogeologic information (PRC and MW 1995). Field activities included a Geoprobe® investigation, CPT, Hydropunch sampling, soil sampling, monitoring well installation, and storm drain sediment sampling. Sampling locations are presented on Figure 6-3.

A Geoprobe® investigation was conducted first during this investigation to assist in determining the nature and extent of soil and groundwater contamination and to assist in determining the locations for the soil borings and monitoring wells. No soil samples were collected for chemical analysis. Groundwater samples collected at six locations were analyzed using field screening test kits. Two locations were resampled and submitted to a laboratory for VOC, TPH-P, and TPH-E analyses. None of these analytes were detected.

The objective of the CPT sampling program was to evaluate the lithology and hydrogeologic characteristics below 15 feet and to identify the SWBZ. Four CPT location (CPT-S13-02 through CPT-S13-05) were driven across Site 13. No soil samples were collected using the CPT; however, CPT resistivity readings were used to evaluate lithology.

A groundwater sample was collected from the SWBZ at each CPT location using a Hydropunch sampling device (DHP-S13-01 through DHP-S13-04). The samples were analyzed for VOCs, SVOCs, TPH-P, TPH-E, metals, and general chemical parameters, including TDS.

Soil

Nine hollow-stem auger borings (B13-28 through B13-32 and M13-06 through M13-09) were advanced, and soil samples and groundwater samples were collected to further evaluate the vertical extent and nature of petroleum hydrocarbons. Soil samples were collected at the surface

and at 2.5 and 5 feet bgs from each boring and monitoring well location. Samples were analyzed for VOCs, TPH-P, TPH-E, and metals (see Table 6-5).

The table below summarizes chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected for each chemical.

Site 13 1994 Follow-On Investigation Soil Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
VOCs	None	Not Applicable
SVOCs	None	Not Applicable
PAHs	Benzo(a)anthracene, BaP, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene	B13-39
	Benzo(b)fluoranthene and chrysene	B13-41
	Dibenzo(a,h)anthracene	B13-44
Metals	Arsenic	M07C-06
	Chromium	B13-30
	Iron and lead	B13-32

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs were detected in soil at concentrations exceeding their respective 2002 residential PRGs.

No SVOCs were detected in soil at concentrations exceeding their respective 2002 residential PRGs.

PAHs were detected at concentrations exceeding their respective 2002 residential PRGs in samples collected from borings B13-39, B13-41, and B13-44 from 14.5 to 15 and 7.0 to 7.5 feet bgs respectively.

Arsenic, iron, and lead were detected at concentrations exceeding their respective 2002 residential PRG in most soil samples collected at Site 13. Chromium from 1.0 to 2.0 feet bgs from soil boring B13-30 also exceeded the 2002 residential PRG. In addition, four metals (lead, nickel, cadmium, and zinc) were detected at concentrations exceeding 10 times the solubility threshold limit concentration value in six soil samples collected from the southeastern portion of Site 13.

Petroleum hydrocarbon-related VOCs and TPH-P were detected in most soil samples collected from borings B13-28 through B13-32. TPH-E, quantified as motor oil, was detected in all of the soil samples collected from the soil borings (PRC and MW 1995).

Based upon Geoprobe® and Hydropunch sampling results, four of the soil borings referenced previously were completed as shallow monitoring wells (M13-06 through M13-09), and one deep monitoring well (D13-01) was installed at Site 13.

Groundwater

A quarterly groundwater monitoring program was conducted from October 1994 to August 1995. Quarterly groundwater samples were collected from the following monitoring wells: MWOR-1, MWOR-2, MWOR-4, MW-1, M13-06, M13-08, M13-09, M07C-06, M07C-07, M07C-09, and D13-01. Samples were analyzed for VOCs, SVOCs, ethylene dibromide (EDB), pesticides/PCBs, dissolved metals, cyanide, TPH-P and TPH-E, sulfide, and general chemistry parameters. Benzene and SVOCs were detected in M13-07 near former ASTs 324 through 328. Elevated concentrations of TPH quantified as diesel (TPH-d) were detected in monitoring wells in the northeast and central portions of Site 13. TPH quantified as motor oil (TPH-mo) was detected in 3 of the 10 monitoring wells located in the east and central portions of Site 13. TPH-P was detected in one groundwater sample near Building 397 (MW-1) (see Table 6-6). The table below summarizes chemicals detected at concentrations exceeding the PRG and sampling location with the highest detected concentration for each chemical.

Site 13 1994 Follow-On Investigation Groundwater Summary

Analytical Group	Detected Chemical Exceeding 2002 Residential PRG	Location of Highest Concentration
VOC	1,2-DCA	M07C-09
	Benzene	B13-30
	Ethylbenzene and total xylenes	B13-28
SVOC	Pentachlorophenol	MWOR-3
PAH	Naphthalene	M13-07
Pesticides and PCBs	None	Not Applicable
Metals	Arsenic, iron, and manganese	M13-07
	Thallium	M07C-06

VOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from M07C-09, B13-30, and B13-28.

The SVOC pentachlorophenol was detected in groundwater at concentrations exceeding the tap water PRG in two samples from MWOR-3.

The PAH naphthalene was detected in groundwater at concentrations exceeding it's the tap water PRG in samples from MW13-07.

No PCBs or pesticides were detected in groundwater at concentrations exceeding their respective tap water PRGs.

Various filtered metals were detected in groundwater at concentrations above their respective tap water PRGs in samples from M13-07 and M07C-06.

Although one storm drain sediment sample (NPS-S13-01) was collected from Site 13 during this investigation, no data were received from the laboratory; therefore, results are not included in this RI report.

The investigation report concluded that chemicals detected in soil and groundwater are similar in nature to those found during the previous (1991) investigation (PRC and MW 1995). TPH-E, quantified as motor oil, extends to 30 feet bgs, and additional soil or groundwater data may be necessary for an HHRA or ERA due to the TPH-E concentrations in groundwater.

6.2.2.3 Follow-On Investigation, 1998

The 1998 investigation consisted of 1 year of basewide quarterly groundwater monitoring to assess and monitor the status of plumes at various sites at Alameda Point (U&A 1998). Samples were collected each quarter from monitoring wells M13-06 and M13-09. The analytical parameters prescribed for these samples varied from quarter to quarter and well to well, but generally included VOCs, SVOCs, dissolved metals, TPH-P and TPH-E, TOC, and general chemistry. VOC and SVOC concentrations were not detected above laboratory reporting limits in groundwater. Dissolved metals concentrations in groundwater generally exceeded MCLs at Site 13. TPH-d and TPH-mo were detected at low concentrations in groundwater at Site 13 (see Table 6-7). The table below summarizes chemicals detected at concentrations exceeding the tap water PRG and the sampling location with the highest detected concentration for each chemical.

Site 13 1998 Follow-On Investigation Groundwater Summary

Analytical Group	Detected Chemical Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	None	Not Applicable
SVOC	None	Not Applicable
PAH	None	Not Applicable
Metals	Unfiltered manganeso, filtered arsenic, and filtered manganese	MW13-09

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs, SVOCs, or PAHs were detected in groundwater at concentrations exceeding their respective tap water PRGs.

Filtered and unfiltered metals were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from M13-09.

Additionally, a tidal influence study was conducted as part of this investigation to establish tidal effects (if any) on groundwater at Alameda Point; however, no data were collected that related to Site 13.

6.2.2.4 Storm Sewer Investigation, 2000

The basewide storm sewer investigation evaluated the physical conditions of storm sewers; identified the places where storm sewers are submerged below groundwater; identified locations where contaminated groundwater intercepts submerged, damaged sections of storm sewers; and identified significant data gaps for further evaluation.

The storm sewer investigation also evaluated the need for repairing the lines by level of priority based on whether the lines were damaged and were intersected by plumes. Most of the storm sewer lines at Site 13 were partially submerged at Site 13. Site 13 contained one segment of pipe with a high priority for repair and two segments of pipe with low priority for repair. The table below summarizes information about the storm sewer lines, and the lines are shown on Figure 6-4.

Damaged Storm Sewer Line Segments

Segment		Diameter (Inches)	Length (feet)	Material	Contaminants
From	To				
High Priority					
6-J	6-JC	12	270	Concrete	BTEX
6J-1	6J-F	15	440	Reinforced Concrete	BTEX
Low Priority					
6J-1A	6J-3	12	332	Reinforced Concrete	BTEX and PAH

6.2.2.5 Supplemental Data Gaps Sampling, 2001

Based on identified data gaps, a supplemental data gap sampling effort was conducted at OU-2A to address two primary data gaps categories: (1) the status of groundwater contaminant plumes and (2) preferential flow paths associated with the storm sewer system (Tetra Tech 2002a). This sampling effort included sampling of groundwater monitoring wells and bedding material at the storm sewers. Additional sampling for secondary data gaps was conducted within Site 13; this included collection of one soil gas sample (see Figure 6-3).

One round of groundwater samples was collected at Site 13 during the data gaps sampling to obtain more recent groundwater data. All wells at Site 13 were sampled during this investigation. Samples were analyzed for VOCs, TPH-P, TPH-E, SVOC, and field parameters (see Table 6-8). The table below summarizes chemicals detected at concentrations exceeding the tap water PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 13 2001 Supplemental Data Gaps Sampling Investigation Groundwater Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration**
VOCs	TCE	MWOR-2
SVOCs	Naphthalene	M13-07
PAHs	Dibenzo(a,h)anthracene	MWOR-1
	Naphthalene	MW13-07

VOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from MWOR-2.

No SVOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs.

PAHs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from MWOR-1 and MW13-07.

No VOCs, SVOCs, or PAHs were detected in groundwater at concentrations exceeding their respective MCLs.

Soil and groundwater samples were collected along storm sewer lines at Site 13 to determine whether storm sewer bedding materials are acting as a preferential pathway for contaminant migration. Vacuum excavation borings were advanced immediately adjacent to storm sewer lines where undisturbed samples of the bedding material were collected. For comparison purposes, samples of the native soil were collected at the approximate depth of the storm sewer, 10 feet away from the vacuum excavation locations. Soil samples were analyzed for geotechnical parameters. Groundwater samples collected from the vacuum extraction locations were analyzed for TPH-P and TPH-E and VOCs. One sample, S13-DGS-VE01, was collected from the storm sewer bedding, and one sample was collected from the native soil located east of Building 397. Two additional samples, S13-DGS-VE02 and S13-DGS-VE03, were collected in the middle of Site 13, along the storm sewer corridor running north and south near ASTs 324 through 328. One sample from the native soil was collected near location S13-DGS-VE02. All three samples exhibited elevated concentrations of TPH. It was concluded that the storm sewer bedding material has a higher hydraulic conductivity than the native soil at Site 13.

One boring was advanced for soil gas sampling at a location selected with assistance from the BCT for use in a future HHRA (see Figure 6-3). The boring was advanced near former ASTs 324 through 328. At the soil gas sampling location, two continuous core soil borings were completed to determine specific groundwater depths and evaluate physical soil parameters required for the risk assessment model. Samples were collected at depths of 1.5 and 4.0 feet bgs. Chlorinated hydrocarbons and BTEX were detected in the soil gas samples.

6.2.2.6 Basewide Groundwater Monitoring, 2002 and 2003

The specific objectives of the 2002 and 2003 basewide monitoring investigation were (1) to evaluate contaminant plumes in groundwater and (2) to determine the main chemicals of concern (Shaw 2003a). The monitoring scheme for OU-2A included 23 of the 46 wells located within the five sites of OU-2A (Sites 9, 13, 19, 22, and 23). Eight monitoring wells (MW-1, D13-01, M07C-06, M07C-09, M13-06, M13-07, M13-08, M13-09, and MWOR-4) located within Site 13 were identified for quarterly or semiannual (twice per year) monitoring. Sampling was conducted in June, September, and December 2002 and April 2003. Samples were analyzed for VOCs, TPH, dissolved metals, and general chemistry (see Table 6-9). The table below summarizes chemicals detected at concentrations exceeding the tap water PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 13 2002 and 2003 Basewide Groundwater Monitoring Investigation Summary

Analytical Group	Detected Chemical Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOCs	Naphthalene	M13-07
	TCE	M07C-09
Metals	Arsenic and manganese	M07C-06
	Iron	MW-1

VOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from M07C-09 and M07C-09.

Various filtered metals were detected in groundwater at concentrations exceeding their respective tap water PRGs and MCLs in samples from 07C-06 and MW-1.

TPH in the diesel, gasoline, motor oil, and JP-5 ranges were detected in samples collected from Site 13.

6.2.2.7 Basewide PAH Study, 2003

The primary objective of the 2003 PAH study was to collect sufficient PAH data to calculate EPCs for ERAs and HHRAs at CERCLA sites (Bechtel 2003). The mean and standard deviation of BaP concentrations from historical PAH data were used to determine the appropriate number of PAH samples to collect at each site. At Site 13, 66 soil borings were advanced using direct-push sample methods. Samples were collected from each of the following four depth intervals: 0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs. Boring logs are presented in Appendix B.

In general, the concentrations of individual PAHs were low. PAH concentrations in samples from nine locations exceeded the action level of 0.62 mg/kg for BaP equivalents (Navy 2001d) (see Table 6-10) (Navy 2001d). Samples collected from locations B029, B034, B047, B051, B052, and B080 exceeded a BaP equivalent of 1.0 mg/kg. The table below summarizes

chemicals detected at concentrations exceeding the 2002 residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical. Results of this investigation are presented separately in Table 6-11, with PAH results summarized as BaP equivalents.

Site 13 2003 Basewide PAH Study Soil Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
PAH	BaP, benzo(b)fluoranthene, benzo(k)fluoranthene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene	C3S013B051
	Chrysene	C3S013B052
	Naphthalene	C3S013B08A

6.2.3 EBS Investigations

The EBS was performed to identify the environmental condition of all base property and facilities to facilitate transfer to the community as expeditiously as possible. Two phases of the EBS were conducted at the installation. Results for the EBS investigations are presented in Table 6-12.

Phase 1. The first phase of investigation comprised an examination of aerial photographs and historical records as well as the performance of site inspections and interviews with current and former employees involved in operations. The Phase 1 EBS found that many parcels had insufficient information to classify them as transferable; therefore, recommendations for additional investigations were prepared and presented in the zone analysis plans and parcel evaluation plans (ERM-West 1995a, 1995b).

Phase 2A. As recommended by the IAS (E&E 1983), the Phase 2 investigations did not focus on areas already under evaluation. Other Navy land uses or areas that may impact transfer were the subject of the investigations. Site 13 is within Zone 22 and comprises Parcels 146, 147, 210, and 214 (see Figure 6-1). EBS samples were collected only at the previous parcels during the EBS Phase 2A sampling effort (IT 2001). One storm sewer corridor sample was collected from Parcel 146 in February 1995 as part of the EBS Phase 2A. In addition, soil sampling was conducted at Parcel 147 in January, February, April, and May 1995 to investigate the former incinerator (now within Site 7 boundaries), the storm sewer corridor, and the industrial waste sewer corridor (IT 2001). Parcels 210 and 214 were not sampled during the EBS. Table 6-1 lists the analyses conducted. Sampling locations are presented on Figure 6-3. No evidence of an incinerator was found at Site 13, and the incinerator was ultimately identified to be present at Site 7.

6.2.4 TPH Investigations

Site 13 was identified as part of CAA 13. Sampling was conducted at Site 13, in relation to CAA-13, under the TPH program in 2000 during the data gaps investigation at the CAAs (Tetra Tech 2001e). This investigation addressed 12 different data gap types, and Site 13 sampling involved data gap Types I, III, IV, and V samples. Figure 6-3 shows each sampling location, and Tables 6-13 and 6-14 present the results for the TPH investigations. This section describes the sampling associated with each type of data gap at Site 13.

Six data gap Type I samples were collected to assess the presence of floating free product. Five samples, CA13-02 through CA13-06, were collected near the eastern end of Building 397, and one sample, CA13-01, was collected east of ASTs 324 through 328. Because approximately 6 inches of floating free product was present at sampling locations CA13-03 and CA13-06, groundwater samples were not collected from these locations (Tetra Tech 2001e). Floating free product also was observed in manhole 5J-2; however, this storm drain section is reportedly capped with no release to an outfall. No floating product was present at the other four sampling locations, and groundwater samples were analyzed for BTEX, MTBE, TPH-P, TPH-E, and dissolved metals.

Two Type III samples were collected to investigate current groundwater TPH concentrations the near storm drains. One groundwater sample was collected from monitoring well MW-1 to investigate the storm drain running from the eastern side of Building 397 to the southern part of Site 13. The second groundwater sample was collected from M13-07 to investigate the storm drain running north and south near the southern end of AST 324 through 328. Both samples were analyzed for BTEX, MTBE, TPH-P, TPH-E, and dissolved metals. MW13-07 exhibited low concentrations of JP-5-range organics.

One Type IV groundwater sample (CA13-26) was collected to investigate OWSs south of Building 397. The groundwater sample was analyzed for BTEX, MTBE, TPH-P, TPH-E, and lead. TPH-d and TPH-mo were detected in the sample.

Fifteen Type V soil and groundwater samples were collected to investigate the source area beneath the storage units located in the southeastern corner of Site 13. The samples were analyzed for BTEX, MTBE, TPH-P, TPH-E, and lead. TTPH was detected in soil at a maximum concentration of 66,000 mg/kg. TPH-mo, TPH-d, and TPH-g were detected in soil at maximum concentrations of 30,000, 36,000, and 1,400 mg/kg respectively. TTPH was detected at a maximum concentration of 1,091 mg/L in groundwater. Several samples indicated the presence of free product.

A concurrent analysis is being completed to analyze TTPH constituents as part of the TPH program and CERCLA chemicals as part of the CERCLA program. In locations where TPH and CERCLA chemicals are commingled, the commingled area or plume will be addressed as part of the CERCLA program. Any residual TPH contamination remaining upon remediation of the CERCLA chemicals will be addressed under the TPH program.

As stated in Section 6.1.3, TPH contamination at AOC 397 is not commingled with CERCLA chemicals and is being addressed under the TPH screening strategy described in Appendix F. At AOC 009, petroleum-related chemicals are commingled with CERCLA chemicals associated with refinery waste; therefore, the chemicals in soil and groundwater at AOC 009 are further discussed in Section 6.4, Nature and Extent of Chemicals in Soil and Groundwater.

6.2.5 Removal Actions

Several removal actions have been conducted at Site 13. These removal actions included removal of tarry refinery waste (TRW) in 1940, removal of lead in 1993, removal of free product at Building 397 in 1993, removal of a fuel line in 1998, and removal of TPH in 2002. Each removal action is summarized below.

TRW Removal, 1940. The area once occupied by the oil refinery had been filled and surfaced by the Navy. The resulting gas pressure buildup from underground hydrocarbons and refinery wastes induced a surface rupture sometime in the 1940s. An area approximately 30 feet by 30 feet was excavated down to the old material, and a concrete slab was emplaced in the bottom of the excavation. The excavation was then backfilled and resurfaced. No information was provided on the location of the excavation area or the concrete slab. These procedures apparently mitigated the problem of gas pressure buildup (E&E 1983).

Lead Removal, 1993. As part of a plan to construct a two-building IMF at Site 13, the Navy conducted a geotechnical investigation in 1989. Free hydrocarbon product and hydrocarbon stains or odors were identified in selected borings. The boring with the highest concentrations of TPH-g, oil and grease, and lead and the lowest pH was located in the central portion of a former oil refinery, adjacent to the previous lubricating building and close to former bleaching tanks and activators (see Figure 6-2). It is believed that these units were the source of the high TPH and high lead and low pH found in the boring. The Navy was directed by DTSC to initiate soil removal activities in the vicinity of the boring. Following three phases of additional characterization sampling near the boring, a removal action was eventually conducted in 1993. The first portion of the removal action activities was conducted from September to October 1993. Confirmation samples indicated that residual total lead concentrations exceeded the interim cleanup goal of 100 mg/kg. Additional excavation was performed from October 1994 to December 1994 to complete the removal action. The final excavation area measured about 25 by 30 feet and had a maximum depth of 7 feet bgs. Approximately 120 cubic yards of contaminated soil was excavated and shipped to a Class I landfill. Lead concentrations in all but one confirmation sample were below the interim cleanup goal of 100 mg/kg. Lead was detected at a concentration (121 mg/kg) exceeding the interim cleanup goal in one confirmation sample (PRC and MW 1995a). The location of the excavation is shown on Figure 6-5.

Free Product Removal at Building 397, 1993. After the 3,500- to 17,000-gallon spill of JP-5 in 1991, DTSC entered into an agreement with NAS Alameda for a soil cleanup action limited to contamination caused by the JP-5 spill. The project scope initially included removal of soil contaminated by only JP-5 and only down to groundwater. In February 1993, IT began an excavation of test holes to groundwater. Samples were collected and analyzed for JP-5 and

BTEX. The excavation extended out from those areas that tested above the cleanup goal of 1,000 ppm total; the excavation was extended 2 feet below the groundwater table. The maximum extent of the excavation was reached on March 8, 1993, with a total of 1,310 tons of soil removed (Navy 1993). The location of the excavation is shown on Figure 6-5.

Contaminated water and floating fuel product were pumped into temporary tanks before testing and disposal. Numerous underground structures and abandoned pipes were encountered and contained water and product. The piping was cut off, plugged, and removed as encountered. Damaged storm and industrial sewers and manholes abandoned in place earlier could not be removed because of their proximity to the building; therefore, they were filled with concrete slurry.

The occurrence of floating free product required installation of a recovery system, based on the Navy's agreement with DTSC. The recovery system consisted of a thick gravel drainage bed in the groundwater and six vertical pipes to allow for pumping. The product recovery system consisted of an air-powered floating pump in the well, a packaged air compressor, a control panel, and a double-walled tank. No information is available on the amount of free product removed.

Fuel Line Removal, 1998. One fuel line ran from Building 372 to Building 397. The line carried JP-5 to the jet engine testing facility located in Building 397. The section of fuel line on Site 13 was removed in October 1998 (Tetra Tech and R&M 2000). Three confirmation samples (030-S19-001 through 030-S19-003) were collected and analyzed for TTPH. Two soil samples (030-S19-002) and (030-S19-003) collected along the north side of Building 397 exhibited elevated concentrations of TPH. Figure 6-3 shows the location of the former fuel line and sampling locations.

DVE for Residual Free Product Recovery, 2001 to 2003. A DVE pilot test was conducted in 2001 by IT to demonstrate the capability of DVE technology to recover free product from the groundwater surface and to capture hydrocarbon vapors from soil. The pilot test indicated that DVE was successfully removing hydrocarbon contaminants from soil. In 2002, a full-scale DVE system was installed on the east end of Building 397. The system began operation in 2002, and activities were suspended on September 17, 2003, after removing 1,148 pounds of TPH. The system operation was suspended because recovery of floating petroleum had reached an asymptotic rate (see Figure 6-11).

6.2.6 Treatability Studies

Several treatability studies have been conducted at Site 13 to determine the viability of different technologies for cleanup and assessment of contaminants at the site. These treatability studies include the Site Characterization and Analysis Penetrometer System (SCAPS) laser-induced fluorescence testing to delineate TPH contamination, intrinsic bioremediation to treat hydrocarbons, emulsion recycling to treat TPH- and metals-impacted soil, and terrain conductivity mapping to delineate the location of the TRW. Each treatability study is summarized below.

SCAPS, 1997. The Navy evaluated the effectiveness of SCAPS laser-induced fluorescence testing in delineating petroleum hydrocarbons at several locations at Alameda Point. The process uses ultraviolet light generated by the laser to induce PAHs present in petroleum products to fluoresce. A CPT rig drives a rod containing a fiberoptic cable into the ground to detect relative subsurface petroleum concentrations based on the response to the ultraviolet light. SCAPS testing was conducted at 11 locations approximately 70 feet south of Building 397 at Site 13. The testing suggested the presence of petroleum products near the water level in five of the test locations near the east end of Building 397. No confirmation samples were collected at Site 13, but confirmation sampling at other locations did not show a strong correlation between SCAPS results and the presence of petroleum products. The technology was not used after the initial study in 1997.

Intrinsic Bioremediation, 1998. The intrinsic bioremediation study was conducted in 1998 by the University of California at Berkeley (UCB), Lawrence Livermore National Laboratory, and Lawrence Berkeley National Laboratory (Berkley Environmental Restoration Center [BERC] 1998). The study objectives were to identify intrinsic bioremediation of hydrocarbons at Site 13 and to estimate the rate of bioremediation. Samples were collected in the field southeast of Building 397 and field and laboratory analyses were performed to accomplish the following objectives: (1) characterize the microbial populations present at each site (microcosms, microbial enrichment, and direct epifluorescent microscopy); (2) characterize the geochemical conditions at each site and identify the occurrence of metabolic substrates and products (field physical/chemical assays, soil gas, and isotopic assays); (3) evaluate the mechanisms responsible for degradation (soil gas and isotopic assays).

Analytical data indicated that although biodegradation of the hydrocarbons is occurring, the mode of degradation is dominated by a coupled process of methanogenesis and methane oxidation rather than by direct aerobic activity on the parent hydrocarbons. The contaminant degradation activity varies significantly over time and is much more pronounced following periods of high rainfall. Modeling results and field observations suggest that oxygen transport is hindered in the unsaturated soils above the hydrocarbons at Site 13, resulting in slow bioremediation rates. Results of this study indicated that to significantly accelerate the in situ bioremediation rate at the site, the permeability within the unsaturated subsurface above the zone of contamination must be increased to facilitate soil gas exchange. In addition, these results suggested that capping Site 13 with an impermeable surface without appropriate gas venting could result in the buildup of potentially hazardous methane gas.

Emulsion Recycling, 1999. During February 2000 a treatability study was conducted to demonstrate the capability of emulsion recycling to immobilize organic and inorganic chemical contaminants in soil at Site 13 to acceptable soluble concentrations, while producing an engineered construction product such as road base material (Tetra Tech and others 2000). TPH and lead in soils at Site 13 were the subject of the study.

Criteria used to evaluate whether the emulsion recycling process was a success included comparing the soluble threshold limit concentration (STLC) as measured by the waste extraction test (WET) to the regulatory limit of 5 mg/L for lead in soil to meet the State of California

regulations. A toxicity characteristic leaching procedure (TCLP) concentration of less than 0.75 mg/L for lead was used to meet federal regulations. In addition, the action level for extractable TPH in soil was selected as 500 mg/kg, excluding asphaltene range hydrocarbons.

During the treatability study, soil samples were collected from two locations at Site 13. One sample was collected near boring B13-30, and the other soil sample was collected near soil boring B13-41 (see Figure 6-3). One sample was characterized as silty sand with relatively high concentrations of lead and low concentrations of TPH. The second soil sample was characterized as poorly graded sand with low concentrations of lead and relatively high concentrations of TPH. Each sample was treated with three dosages of asphalt emulsion and three dosages of lime to determine the optimum mix design to yield the maximum strength when subject to a Marshall stability test (Tetra Tech and others 2000). The maximum strength samples were then subjected to the TCLP and WET extractions followed by analyses for lead and TPH, as described previously. Based on STLC criteria, the sample exhibiting the highest concentration of lead was not adequately immobilized. The optimum mix design for that soil was altered by substituting magnesium oxide for the lime. The substitution of magnesium oxide for lime resulted in acceptable WET concentrations that met the 5-mg/L STLC requirement for lead.

Results of the physical testing of the emulsion-treated product showed that both soils exceeded specifications for an aggregate base (Tetra Tech and others 2000). A construction cost estimate showed that this technology could be used at Site 13 for treatment of contaminated soils for less than the cost of transporting the soil to an appropriate off-site landfill. The study recommended the results of this treatability study be evaluated in the FS.

Terrain Conductivity Mapping, 2003. In June and August 2003, a pilot test was conducted to evaluate the effectiveness of this technology for mapping the TRW. This nonintrusive technology transmits an alternating electromagnetic current flow into the ground, which produces a secondary magnetic field. The instrument receiver senses the secondary magnetic field strength that is a function of terrain conductivity. The equipment measured the relative conductivity of the soil to determine whether the TRW affected the soil conductivity in two pilot test areas. After the sensor readings were plotted on a map and compared with boring logs that identified the refinery waste, it was evident that conductivity was not correlated with the presence of the refinery waste; therefore, the technology was considered not practical for mapping the refinery waste. Confirmation sampling was conducted to determine the chemical characteristics of the material. The samples were collected in seven areas (see Figures 6-5, 6-6, and 6-7) and tested for TPH-P, TPH-E, BTEX, PAHs, lead, and pH. The results, as shown in Table 6-11, indicated that the pH of the wastes are as low as 1.1 and that the waste contains elevated concentrations of TPH-g, TPH-d, TPH-mo, BTEX, PAHs, and lead.

6.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 6.2, the Navy completed an initial data evaluation for Site 13. This evaluation included (1) a site-specific CSM, (2) a data quality

assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

6.3.1 Site 13 CSM

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 13. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 13 is described in the following text and presented in Figure 6-8.

Through environmental investigations and literature searches for Site 13, physical features and activities at Site 13 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination:

- Oil refinery operations and disposal practices – Former location of the Pacific Coast Oil Works Company Refinery, which used an acid-sludge process for refining fresh crude oil; potential source of crude oil, kerosene, lubricating and fuel oils, and heavier-end hydrocarbons, including black TRW.
- Former ASTs 324 through 328 (AOC 009) – Located in the eastern portion of Site 13 in an area used for aircraft storage; capacities and contents of the tanks are unknown; potential source of petroleum products.
- Building 397 and associated OWSs 397A, 397B, 397C, and 397D – Located in the northwest portion of Site 13; aircraft overhaul plant services facility; potential source of petroleum products, halogenated and nonhalogenated solvents, and aircraft fuel (JP-5).
- NADEP GAP 62 – Nonpermitted RCRA GAP located in the west end of Building 397; temporary storage area for 30- to 55-gallon drums containing hazardous waste, including Mil-L-23699 lubrication and engine oil.
- Placement of dredged fill material used to build the island – Potential source of PAHs.

Former Building 298, former Building 401, former Structure 285, RV parking area, and a self-storage area were not considered potential sources. Former Building 298 was used as a weather station. Former Building 401 served as a bus shelter. The nature and use of former Structure 285 is not known. The self-storage area consists of Buildings MS-01 through MS-10.

The Phase I EBS concluded that NADEP GAP 62 did not require further investigation because the area was paved and site inspectors did not observe staining (ERM-West 1994). A letter from DTSC dated November 4, 1999, recommended NFA for this SWMU (DTSC 1999). The SWMU Evaluation Report recommends NFA for NADEP GAP 62 (Appendix G).

Of these potential sources, (1) former oil refinery activities; (2) ASTs 324 through 328; (3) Building 397 and associated OWSs 397A, 397B, 397D, and 397D; and (4) fill material containing PAHs were identified as likely sources of contaminants in soil and groundwater at Site 13. The exposure pathways and primary and secondary release mechanisms may include the following:

Direct release of petroleum products acids (such as sulphuric acid), PAHs, and possibly metals associated with oil refinery activities to soil.

Direct release of petroleum products to soil and groundwater from spills around former ASTs 324 through 328. No documented releases occurred from these ASTs, but they are a likely source of the free petroleum hydrocarbon product found in soil and groundwater located east of former ASTs 324 through 328.

Direct release of petroleum products to soil and groundwater from spills around Building 397 and associated OWSs 397A, 397B, 397C, and 397D. A spill occurred during which 3,500 to 17,000 gallons of JP-5 was released from a drain valve in the eastern end of the building to a floor drain connected to OWS 397A, 397B, and 397C, which in turn drained to the storm sewer system. The jet fuel at Building 397 is not considered a CERCLA waste.

- Placement of fill material that contained PAHs.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration uptake.
- Secondary release from groundwater to air through volatilization.
- Secondary release from groundwater into domestic use through a well.

As shown in the CSM for Site 9 (see Figure 6-8), residential, commercial/industrial, and construction worker receptors were identified as potential human receptors. Exposure scenarios that include ingestion of homegrown produce and ingestion, dermal contact, and inhalation of soil and groundwater are evaluated in the HHRA (see Appendix H). Exposure of potential ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ERA (see Appendix I).

Exposure of potential ecological receptors to groundwater from migration to surface water was considered an incomplete pathway. Tidal influence studies indicated that only one well (MWOR-2) at Site 13 is tidally influenced (Tetra Tech 1997a). Groundwater contamination has not migrated to San Francisco Bay, and the storm sewer system at Site 13 is not considered a preferential pathway for contaminant migration to San Francisco Bay. In addition, samples collected from the storm drain bedding downstream at Site 13 did not contain VOCs at

concentrations greater than the detection limits, indicating that the bedding is not a migration pathway.

The storm sewer main line (sewer line J) runs through the eastern portion of Site 13 into Site 23 (see Figure 6-4). A storm drain lateral runs from Building 397 (manhole 5J-3) to the main line and was replaced with new PVC piping in 1991. Three additional lateral lines (originating at 6J-b, 6J-C and 6J-G) flow into the main line from the eastern portion of Site 13. The line from 6J-B to the main line was replaced with new PVC piping in 1991 (Tetra Tech 2000b). The line from 6J-C to the main line was cleaned in 1997, but has been identified as a high priority for repair. Additional line cleaning was conducted in 2003. The line from 6J-G to the mainline was cleaned in 1997 and was noted to be in good condition. The area where refinery waste is present intersects portions of this line. A second storm sewer line runs through the western portion of Site 13 (4J-1C to the southern border of Site 13). This line was cleaned and inspected in 1991 (see Figure 6-4) (Tetra Tech 2000b). Data collected from storm drain manhole 3J (downstream on Site 13) indicated that very low concentrations of VOCs are present in storm water (Tetra Tech 2000b). Samples collected from the storm drain bedding down stream at Site 13 did not contain VOCs at concentrations exceeding the detection limits, indicating that the bedding is a migration pathway.

6.3.2 Site 13 Data Quality Assessment

As discussed in Section 6.2, several environmental investigations were conducted at Site 13 as a part of the CERCLA and EBS Programs to identify and assess the extent of contamination in soil and groundwater and to determine risk. Data were collected over a period of approximately 13 years from 1990 through 2003 using a biased and phased sampling approach. Sampling focused on the following:

- Presence of the TRW in the central portion of Site 13
- TPH contamination around Building 397
- TPH contamination in the southeast portion of Site 13
- Industrial, sanitary, and storm sewers
- Fill material and native sediments to assess the presence of PAHs

These data, through an iterative process, were used to construct and refine the site-specific CSM presented in Section 6.3.1. They also were used to identify and fill data gaps until the quantity and quality of the data at Site 13 were judged to be adequate to complete the RI, as determined by applying the DQOs presented in Section 3.4.

Detection limits for some of the data used to evaluate Site 13 are elevated over residential PRGs (EPA 2002a); these elevated detection limits are the consequence of one or more of the following circumstances: (1) the evolution of lower detection limits as technology improves, (2) the revision of PRGs over time (which are not always technologically feasible), (3) and matrix interference. The first two of these circumstances generally do not result in significantly

elevated detection limits. However, matrix interferences sometimes cause significant elevations in the detection limits for a chemical contaminant, which leads to uncertainty as to whether that undetected compound could be present in significant concentrations at a site. Although some detection limits (SQL) were elevated above 2002 residential PRGs, detection limits for nondetected chemicals were typically sufficiently low to permit identification of potential health risks. However, because of elevated detection limits for SVOCs in soil and groundwater, further sampling and analysis of soil and groundwater may be needed to confirm these chemicals are not present. Additionally, sampling and analyses of soil for lead, PAHs, TPH, and pH to further define the boundaries of the TRW is also recommended.

Although soil and groundwater data gaps were identified, it was determined that the types and numbers of samples collected at Site 13 (see Figures 6-9A through 6-9N) and the analyses conducted were sufficient to characterize the site and to conduct risk assessments because data collection at Site 13 focused mainly on potential sources and was conducted in a phased approach. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of collected data and on the need to collect additional data to identify releases and complete the RI report. It is unlikely that the RI would recommend NFA if the site poses a potential significant risk to human health or the environment.

Both definitive and screening-level data were generated. Screening data were considered appropriate for use only in evaluations of nature and extent and fate and transport of chemicals. Section 3.4.2 provides further detail on the assessment of data quality and the use of definitive and screening-level data.

Data generated during the environmental investigations that were considered to be of sufficient quality for use in the RI report are presented in Appendix D and in the subsections below. Tables 6-15 through 6-17 summarize results of the CERCLA and EBS investigations for soil, groundwater, and soil gas. No data were collected at Site 9 under the TPH investigations. The summaries are organized according to analytical group and include the following: (1) the number and percent of detections of chemicals; (2) the average, minimum, and maximum detected concentrations; (3) minimum and maximum detection limits for nondetected samples; and (4) whether the maximum detected concentrations or detection limits exceed Region 9 residential PRGs or Cal-modified PRGs (EPA 2002a). Cal-modified PRGs are used for some chemicals if the California EPA PRG is more protective than the federal EPA value. PRGs and MCLs are provided in the tables for comparison only.

6.3.2.1 Soil

Soil samples collected at Site 13 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, dioxins, as well as physical parameters (hardness, acidity, pH, anions, specific conductance, total dissolved solids, dissolved gases, sulfides, and biological and chemical oxygen demand) (see Table 6-1). Of the samples collected and analyzed, 178 samples for VOCs, 169 samples for SVOCs, 106 pesticides and PCBs, 256 samples for metals, and 1 sample for dioxins were considered acceptable for use in this RI report. During additional PAH sampling in 2003, 323 samples for PAHs were identified as acceptable for use in this RI report. PAH data

for soil samples collected during previous investigations were not evaluated because of the high detection limits associated with these data. Laboratory detection limits for other chemicals exceeded residential PRGs (EPA 2002a) and are noted in Table 6-15. Detection limits for a few of the nondetected VOCs, SVOCs, and pesticides and PCBs were also elevated above residential PRGs (EPA 2002a); however, most of the nondetected samples had detection limits below PRGs. Therefore, detection limits for VOCs, SVOCs, and pesticides and PCBs were sufficiently low to identify potential health risks except for the following SVOCs: 2-nitroaniline, bis(2-chloroethyl)ether, hexachlorobenzene, n-nitroso-di-n-propylamine, and n-nitrosodimethylamine. Nondetected arsenic and thallium in soil were also elevated above residential PRGs (EPA 2002a). However, Site 13 was not identified as a source of arsenic or thallium (see Section 6.3.1, CSM) and concentrations detected in soil are similar to concentrations detected in ambient soil at Site 13.

A subset of the soil data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data were collected for screening purposes as part of the EBS, and inclusion of these data could add more uncertainty to the risk assessments. Soil samples collected from petroleum-saturated soil were not included in the risk assessments; therefore, the risk presented is underestimated. Petroleum-saturated soil was encountered in the center and southeast portions of Site 13, which were associated with oil refinery waste, and around Building 397, which was associated with the release of jet fuel. Risk from TPH was assessed separately (see Appendix F). Data from soils that are no longer present at Site 13 due to removal actions were not included because they do not reflect the current condition at the site.

Data for soil from each site were aggregated in depth intervals of 0 to 2, 0 to 4, and 0 to 8 feet bgs. The depth intervals evaluate potential exposures associated with site use. The 0-to-2-feet and 0-to-8-feet-bgs depth intervals evaluate potential human health exposures, and the 0-to-4-feet-bgs depth interval evaluates potential ecological exposures. The total number of samples for each analytical group included in the data set for each of these depth intervals is presented in the table below.

Number of Suitable Soil Data for Site 13 Risk Assessments (by depth interval)

Analytical Group	0 to 2 feet bgs	0 to 4 feet bgs	0 to 8 feet bgs
VOCs	10	45	96
SVOCs	22	54	86
PAHs	158	240	322
Pesticides and PCBs	17	38	54
Metals	33	81	147

The quantity of soil data was considered adequate to evaluate risk. In general, the highest concentrations of chemicals (except for TRW and TPH) are used in the HHRA. However,

further sampling and analyses of soil for PAHs, lead, TPH, and pH to further define the boundaries of the tarry refinery waste is recommended.

6.3.2.2 Groundwater

Groundwater samples collected at Site 13 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals, as well as physical parameters (hardness, acidity, pH, anions, specific conductance, total dissolved solids, dissolved gases, sulphides, biological and chemical oxygen demand) (see Table 6-16). Of the samples collected and analyzed, 131 samples for VOCs, 71 samples for SVOCs, and 45 samples for pesticides and PCBs were considered acceptable for use in this RI report. Thirteen samples for PAHs and 86 samples for filtered metals also were considered acceptable. As with soil, laboratory detection limits for some chemicals exceeded residential PRGs (EPA 2002a) and are identified in Table 6-4. Detection limits for some of the nondetected PAHs, pesticides (aldrin, chlordane, dieldrin, heptachlor, heptachlor epoxide, and toxaphenene), and PCBs in groundwater had detection limits elevated over tap water PRGs (EPA 2002a); however, they were not significantly elevated and are due to the revision of PRGs over time and detection limits that are not always technologically feasible. Detection limits for PAHs were equivalent to MCLs. Detection limits for some VOCs and SVOCs that were nondetected or detected in groundwater at a low frequency were also elevated (see Table 6-17). Arsenic and thallium were detected at a low frequency, and detection limits for nondetected samples were also elevated.

A subset of the groundwater data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Groundwater data for Site 13 were aggregated by contaminant plume rather than by site. Data for groundwater later replaced with more current data were not included because they do not reflect current conditions at Site 13. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS were not used to evaluate risk because they were collected with DQOs that differ from the CERCLA investigations. At least four quarters of groundwater data from monitoring wells were used. However, if data were lacking for an analytical group, older data were included for all analytical groups. Groundwater data included samples collected from April 1994 to September 2002. Field and screening-level data typically were not used; however, data obtained using direct-push methods were used because of a lack of data from monitoring wells in the concentrated plume areas.

Groundwater samples collected from floating product areas were not included in the risk assessments. Floating product encountered in the center and southeast portions of Site 13 was associated with refinery waste. Floating product encountered around Building 397 was associated with the release of jet fuel.

Number of Suitable Groundwater Data for Site 13		
Analytical Group	**Suitable for RI Report**	**Used in Risk Assessments**
VOCs	131	66
SVOCs	71	36
PAHs	13	13
Pesticides and PCBs	45	19
Metals	86	52

The quantity of groundwater data was considered adequate to evaluate risk.

6.3.2.3 Soil Gas

Soil gas data were collected to evaluate indoor air risk in the HHRA. Two soil gas samples were collected at Site 13 near the maximum concentrations of VOCs in groundwater at depths of 0.5 and 4 feet bgs; these samples were analyzed for VOCs. Detection limits for many of the nondetected VOCs exceeded ambient air PRGs; however, SQLs were not set to meet the PRGs.

6.3.3 Site 13 Background Comparison

A background comparison was conducted for Site 13 by comparing a background data set with analytical results for metals in samples representative of Site 13. This comparison was used to determine if metals in soil and groundwater are statistically similar to background and could be considered to be either naturally occurring (background) or potentially resulting from historical site activities. The complete approach is presented in Appendix A and is summarized in Section 3.4.3.

Metals that exceeded background in soil included antimony, arsenic, beryllium, iron, lead, mercury, selenium, and zinc.

The statistical evaluation determined that arsenic in soil at Site 13 is not background based on frequency of detection. For Site 13 soil, the detection frequency for arsenic in the background data set was too low to support a comparison of median concentrations using the Wilcoxon rank sum (WRS) test. However, sufficient data were detected to compare the right-hand tails using the quantile test, and results of the comparison clearly showed that arsenic concentrations at Site 13 were below background. That is, only three of the highest five concentrations in the pooled site and background data set came from Site 13. In order for site concentrations to be statistically higher than background at the 5-percent level of significance, all five of the highest measurements would have to come from the site population. Examination of outlier box plots and quantile tables (provided in Appendix A) also showed that the maximum detected concentration of arsenic in the background data set (23 mg/kg) exceeded the maximum detected concentration of arsenic in the site data set (20 mg/kg). Therefore, arsenic in soil at Site 13 is likely attributed to background.

The statistical evaluation of lead in soil determined that lead at Site 13 is not background. A review of the range of concentrations shows that lead concentrations in soil at Site 13 are well above background concentrations (see Appendix A). Background concentrations ranged from 1.3 to 41 mg/kg, while site concentrations ranged from 1.3 to 431 mg/kg. Lead concentrations detected in refinery waste at Site 13 were as high as 2,000 mg/kg. As a result, lead concentrations detected in soil at Site 13 are considered above the range of background for Alameda Point.

Antimony, barium, beryllium, chromium, iron, manganese, and selenium exceeded background in groundwater at Site 13.

6.4 NATURE AND EXTENT OF CHEMICALS IN SOIL AND GROUNDWATER

This section summarizes the nature and extent of contamination in soil and groundwater at Site 13. The nature and extent evaluation summarizes (1) TPH detected at the site, (2) types and concentrations of CERCLA chemicals that most likely were used at the site, and (3) CERCLA chemicals that demonstrate significant risk to human health or the environment (also known as "risk drivers"). Only chemicals that pose risk to human health or the environment (see Appendices H and I) or relate to past site activity are discussed in the sections below. Section 6.4.2, Chemicals Used at Site 13, assisted the Navy in determining whether contamination "hot spots" were present at Site 13. The nature and extent of risk drivers, excluding those that may occur naturally at the site, are evaluated in Section 6.4.3. Risk drivers are those chemicals that pose a cancer risk above 1E-06 or an HI above 1 to human receptors or pose significant risk to ecological receptors. The evaluation of risk drivers includes (1) site-specific figures to assess the spatial distribution and concentration patterns of risk drivers and (2) a review of the figures, data, and site hydrology to identify the boundaries of the contamination, the volume of the affected media, and, if possible, the suspected source of the risk drivers at the site.

6.4.1 TPH

Even though TPH is not a CERCLA contaminant, soil and groundwater were sampled at various locations across Site 13 for TTPH, which includes all TPH-fractions (TPH-d, TPH-g, jet fuel, or TPH-mo) and TPH-associated constituents (BTEX, lead, and MTBE) (see Figure 6-3). An evaluation of TPH in soil and groundwater at Site 13 was conducted based on the TPH strategy for Alameda Point (see Appendix F) to assess contamination and possible risk at the site. Based on the evaluation, further action is recommended for TTPH and TPH-associated chemicals present in soil and groundwater within Plume 1 of Site 13 under the TPH program. Further action is recommended for TTPH and TPH-associated chemicals present in soil and groundwater within Plume 2 of Site 13 under the CERCLA program for commingled contaminants.

The following potential sources of TPH contamination were identified at Site 13:

- A spill occurred in Building 397 during which 3,500 to 17,000 gallons of JP-5 were released from a drain valve in the eastern end of the building to a floor drain connected to OWSs 397A, 397B, and 397C, which in turn drained to the storm sewer system.
- OWSs 397A, 397B, 397C, and 397D, located on the eastern end of Building 397, were filled with petroleum product during the release of jet fuel. Subsequently, OWSs 397A, 397B, and 397C were pumped out and filled with concrete slurry; OWS 397D was removed in 1993 (Navy 1993).
- Original industrial waste treatment sewer lines transported waste from the JETCs at Building 397 to an off-site municipal treatment plant. The lines were no longer used after being plugged in 1989 and replaced with new PVC piping in 1991.
- An underground fuel line ran from Building 372 (located on Site 11 to the north) into Building 397 to support jet engine testing activities. The line was approximately 1,000 feet long and supplied JP-5 to Building 397. During a scheduled pressure test in 1991, the line lost approximately 15 psi of pressure from an initial 100 psi in about 20 minutes (PRC and JMM 1992). The fuel line was removed in October 1998 (Tetra Tech and R&M 2000).
- GAP 62, located in the west end of Building 397, served as a temporary storage area for 30- to 55-gallon drums containing hazardous waste, including Mil-L-23699 lubrication and engine oil within Building 397; GAP 62 is recommended for closure under the SWMU evaluation (see Appendix G).
- The oil refinery, located primarily in the southern portion of Site 13, is the source of the black tarry material; it is the result of disposal practices that may have occurred along the former shoreline and within the former refinery boundaries.
- ASTs 324 through 328, which were located on the eastern portion of Site 13 and were demolished before 1990, were likely used to store petroleum hydrocarbons. No documented releases occurred from these ASTs, but they are possibly a source of free petroleum hydrocarbon product found in soil and groundwater east of the former AST locations.

Two plumes contain floating product at Site 13 (see Figures 6-10 and 6-11). The first plume (Plume 1) is located near the western end of Building 397, runs approximately 360 feet north to south and 420 feet east to west, and is limited to the first FWBZ. Plume 1 is associated with the release of JP-5 within Building 397 that entered the OWSs and nearby piping. The release was stopped, and the OWSs were pumped out and removed or filled with concrete slurry. Excavation was conducted to address saturated soil around the former OWSs and associated piping. Storm drain piping was replaced with new PVC piping. The Navy operated a DVE system to address residual TPH remaining near Building 397. The second plume (Plume 2) is located along the southern and eastern end of Site 13, runs approximately 540 feet north to south and 420 feet east to west at its widest area, and is limited to the FWBZ.

Plume 1

Two soil borings, CA13-03 and CA13-06, were drilled within the boundary of Plume 1 and contained approximately 6 inches of floating product (see Figure 6-10). Samples from the borings were not analyzed for chemicals; however, floating product was noted in the boring logs. Four groundwater samples collected within the boundary of Plume 1 did not exhibit chemical concentrations exceeding floating product criteria. TPH-associated benzene was detected at concentrations exceeding the site-specific PRG in groundwater within Plume 1.

Plume 2

Samples, ranging in depth from 1 to 9.5 feet bgs, were collected from eight locations (B13-29, B13-30, B13-31, B13-41, CA13-17, CA13-20, CA13-21, and CA13-22) within the Plume 2 boundary and exhibited TTPH concentrations exceeding the floating product screening level of 14,000 mg/kg (see Figure 6-10). Concentrations in samples from the eight locations ranged from 14,900 to 297,320 mg/kg. The southern end of the plume also is commingled with TRW, which has been identified as a CERCLA waste at Site 13.

Soil samples collected from the TRW exhibited lead concentrations as high as 2,000 mg/kg. Lead in groundwater in the vicinity of the TRW was detected at a high concentration of 1,770 µg/L.

Elevated concentrations of both TPH-mo and TPH-g were detected at soil sampling locations B13-28, B13-29, CA13-11, CA13-15, CA13-16, CA13-17, CA13-20, and CA13-21, within the mini-storage area and the TRW area in the southern portion of Plume 2. Concentrations ranged from 7,400 to 69,200 mg/kg for TPH-mo and 1,300 mg/kg for TPH-g. Soil sampling locations are depicted on Figure 6-4.

Samples collected from 11 sampling locations (B13-28, B13-29, B13-30, CA13-11, CA13-12, CA13-13, CA13-15, CA13-17, CA13-20, CA13-22, and CA13-24) within the Plume 2 boundary exhibited TTPH concentrations exceeding the screening criterion for floating product of 20,000 µg/L (see Figure 6-11). Concentrations from the 11 sampling locations ranged from 24,620 to 1,091,000 µg/L. Groundwater sampling location B13-30 is located in the northern portion of Plume 2, and locations B13-28, B13-29, CA13-11, CA13-12, CA13-13, CA13-15, CA13-17, CA13-20, CA13-22, and CA13-24 are located within the mini-storage area and TRW area in the southern portion of Plume 2.

Samples collected from 11 sampling locations (B13-29, CA13-11, CA13-12, CA13-13, CA13-14, CA13-15, CA13-16, CA13-17, CA13-22, CA13-23, and CA13-25) in the southern portion of Plume 2 exhibited benzene concentrations that ranged from 1.4 to 1,400 µg/L. Results indicate a benzene plume exists in this area. This portion of Plume 2 is commingled with the TRW.

6.4.2 Chemicals Used at Site 13

This section focuses on CERCLA chemicals detected in soil and groundwater that were used historically at Site 13. Chemicals that most likely were used at Site 13 and their breakdown products include TPH, BTEX, and solvents such as PCE within Building 397. Numerous releases of petroleum fuels, historical aircraft defueling, and overhaul activities were reported during interviews with personnel during the EBS (IT 2001). These chemical concentrations and a general description of their extent are presented below by medium. Most of the chemicals detected across Site 13 are consistent with historical activities known to occur at the site, which included the former oil refinery and aircraft storage, overhaul, and defueling. Statistical summaries of all results for soil, groundwater, and soil gas are presented in Tables 6-15 through 6-17.

Soil

The table below lists the chemicals that most likely were used at Site 13 (or their breakdown components), the residential PRG (EPA 2002a), the range of concentrations detected in soil at the site, and the sampling locations where the maximum concentration of each chemical was detected. It also lists chemicals not detected in soil but detected in groundwater at Site 13. Figure 6-3 shows the sampling locations.

Soil Analytical Results for Chemicals used at Site 13

Chemical	Residential PRG (mg/kg)	Range of Concentrations (mg/kg)	Sampling Location of Maximum Concentration
TPH-g (associated with TRW only)	NA	580 to 4,500	028-S123-004
TPH-d (associated with TRW only)	NA	5,000 to 140,000	028-S13-007
TPH-mo (associated with TRW only)	NA	440 to 110,000	028-S13-007
Benzene	0.6	0.0005 to 31	028-S13-002
Ethylbenzene	8.9	0.0002 to 81	028-S13-001
Toluene	520	0.0005 to 27	028-S13-001
Xylene	2,700	0.0003 to 31	028-S13-001
1,2,4-Trimethylbenzene	520	Not detected	Not applicable
1,3,5-Trimethylbenzene	210	Not detected	Not applicable
Naphthalene	56	Not detected	Not applicable
2-methylnaphthalene	NA	Not detected	Not applicable
TCE	1.5	Not detected	Not applicable
PAHs (represented as BaP Equivalent)	0.062	0.0017 to 7.198	C3S013B051
Lead	150*	1.9 to 2,000	028-S13-002

Note: Residential PRG is provided for reference only. Risks are quantified in the HHRA section of this document.

* Denotes California-modified PRG

Previous site activities associated with the operation of the former refinery at Site 13 were identified as a source of CERCLA contaminants. Based on the review of historical information and conjecture about operating practices typical of the era, refinery waste likely was disposed of on site or in the tidal lands. These wastes are tarry and contain elevated concentrations of TPH-g (3,000 mg/kg), TPH-d (140,000 mg/kg), TPH-mo (110,000 mg/kg), benzene (31mg/kg), toluene (130 mg/kg), ethylbenzene (81 mg/kg), xylenes (160 mg/kg), PAHs quantified as BaP equivalent (7.198 mg/kg), and lead (2,000 mg/kg). The wastes exhibit a pH as low as 1.1 (see Table 6-11). The material is black and globular in nature with strong hydrocarbon odors, and black and gray sand has been observed to be surrounding the waste. Samples from these stained sands contained elevated concentrations of TPH, xylene, ethylbenzene, and PAHs. These elevated concentrations indicate that chemicals present in the oil refinery waste have diffused into nearby soil.

Although the extent of the material in soil is not fully defined, the location of the material was determined by reviewing boring logs and by test pits completed in association with sampling activities during the pilot test for terrain conductivity mapping technology (see Figure 6-12). The TRW appears to be located along the former site shoreline and has been observed at the surface in several locations. More material appears to come to the surface in the summer, when the sun heats the soil. The material appears to move to the surface along preferential flow paths in between the original soil of the former shoreline and the fill material.

The TRW appears in various forms at Site 13, both in the asphaltic form seen in the test pits and as floating product in the southeast portion of Site 13. The historical refinery operation produced petroleum products with a range of molecular weights (heavier- to lighter-range hydrocarbons) that were likely disposed of within Site 13. The lighter-range hydrocarbons moved more freely, while the heavier-range hydrocarbons were more apt to sink and not migrate. Therefore, the heavier-range hydrocarbons are generally found in the area of the test pits, while the lighter-range material is found in the southeastern portion of Site 13.

The depth at which TRW has been observed is summarized in Table 6-5. In addition, locations and cross sections of test pits completed in August 2003 are included on Figures 6-5, 6-6, and 6-7. TRW ranges in depth from just below the ground surface to approximately 8 feet bgs. The stained sand around the TRW is identified from the former shoreline to the eastern portion of Site 13 in the footprint of the former refinery. Stained sand may indicate the presence of TRW and is also identified on Figure 6-12. The location of the former refinery, the shoreline, and the approximate location of the TRW observed in borings supports the historical information about disposal of the oil refinery wastes on site.

Benzene was detected in soil within the TRW (ranging in depth from just below the ground surface to approximately 8 feet bgs) in the southeast and central portions of Site 13 (see Figure 6-13). The concentrations of benzene in soil are presented in Table 6-15. Except for one sample (collected from BOR-9), all of the samples containing detectable concentrations of benzene in soil were collected from locations where TRW had been identified.

Lead was detected in soil across Site 13. Concentrations are elevated in locations where TRW and TPH contamination exist. Lead was detected in soil within TRW in the southeast and central portions of Site 13, ranging in depth from just below the ground surface to approximately 8 feet bgs (see Figure 6-14). The concentrations of lead in soil are presented in Table 6-15. All of the samples containing concentrations of lead above the California-modified PRG for residential soil (EPA 2002a), except for a sample collected from boring B13-30, were from borings or samples where TRW has been identified. A removal action was conducted at the site to remove soil with lead concentrations exceeding 13,000 mg/kg in soils (PRC and MW 1995a).

Petroleum fuels such as diesel fuel, aviation fuel, motor oil, and gasoline were likely stored in ASTs 324 through 328, just east of Skyhawk Street at Site 13 (see Figure 6-1). TPH-d, TPH-mo, and TPH-g were detected in soil at concentrations indicating the presence of free product just east of the tanks in AOC 009; therefore, the tanks are the most likely source of these contaminants. Petroleum in soil and groundwater at AOC 009 appears to be commingled with the TRW, which is considered a CERCLA waste. The maximum BaP equivalent concentration was detected at C3S013B051, in the vicinity of AOC 009. Table 6-10 lists the BaP equivalent data from the PAH sampling program.

Jet fuel was used on Site 13 at the jet engine rehabilitation and testing facility in the east end of Building 397. In addition, 3,500 to 17,000 gallons of jet fuel was released to the storm drain system on the east end of Building 397 in 1991. Immediate cleanup of the free product commenced, but not before some of the material entered soil and groundwater in the area. The presence of free product in soil and groundwater was confirmed during subsequent investigations, and the area of free product was designated AOC 397. In 2001, a pilot scale DVE system was installed to remove jet fuel from soil and groundwater in AOC 397. The system successfully removed jet fuel from soil and groundwater; as a result, it was upgraded to full-scale operation in 2002. As of December 2003, the system appears to have removed nearly all the free product. The data indicate that the jet fuel contamination likely is not commingled with any CERCLA chemicals.

Groundwater

The table below lists the chemicals that were most likely used at Site 13, the tap water PRGs (EPA 2002a), the range of concentrations detected in groundwater, and the sampling location of the maximum detected concentration. Figure 6-3 shows the groundwater sampling locations at Site 13.

Groundwater Analytical Results for Chemicals used at Site 13

Chemical	Tap Water PRG (µg/L)	Range of Concentrations (µg/L)	Sampling Location of Maximum Concentration
Benzene	0.34	0.5 to 1,400	CA13-17
Ethylbenzene	2.9	0.2 to 130	B13-28
Toluene	720	0.3 to 65	CA13-13
Xylene	210	0.3 to 530	B13-28

Groundwater Analytical Results for Chemicals used at Site 13			
Chemical	**Tap Water PRG (µg/L)**	**Range of Concentrations (µg/L)**	**Sampling Location of Maximum Concentration**
1,2,4-Trimethylbenzene	12	0.5 to 40	CA13-12
1,3,5-Trimethylbenzene	12	0.5 to 16	CA13-12
Naphthalene	6.2	1.1 to 210	M13-07
2-Methylnaphthalene	NA	0.9 to 130	M13-07
TCE	0.03	0.2 to 1	M07C-09
Lead	15	0.13 to 1,770	B-IMF-09

Note: Residential PRGs are provided for reference only. Risks are quantified in the HHRA section of this document.

The oil refinery wastes, Building 397, and ASTs 324 through 328 (also called AOC 009) may have contributed chemicals to groundwater at Site 13 in the form of petroleum contamination as well as associated chemicals such as BTEX, 2-methylnaphthalene, naphthalene, trimethylbenzenes, and lead. In general, groundwater is impacted with these chemicals in the same area where TRW was identified, which is in the southeast portion of Site 13, near the mini-storage area.

TRW does not appear to be easily mobilized to groundwater unless unusual conditions are present. Benzene, ethylbenzene, and xylene are likely present in groundwater because TRW in the area intersects groundwater. Areas where low pH soil and lead are present do not show that lead is leaching to groundwater in large quantities. Commingling of TRW with refined petroleum may cause the TRW to dissolve and become mobile in groundwater. However, distinctions in the commingled material cannot be made because the TRW appears to have a similar composition to diesel fuel, motor oil, and gasoline and data are limited.

Ethylbenzene was detected in groundwater southeast of Building 397 (Plume 1) and in the southeastern portion of the site (Plume 2) (see Figure 6-11). In 1990, a sample collected from monitoring well MW-1 exhibited ethylbenzene at a concentration of 34 µg/L; however, ethylbenzene was not detected in samples collected in 1994, 1995, 2000, 2001, and 2002. Because MW-1 is close to Building 397, it is assumed that ethylbenzene detected at this location is from activities at Building 397 (Plume 1). Ethylbenzene in the southeastern portion of Site 13 is located near the TRW area. Ten of 16 groundwater samples collected near the TRW contained ethylbenzene concentrations ranging from 5.6 to 96 µg/L. Samples from locations CA13-12 and CA13-17 exhibited ethylbenzene at concentrations of 96 and 85 µg/L, respectively.

Xylene was detected in groundwater in the southeastern portion of Site 13 near the TRW area (Plume 2). In 1994, two samples collected from sampling locations B13-28 and B13-29 exhibited xylene at concentrations of 530 and 240 µg/L, respectively (see Figure 6-11). In 2000, six groundwater samples were collected and analyzed for total xylenes; one sample from location, CA13-12, exhibited xylene at a concentration of 450 µg/L. Groundwater samples were collected on all four sides of location CA13-12, and all the samples contained xylene concentrations less than the tap water PRG (EPA 2002a).

The maximum concentrations of naphthalene and 2-methylnaphthalene historically were detected in monitoring well M13-07, which is near ASTs 324 through 328 and the TRW. Elevated concentrations of naphthalene were detected only in locations where TRW is present or where the hydrocarbon plumes are present, specifically in monitoring wells M13-07 and MW-1. Naphthalene also was detected infrequently in monitoring well M13-09 (see Figure 6-11).

Lead in groundwater was detected in only one sample at an elevated concentration (1,770 µg/L); this sample was located in the same area as high lead concentrations in soil that was collocated with the asphaltic TRW (B-IMF-09). A groundwater sample from location M-IMF-01, located approximately 30 feet southwest and immediately downgradient of B-IMF-09, exhibited lead at a concentration of 1.5 µg/L. A sample from location M13-06, located approximately 80 feet west of location B-IMF-09, exhibited lead at a concentration less than 0.23 µg/L. The MCL for lead in groundwater is 15 µg/L. Based on the data observed at Site 13, significant mobilization of lead is not occurring. Although elevated lead in soil appears to be only in the TRW above the groundwater table and is not expected to move quickly, elevated lead in soil may dissolve and become mobile in groundwater.

6.4.3 Risk Drivers

Although numerous chemicals were detected at Site 13, most of these chemicals do not pose significant risk as defined by the risk assessments. As a result, the purpose of this section is to further characterize the nature and extent of CERCLA chemicals driving risk at Site 9 that are not background. Selection of these chemicals was based on the background comparison for metals and results of the HHRA and ERA. Based on the HHRA, arsenic and BaP were identified as soil risk drivers. Benzene, manganese, PCP, thallium, and TCE were identified as groundwater risk drivers. Zinc in soil was determined to pose risk to terrestrial ecological receptors. Arsenic and zinc in soil and thallium in groundwater are attributed to background, so the nature and extent of these metals was not evaluated further.

6.4.3.1 Risk Drivers in Soil

PAHs quantified as BaP equivalents were detected within TRW (ranging in depth from just below the ground surface to approximately 8 feet bgs) and in locations where stained soil was observed across Site 13 (see Figure 6-12). The elevated concentrations of BaP equivalents are most likely associated with the TRW at Site 13. The highest concentrations were detected in samples of the TRW.

6.4.3.2 Risk Drivers in Groundwater

The following discussions focus on the nature and extent of benzene, manganese, PCP, and TCE in groundwater.

ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

SOLID WASTE MANAGEMENT UNIT (SWMU)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-1
SITE 13 FEATURES

Operable Unit 2A
Remedial Investigation Report

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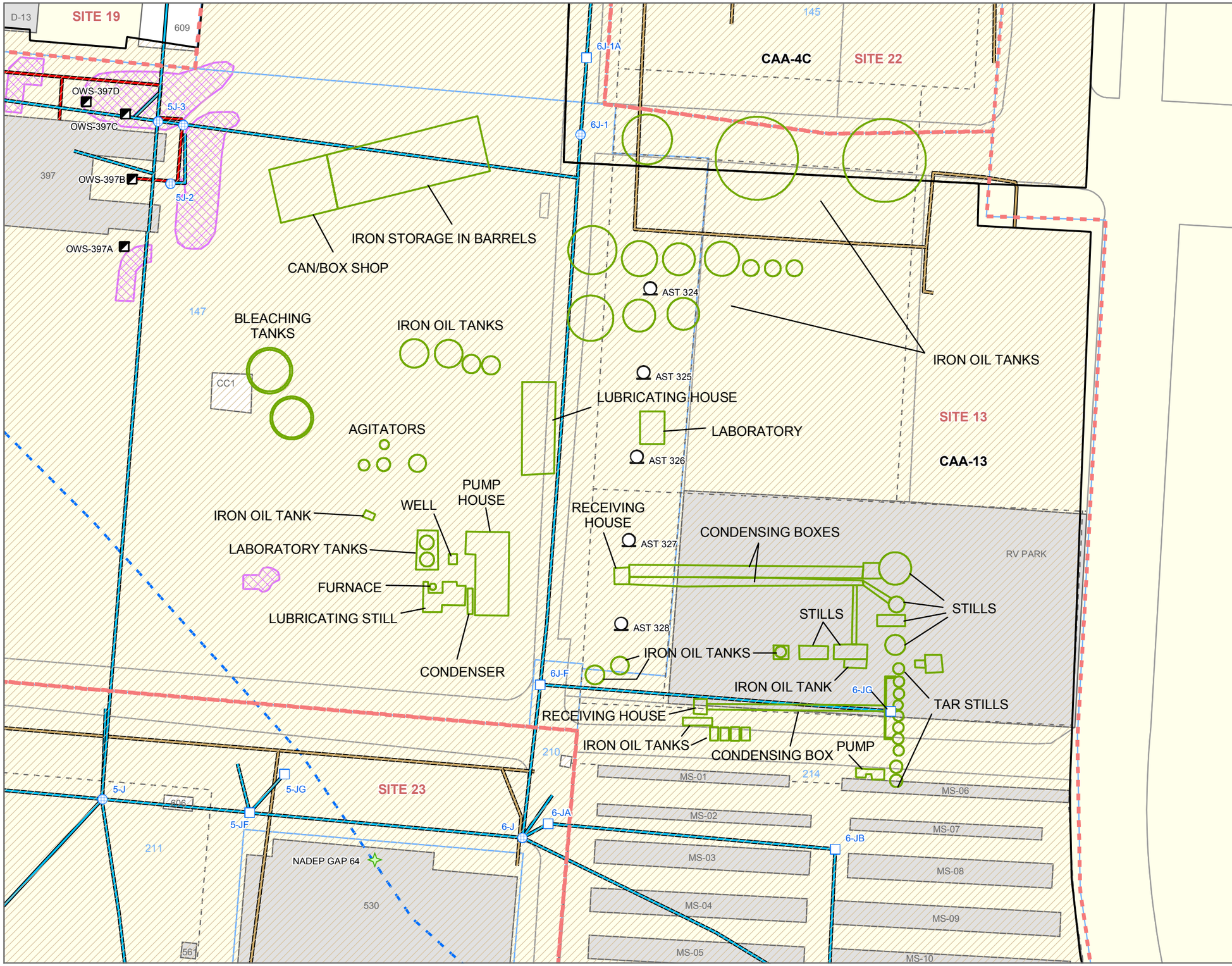

ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

EXCAVATION

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

40 0 40 80 Feet

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-2
SITE 13
FORMER OIL REFINERY FEATURES

Operable Unit 2A
Remedial Investigation Report

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SAMPLE LOCATION
- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Soil Gas
- Surface Location
- Vacuum Extraction

SAMPLE INVESTIGATION
- HLA 1989
- Phase 1 & 2A, 1991
- IMF Removal Action, 1993
- Follow-On Investigation 1994
- Data Gap Sampling 2001
- Total Petroleum Hydrocarbon Program
- EBS Phase 2A
- PAH Investigation 2003

- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

60 0 60 120 Feet

Tetra Tech EM Inc.

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U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-3
SITE 13 CERCLA, TPH AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

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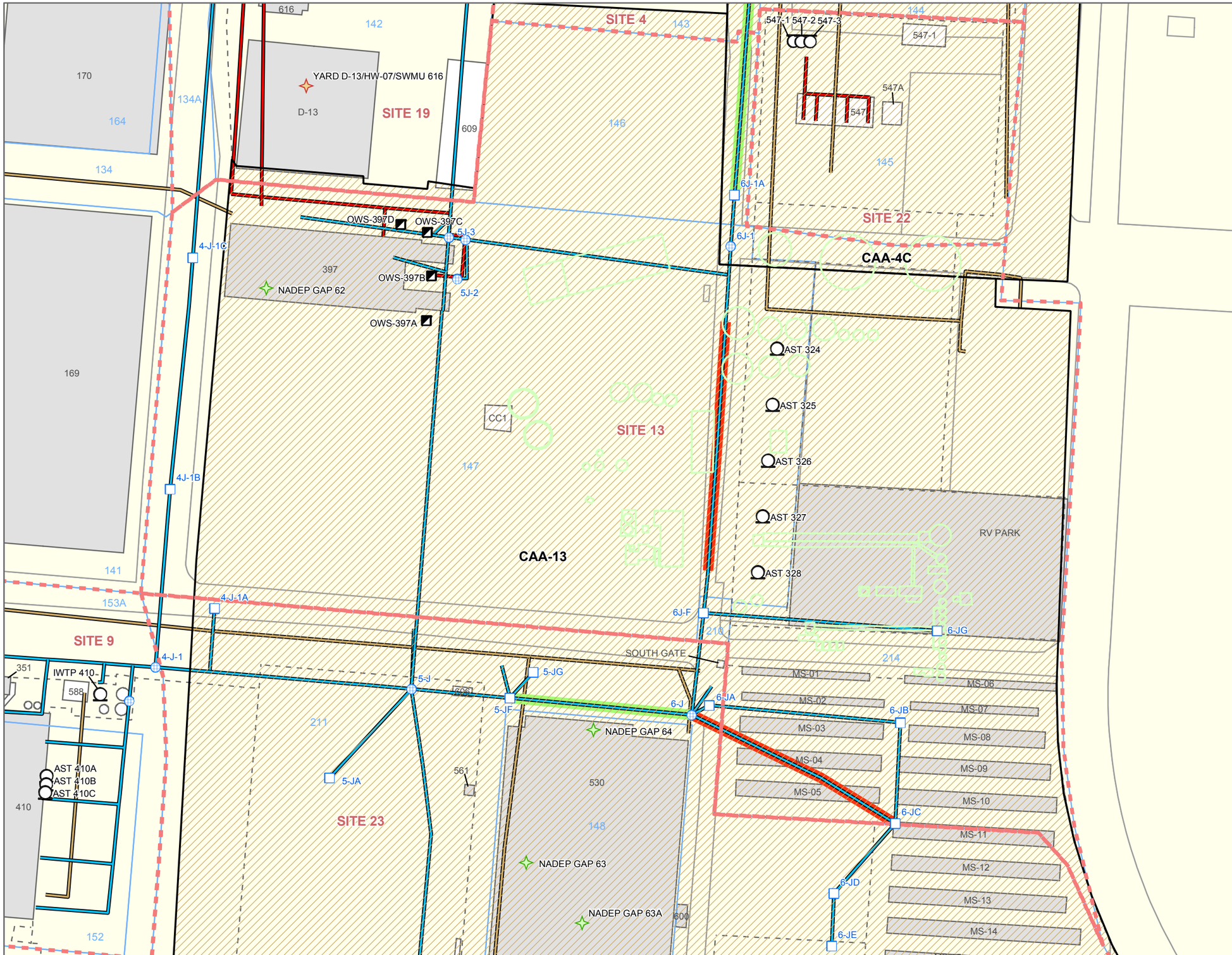

ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

SOLID WASTE MANAGEMENT UNIT (SWMU)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

Unclassified

Damaged - high priority

Damaged - low priority

CORRECTIVE ACTION AREA (CAA)

FORMER OIL REFINERY

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-4
SITE 13
STORM SEWER CONDITION

Operable Unit 2A
Remedial Investigation Report

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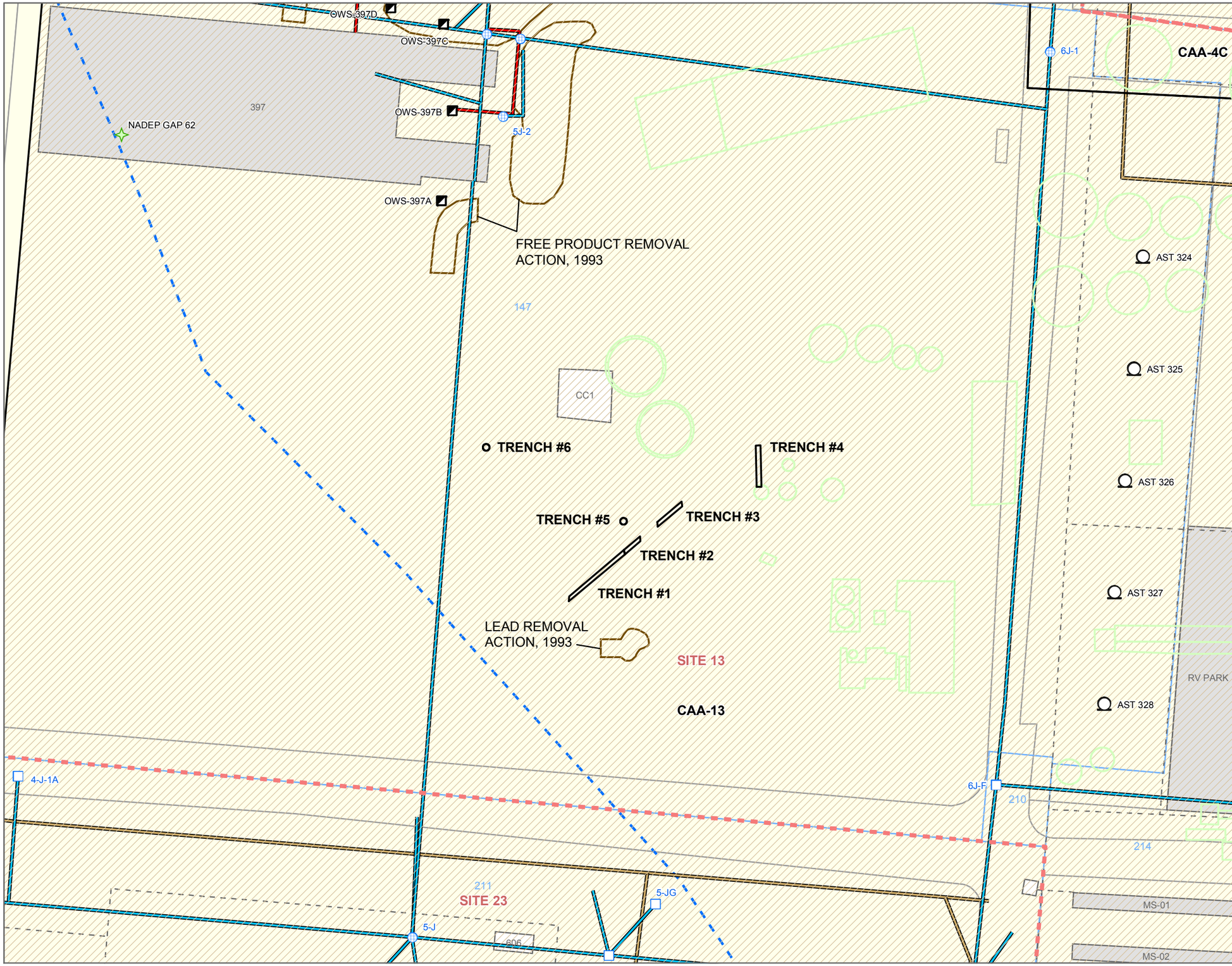

ABOVEGROUND STORAGE TANK (AST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

FORMER-OIL WATER SEPARATOR (OWS)

TRENCH, TERRAIN CONDUCTIVITY MAPPING, 2003

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

EXCAVATION

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

30 0 30 60 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-5
SITE 13 PAST REMOVAL ACTIONS AND TERRAIN CONDUCTIVITY MAPPING

Operable Unit 2A
Remedial Investigation Report

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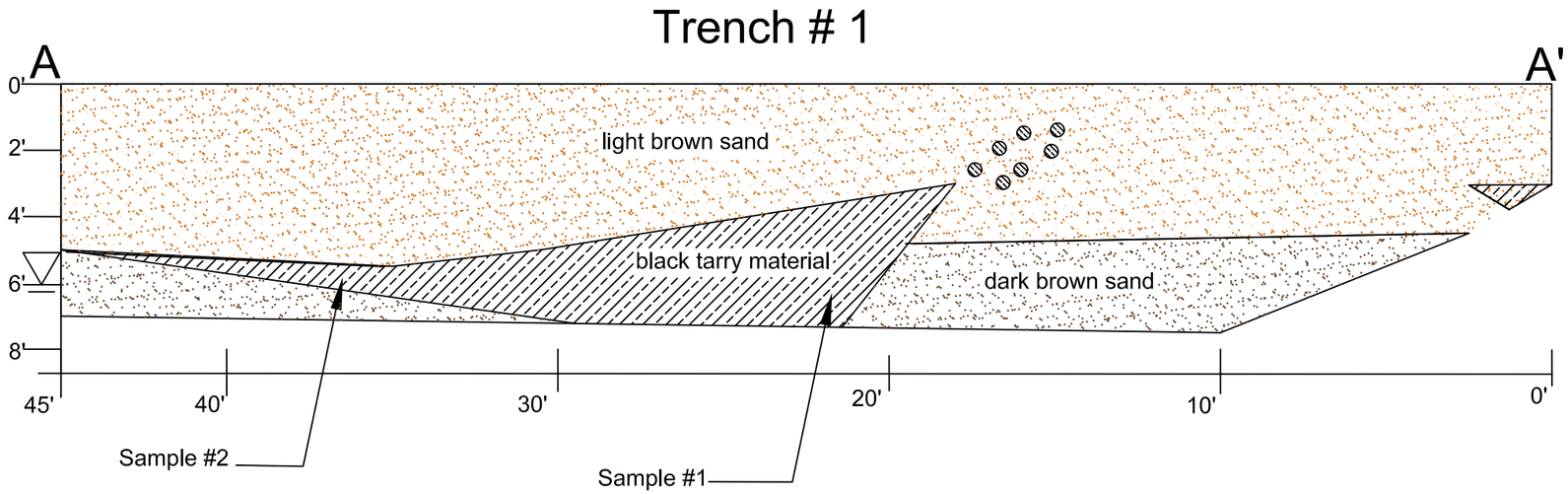
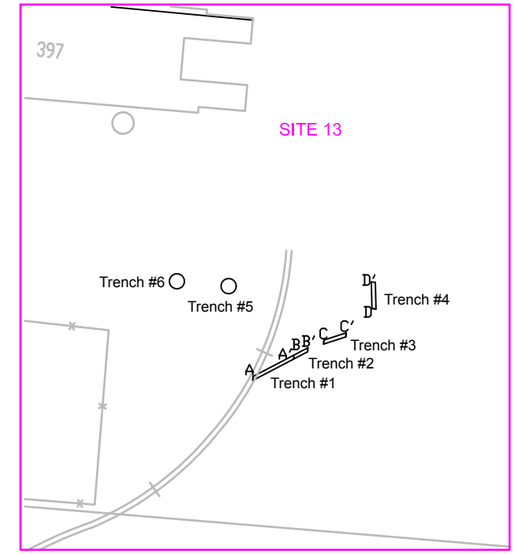
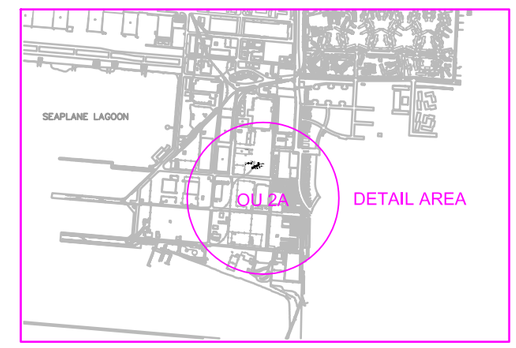
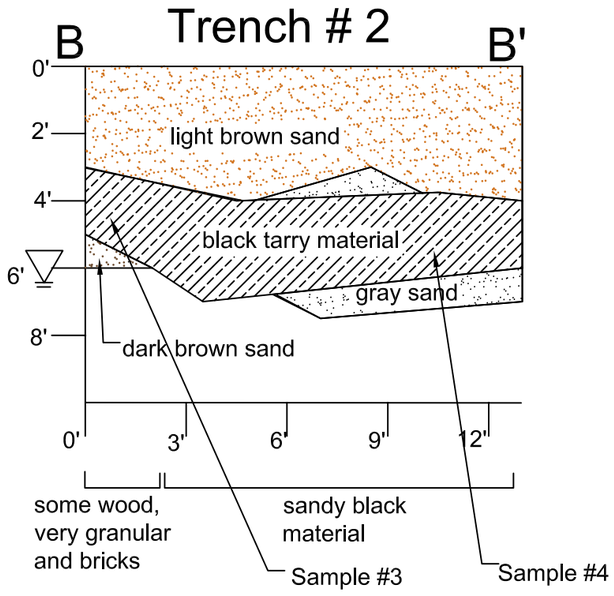
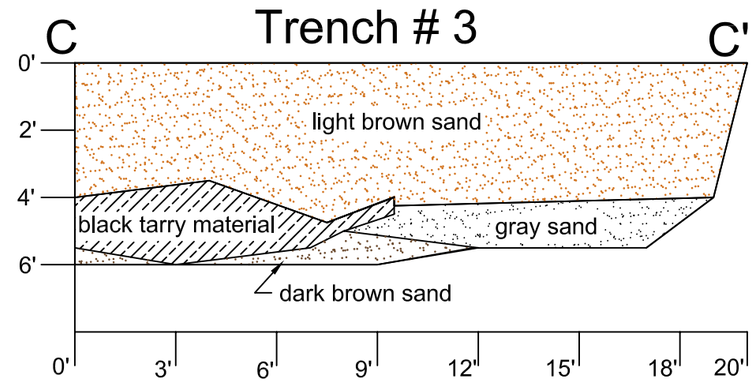










N

5' 0' 5' 10'

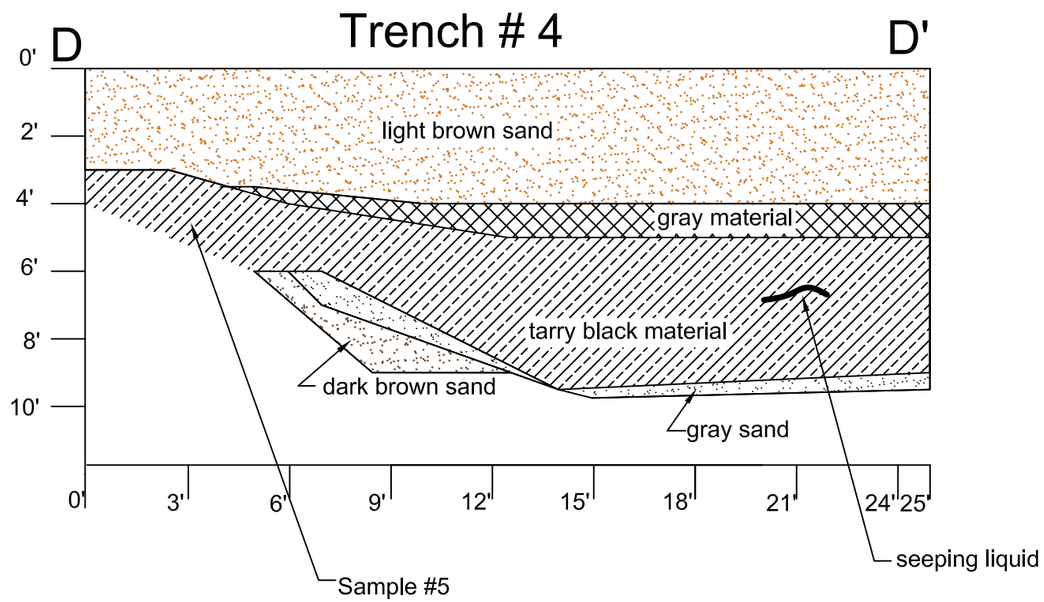
▽ = Water level encountered in Test Pits

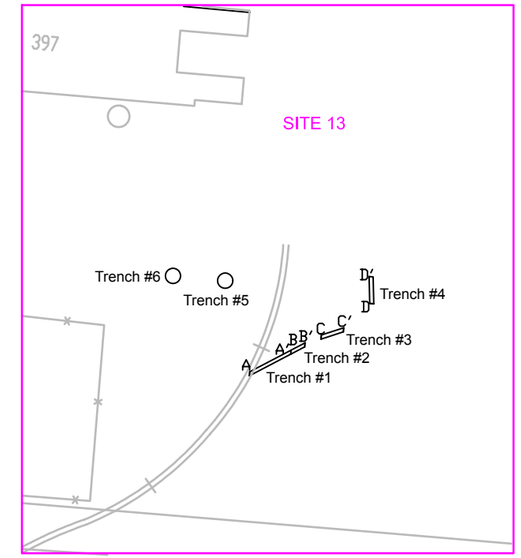
Tetra Tech EM Inc.

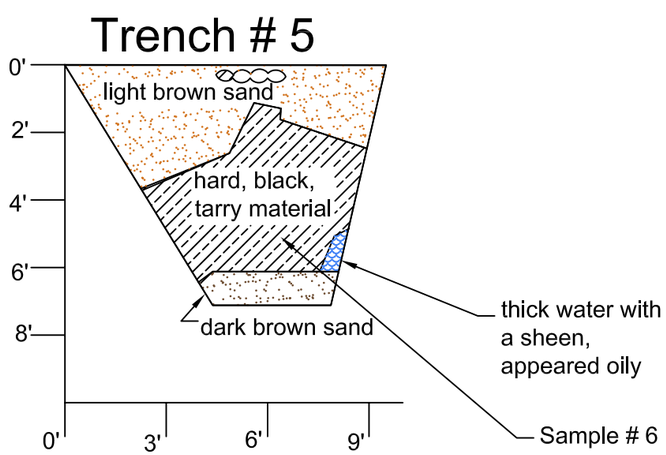
ALAMEDA POINT
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-6
GEOLOGICAL CROSS SECTION and CONDUCTIVITY SAMPLE LOCATIONS, TRENCHES 1 - 3
Operable Unit 2A, Site 13
Operable Unit 2A
Remedial Investigation Report

S:/AECRU/ALAMEDA/Operable Unit 2A (DO 028)\OU-2A RI\WORKING FILES\PAH\Trench PAH\tarry waste

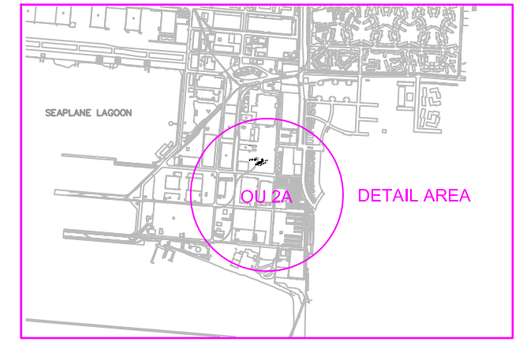






Trench # 6

Surface Sample # 7



▽ = Water level encountered in Test Pits

N

5' 0' 5' 10'

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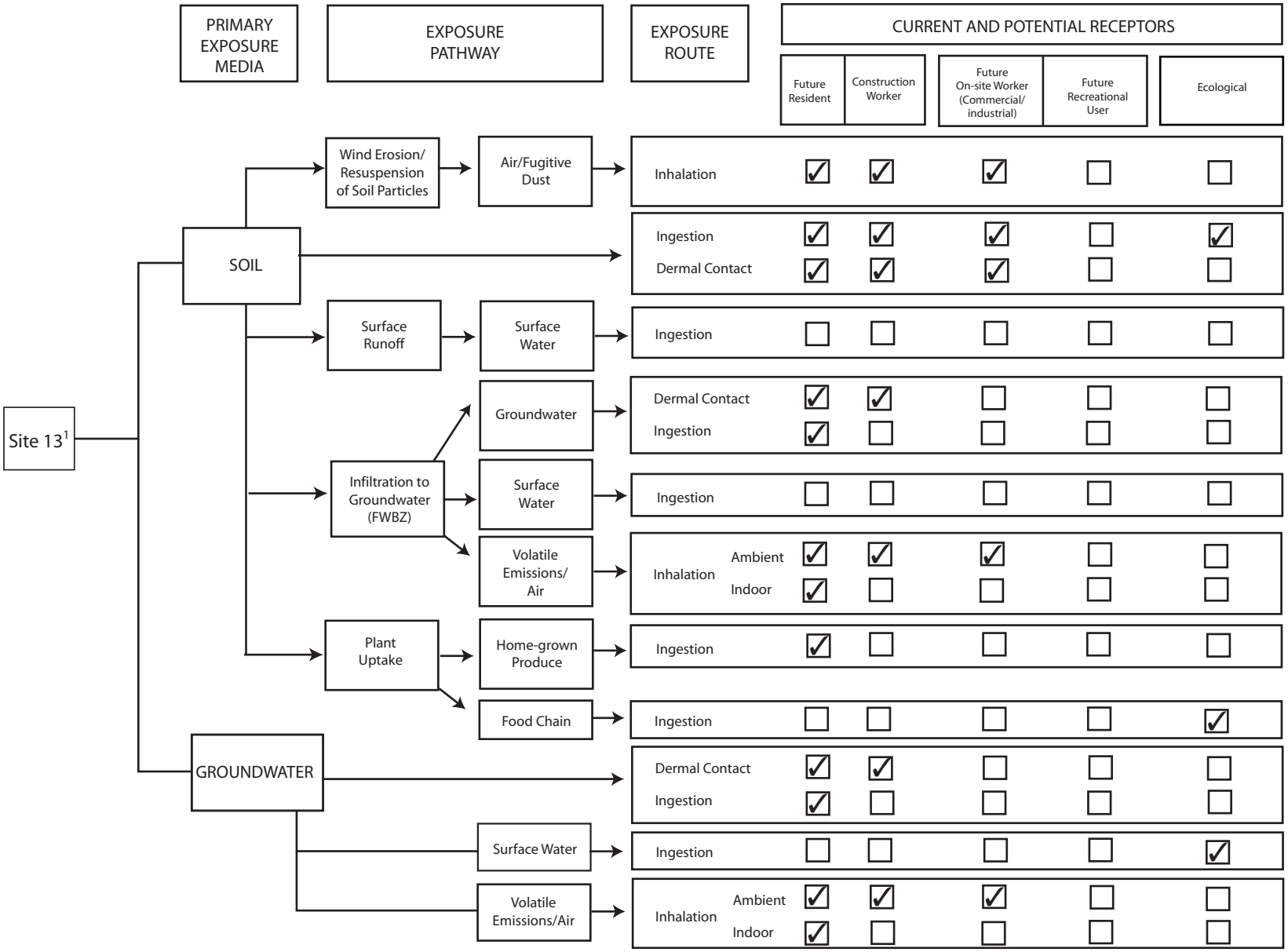
FIGURE 6-7
GEOLOGICAL CROSS SECTION and SAMPLE LOCATIONS, TRENCHES 4 - 6
Operable Unit 2A, Site 13
Operable Unit 2A
Remedial Investigation Report

S:/AECRU/ALAMEDA/Operable Unit 2A (DO 028)\OU-2A RI\WORKING FILES\PAH\Trench PAH\tarry waste



[1]Oil refinery, former ASTs 324-328, Building 397 and associated OWSs 397A-397D, fill material

☑ Potentially Complete Exposure Pathway

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FIGURE 6-8
CONCEPTUAL SITE MODEL
Operable Unit 2A
Remedial Investigation Report

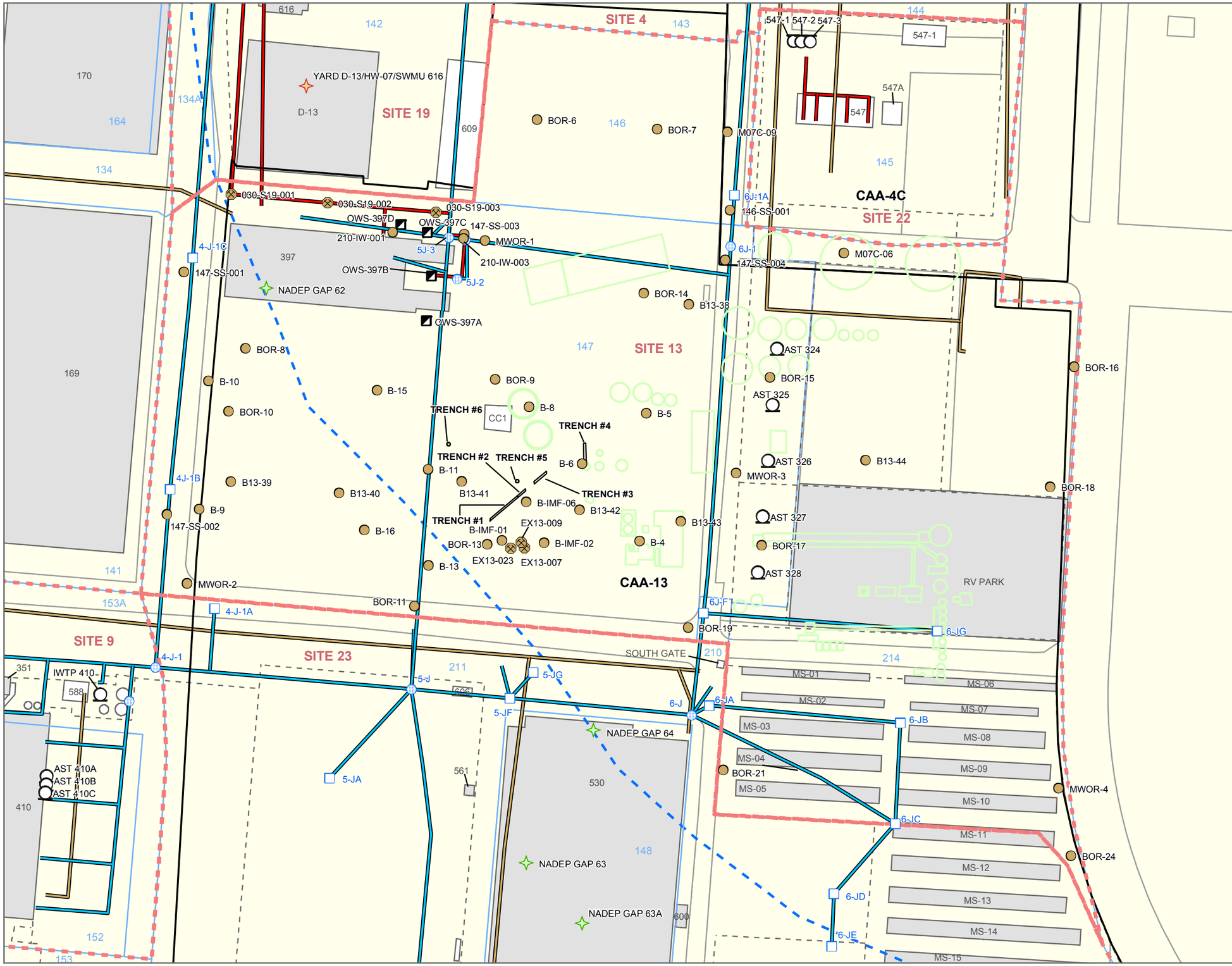

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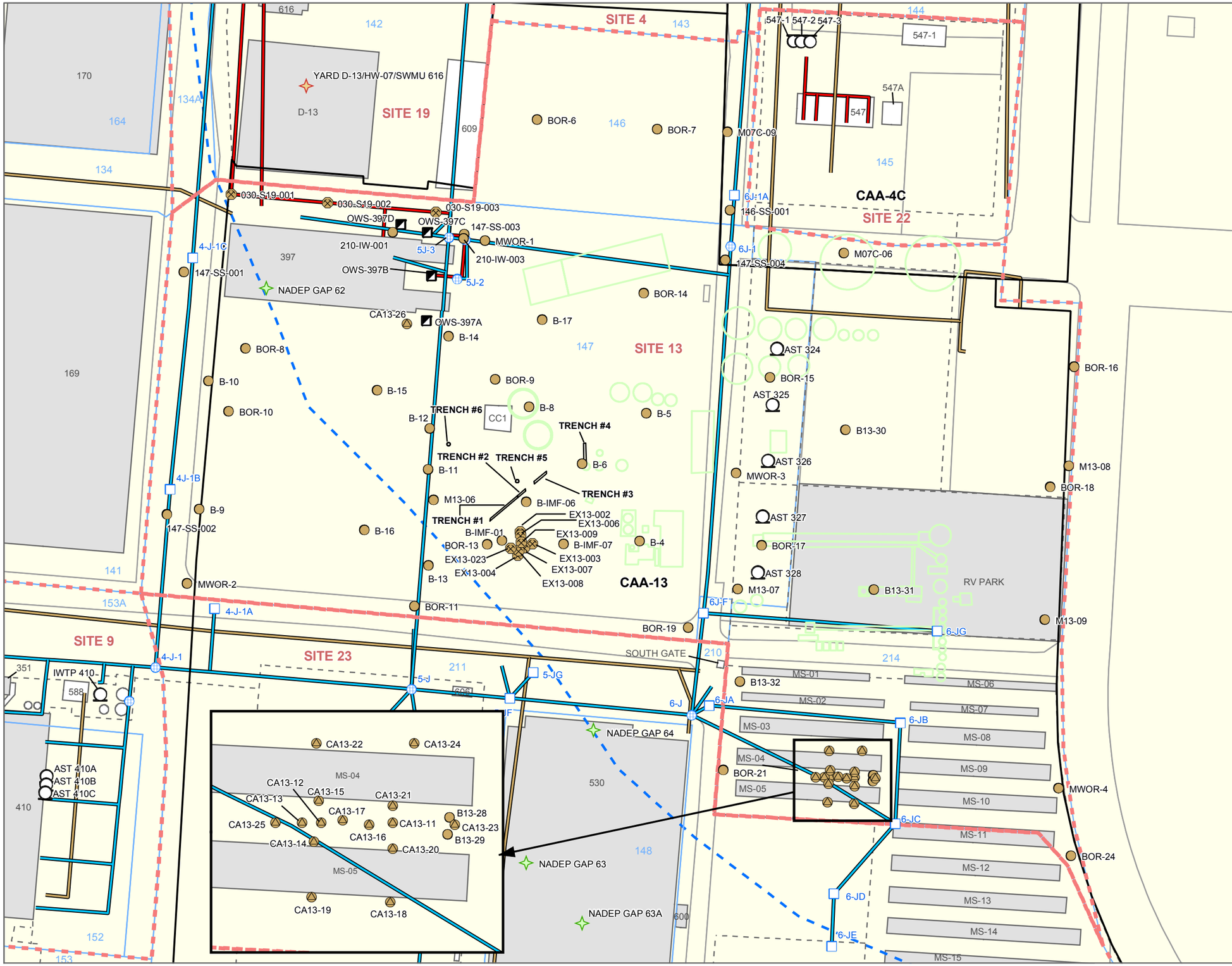
FIGURE 6-9A
SITE 13 SAMPLING LOCATIONS FOR SVOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-07 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9A_s13_soil_svoc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

N

60 0 60 120 Feet

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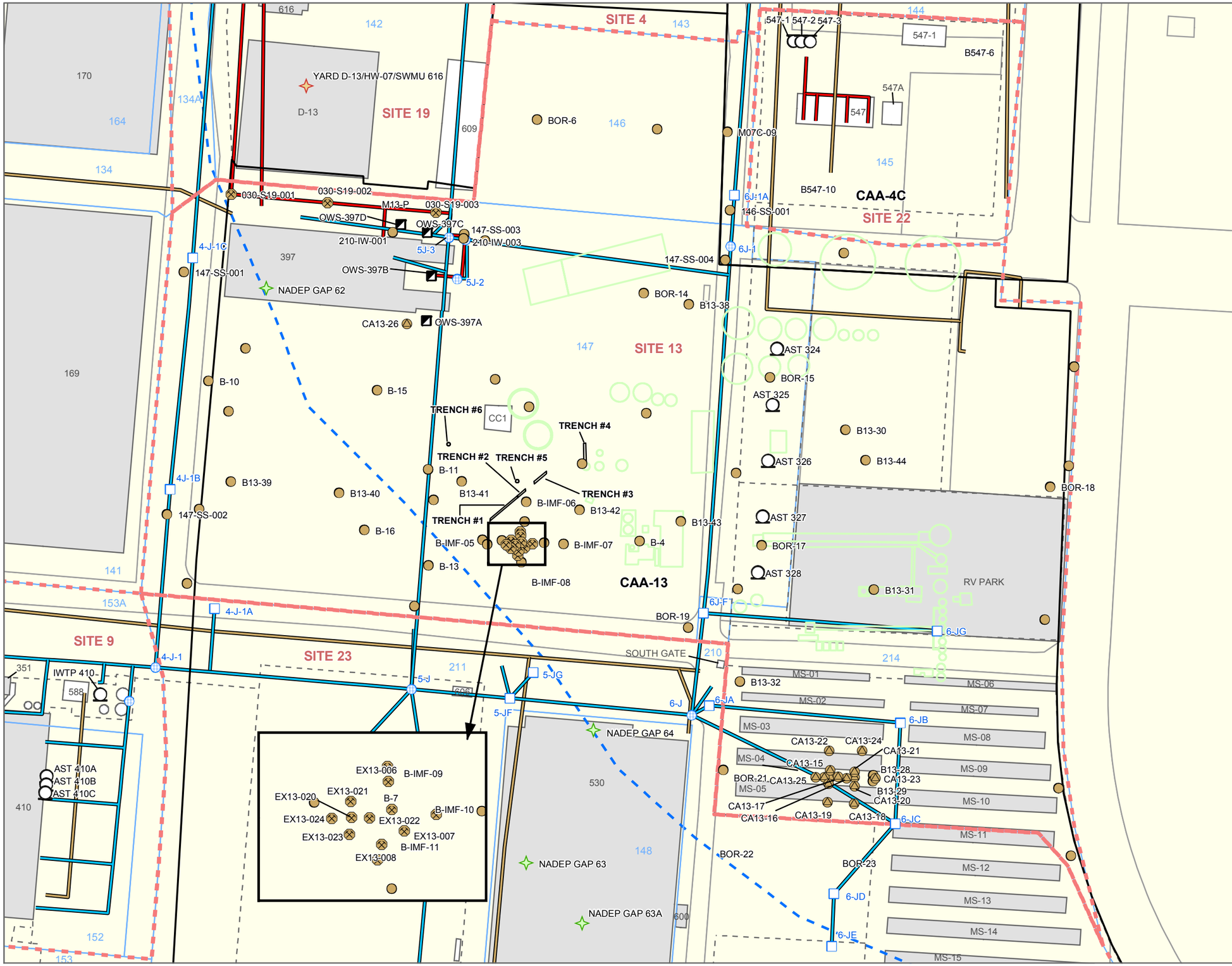
FIGURE 6-9B
SITE 13 SAMPLING LOCATIONS FOR VOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-07 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9B_s13_soil_voc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

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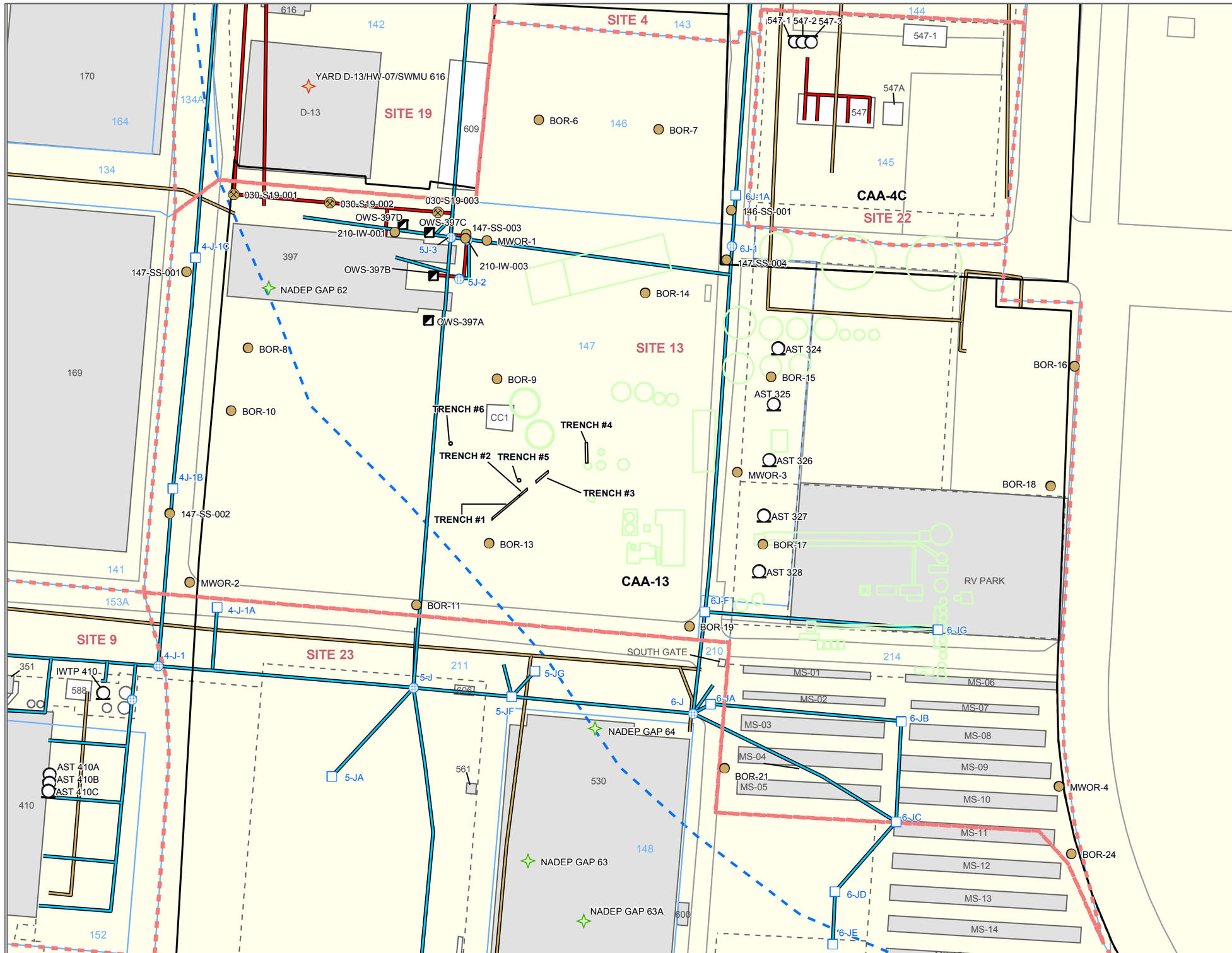
FIGURE 6-9C
SITE 13 SAMPLING LOCATIONS FOR METALS IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-07 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9C_s13_soil_metal.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

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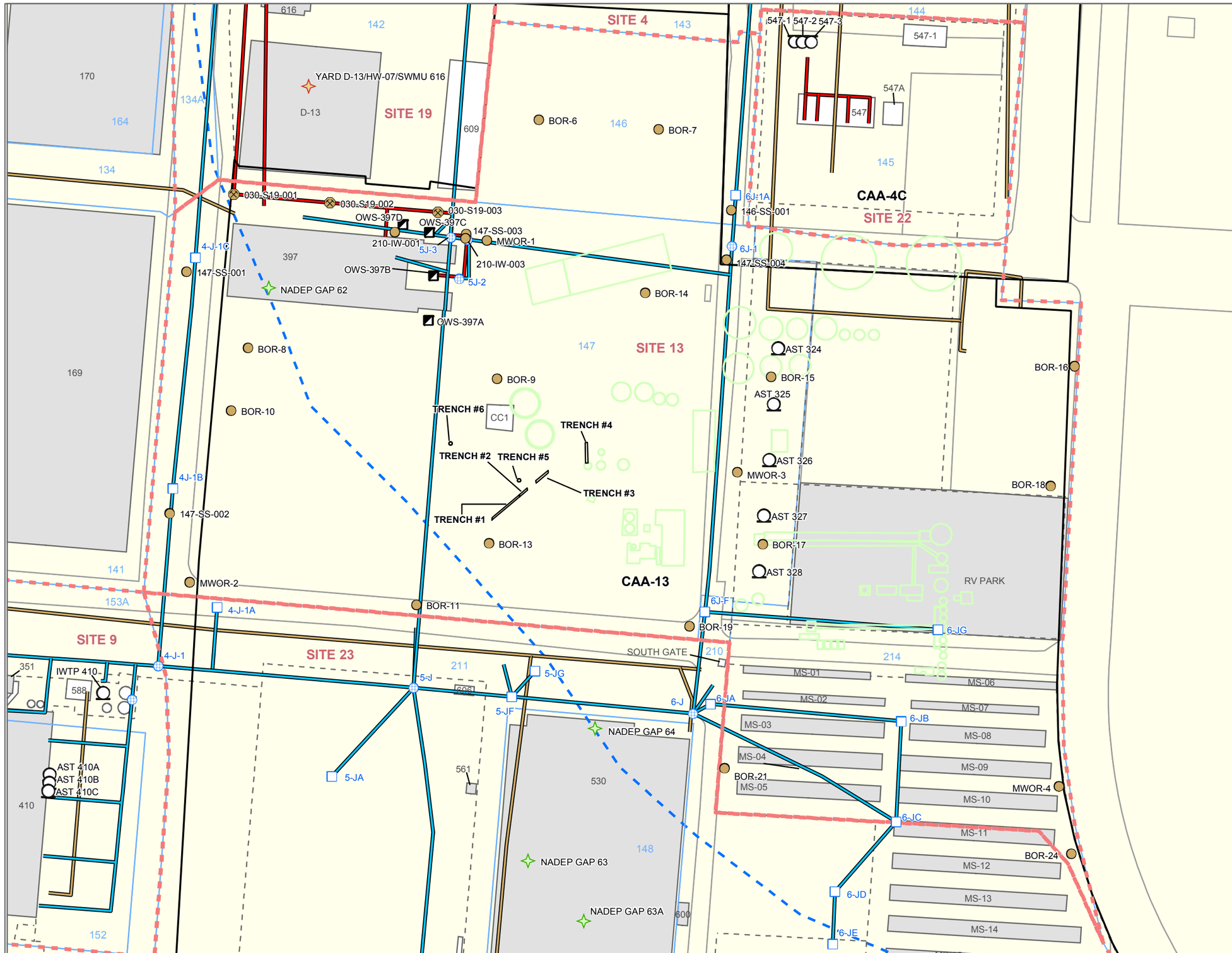
FIGURE 6-9D
SITE 13 SAMPLING LOCATIONS FOR PESTICIDES IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-07 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9D_s13_soil_pest.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated biphenyl

N

60 0 60 120 Feet

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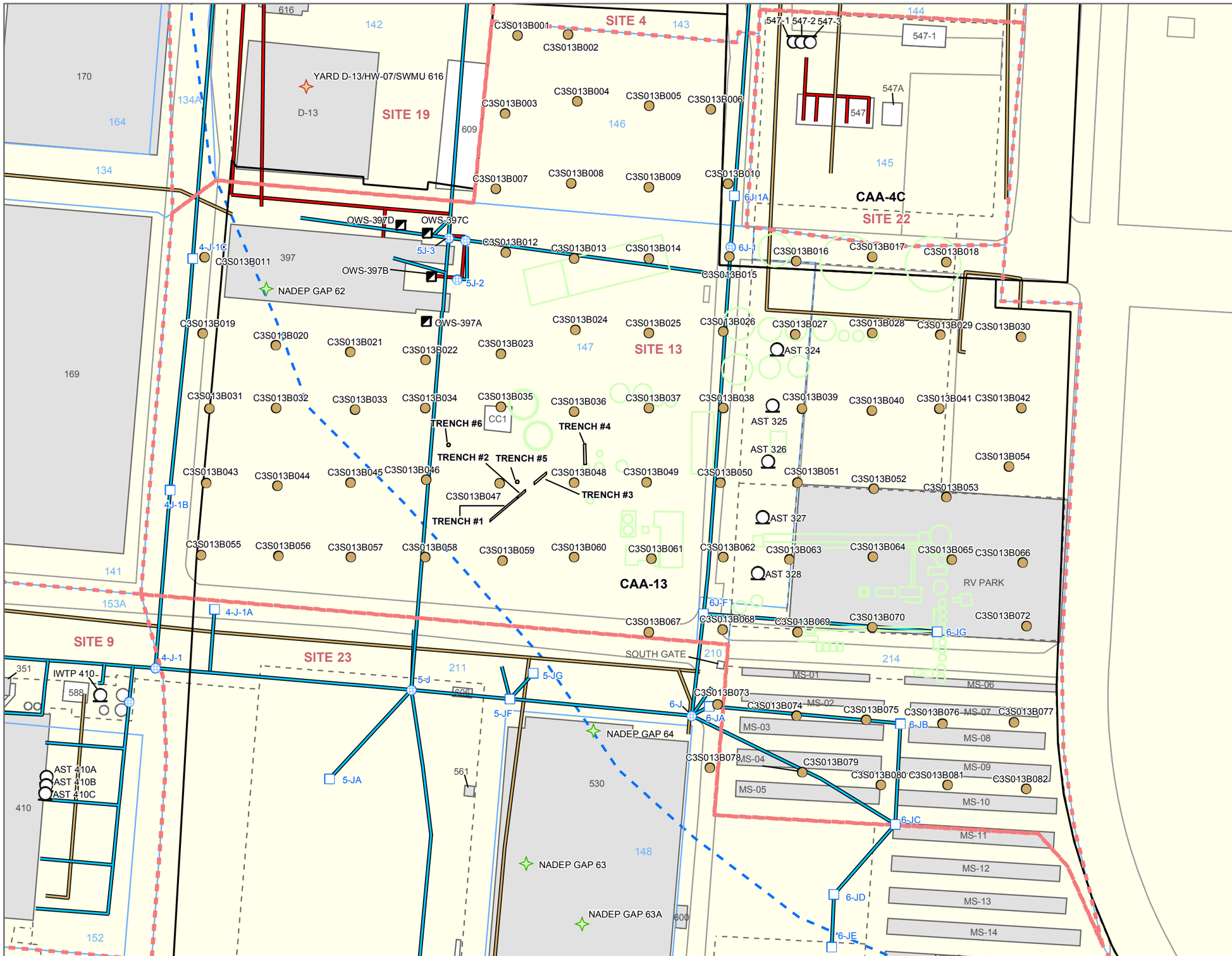
FIGURE 6-9E
SITE 13 SAMPLING LOCATIONS FOR PCBs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9E_s13_soil_pcb.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

60 0 60 120 Feet

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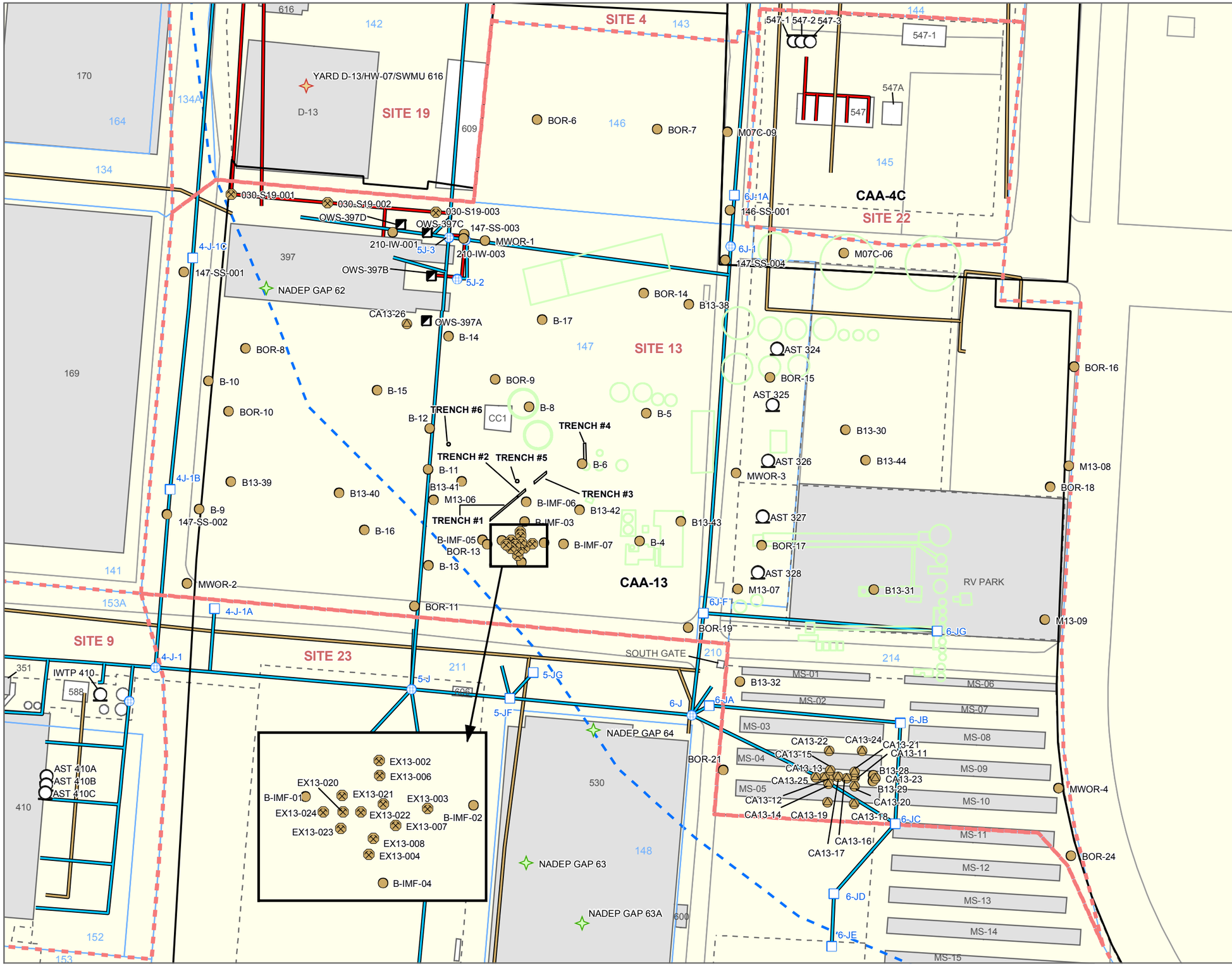
FIGURE 6-9F
SITE 13 SAMPLING LOCATIONS FOR PAHs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9F_s13_soil_pah.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
TPH = Total Petroleum Hydrocarbon

60 0 60 120 Feet

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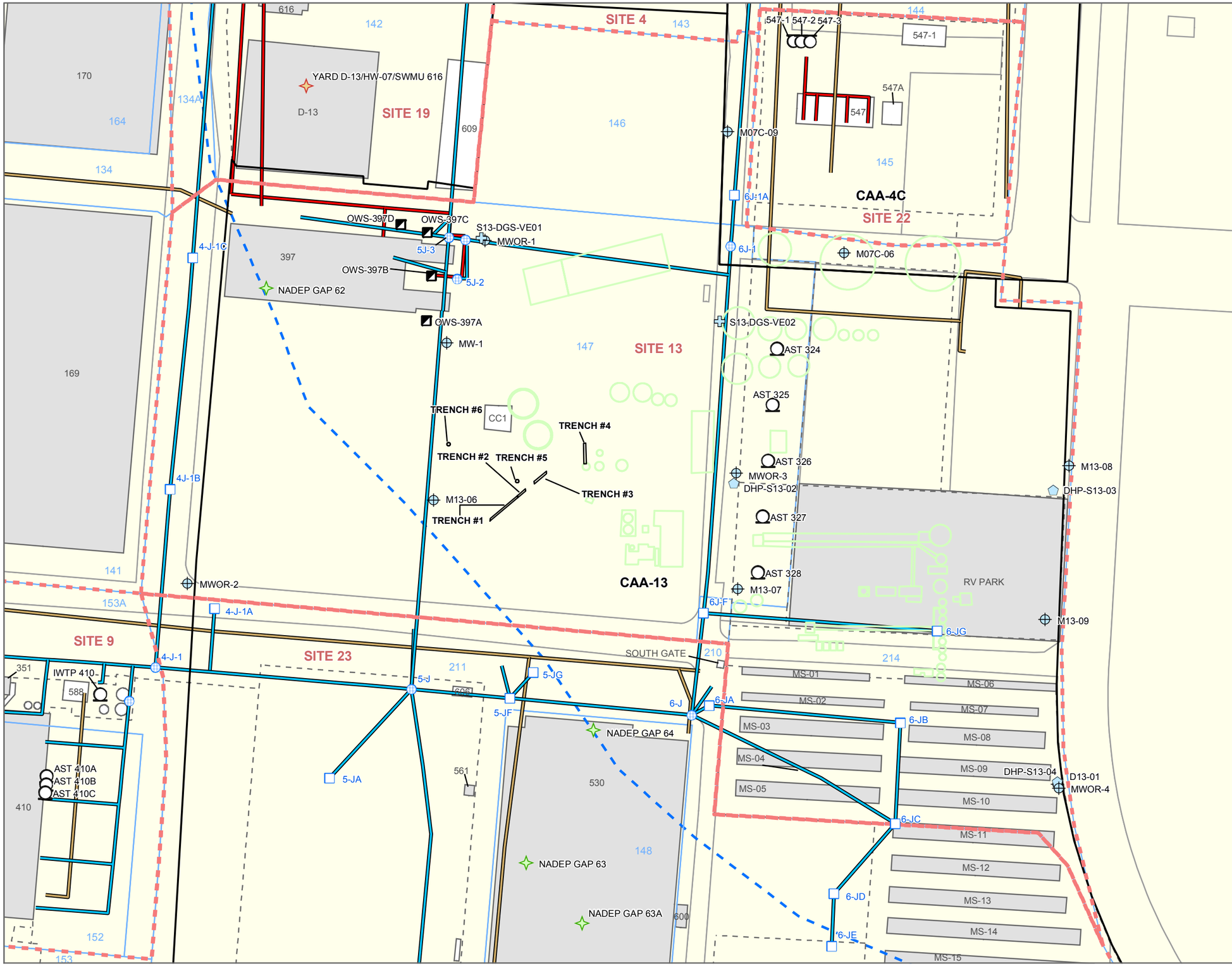
FIGURE 6-9G
SITE 13 SAMPLING LOCATIONS FOR TPH IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9G_s13_soil_tph.mxd TtEMI-SA K. Johnson



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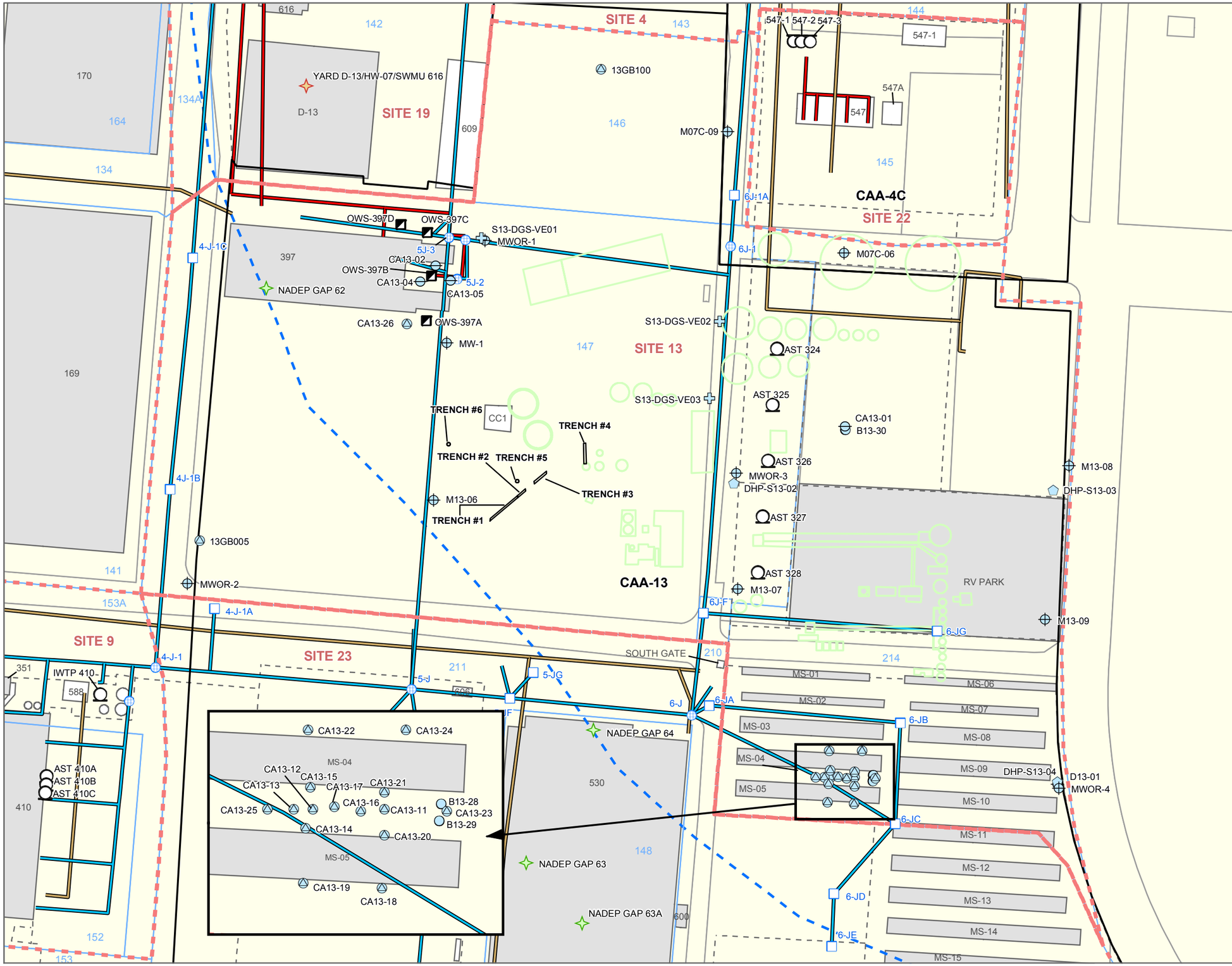
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-9H
SITE 13 SAMPLING LOCATIONS FOR SVOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9H_s13_gw_svoc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Vacuum Extraction
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

N

60 0 60 120 Feet

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U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-9I
SITE 13 SAMPLING LOCATIONS FOR VOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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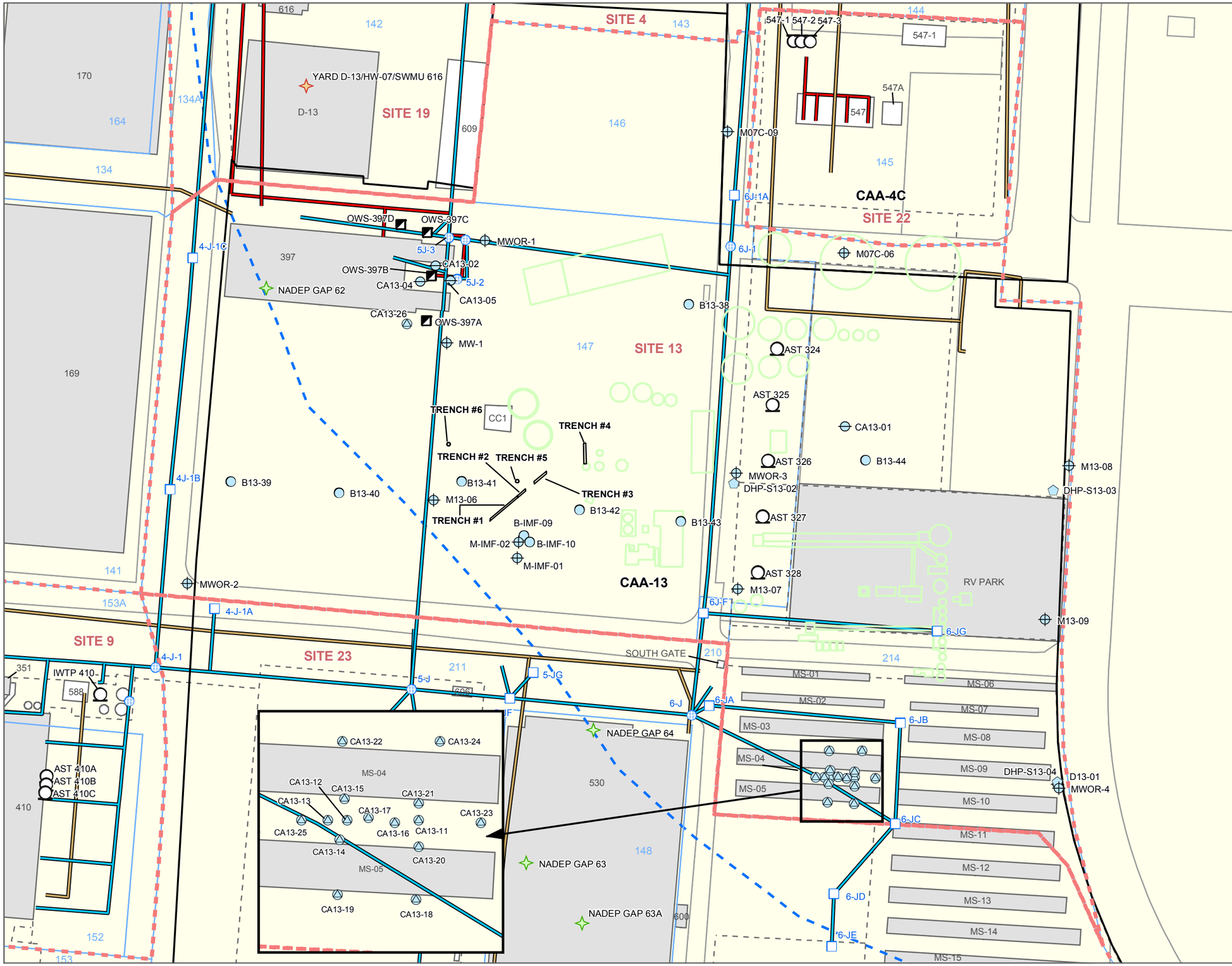

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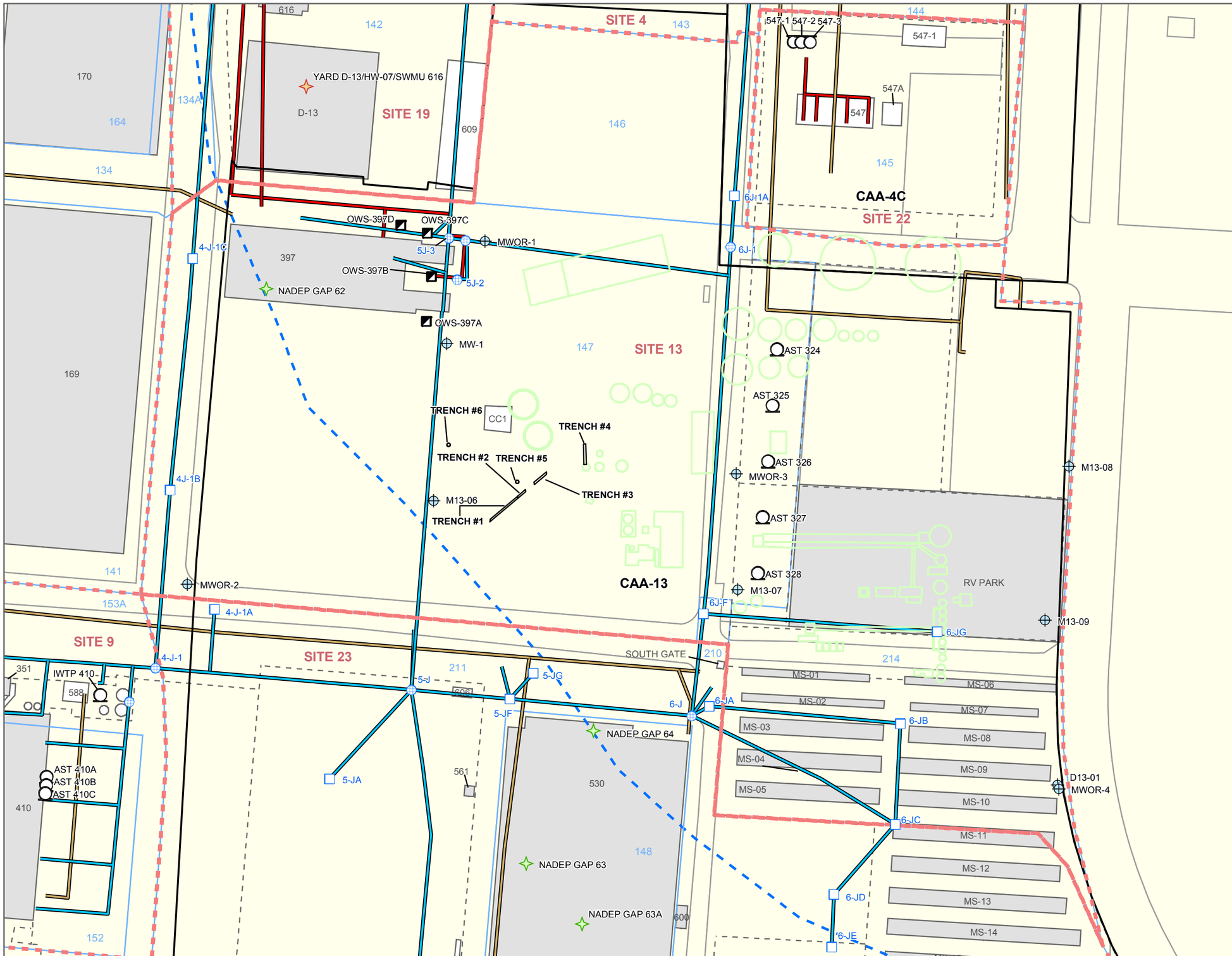
FIGURE 6-9J
SITE 13 SAMPLING LOCATIONS FOR METALS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9J_s13_gw_metal.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda

N

60 0 60 120 Feet

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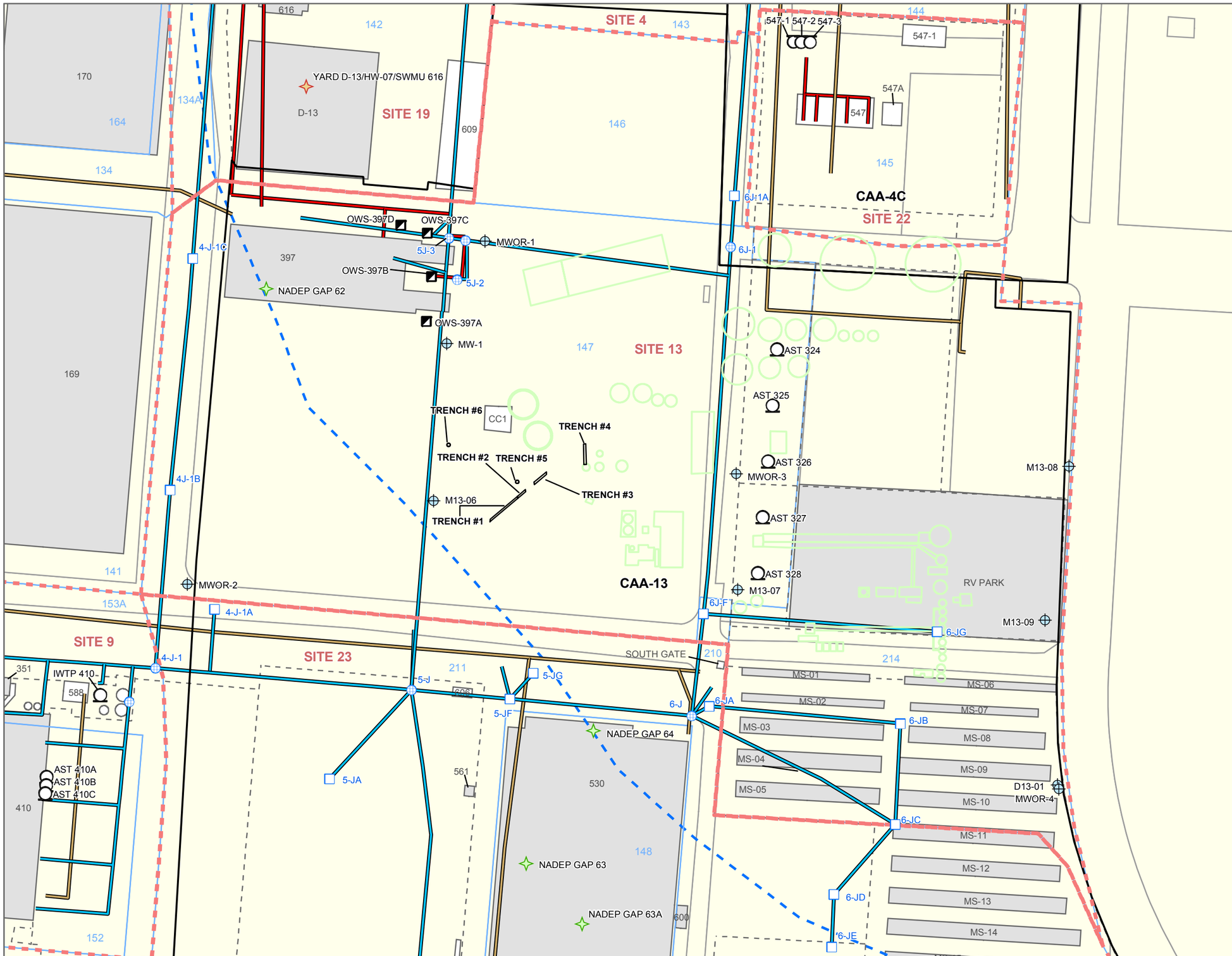
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-9K
SITE 13 SAMPLING LOCATIONS FOR PESTICIDES IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9K_s13_gw_pest.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated biphenyl

N

60 0 60 120 Feet

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Alameda Point
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FIGURE 6-9L
SITE 13 SAMPLING LOCATIONS FOR PCBs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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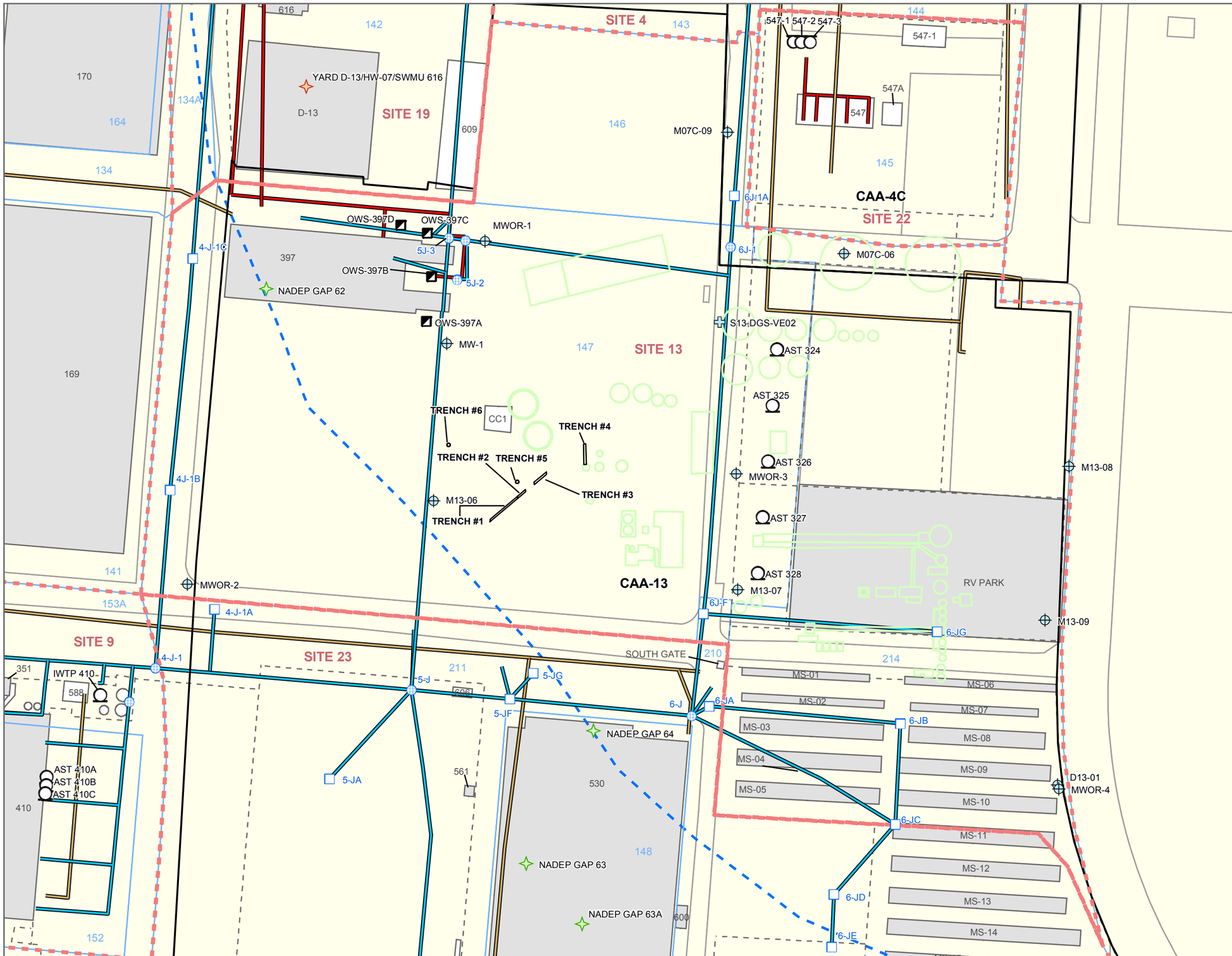

SAMPLING LOCATION

- Monitoring Well
- Vacuum Extraction
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

60 0 60 120 Feet

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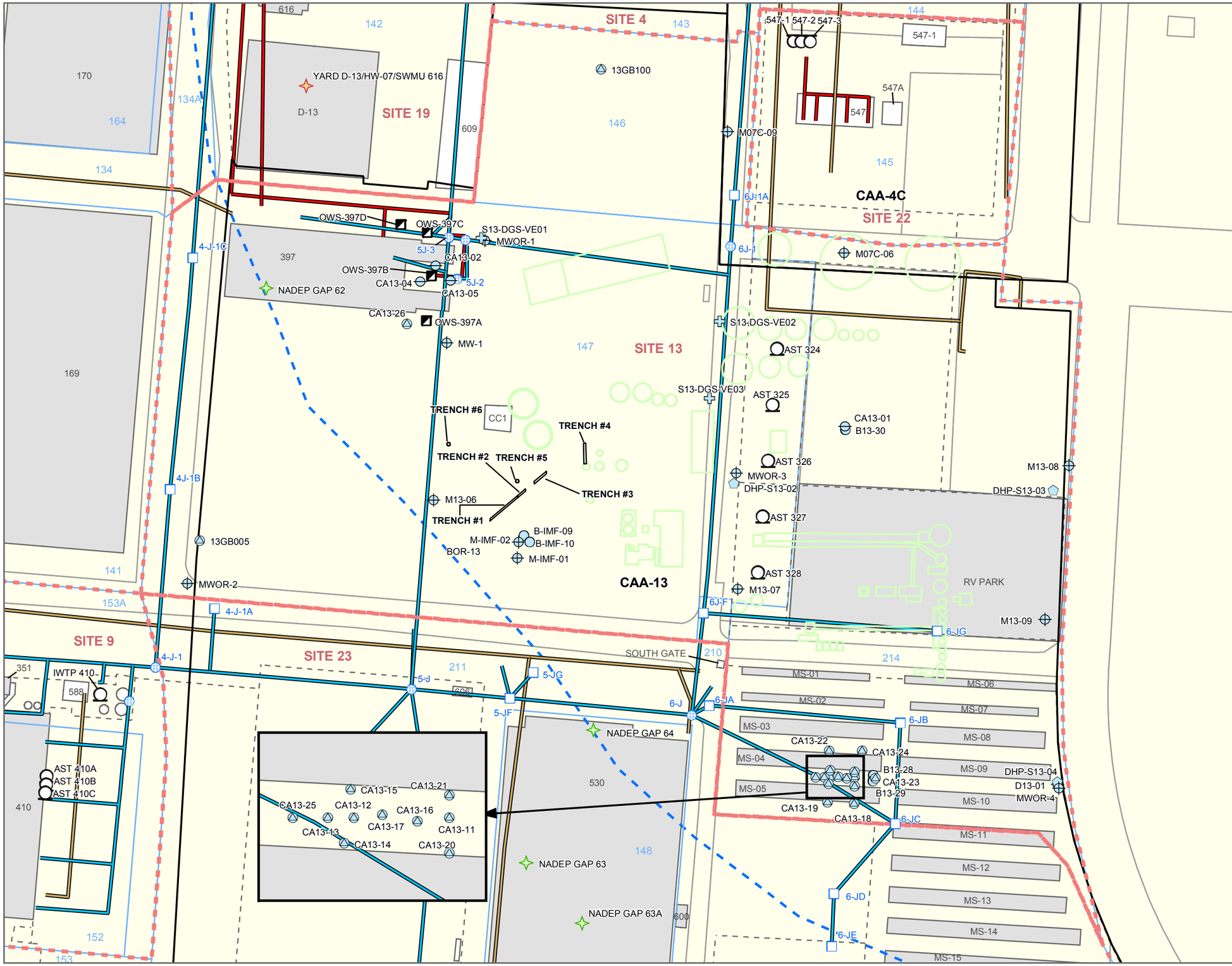
FIGURE 6-9M
SITE 13 SAMPLING LOCATIONS FOR PAHs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9M_s13_gw_pah.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Vacuum Extraction
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
TPH = Total Petroleum Hydrocarbon

N

60 0 60 120 Feet

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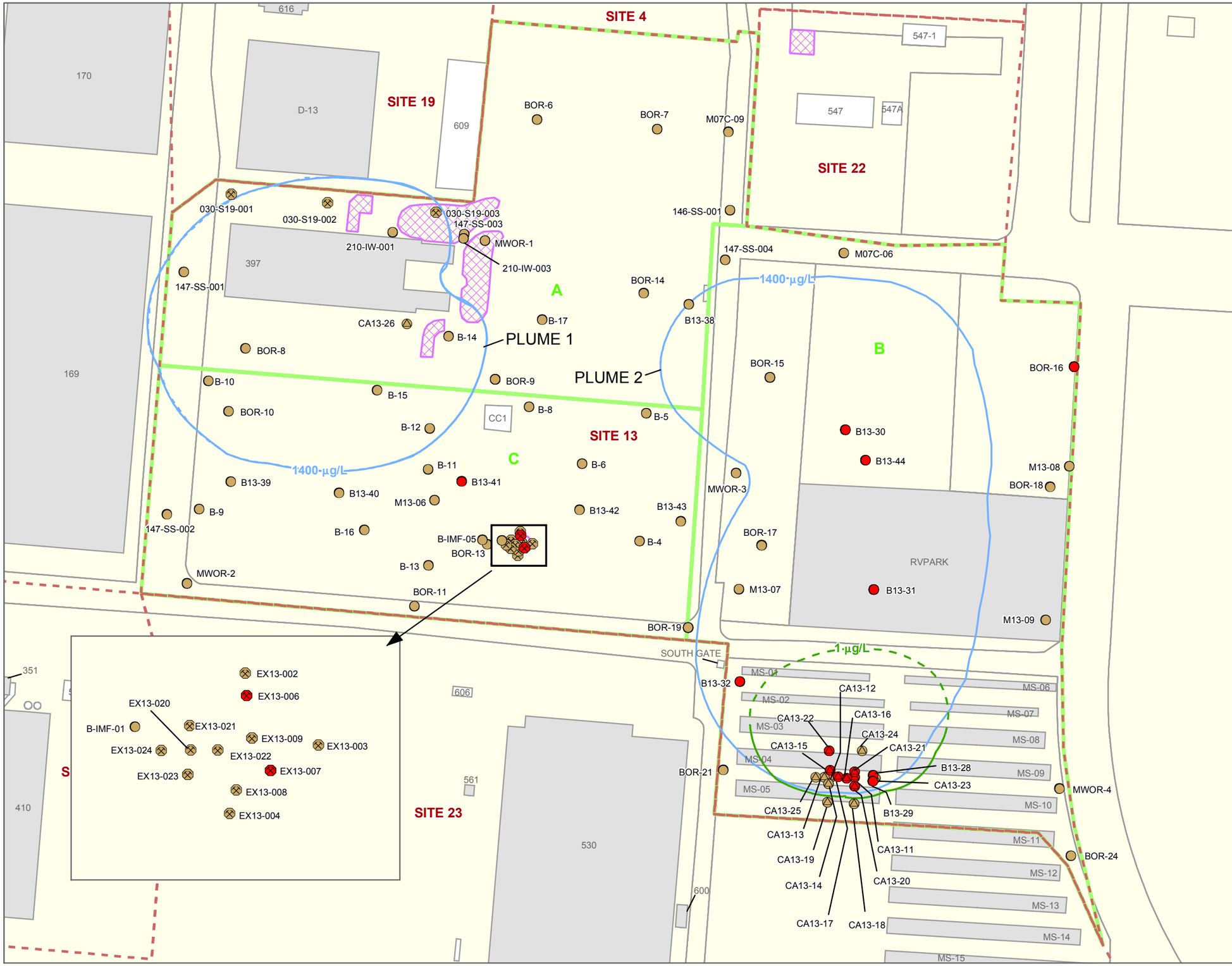
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-9N
SITE 13 SAMPLING LOCATIONS FOR TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-11 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-9N_s13_gw_tph.mxd TtEMI-SA K. Johnson



SOIL SAMPLE LOCATION
(RED INDICATES "EXCEEDS PRC")

- DIRECT-PUSH
- EXCAVATION
- SOIL BORING
- SITE 13 SECTIONS
- CERCLA SITE BOUNDARY
- BENZENE PLUME (DASHED WHERE INFERRED)
- TTPH PLUME (DASHED WHERE INFERRED)
- EXCAVATION

BUILDING

- Present
- Removed
- LAND COVER
- OPEN WATER

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

Benzene plume delineated based on 1 µg/L
TPH plume delineated based on 1,400 µg/L

N

60 0 60 120 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-10
SITE 13
LOCATION OF TPH IN SOIL

Operable Unit 2A
Remedial Investigation Report

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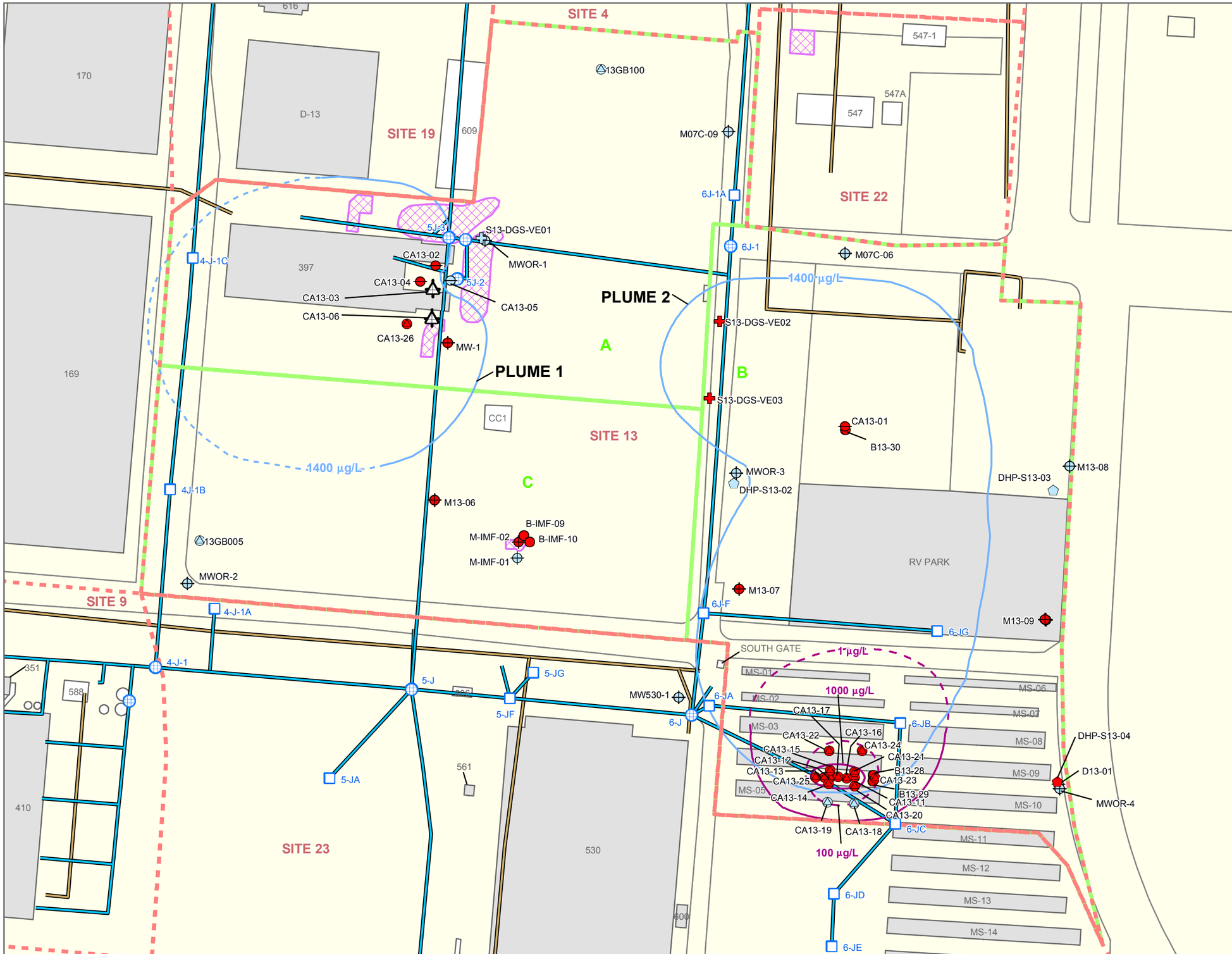
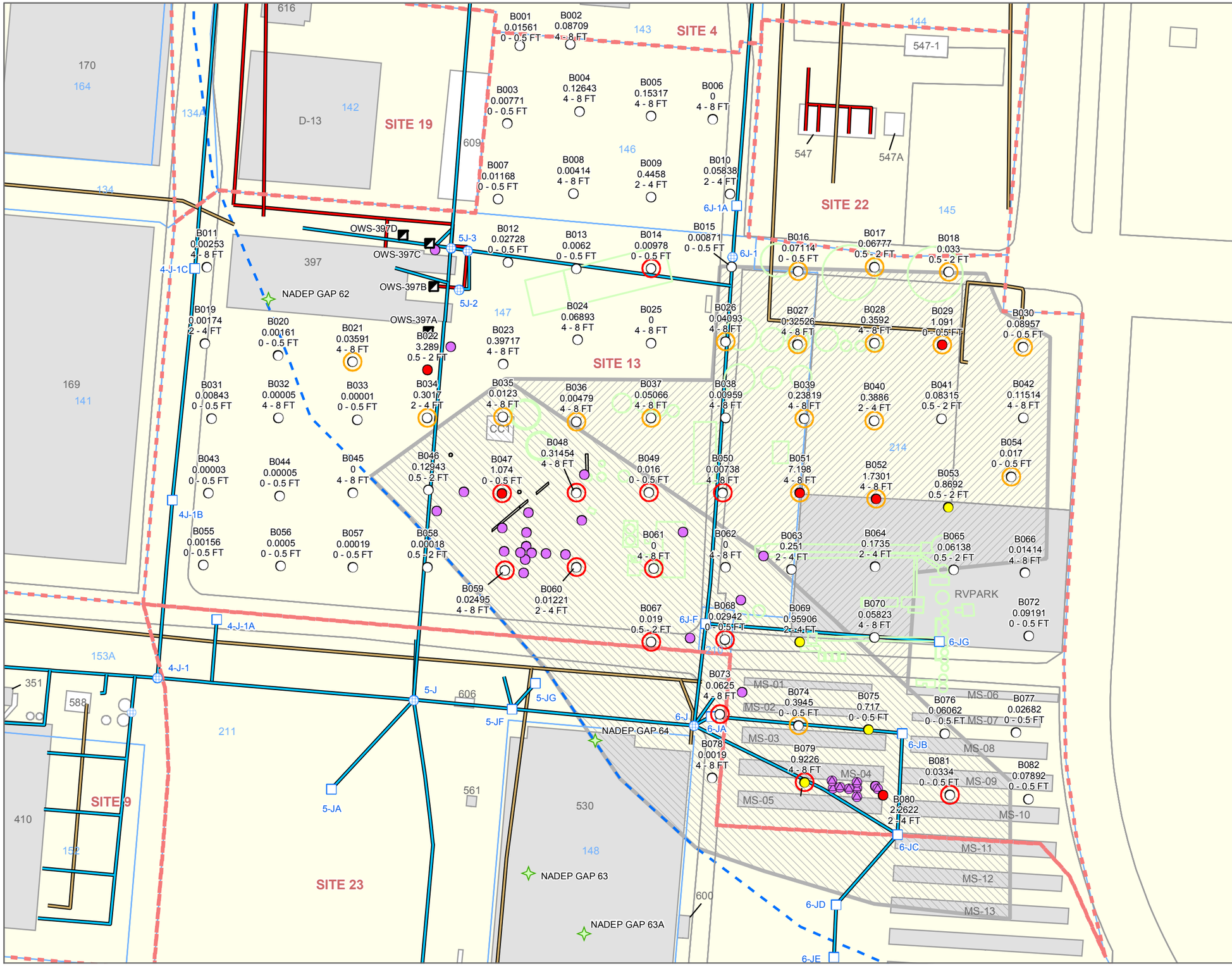


Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-11
SITE 13
LOCATION OF TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-10 U:\almda_sa\do028\ou2a\ri\mxd\fig06-11_s13_gw_tph_location.mxd TtEMI-SA K. Johnson



PAH SAMPLE LOCATION

- BaP < 0.6 mg/kg
- 0.6 mg/kg > BaP < 1 mg/kg
- BaP >= 1 mg/kg
- Tarry Refinery Waste
- Black Soil Identified

TRW - HISTORICALLY IDENTIFIED

- Direct-Push
- Soil Boring
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CERCLA SITE BOUNDARY
- AREA IMPACTED BY TRW
- AREA POTENTIALLY IMPACTED BY TRW
- FORMER OIL REFINERY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
BaP = Benzo(a)pyrene equivalent
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear aromatic hydrocarbon
TRW = Tarry refinery waste

Concentrations presented are in milligrams per kilogram and are the highest concentration detected in the four soil samples taken from a single point.

60 0 60 120 Feet

N

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-12
SITE 13 SOIL BaP EQUIVALENT VALUES AND AREA IMPACTED BY TARRY REFINERY WASTE

Operable Unit 2A
Remedial Investigation Report

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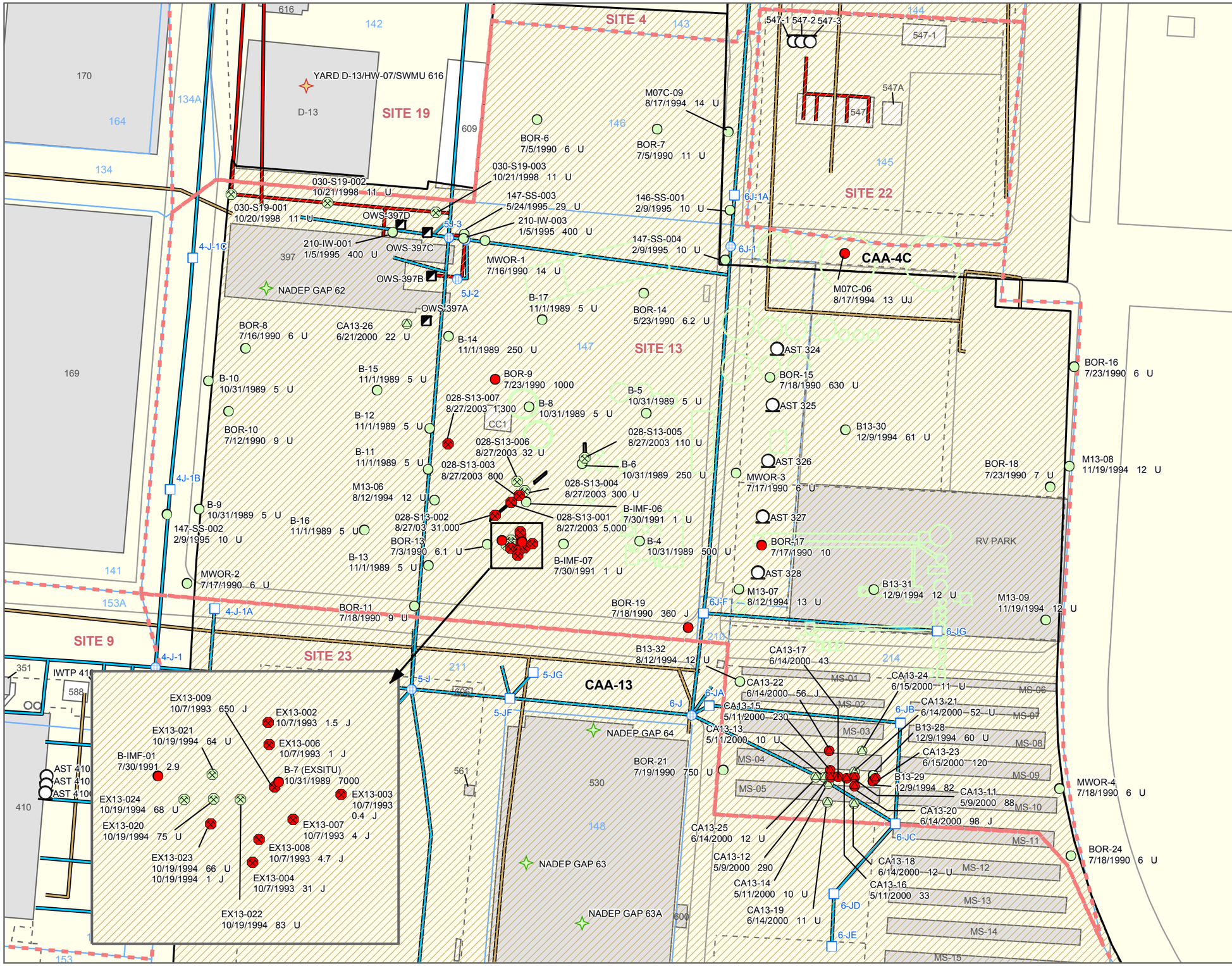
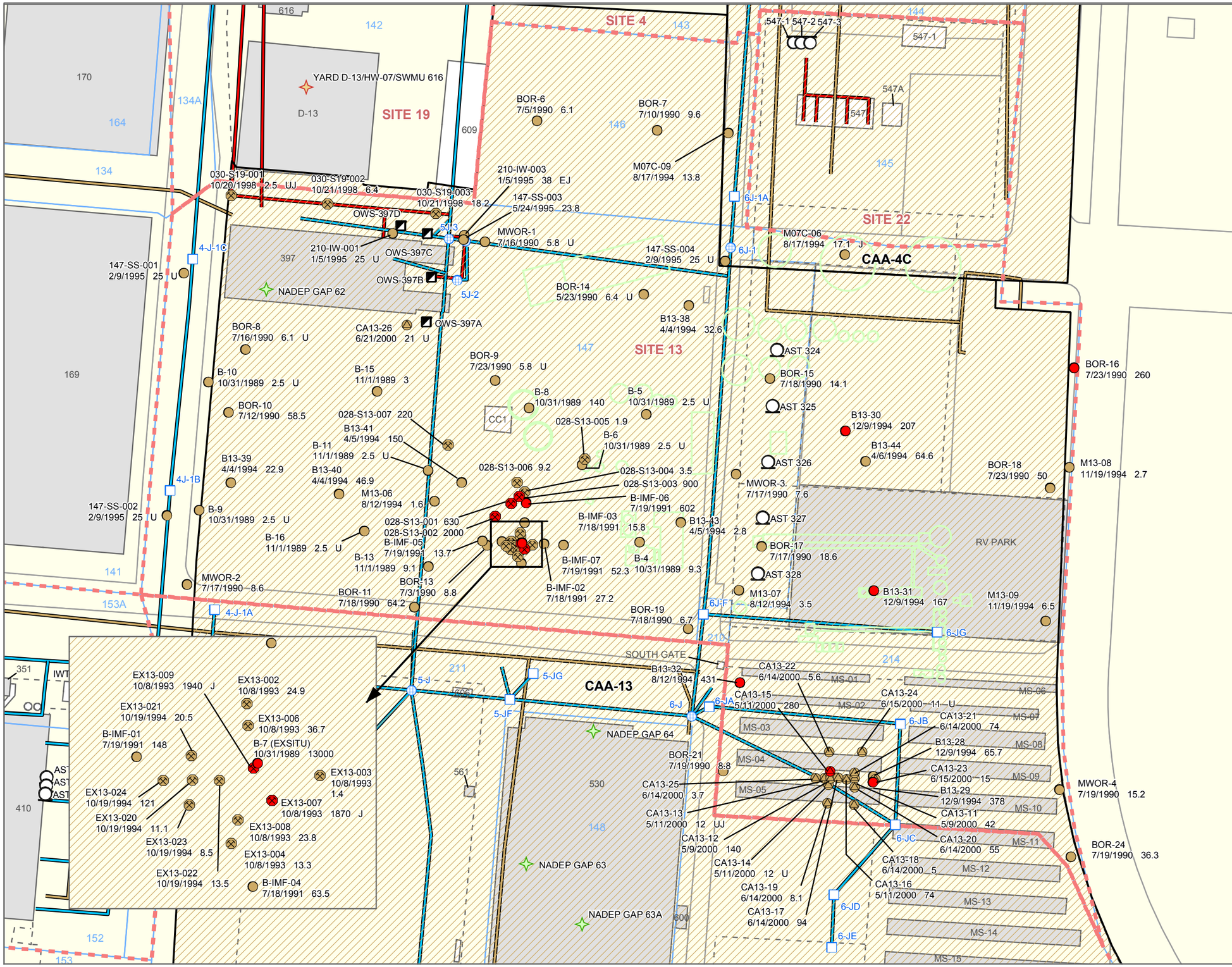


Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-13
SITE 13
BENZENE IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-05 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-13_s13_soil_benzene.mxd TtEMI-SA K. Johnson



SAMPLE LOCATION
(RED = EXCEEDS CALIFORNIA MODIFIED PRELIMINARY REMEDIATION GOAL FOR LEAD IN RESIDENTIAL SOIL)

- Direct-Push
- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
J = Estimated
ND = Non-detect
U = Not detected

Concentrations presented are in milligrams per kilogram and are the highest concentration detected in soil samples from a single point.

60 0 60 120 Feet

N

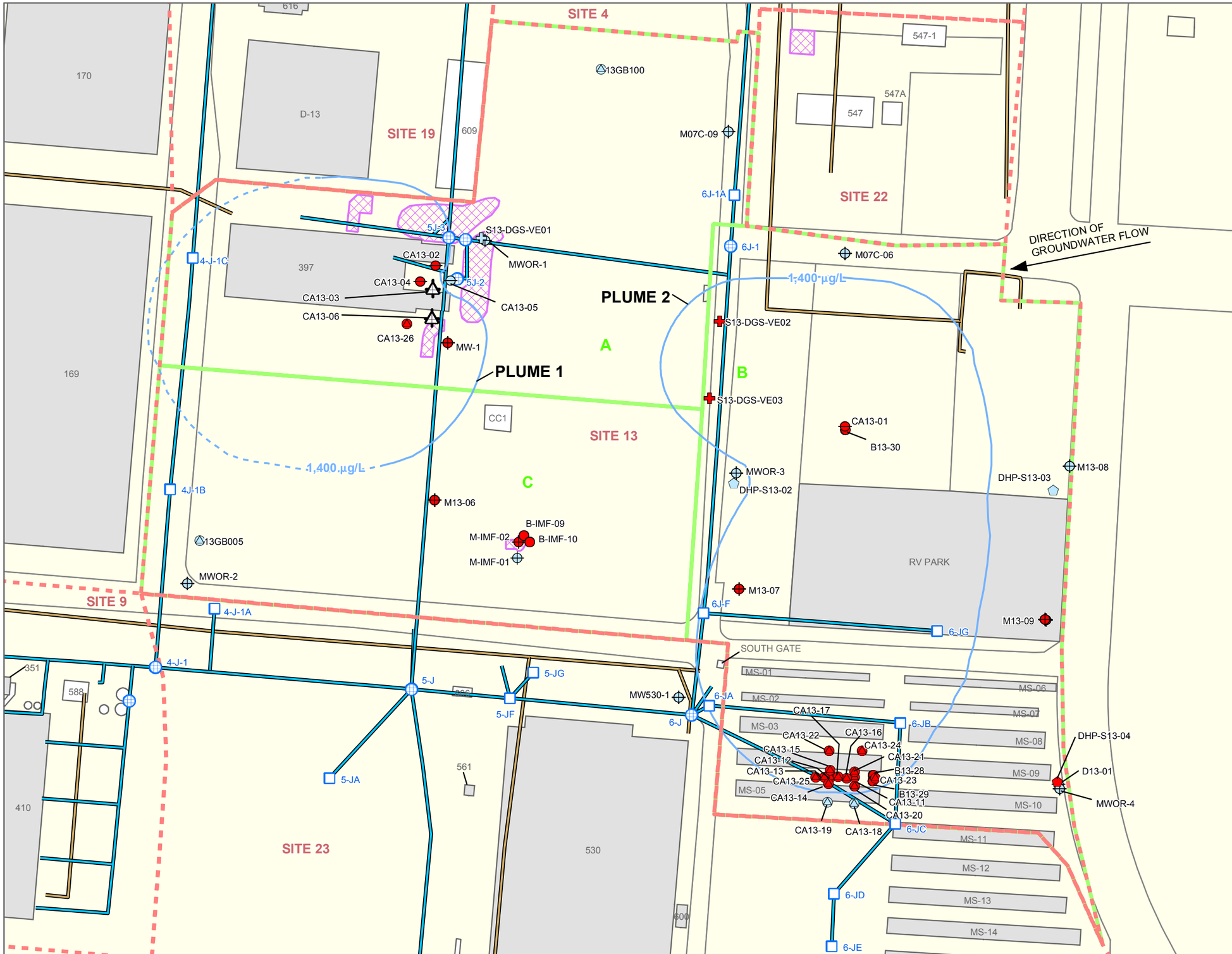
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-14
SITE 13
LEAD IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-02-03 U:\almda_sa\DO028\OU2A\RI\mxd\fig06-14_s13_soil_lead.mxd TtEMI-SA K. Johnson



Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PRC = Preliminary remediation criteria for TPH
TTPH = Total total petroleum hydrocarbon
µg/L = Micrograms per liter

TPH plume delineated based on 1,400 µg/L, the action level for total TPH in groundwater to be protective of ecological receptors, if TPH were to reach the San Francisco bay.

Groundwater data used in the RI were collected between 1990 and April 2003.
Remedial activity is on-going at this site.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-15
SITE 13
TOTAL PETROLEUM HYDROCARBONS IN GROUNDWATER
Operable Unit 2A
Remedial Investigation Report

2005-02-03 U:\almda_sa\do028\ou2a\ri\mxd\fig06-15_s13_gw_tph.mxd TtEMI-SA K. Johnson

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
CERCLA INVESTIGATIONS																		
Intermediate Maintenance Facility Pre-Removal Action, 1989																		
B-4	18591-1	10/31/1989	5.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-5	18591-3	10/31/1989	5	X	X	--	--	X	--	X	--	X	--	--	X	--	--	--
B-6	18591-4	10/31/1989	5.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-8	18591-6	10/31/1989	4.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-9	18591-7	10/31/1989	5.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-10	18591-8	10/31/1989	4.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-11	18606-1	11/01/1989	3.5	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-12	18607-1	11/01/1989	5	--	X	--	--	--	--	--	X	--	--	--	X	--	--	--
B-13	18606-2	11/01/1989	3	X	X	--	--	X	--	X	X	X	--	--	X	--	--	--
B-14	18607-2	11/01/1989	4	--	X	--	--	--	--	--	X	--	--	--	X	--	--	--
	18607-4	11/01/1989	15	--	X	--	--	--	--	--	X	--	--	--	X	--	--	--
B-15	18607-5	11/01/1989	5.5	--	X	--	--	--	--	--	X	--	--	--	X	--	--	--
	18620-1	11/01/1989	5.5	X	X	--	--	X	--	X	--	X	--	--	--	--	--	--
B-16	18606-3	11/01/1989	5	X	X	--	--	--	--	X	X	X	--	--	X	--	--	--
B-17	18607-6	11/01/1989	5.5	--	X	--	--	--	--	--	X	--	--	--	X	--	--	--
Phases 1 & 2A Investigation, 1991						--												
BOR-6	BOR-6 [0.5-1.0]	07/05/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-6 [2.0-2.5]	07/05/1990	2 - 2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-6 [5.5-6.0]	07/05/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-6 [6.0-6.5]	07/05/1990	6 - 6.5	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
	BOR-6 [8.0-8.5]	07/05/1990	8 - 8.5	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-6 [8.5-9.0]	07/05/1990	8.5 - 9	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
	BOR-6 [11.0-11.5]	07/05/1990	11 - 11.5	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-6 [11.5-12.0]	07/05/1990	11.5 - 12	--	--	--	X	X	--	X	X	--	--	--	--	--	--	--
	BOR-6 [14.0-14.5]	07/05/1990	14 - 14.5	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-6 [14.5-15.0]	07/05/1990	14.5 - 15	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
BOR-7	BOR-7 [0.5-1.0]	07/05/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-7 [2.0-2.5]	07/05/1990	2 - 2.5	--	--	--	X	X	--	X	X	--	--	--	--	--	--	--
	BOR-7 [2.5-3.0]	07/05/1990	2.5 - 3	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-7 [3.5-4.0]	07/10/1990	3.5 - 4	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
	BOR-7 [4.0-4.5]	07/05/1990	4 - 4.5	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-7 [6.0-6.5]	07/05/1990	6 - 6.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-7 [8.5-9.0]	07/05/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-7 [9.0-9.5]	07/10/1990	9 - 9.5	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
	BOR-7 [13.5-14.0]	07/05/1990	13.5 - 14	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-7 [14.5-15.0]	07/10/1990	14.5 - 15	--	--	--	X	X	--	--	X	--	--	--	--	--	--	--
BOR-8	BOR-8 [1.0-1.5]	07/16/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-8 [2.5-3.0]	07/16/1990	2.5 - 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-8 [3.0-3.5]	07/16/1990	3 - 3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-8 [3.5-4.0]	07/16/1990	3.5 - 4	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-8 [4.0-4.5]	07/16/1990	4 - 4.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-8 [6.5-7.0]	07/16/1990	6.5 - 7	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-8 [7.0-7.5]	07/16/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-8 [10.5-11.0]	07/16/1990	10.5 - 11	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)						--												
BOR-8	BOR-8 [11.0-11.5]	07/16/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
(Continued)	BOR-8 [12.5-13.0]	07/16/1990	12.5 - 13	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-8 [14.0-14.5]	07/16/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
BOR-9	BOR-9 [0.5-1.0]	07/23/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-9 [2.0-2.5]	07/23/1990	2 - 2.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-9 [2.5-3.0]	07/23/1990	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-9 [4.0-4.5]	07/23/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-9 [6.5-7.0]	07/23/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-9 [7.0-7.5]	07/23/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-9 [11.0-11.5]	07/23/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-9 [11.5-12.0]	07/23/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-9 [14.0-14.5]	07/23/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-9 [14.5-15.0]	07/23/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-10	BOR-10 [0.5-1.0]	07/12/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-10 [1.0-1.5]	07/12/1990	1 - 1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-10 [3.5-4.0]	07/12/1990	3.5 - 4	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-10 [4.0-4.5]	07/12/1990	4 - 4.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-10 [7.0-7.5]	07/12/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-10 [8.0-8.5]	07/12/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-10 [11.0-11.5]	07/12/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-10 [11.5-12.0]	07/12/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-10 [14.0-14.5]	07/12/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-10 [14.5-15.0]	07/12/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-11	BOR-11 [0.5-1.0]	07/18/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-11 [2.5-3.0]	07/18/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-11 [3.5-4.0]	07/18/1990	3.5 - 4	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-11 [4.0-4.5]	07/18/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-11 [6.5-7.0]	07/18/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-11 [7.0-7.5]	07/18/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-11 [11.0-11.5]	07/18/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-11 [11.5-12.0]	07/18/1990	11.5 -12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-11 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-11 [14.5-15.0]	07/18/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-13	BOR-13 [0.5-1.0]	07/03/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-13 [1.0-1.5]	07/03/1990	1 - 1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-13 [2.0-2.5]	07/03/1990	2 - 2.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-13 [2.5-3.0]	07/03/1990	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-13 [6.5-7.0]	07/03/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-13 [7.0-7.5]	07/03/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-13 [11.0-11.5]	07/03/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-13 [11.5-12.0]	07/03/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-13 [14.0-14.5]	07/03/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-13 [14.5-15.0]	07/03/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-14	BOR-14 [0.0-0.5]	05/23/1990	0 - 0.5	X	--	--	X	X	--	X	X	--	--	--	--	--	--	--
	BOR-14 [0.5-1.0]	05/23/1990	0 - 0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [1.0-1.5]	05/23/1990	1 - 1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)						--												
BOR-14	BOR-14 [4.0-4.5]	05/23/1990	4 - 4.5	X	--	--	X	X	--	X	X	--	--	--	--	--	--	--
(Continued)	BOR-14 [4.5-5.0]	05/23/1990	4.5 - 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [6.0-6.5]	05/23/1990	6 - 6.5	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [8.0-8.5]	05/23/1990	8 - 8.5	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [8.5-9.0]	05/23/1990	8.5 - 9	X	--	--	X	X	--	X	X	--	--	--	--	--	--	--
	BOR-14 [9.0-9.5]	05/23/1990	9 - 9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [13.0-13.5]	05/23/1990	13 - 13.5	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-14 [14.0-14.5]	05/23/1990	14 - 14.5	X	--	--	X	X	--	X	X	--	--	--	--	--	--	--
	BOR-14 [14.5-15.0]	05/23/1990	14.5 - 15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOR-15	BOR-15 [0.5-1.0]	07/18/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-15 [2.0-2.5]	07/18/1990	2 - 2.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-15 [2.5-3.0]	07/18/1990	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-15 [4.0-4.5]	07/18/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-15 [6.5-7.0]	07/18/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-15 [7.0-7.5]	07/18/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-15 [11.0-11.5]	07/18/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-15 [11.5-12.0]	07/18/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-15 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-15 [14.5-15.0]	07/18/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-16	BOR-16 [0.5-1.0]	07/23/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-16 [2.0-2.5]	07/23/1990	2 - 2.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-16 [2.5-3.0]	07/23/1990	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-16 [3.5-4.0]	07/23/1990	3.5 - 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-16 [6.5-7.0]	07/23/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-16 [7.0-7.5]	07/23/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-16 [11.0-11.5]	07/23/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-16 [11.5-12.0]	07/23/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-16 [14.0-14.5]	07/23/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-16 [14.5-15.0]	07/23/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-17	BOR-17 [2.0-2.5]	07/17/1990	2 - 2.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-17 [2.5-3.0]	07/17/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-17 [4.0-4.5]	07/17/1990	4 - 4.5	--	--	--	X	X		X	--	--	--	--	--	--	--	--
	BOR-17 [5.0-5.5]	07/17/1990	5 - 5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-17 [7.0-7.5]	07/17/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-17 [8.0-8.5]	07/17/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-17 [10.0-10.5]	07/17/1990	10 - 10.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-17 [11.0-11.5]	07/17/1990	11 - 11.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-17 [11.5-12.0]	07/17/1990	11.5 - 12	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-17 [14.5-15.0]	07/17/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-17R [10.5-11.0]	07/17/1990	10.5 - 11	X	--	--	X	X	--	--	X	--	--	--	--	--	--	--
BOR-18	BOR-18 [0.5-1.0]	07/23/1990	0.5 - 1	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-18 [2.5-3.0]	07/23/1990	2.5 - 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-18 [3.5-4.0]	07/23/1990	3.5 - 4	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-18 [4.0-4.5]	07/23/1990	4 - 4.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-18 [7.0-7.5]	07/23/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-18 [7.5-8.0]	07/23/1990	7.5 - 8	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)						--												
BOR-18	BOR-18 [11.0-11.5]	07/23/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
(Continued)	BOR-18 [11.5-12.0]	07/23/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-18 [14.0-14.5]	07/23/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-18 [14.5-15.0]	07/23/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-19	BOR-19 [0.5-1.0]	07/18/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-19 [2.5-3.0]	07/18/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-19 [3.5-4.0]	07/18/1990	3.5 - 4	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-19 [4.0-4.5]	07/18/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-19 [7.0-7.5]	07/18/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-19 [8.0-8.5]	07/18/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-19 [11.0-11.5]	07/18/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-19 [11.5-12.0]	07/18/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-19 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-19 [14.5-15.0]	07/18/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-19R [7.5-8.0]	07/23/1990	7.5 - 8	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
BOR-21	BOR-21 [0.5-1.0]	07/19/1990	0.5 - 1	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-21 [2.5-3.0]	07/18/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-21 [3.0-3.5]	07/19/1990	3 - 3.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-21 [4.0-4.5]	07/19/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-21 [7.0-7.5]	07/19/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-21 [7.5-8.0]	07/19/1990	7.5 - 8	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-21 [11.5-12.0]	07/19/1990	11.5 - 12	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-21 [12.0-12.5]	07/19/1990	12 - 12.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-21 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-21 [15.0-15.5]	07/19/1990	15 - 15.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
BOR-24	BOR-24 [1.0-1.5]	07/19/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-24 [2.5-3.0]	07/18/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-24 [3.0-3.5]	07/19/1990	3 - 3.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	BOR-24 [4.0-4.5]	07/19/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-24 [7.0-7.5]	07/18/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-24 [7.5-8.0]	07/24/1990	7.5 - 8	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-24 [11.0-11.5]	07/18/1990	11 - 11.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-24 [11.5-12.0]	07/19/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	BOR-24 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	BOR-24 [14.5-15.0]	07/24/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
MWOR-1	MWOR-1 [0.5-1.0]	05/23/1990	0.5 - 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [1.0-1.5]	07/16/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [2.5-3.0]	07/16/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-1 [3.0-3.5]	07/16/1990	3 - 3.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	MWOR-1 [4.0-4.5]	07/16/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [4.5-5.0]	08/23/1990	4.5 - 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [7.0-7.5]	07/16/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-1 [7.5-8.0]	07/16/1990	7.5 - 8	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [9.0-9.5]	08/23/1990	9 - 9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-1 [11.5-12.0]	07/16/1990	11.5 - 12	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-1 [12.0-12.5]	07/16/1990	12 - 12.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)						--												
MWOR-1	MWOR-1 [14.5-15.0]	07/16/1990	14.5 - 15	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
(Continued)	MWOR-1 [15.0-15.5]	07/16/1990	15 - 15.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
MWOR-2	MWOR-2 [2.0-2.5]	07/16/1990	2 - 2.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-2 [2.5-3.0]	07/17/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-2 [4.0-4.5]	07/17/1990	4 - 4.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	MWOR-2 [5.0-5.5]	07/16/1990	5 - 5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-2 [7.0-7.5]	07/17/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-2 [8.0-8.5]	07/17/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-2 [10.0-10.5]	07/17/1990	10 - 10.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-2 [11.0-11.5]	07/17/1990	11 - 11.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-2 [12.0-12.5]	07/17/1990	12 - 12.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-2 [13.0-13.5]	07/17/1990	13 - 13.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
MWOR-3	MWOR-3 [2.0-2.5]	07/17/1990	2 - 2.5	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-3 [2.5-3.0]	07/17/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-3 [4.0-4.5]	07/17/1990	4 - 4.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	MWOR-3 [5.0-5.5]	07/17/1990	5 - 5.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	MWOR-3 [7.0-7.5]	07/17/1990	7 - 7.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-3 [8.0-8.5]	07/17/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-3 [10.0-10.5]	07/17/1990	10 - 10.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-3 [11.0-11.5]	07/17/1990	11 - 11.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-3 [11.5-12.0]	07/17/1990	11.5 - 12	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-3 [13.0-13.5]	07/17/1990	13 - 13.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
MWOR-4	MWOR-4 [1.5-2.0]	07/19/1990	1.5 - 2	X	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-4 [2.5-3.0]	07/18/1990	2.5 - 3	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-4 [3.0-3.5]	07/19/1990	3 - 3.5	--	--	--	X	X	--	X	--	--	--	--	--	--	--	--
	MWOR-4 [4.0-4.5]	07/19/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MWOR-4 [6.5-7.0]	07/18/1990	6.5 - 7	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-4 [7.0-7.5]	07/19/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-4 [10.0-10.5]	07/18/1990	10 - 10.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-4 [10.5-11.0]	07/19/1990	10.5 - 11	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
	MWOR-4 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-4 [14.5-15.0]	07/19/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
Follow-on Investigation, 1994																		
B13-28	280-S13-001	12/09/1994	1 - 2	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-002	12/09/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-003	12/09/1994	5.5 - 6	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-29	280-S13-004	12/09/1994	1 - 1.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-006	12/09/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-007	12/09/1994	5 - 5.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-30	280-S13-008	12/09/1994	1 - 2	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-009	12/09/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-010	12/09/1994	5 - 5.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-31	280-S13-011	12/09/1994	1 - 2	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-012	12/09/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-013	12/09/1994	4.5 - 5.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Follow-on Investigation, 1994 (Continued)																		
B13-32	280-S13-015	08/12/1994	0.5 - 1.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-016	08/12/1994	2 - 3	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-017	08/12/1994	4 - 5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-38	ALA13B38-1	04/04/1994	0 - 1.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B38-2	04/04/1994	4.5 - 5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B38-3	04/04/1994	10 - 10.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B38-4	04/04/1994	15.5 - 16	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-39	ALA13B39-1	04/04/1994	3 - 3.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B39-2	04/04/1994	8 - 8.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B39-3	04/04/1994	11.5 - 12	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B39-4	04/04/1994	14 - 14.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B39-5	04/04/1994	16 - 16.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-40	ALA13B40-1	04/04/1994	0.5 - 1	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B40-2	04/04/1994	4.5 - 5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B40-3	04/04/1994	9.5 - 10	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B40-4	04/04/1994	13 - 13.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B40-5	04/04/1994	15.5 - 16	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-41	ALA13B41-1	04/05/1994	0.5 - 1	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-2	04/05/1994	4.5 - 5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-3	04/05/1994	7 - 7.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-4	04/05/1994	8 - 8.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-5	04/05/1994	8.5 - 9	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-6	04/05/1994	9 - 9.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-7	04/05/1994	11 - 11.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B41-8	04/05/1994	15 - 15.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-42	ALA13B42-1	04/05/1994	3 - 3.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-2	04/05/1994	5.5 - 6	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-3	04/05/1994	6.5 - 7	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-4	04/05/1994	7.5 - 8	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-5	04/05/1994	9.5 - 10	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-6	04/05/1994	12.5 - 13	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-7	04/05/1994	15.5 - 16	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B42-8	04/05/1994	19.5 - 20	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-43	ALA13B43-1	04/05/1994	3.5 - 4	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B43-2	04/05/1994	9.5 - 10	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B43-3	04/05/1994	12 - 12.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B43-4	04/05/1994	14.5 - 15	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
B13-44	ALA13B44-1	04/06/1994	2 - 2.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-2	04/06/1994	3.5 - 4	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-3	04/06/1994	6 - 6.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-4	04/06/1994	8.5 - 9	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-5	04/06/1994	11.5 - 12	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-6	04/06/1994	14.5 - 15	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	ALA13B44-6D	04/06/1994	15 - 15.5	X	--	--	--	X	--	X	X	--	--	--	--	--	--	--

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				ANALYSES PERFORMED														
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Follow-on Investigation, 1994 (Continued)																		
M07C-06	280-S7C-017	08/17/1994	0.5 - 1.5	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S7C-018	08/17/1994	2.5 - 3.5	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S7C-019	08/17/1994	5 - 6	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
M07C-09	280-S7C-095	08/17/1994	0.5 - 1.5	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S7C-096	08/17/1994	2.5 - 3.5	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S7C-097	08/17/1994	5 - 6	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
M13-06	280-S13-018	08/12/1994	0 - 1	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-019	08/12/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-020	08/12/1994	4 - 5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
M13-07	280-S13-021	08/12/1994	0 - 1	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-022	08/12/1994	1.5 - 2.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-023	08/12/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-024	08/12/1994	4.5 - 5.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
M13-08	280-S13-025	11/19/1994	1 - 2	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-026	11/19/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-027	11/19/1994	5 - 6	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
M13-09	280-S13-028	11/19/1994	1 - 2	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-029	11/19/1994	2.5 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S13-030	11/19/1994	5 - 6	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
NPS-S07C-01	280-S7C-027	07/20/1994	--	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
NPS-S19-01	280-S19-014	07/18/1994	--	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	280-S19-015	07/18/1994	--	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
PAH Study, 2003																		
C3S013B001	C0590583	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590584	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590585	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590586	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B002	C0590587	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590588	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590589	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590590	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B003	C0590591	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590593	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590594	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590595	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B004	C0590596	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590597	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590598	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590599	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B005	C0590600	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590601	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590603	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590604	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

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				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																		
C3S013B006	C0590605	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590606	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590607	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590608	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B007	C0590609	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590610	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590611	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590613	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B008	C0590614	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590615	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590616	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590617	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B009	C0590618	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590619	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590620	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590621	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B010	C0590623	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590624	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590625	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590626	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B011	C0590627	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590628	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590629	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590630	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B012	C0590631	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590633	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590634	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590635	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B013	C0590636	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590637	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590638	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590639	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B014	C0590640	7/25/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590641	7/25/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590643	7/25/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590644	7/25/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B015	C0590645	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590646	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590647	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590648	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B016	C0590649	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590650	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590651	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590653	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

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PAH Study, 2003 (Continued)																		
C3S013B017	C0590654	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590655	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590656	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590657	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B018	C0590658	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590659	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590660	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590661	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B019	C0590663	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590664	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590665	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590666	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B020	C0590667	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590668	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590669	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590670	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B021	C0590671	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590673	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590674	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590675	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B022	C0590676	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590677	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590678	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B023	C0590680	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590681	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590683	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590684	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B024	C0590685	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590686	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590687	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590688	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B025	C0590689	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590690	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590691	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590693	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B026	C0590694	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590695	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590696	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590697	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B027	C0590698	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590699	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590700	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590701	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B028	C0590703	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590704	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590705	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590706	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																		
C3S013B029	C0590707	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590708	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590709	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590710	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B030	C0590711	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590713	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590714	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590715	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B031	C0590716	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590717	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590718	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590719	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B032	C0590720	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590721	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590723	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590724	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B033	C0590725	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590726	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590727	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590728	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B034	C0590729	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590730	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590731	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590733	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B035	C0590734	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590735	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590736	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590737	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B036	C0590738	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590739	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590740	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590741	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B037	C0590743	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590744	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590745	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590746	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B038	C0590747	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590748	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590749	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590750	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B039	C0590751	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590753	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590754	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590755	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																		
C3S013B040	C0590756	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590757	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590758	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590759	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B041	C0590760	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590761	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590763	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590764	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B042	C0590765	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590766	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590767	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590768	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B043	C0590769	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590770	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590771	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590772	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B044	C0590774	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590775	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590776	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590777	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B045	C0590778	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590779	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590780	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590781	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B046	C0590783	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590784	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590785	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590786	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B047	C0590787	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590788	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590789	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590790	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B048	C0590791	7/28/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590793	7/28/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590794	7/28/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590795	7/28/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B049	C0590796	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590797	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590798	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590799	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B050	C0590800	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590801	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590803	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590804	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

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Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																		
C3S013B051	C0590805	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590806	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590807	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590808	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B052	C0590809	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590810	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590811	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590813	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B053	C0590814	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590815	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590816	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590817	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B054	C0590818	7/31/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590819	7/31/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590820	7/31/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590821	7/31/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B055	C0590823	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590824	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590825	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590826	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B056	C0590827	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590828	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590829	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590830	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B057	C0590831	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590833	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590834	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590835	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B058	C0590836	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590837	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590838	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590839	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B059	C0590840	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590841	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590843	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590844	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B060	C0590845	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590846	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590847	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590848	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B061	C0590849	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590850	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590851	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590853	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																		
C3S013B062	C0590854	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590855	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590856	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590857	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B063	C0590858	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590859	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590860	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590861	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B064	C0590863	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590864	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590865	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590866	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B065	C0590867	7/31/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590868	7/31/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590869	7/31/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590870	7/31/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B066	C0590871	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590873	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590874	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590875	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B067	C0590876	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590877	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590878	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590879	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B068	C0590880	7/29/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590881	7/29/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590883	7/29/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590884	7/29/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B069	C0590885	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590886	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590887	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590888	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B070	C0590889	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590890	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590891	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590893	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B072	C0590898	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590899	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590900	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590901	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B073	C0590903	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590904	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590905	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590906	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--

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				ANALYSES PERFORMED														
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PAH Study, 2003 (Continued)																		
C3S013B074	C0590907	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590908	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590909	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590910	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B075	C0590911	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590913	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590914	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590915	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B076	C0590916	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590917	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590918	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590919	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B077	C0590920	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590921	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590923	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590924	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B078	C0590925	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590926	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590927	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590928	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B079	C0590929	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590930	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590931	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590933	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B080	C0590934	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590935	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590936	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590937	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B081	C0590938	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590939	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590940	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590941	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
C3S013B082	C0590943	7/30/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590944	7/30/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590945	7/30/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
	C0590946	7/30/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
ENVIRONMENTAL BASELINE SURVEY																		
Phase IIA Environmental Baseline Survey																		
146-SS-001	146M-001	02/09/1995	3 - 4	--	--	--	X	--	--	X	--	--	--	--	X	X	X	--
	146M-001M	02/09/1995	3 - 4	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--
147-SS-001	147M-001	02/09/1995	2 - 2.5	X	--	--	X	--	--	X	--	--	--	--	X	X	X	--
	147M-001M	02/09/1995	2 - 2.5	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--
147-SS-002	147M-002	02/09/1995	7 - 8	X		--	X	--	--	X	--	--	--	--	X	X	X	--
	147M-002M	02/09/1995	7 - 8	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--

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Phase IIA Environmental Baseline Survey (Continued)																		
147-SS-003	147M-003	05/24/1995	5.5 - 6.5	X	--	--	X	--	--	X	--	--	--	--	X	X	X	--
	147M-003M	05/24/1995	5.5 - 6.5	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--
147-SS-004	147M-004	02/09/1995	6 - 7	X	--	--	X	--	--	X	--	--	--	--	X	X	X	--
	147M-004M	02/09/1995	6 - 7	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--
147-Z22-001	147-0001	04/06/1995	0 - 0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
210-IW-001	210I-001	01/05/1995	3 - 3.5	X	X	--	X	X	--	X	X	--	--	X	X	X	X	--
	210I-001M	01/05/1995	3 - 3.5	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--
210-IW-003	210I-003	01/05/1995	5 - 5.5	X	X	--	X	X	--	X	X	--	--	X	X	X	X	--
	210I-003M	01/05/1995	5 - 5.5	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS																		
Fuel Line and Underground Storage Tank Investigations																		
CA13-11	030-CAP-205	05/09/2000	3 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-206	05/09/2000	7 - 8	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-12	030-CAP-207	05/09/2000	3 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-378	05/09/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-208	05/09/2000	4.5 - 5.3	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-13	030-CAP-209	05/11/2000	2.8 - 3.8	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-210	05/11/2000	4.5 - 5.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-14	030-CAP-211	05/11/2000	3 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-212	05/11/2000	7.5 - 8	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-15	030-CAP-214	05/11/2000	3 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-213	05/11/2000	4 - 5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-16	030-CAP-215	05/11/2000	1.5 - 2.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-216	05/11/2000	4 - 5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-17	030-CAP-217	06/14/2000	3 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-218	06/14/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-18	030-CAP-219	06/14/2000	3 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-220	06/14/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-19	030-CAP-221	06/14/2000	3 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-222	06/14/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-20	030-CAP-223	06/14/2000	3 - 3.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-224	06/14/2000	6.5 - 7	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-21	030-CAP-411	06/14/2000	3.5 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-412	06/14/2000	5.5 - 6	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-22	030-CAP-414	06/14/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-415	06/14/2000	7.5 - 8	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-23	030-CAP-417	06/15/2000	3.5 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-418	06/15/2000	5 - 6.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-24	030-CAP-420	06/15/2000	2.5 - 3	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-421	06/15/2000	4 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-25	030-CAP-424	06/14/2000	3.5 - 4	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-425	06/14/2000	4.5 - 5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
CA13-26	030-CAP-427	06/21/2000	3.5 - 4.5	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--
	030-CAP-428	06/21/2000	6.5 - 7	--	X	--	--	X	--	X	X	--	--	--	--	--	--	--

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REMOVAL ACTIONS																		
Intermediate Maintenance Facility Removal Action																		
B-IMF-01	IMF-01-00	07/19/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-01-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-01-02	07/19/1991	2 - 2.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-01-04	07/19/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-01-04	12/05/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-01-06	07/19/1991	6 - 6.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-01-08	07/19/1991	8 - 8.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	IMF-01-08	07/30/1991	8 - 8.5	X	X	--	--	X	--	--	--	--	--	--	--	--	--	--
	IMF-01-10	07/19/1991	9.5 - 10	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
B-IMF-02	IMF-02-00	07/18/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-02-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-02-02	07/18/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-02-04	07/18/1991	4 - 4.5	--	--	--	--	--	--	X	X	--	--	--	--	--	--	--
	IMF-02-04	07/31/1991	4 - 4.5	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	IMF-02-06	07/18/1991	6 - 6.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-02-08	07/18/1991	8 - 8.3	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
B-IMF-03	IMF-03-00	07/18/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-03-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-03-02	07/18/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-03-04	07/18/1991	4 - 4.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	IMF-03-06	07/18/1991	6 - 6.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-03-08	07/18/1991	8 - 8.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-03-10	07/18/1991	10 - 10.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
B-IMF-04	IMF-04-00	07/18/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-04-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-04-02	07/18/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-04-04	07/18/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-04-04	12/05/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-04-06	07/18/1991	6 - 6.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	IMF-04-08	07/18/1991	8 - 8.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-04-08	08/25/1991	8 - 8.5	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
	IMF-04-10	07/18/1991	9.5 - 10	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
B-IMF-05	IMF-05-00	07/19/1991	0 - 0.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	IMF-05-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-05-02	07/19/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-05-04	07/19/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-05-06	07/19/1991	6 - 6.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-05-08	07/19/1991	8 - 8.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-05-10	07/19/1991	10 - 10.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
B-IMF-06	IMF-06-00	07/19/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-06-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-06-02	07/19/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-06-04	07/19/1991	4 - 4.5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
	IMF-06-04	12/05/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--

TABLE 6-1: SITE 13 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED														
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	TCLP Metals	General Chemistry	TPH	WET Metals	BTEX	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Intermediate Maintenance Facility Removal Action																		
	IMF-06-04	07/31/1991	4 - 4.5	X	--	--	--	X	--	--	--	--	--	--	--	--	--	--
	IMF-06-06	07/19/1991	6 - 6.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-06-08	07/19/1991	8 - 8.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-06-10	07/19/1991	10 - 10.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-06-10	07/30/1991	10 - 10.5	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
B-IMF-07	B7-04	12/05/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-00	07/19/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-02	07/19/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-04	07/19/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-06	07/19/1991	6 - 6.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-07-08	07/19/1991	8 - 8.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-07-10	07/19/1991	10 - 10.5	--	--	--	--	X	--	X	--	--	--	--	--	--	--	--
	IMF-07-10	07/30/1991	10 - 10.5	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
B-IMF-08	IMF-08-00	07/19/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-00	12/05/1991	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-02	07/19/1991	2 - 2.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-04	07/19/1991	4 - 4.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-06	07/19/1991	6 - 6.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-08	07/19/1991	8 - 8.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
	IMF-08-10	07/19/1991	10 - 10.5	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
EX13-002	137-S13-002	10/07/1993	5	--	--	--	--	X	--	--	X	--	X	--	--	--	--	--
EX13-003	137-S13-003	10/07/1993	5	--	--	--	--	X	--	--	X	--	X	--	--	--	--	--
EX13-004	137-S13-004	10/07/1993	5	--	--	--	--	X	--	--	X	--	X	--	--	--	--	--
EX13-006	137-S13-006	10/07/1993	4	--	--	--	--	X	--	--	X	--	X	--	--	--	--	--
EX13-007	137-S13-007	10/07/1993	4	X	X	--	--	X	X	--	X	--	X	--	--	--	--	--
	137-S13-010	10/07/1993	4	X	X	--	--	X	X	--	X	--	X	--	--	--	--	--
EX13-008	137-S13-008	10/07/1993	4	--	--	--	--	X	--	--	X	--	X	--	--	--	--	--
EX13-009	137-S13-009	10/07/1993	7	X	X	--	--	X	X	--	X	--	X	--	--	--	--	--
EX13-020	137-S13-020	10/19/1994	7	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
EX13-021	137-S13-021	10/19/1994	5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
EX13-022	137-S13-022	10/19/1994	5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
EX13-023	137-S13-023	10/19/1994	5	X	X	--	--	X	--	X	X	--	--	--	--	--	--	--
EX13-024	137-S13-024	10/19/1994	5	--	--	--	--	X	--	X	X	--	--	--	--	--	--	--
Basewide Fuel Line Removal Action Confirmation Sampling, 1998																		
030-S19-001	030-S19-001	10/20/1998	0 - 4.5	X	X	--	X	X	--	X	X	--	--	--	--	--	--	--
030-S19-002	030-S19-002	10/21/1998	0 - 3	X	X	--	X	X	--	X	X	--	--	--	--	--	--	--
030-S19-003	030-S19-003	10/21/1998	0 - 4	X	X	--	X	X	--	X	X	--	--	--	--	--	--	--

Notes:

--	These analyses were not performed.
BTEX	Benzene, toluene, ethylbenzene, and xylene
ft bgs	Feet below ground surface
General chemistry	Percent moisture, flashpoint, cations, anions, TKN, TOC, reactivity, and/or pH
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic compound
TCLP	Toxicity characteristics leaching procedure
TKN	Total Kjelkahl nitrogen
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
VOC	Volatile organic compound
WET	Waste extraction test
X	These analyses were performed.

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
CERCLA INVESTIGATIONS												
Phases 1 & 2A Investigation, 1991												
MW-1	MW-1 [10/15/90]	10/15/1990		X	X	X	--	X	X	--	--	--
MWOR-1	MWOR-1 [08/24/90]	08/24/1990		X	X	--	--	X	X	--	--	--
MWOR-2	MWOR-2 [08/27/90]	08/27/1990		X	X	--	--	X	X	--	--	--
MWOR-3	MWOR-3 [08/27/90]	08/27/1990		X	X	--	--	X	X	--	X	--
MWOR-4	MWOR-4 [08/28/90]	08/27/1990		X	X	X	--	X	X	--	X	--
Follow-on Investigation, 1994												
13GB005	GPW13-500	08/17/1994	5 - 6	--	X	--	--	--	--	--	X	--
13GB100	GPW13-100	08/17/1994	5 - 6	--	X	--	--	--	--	--	X	--
B13-28	280-S13-106	12/09/1994	6 - 6.5	--	X	--	--	--	--	--	X	--
B13-29	280-S13-146	12/09/1994	5.5 - 6	--	X	--	--	--	--	--	X	--
B13-30	280-S13-108	12/09/1994	5.5 - 6	--	X	--	--	--	--	--	X	--
B13-38	ALA13B38-W	04/04/1994	16	--	--	X	--	--	X	--	--	--
B13-39	ALA13B39-W	04/04/1994	17.5	--	--	X	--	--	X	--	--	--
B13-40	ALA13B40-W	04/04/1994	17.5	--	--	X	--	--	X	--	--	--
B13-41	ALA13B41-W	04/05/1994	16	--	--	X	--	--	X	--	--	--
B13-42	ALA13B42-W	04/05/1994	21	--	--	X	--	--	X	--	--	--
B13-43	ALA13B43-W	04/05/1994	16	--	--	X	--	--	X	--	--	--
B13-44	ALA13B44-W	04/06/1994	15.5	--	--	X	--	--	X	--	--	--
D13-01	280-S13-100	12/16/1994		X	X	X	--	X	X	--	X	--
	280-S13-111	02/23/1995		X	X	X	--	X	X	--	--	--
	280-S13-112	06/26/1995		X	X	X	--	X	X	--	--	--
	280-S13-113	09/19/1995		X	X	X	--	X	X	--	--	--
DHP-S13-02	280-S13-073	08/02/1994	17.9	X	X	X	--	--	X	--	X	--
DHP-S13-03	280-S13-074	07/20/1994	22	X	X	X	--	--	X	--	X	--
DHP-S13-04	280-S13-075	07/20/1994	30	X	X	X	--	--	X	--	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
Follow-on Investigation, 1994 (Continued)												
M07C-06	280-S7C-049	11/10/1994		X	X	X	--	--	X	--	X	--
	280-S7C-050	02/17/1995		--	X	X	--	--	X	--	X	--
	280-S7C-051	06/20/1995		X	X	X	--	--	X	--	X	--
	280-S7C-053	08/31/1995		--	X	X	--	--	X	--	X	--
M07C-09	280-S7C-062	11/10/1994		X	X	X	--	--	X	--	X	--
	280-S7C-063	02/20/1995		--	X	X	--	--	X	--	X	--
	280-S7C-064	06/21/1995		X	X	X	--	--	X	--	X	--
	280-S7C-065	08/30/1995		--	X	X	--	--	X	--	X	--
M13-06	280-S13-054	10/21/1994		X	X	X	--	X	X	--	X	--
	280-S13-055	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-057	06/27/1995		X	X	X	--	X	X	--	X	--
	280-S13-058	08/11/1995		X	X	X	--	X	X	--	X	--
M13-07	280-S13-059	11/01/1994		X	X	X	--	X	X	--	X	--
	280-S13-060	02/28/1995		X	X	X	--	X	X	--	X	--
	280-S13-061	06/28/1995		X	X	X	--	X	X	--	X	--
	280-S13-062	08/16/1995		X	X	X	--	X	X	--	X	--
M13-08	280-S13-063	12/14/1994		X	X	X	--	X	X	--	X	--
	280-S13-065	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-066	06/28/1995		X	X	X	--	X	X	--	X	--
	280-S13-067	08/16/1995		X	X	X	--	X	X	--	X	--
M13-09	280-S13-068	12/09/1994		X	X	X	--	X	X	--	X	--
	280-S13-069	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-070	06/28/1995		X	X	X	--	X	X	--	X	--
	280-S13-071	08/18/1995		X	X	X	--	X	X	--	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
Follow-on Investigation, 1994 (Continued)												
MW-1	280-S13-099	12/06/1994		X	X	X	--	X	X	--	X	--
	280-S13-149	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-150	06/27/1995		X	X	X	--	X	X	--	X	--
	280-S13-151	08/17/1995		X	X	X	--	X	X	--	X	--
MWOR-1	280-S13-032	10/20/1994		X	X	X	--	X	X	--	X	--
	280-S13-033	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-034	06/27/1995		X	X	X	--	X	X	--	X	--
	280-S13-035	08/09/1995		X	X	X	--	X	X	--	X	--
MWOR-2	280-S13-037	10/20/1994		X	X	X	--	X	X	--	X	--
	280-S13-038	02/24/1995		X	X	X	--	X	X	--	X	--
	280-S13-039	06/27/1995		X	X	X	--	X	X	--	X	--
	280-S13-040	08/09/1995		X	X	X	--	X	X	--	X	--
MWOR-3	280-S13-041	10/20/1994		X	X	X	--	X	X	--	X	--
	280-S13-042	02/28/1995		X	X	X	--	X	X	--	X	--
	280-S13-043	06/27/1995		X	X	X	--	X	X	--	X	--
	280-S13-045	08/10/1995		X	X	X	--	X	X	--	X	--
MWOR-4	280-S13-046	10/20/1994		X	X	X	--	X	X	--	X	--
	280-S13-047	02/23/1995		X	X	X	--	X	X	--	X	--
	280-S13-048	06/26/1995		X	X	X	--	X	X	--	X	--
	280-S13-049	08/17/1995		X	X	X	--	X	X	--	X	--
Follow-on Investigation, 1998												
M13-06	108-S13-001	11/06/1997		X	X	X	--	--	X	--	X	--
	108-S13-005	02/10/1998		X	X	X	--	--	X	--	X	--
	108-S13-009	05/06/1998		X	X	X	--	--	X	--	X	--
	108-S13-013	08/07/1998		X	X	--	X	--	X	--	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
Follow-on Investigation, 1998 (Continued)												
M13-09	108-S13-002	11/06/1997		--	X	X	--	--	X	--	X	--
	108-S13-006	02/10/1998		--	X	X	--	--	X	--	X	--
	108-S13-010	05/12/1998		--	X	X	--	--	X	--	X	--
	108-S13-014	08/07/1998		--	X	--	X	--	X	--	X	--
Supplemental Remedial Investigation Data Gap Sampling, 2001												
D13-01	385-S13-011	06/29/2001		X	X	--	--	--	--	--	X	X
M07C-06	385-S22-006	07/05/2001		X	X	--	--	--	--	--	X	X
M07C-09	385-S22-009	07/05/2001		X	X	--	--	--	--	--	X	X
M13-06	385-S13-006	06/27/2001		X	X	--	--	--	--	--	X	X
M13-07	385-S13-007	06/27/2001		--	X	--	--	--	--	--	X	--
	385-S13-007A	06/28/2001		X	--	--	--	--	--	--	X	X
M13-08	385-S13-008	06/28/2001		X	X	--	--	--	--	--	X	X
M13-09	385-S13-009	06/28/2001		X	X	--	--	--	--	--	X	X
MW-1	385-S13-010	06/27/2001		--	X	--	--	--	--	--	X	--
	385-S13-010A	06/28/2001		X	--	--	--	--	--	--	X	X
MWOR-1	385-S13-001	06/27/2001		X	X	--	--	--	--	--	X	X
MWOR-2	385-S13-002	06/28/2001		--	X	--	--	--	--	--	X	--
	385-S13-002A	07/19/2001		X	--	--	--	--	--	--	X	X
MWOR-3	385-S13-003	06/28/2001		X	X	--	--	--	--	--	X	X
MWOR-4	385-S13-004	06/29/2001		X	X	--	--	--	--	--	X	X
S13-DGS-VE01	385-S13-014	08/08/2001	5.5 - 8	--	X	--	--	--	--	--	X	--
	385-S13-014A	08/08/2001	5.5 - 8	X	--	--	--	--	--	--	--	--
S13-DGS-VE02	385-S13-017	08/07/2001	8.5 - 10	--	X	--	--	--	--	--	X	--
	385-S13-017A	08/07/2001	8.5 - 10	X	X	--	--	--	--	--	X	X
S13-DGS-VE03	385-S13-027	04/26/2002	7	--	X	--	--	--	--	--	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
Basewide Groundwater Monitoring, 2002												
D13-01	D13-01-A1138	07/08/2002		--	X	X	--	--	X	X	X	--
	D13-01-A1639	12/17/2002		--	X	X	--	--	X	X	X	--
M07C-06	M07C-06-A1139	06/21/2002		--	X	X	--	--	X	X	X	--
	M07C-06-A1339	09/05/2002		--	X	--	--	--	--	--	X	--
	M07C-06-A1640	12/17/2002		--	X	X	--	--	X	X	X	--
	M07C-06-A1993	04/14/2003		--	X	--	--	--	--	--	X	--
M07C-09	MW7C-09-A1141	06/19/2002		--	X	X	--	--	X	X	X	--
	M07C-09-A1340	09/04/2002		--	X	--	--	--	--	--	X	--
	M07C-09-A1642	12/17/2002		--	X	X	--	--	X	X	X	--
	M07C-09-A1994	04/10/2003		--	X	--	--	--	--	--	X	--
M13-06	M13-06-A1144	06/18/2002		--	X	X	--	--	X	X	X	--
	M13-06-A1645	12/17/2002		--	X	X	--	--	X	X	X	--
M13-07	M13-07-A1145	06/18/2002		--	X	X	--	--	X	X	X	--
	M13-07-A1646	12/17/2002		--	X	X	--	--	X	X	X	--
M13-08	M13-08-A1146	06/20/2002		--	X	X	--	--	X	X	X	--
	M13-08-A1647	12/17/2002		--	X	X	--	--	X	X	X	--
M13-09	M13-09-A1147	06/19/2002		--	X	X	--	--	X	X	X	--
	M13-09-A1648	12/17/2002		--	X	X	--	--	X	X	X	--
MW-1	MW-1-A1148	06/18/2002		--	X	X	--	--	X	X	X	--
	MW-1-A1649	12/17/2002		--	X	X	--	--	X	X	X	--
MWOR-4	MWOR-4-A1159	06/19/2002		--	X	X	--	--	X	X	X	--
	MWOR-4-A1660	12/17/2002		--	X	X	--	--	X	X	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS												
Fuel Line and Underground Storage Tank Investigations												
CA13-01	030-CAP-187	04/27/2000	0 - 10	--	X	X	--	--	X	--	X	--
CA13-02	030-CAP-188	05/11/2000	0 - 10	--	X	X	--	--	X	--	X	--
CA13-04	030-CAP-189	06/15/2000	0 - 10	--	X	X	--	--	X	--	X	--
CA13-05	030-CAP-423	06/15/2000	0 - 10	--	X	--	--	--	X	--	X	--
	030-CAP-423A	06/16/2000	0 - 10	--	--	X	--	--	X	--	X	--
CA13-11	030-CAP-225	05/09/2000	0 - 10	--	X	X	--	--	--	--	X	--
CA13-12	030-CAP-226	05/09/2000	0 - 10	--	X	X	--	--	--	--	X	--
CA13-13	030-CAP-227	05/11/2000	2.5 - 7.5	--	X	X	--	--	--	--	X	--
CA13-14	030-CAP-228	05/11/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-15	030-CAP-229	05/11/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-16	030-CAP-230	05/11/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-17	030-CAP-231	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-18	030-CAP-232	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-19	030-CAP-233	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-20	030-CAP-234	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-21	030-CAP-413	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-22	030-CAP-416	06/15/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-23	030-CAP-419	06/15/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-24	030-CAP-422	06/15/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-25	030-CAP-426	06/14/2000	3 - 8	--	X	X	--	--	--	--	X	--
CA13-26	030-CAP-429	06/21/2000	3 - 8	--	X	X	--	--	--	--	X	--
M07C-09	030-CAP-065	04/27/2000		--	X	--	--	--	--	--	--	--
M13-07	030-CAP-199	04/25/2000		--	X	X	--	--	--	--	X	--
MW-1	030-CAP-196	04/25/2000		--	X	X	--	--	--	--	X	--

TABLE 6-2: SITE 13 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	Landfill Gases	TPH	PAH
REMOVAL ACTIONS												
Intermediate Maintenance Facility Removal Action												
B-IMF-09	B-IMF-09	04/03/1992	6	--	--	X	--	--	--	--	--	--
B-IMF-10	B-IMF-10	04/03/1992	10 - 10.5	--	--	X	--	--	--	--	--	--
M-IMF-01	MIMF-01	08/09/1991		--	--	X	--	--	X	--	X	--
	M-IMF-01	04/17/1992		--	--	X	--	--	--	--	--	--
M-IMF-02	M-IMF-02	04/17/1992		--	--	X	--	--	--	--	--	--

Notes:

--	These analyses were not performed.
DOC	Dissolved organic carbon
ft bgs	Feet below ground surface
General chemistry	Acidity, alkalinity, major anions, conductivity, DOC, dissolved gases, hardness, oxydation, MBAS, pH, TDS and/or TOC
MBAS	Methylene blue active substances (surfactants)
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic cmpound
TDS	Total dissolved solids
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound
X	These analyses were performed.

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	75	0	0	--	--	--	5	2,900	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	75	0	0	--	--	--	5	**5,900**	0	7	410
1,1,2-TRICHLOROETHANE	75	0	0	--	--	--	5	**2,900**	0	5	730
1,1-DICHLOROETHANE	75	0	0	--	--	--	5	**2,900**	0	1	2,800 (CAL-modified)
1,1-DICHLOROETHENE	75	0	0	--	--	--	5	2,900	0	0	120,000
1,2-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	370,000
1,2-DICHLOROETHANE	75	0	0	--	--	--	5	**2,900**	0	7	280
1,2-DICHLOROETHENE (TOTAL)	75	0	0	--	--	--	5	2,900	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	75	0	0	--	--	--	5	**2,900**	0	7	340
1,3-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	16,000
1,4-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	3,400
2-BUTANONE	75	0	0	--	--	--	10	5,900	--	--	NA
2-CHLOROETHYLVINYLETHER	56	0	0	--	--	--	10	5,900	--	--	NA
2-HEXANONE	75	0	0	--	--	--	10	5,900	--	--	NA
4-METHYL-2-PENTANONE	75	0	0	--	--	--	5	5,900	--	--	NA
ACETONE	75	0	0	--	--	--	10	5,900	0	0	1,600,000
BENZENE	75	5	7	470	2 J	**1,000**	5	**2,900**	2	4	600
BROMODICHLOROMETHANE	75	0	0	--	--	--	5	**2,900**	0	1	820
BROMOFORM	75	0	0	--	--	--	5	2,900	0	0	62,000
BROMOMETHANE	75	0	0	--	--	--	10	**5,900**	0	1	3,900
CARBON DISULFIDE	75	0	0	--	--	--	5	2,900	0	0	360,000
CARBON TETRACHLORIDE	75	0	0	--	--	--	5	**2,900**	0	7	250
CHLOROBENZENE	75	0	0	--	--	--	5	2,900	0	0	150,000
CHLOROETHANE	75	0	0	--	--	--	10	**5,900**	0	1	3,000
CHLOROFORM	75	0	0	--	--	--	5	**2,900**	0	1	940 (CAL-modified)
CHLOROMETHANE	75	0	0	--	--	--	10	**5,900**	0	7	1,200
CIS-1,3-DICHLOROPROPENE	75	0	0	--	--	--	5	**2,900**	0	2	780 (not cis)
DIBROMOCHLOROMETHANE	75	0	0	--	--	--	5	**2,900**	0	1	1,100
ETHYLBENZENE	75	6	8	790	5 J	1,800	5	790	0	0	8,900
METHYLENE CHLORIDE	75	0	0	--	--	--	5	5,900	0	0	9,100
STYRENE	75	0	0	--	--	--	5	2,900	0	0	1,700,000

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TETRACHLOROETHENE	75	0	0	--	--	--	5	**2,900**	0	1	1,500
TOLUENE	75	63	84	100	1 J	1,600	5	2,900	0	0	520,000
TRANS-1,3-DICHLOROPROPENE	75	0	0	--	--	--	5	**2,900**	0	2	780 (not trans)
TRICHLOROETHENE	75	0	0	--	--	--	5	**2,900**	0	7	53
TRICHLOROFLUOROMETHANE	56	0	0	--	--	--	5	2,900	0	0	390,000
VINYL ACETATE	74	0	0	--	--	--	10	5,900	0	0	430,000
VINYL CHLORIDE	75	0	0	--	--	--	10	**5,900**	0	7	79 (child or adult)
XYLENE (TOTAL)	75	2	3	2,100	27	4,100	5	2,900	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	95	0	0	--	--	--	340	34,000	0	0	650,000
1,2-DICHLOROBENZENE	95	0	0	--	--	--	340	34,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	81	0	0	--	--	--	340	**7,900**	0	11	610
1,3-DICHLOROBENZENE	95	0	0	--	--	--	340	**34,000**	0	1	16,000
1,4-DICHLOROBENZENE	95	0	0	--	--	--	340	**34,000**	0	6	3,400
2,4,5-TRICHLOROPHENOL	95	0	0	--	--	--	1,600	170,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	95	0	0	--	--	--	340	**34,000**	0	3	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	95	0	0	--	--	--	340	34,000	0	0	180,000
2,4-DIMETHYLPHENOL	95	0	0	--	--	--	340	34,000	0	0	1,200,000
2,4-DINITROPHENOL	95	0	0	--	--	--	1,600	**170,000**	0	1	120,000
2,4-DINITROTOLUENE	95	0	0	--	--	--	340	34,000	0	0	120,000
2,6-DINITROTOLUENE	95	0	0	--	--	--	340	34,000	0	0	61,000
2-CHLORONAPHTHALENE	95	0	0	--	--	--	340	34,000	--	--	NA
2-CHLOROPHENOL	95	0	0	--	--	--	340	34,000	0	0	63,000
2-METHYLNAPHTHALENE	95	7	7	6,000	50 J	17,000	340	34,000	--	--	NA
2-METHYLPHENOL	95	0	0	--	--	--	340	34,000	--	--	NA
2-NITROANILINE	95	0	0	--	--	--	1,600	**170,000**	0	75	1,700
2-NITROPHENOL	95	0	0	--	--	--	340	34,000	--	--	NA
3,3'-DICHLOROBENZIDINE	95	0	0	--	--	--	670	**68,000**	0	19	1,100
3-NITROANILINE	95	0	0	--	--	--	1,600	170,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	95	0	0	--	--	--	1,600	170,000	--	--	NA

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
4-BROMOPHENYL-PHENYLETHER	95	0	0	--	--	--	340	34,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	95	0	0	--	--	--	340	34,000	--	--	NA
4-CHLOROANILINE	95	0	0	--	--	--	340	34,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	95	0	0	--	--	--	340	34,000	--	--	NA
4-METHYLPHENOL	95	0	0	--	--	--	340	34,000	0	0	310,000
4-NITROANILINE	95	0	0	--	--	--	1,600	170,000	--	--	NA
4-NITROPHENOL	95	0	0	--	--	--	390	170,000	--	--	NA
ACENAPHTHENE	94	1	1	410	410 J	410 J	340	34,000	0	0	3,700,000
ACENAPHTHYLENE	95	0	0	--	--	--	340	34,000	--	--	NA
ANILINE	40	0	0	--	--	--	340	6,900	0	0	85,000
ANTHRACENE	95	5	5	65	40 J	100 J	340	34,000	0	0	22,000,000
BENZO(A)ANTHRACENE	95	10	11	150	52 J	390 J	340	**34,000**	0	16	620
BENZO(A)PYRENE	95	6	6	**240**	**63 J**	**520**	**340**	**34,000**	6	89	62
BENZO(B)FLUORANTHENE	95	5	5	420	95 J	**1,100**	340	**34,000**	1	17	620
BENZO(G,H,I)PERYLENE	94	4	4	540	100 J	1,400	340	34,000	--	--	NA
BENZO(K)FLUORANTHENE	95	4	4	300	110 J	**510**	340	**34,000**	2	61	380 (CAL-modified)
BENZOIC ACID	95	0	0	--	--	--	1,600	170,000	0	0	100,000,000
BENZYL ALCOHOL	95	0	0	--	--	--	340	34,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	95	0	0	--	--	--	340	34,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	95	0	0	--	--	--	**340**	**34,000**	0	95	210
BIS(2-ETHYLHEXYL)PHTHALATE	95	0	0	--	--	--	340	34,000	0	0	35,000
BUTYLBENZYLPHTHALATE	95	0	0	--	--	--	340	34,000	0	0	12,000,000
CHRYSENE	95	12	13	350	40 J	2,300 J	340	**34,000**	0	4	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	95	0	0	--	--	--	340	34,000	--	--	NA
DI-N-OCTYLPHTHALATE	95	0	0	--	--	--	340	34,000	--	--	NA
DIBENZO(A,H)ANTHRACENE	95	0	0	--	--	--	**340**	**34,000**	0	95	62
DIBENZOFURAN	95	0	0	--	--	--	340	34,000	0	0	290,000
DIETHYLPHTHALATE	95	0	0	--	--	--	340	34,000	0	0	49,000,000
DIMETHYLPHTHALATE	95	0	0	--	--	--	340	34,000	0	0	100,000,000
FLUORANTHENE	95	11	12	250	42 J	800	340	34,000	0	0	2,300,000
FLUORENE	95	5	5	300	41 J	790 J	340	34,000	0	0	2,700,000

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
HEXACHLOROBENZENE	95	0	0	--	--	--	**340**	**34,000**	0	95	300
HEXACHLOROBUTADIENE	95	0	0	--	--	--	340	**34,000**	0	5	6,200
HEXACHLOROCYCLOPENTADIENE	95	0	0	--	--	--	340	34,000	0	0	370,000
HEXACHLOROETHANE	95	0	0	--	--	--	340	34,000	0	0	35,000
INDENO(1,2,3-CD)PYRENE	95	3	3	350	90 J	**690**	340	**34,000**	1	17	620
ISOPHORONE	95	0	0	--	--	--	340	34,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	94	0	0	--	--	--	**340**	**34,000**	0	94	69
N-NITROSODIMETHYLAMINE	40	0	0	--	--	--	**340**	**6,900**	0	40	10
N-NITROSODIPHENYLAMINE	94	31	33	190	42 J	2,700 J	340	34,000	0	0	99,000
NAPHTHALENE	95	28	29	610	36 J	5,400	340	34,000	0	0	56,000
NITROBENZENE	94	0	0	--	--	--	340	**34,000**	0	1	20,000
PENTACHLOROPHENOL	95	4	4	520	170 J	1,000 J	1,600	**170,000**	0	17	3,000
PHENANTHRENE	95	17	18	300	37 J	1,800	340	34,000	--	--	NA
PHENOL	95	0	0	--	--	--	340	34,000	0	0	37,000,000
PYRENE	95	13	14	360	46 J	1,900	340	34,000	0	0	2,300,000
PCBs/Pesticides (µg/kg)											
4,4'-DDD	96	2	2	7	5	9	2	470	0	0	2,400
4,4'-DDE	96	5	5	24	4	35	2	470	0	0	1,700
4,4'-DDT	96	7	7	30	2	160	2	470	0	0	1,700
ALDRIN	96	0	0	--	--	--	1	**240**	0	4	29
ALPHA-BHC	96	0	0	--	--	--	1	240	--	--	NA
ALPHA-CHLORDANE	36	0	0	--	--	--	4	**2,400**	0	1	1,600 (chlordane)
AROCLOR-1016	95	0	0	--	--	--	26	2,400	0	0	3,900
AROCLOR-1221	95	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1232	95	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1242	95	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1248	95	0	0	--	--	--	17	**2,400**	0	7	220
AROCLOR-1254	95	0	0	--	--	--	17	**4,700**	0	11	220
AROCLOR-1260	95	0	0	--	--	--	17	**4,700**	0	11	220
BETA-BHC	96	2	2	3	2	4	1	240	--	--	NA

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
PCBs/Pesticides (µg/kg)											
CHLORDANE	59	0	0	--	--	--	10	530	0	0	1,600
DELTA-BHC	96	0	0	--	--	--	1	240	--	--	NA
DIELDRIN	96	0	0	--	--	--	1	**470**	0	5	30
ENDOSULFAN I	96	0	0	--	--	--	2	240	0	0	370,000
ENDOSULFAN II	96	0	0	--	--	--	2	470	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	96	0	0	--	--	--	2	470	--	--	NA
ENDRIN	94	0	0	--	--	--	2	470	0	0	18,000
ENDRIN ALDEHYDE	60	0	0	--	--	--	2	100	--	--	NA
ENDRIN KETONE	36	0	0	--	--	--	8	470	--	--	NA
GAMMA-BHC (LINDANE)	95	0	0	--	--	--	1	240	--	--	NA
GAMMA-CHLORDANE	36	0	0	--	--	--	4	**2,400**	0	1	1,600 (chlordane)
HEPTACHLOR	94	0	0	--	--	--	1	**240**	0	1	110
HEPTACHLOR EPOXIDE	92	1	1	5	5	5	1	**240**	0	2	53
METHOXYCHLOR	96	0	0	--	--	--	5	2,400	0	0	310,000
TOXAPHENE	95	0	0	--	--	--	52	**4,700**	0	13	440
Metals (mg/kg)											
ALUMINUM	94	94	100	7,510	45.8	18,200	0.0	0.0	0	0	76,000
ANTIMONY	95	25	26	5.0	2.7	8.2	2.1	7.8	0	0	31.0
ARSENIC	94	30	32	**4.7**	**2.5**	**20.0**	**2.5**	**13.0**	30	64	0.39
BARIUM	94	89	95	62.4	17.6	290	21.0	24.0	0	0	5,400
BERYLLIUM	95	21	22	0.30	0.20	0.40	0.20	1.3	0	0	150
CADMIUM	95	35	37	0.50	0.20	3.5	0.20	1.3	0	0	37.0
CALCIUM	94	94	100	3,020	870	26,500	0.0	0.0	--	--	NA
CHROMIUM	94	94	100	36.4	3.6	75.0	0.0	0.0	0	0	210
COBALT	95	68	72	6.3	2.7	15.2	5.1	6.3	0	0	900
COPPER	94	93	99	18.2	4.7	160	5.8	5.8	0	0	3,100
IRON	94	94	100	11,800	5,450	**28,500**	0.0	0.0	2	0	23,000
LEAD	95	33	35	23.3	5.7	**260**	5.1	6.5	1	0	150 (CAL-modified)
MAGNESIUM	94	94	100	3,070	1,200	12,000	0.0	0.0	--	--	NA
MANGANESE	94	94	100	159	64.0	702	0.0	0.0	0	0	1,800

TABLE 6-3 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
MOLYBDENUM	95	0	0	--	--	--	1.0	6.5	0	0	390
NICKEL	94	94	100	36.4	2.6	69.1	0.0	0.0	0	0	1,600
POTASSIUM	94	88	94	863	270	2,700	520	590	--	--	NA
SELENIUM	94	5	5	13.0	12.0	15.0	4.3	13.0	0	0	390
SILVER	95	0	0	--	--	--	0.60	6.5	0	0	390
SODIUM	94	59	63	617	102	2,550	510	650	--	--	NA
THALLIUM	94	1	1	2.7	2.7	2.7	2.7	**13.0**	0	43	5.2
TITANIUM	94	94	100	413	42.6	655	0.0	0.0	--	--	NA
VANADIUM	94	94	100	42.6	12.5	**1,780**	0.0	0.0	1	0	550
ZINC	94	94	100	46.5	14.0	1,280	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
mg/kg	Milligrams per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Micrograms per kilogram

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	5	0	0	--	--	--	5	25	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	5	0	0	--	--	--	**5**	**25**	0	5	0.06	1
1,1,2-TRICHLOROETHANE	5	0	0	--	--	--	**5**	**25**	0	5	0.2	5
1,1-DICHLOROETHANE	5	0	0	--	--	--	**5**	**25**	0	5	2 (CAL-modified)	5
1,1-DICHLOROETHENE	5	0	0	--	--	--	5	25	0	0	340	6
1,2-DICHLOROETHANE	5	0	0	--	--	--	**5**	**25**	0	5	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	5	0	0	--	--	--	5	25	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	5	0	0	--	--	--	**5**	**25**	0	5	0.2	5
2-BUTANONE	5	0	0	--	--	--	10	50	--	--	NA	NA
2-HEXANONE	5	0	0	--	--	--	10	50	--	--	NA	NA
4-METHYL-2-PENTANONE	5	0	0	--	--	--	10	50	--	--	NA	NA
ACETONE	5	0	0	--	--	--	10	50	0	0	610	NA
BENZENE	5	1	20	**400**	**400**	**400**	**5**	**5**	1	4	0.3	1
BROMODICHLOROMETHANE	5	0	0	--	--	--	**5**	**25**	0	5	0.2	80
BROMOFORM	5	0	0	--	--	--	5	**25**	0	1	9	80
BROMOMETHANE	5	0	0	--	--	--	**10**	**50**	0	5	9	NA
CARBON DISULFIDE	5	0	0	--	--	--	5	25	0	0	1,000	NA
CARBON TETRACHLORIDE	5	0	0	--	--	--	**5**	**25**	0	5	0.2	0.5
CHLOROBENZENE	5	0	0	--	--	--	5	25	0	0	110	70
CHLOROETHANE	5	0	0	--	--	--	**10**	**50**	0	5	5	NA
CHLOROFORM	5	0	0	--	--	--	**5**	**25**	0	5	0.5 (CAL-modified)	80
CHLOROMETHANE	5	0	0	--	--	--	**10**	**50**	0	5	2	NA
CIS-1,3-DICHLOROPROPENE	5	0	0	--	--	--	**5**	**25**	0	5	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	5	0	0	--	--	--	**5**	**25**	0	5	0.1	80
ETHYLBENZENE	5	1	20	**34**	**34**	**34**	**5**	**5**	1	4	3	300
METHYLENE CHLORIDE	5	0	0	--	--	--	**5**	**25**	0	5	4	NA
STYRENE	5	0	0	--	--	--	5	25	0	0	1,600	100
TETRACHLOROETHENE	5	0	0	--	--	--	**5**	**25**	0	5	0.7	5
TOLUENE	5	0	0	--	--	--	5	25	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	5	0	0	--	--	--	**5**	**25**	0	5	0.4 (not trans)	0.5
TRICHLOROETHENE	5	0	0	--	--	--	**5**	**25**	0	5	0.03	5

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
VINYL ACETATE	5	0	0	--	--	--	5	25	0	0	410	NA
VINYL CHLORIDE	5	0	0	--	--	--	**10**	**50**	0	5	0.02 (child or adult)	0.5
XYLENE (TOTAL)	5	1	20	32	32	32	5	5	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	5	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	5	0	0	--	--	--	10	10	0	0	370	600
1,3-DICHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	6	NA
1,4-DICHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	0.5	5
2,4,5-TRICHLOROPHENOL	5	0	0	--	--	--	50	50	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	5	0	0	--	--	--	**10**	**10**	0	5	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	5	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	5	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	5	0	0	--	--	--	50	50	0	0	73	NA
2,4-DINITROTOLUENE	5	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	5	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	5	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	5	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	5	1	20	16	16	16	10	10	--	--	NA	NA
2-METHYLPHENOL	5	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	5	0	0	--	--	--	**50**	**50**	0	5	1	NA
2-NITROPHENOL	5	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	5	0	0	--	--	--	**20**	**20**	0	5	0.2	NA
3-NITROANILINE	5	0	0	--	--	--	50	50	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	5	0	0	--	--	--	50	50	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	5	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	5	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	5	0	0	--	--	--	10	10	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	5	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	5	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	5	0	0	--	--	--	50	50	--	--	NA	NA

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-NITROPHENOL	5	0	0	--	--	--	50	50	--	--	NA	NA
ACENAPHTHENE	5	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	5	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	5	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	0.1
BENZO(A)PYRENE	5	0	0	--	--	--	**10**	**10**	0	5	0.009	0.2
BENZO(B)FLUORANTHENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	NA
BENZO(G,H,I)PERYLENE	5	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	5	0	0	--	--	--	**10**	**10**	0	5	0.06 (CAL-modified)	NA
BENZOIC ACID	5	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	5	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	5	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	5	0	0	--	--	--	**10**	**10**	0	5	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	5	0	0	--	--	--	**10**	**11**	0	5	5	NA
BUTYLBENZYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	7,300	NA
CHRYSENE	5	0	0	--	--	--	**10**	**10**	0	5	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	5	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	5	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	5	0	0	--	--	--	**10**	**10**	0	5	0.009	NA
DIBENZOFURAN	5	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	5	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	5	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	0.04	1
HEXACHLOROBUTADIENE	5	0	0	--	--	--	**10**	**10**	0	5	0.9	NA
HEXACHLOROCYCLOPENTADIENE	5	0	0	--	--	--	10	10	0	0	220	NA
HEXACHLOROETHANE	5	0	0	--	--	--	**10**	**10**	0	5	5	NA
INDENO(1,2,3-CD)PYRENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	NA
ISOPHORONE	5	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	5	0	0	--	--	--	**10**	**10**	0	5	0.01	NA

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
N-NITROSODIPHENYLAMINE	5	0	0	--	--	--	10	10	0	0	14	NA
NAPHTHALENE	5	1	20	**23**	**23**	**23**	**10**	**10**	1	4	6	NA
NITROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	3	NA
PENTACHLOROPHENOL	5	0	0	--	--	--	**50**	**50**	0	5	0.6	1
PHENANTHRENE	5	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	5	0	0	--	--	--	10	10	0	0	22,000	NA
PYRENE	5	0	0	--	--	--	10	10	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	2	0	0	--	--	--	0.02	0.02	0	0	0.3	NA
4,4'-DDE	2	0	0	--	--	--	0.02	0.02	0	0	0.2	NA
4,4'-DDT	2	1	50	0.08	0.08	0.08	0.02	0.02	0	0	0.2	NA
ALDRIN	2	0	0	--	--	--	**0.02**	**0.02**	0	2	0.004	NA
ALPHA-BHC	2	0	0	--	--	--	0.02	0.02	--	--	NA	NA
AROCLOR-1016	2	0	0	--	--	--	0.3	0.3	0	0	1	NA
AROCLOR-1221	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.03	NA
AROCLOR-1232	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.03	NA
AROCLOR-1242	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.03	NA
AROCLOR-1248	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.03	NA
AROCLOR-1254	2	0	0	--	--	--	**0.5**	**0.5**	0	2	0.03	NA
AROCLOR-1260	2	0	0	--	--	--	**0.5**	**0.5**	0	2	0.03	NA
BETA-BHC	2	0	0	--	--	--	0.02	0.02	--	--	NA	NA
CHLORDANE	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.2	NA
DELTA-BHC	2	0	0	--	--	--	0.02	0.02	--	--	NA	NA
DIELDRIN	2	0	0	--	--	--	**0.02**	**0.02**	0	2	0.004	NA
ENDOSULFAN I	2	0	0	--	--	--	0.02	0.02	0	0	220	NA
ENDOSULFAN II	5	0	0	--	--	--	0.02	0.02	--	--	NA	NA
ENDOSULFAN SULFATE	2	0	0	--	--	--	0.02	0.02	--	--	NA	NA
ENDRIN	2	0	0	--	--	--	0.02	0.02	0	0	11	2
ENDRIN ALDEHYDE	5	0	0	--	--	--	0.02	0.02	--	--	NA	NA
GAMMA-BHC (LINDANE)	2	0	0	--	--	--	0.02	0.02	--	--	NA	NA

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
PCBs/Pesticides (µg/L)												
HEPTACHLOR	2	0	0	--	--	--	**0.02**	**0.02**	0	2	0.02	0.01
HEPTACHLOR EPOXIDE	5	0	0	--	--	--	**0.02**	**0.02**	0	5	0.007	0.01
METHOXYCHLOR	2	0	0	--	--	--	0.05	0.05	0	0	180	30
TOXAPHENE	2	0	0	--	--	--	**1**	**1**	0	2	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	2	2	100	147,000	**50,000**	**244,000**	0.0	0.0	2	0	36,000	NA
ANTIMONY	2	0	0	--	--	--	**60.0**	**60.0**	0	2	15.0	6.0
ARSENIC	2	0	0	--	--	--	**50.0**	**200**	0	2	0.045	10.0
BARIUM	2	2	100	1,180	660	1,700	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	2	1	50	6.0	6.0	6.0	5.0	5.0	0	0	73.0	4.0
CADMIUM	2	0	0	--	--	--	5.0	5.0	0	0	18.0	5.0
CALCIUM	2	2	100	71,500	61,000	82,000	0.0	0.0	--	--	NA	NA
CHROMIUM	2	2	100	435	150	720	0.0	0.0	--	--	NA	50.0
COBALT	2	1	50	170	170	170	50.0	50.0	0	0	730	NA
COPPER	2	2	100	121	51.0	190	0.0	0.0	0	0	1,500	1,300
IRON	2	2	100	196,000	**92,000**	**300,000**	0.0	0.0	2	0	11,000	NA
LEAD	2	0	0	--	--	--	50.0	50.0	--	--	NA	15.0
MAGNESIUM	2	2	100	80,500	80,000	81,000	0.0	0.0	--	--	NA	NA
MANGANESE	2	2	100	3,750	**2,700**	**4,800**	0.0	0.0	2	0	880	NA
MOLYBDENUM	2	0	0	--	--	--	50.0	50.0	0	0	180	NA
NICKEL	2	2	100	555	190	**920**	0.0	0.0	1	0	730	100
POTASSIUM	2	2	100	20,500	16,000	25,000	0.0	0.0	--	--	NA	NA
SELENIUM	2	1	50	120	120	120	100	100	0	0	180	50.0
SILVER	2	0	0	--	--	--	10.0	10.0	0	0	180	NA
SODIUM	2	2	100	277,000	47,000	506,000	0.0	0.0	--	--	NA	NA
THALLIUM	2	0	0	--	--	--	**50.0**	**100**	0	2	2.4	2.0
TITANIUM	2	2	100	3,450	1,300	5,600	0.0	0.0	--	--	NA	NA
VANADIUM	2	2	100	**340**	130	**550**	0.0	0.0	1	0	260	NA
ZINC	2	2	100	370	180	560	0.0	0.0	0	0	11,000	NA

TABLE 6-4 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 6-5 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	30	0	0	--	--	--	10	61	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	30	0	0	--	--	--	10	61	0	0	410
1,1,2-TRICHLOROETHANE	30	0	0	--	--	--	10	61	0	0	730
1,1-DICHLOROETHANE	30	0	0	--	--	--	10	61	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	30	0	0	--	--	--	10	61	0	0	120,000
1,2-DICHLOROETHANE	30	0	0	--	--	--	10	61	0	0	280
1,2-DICHLOROETHENE (TOTAL)	30	0	0	--	--	--	10	61	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	30	0	0	--	--	--	10	61	0	0	340
2-BUTANONE	30	0	0	--	--	--	10	61	--	--	NA
2-HEXANONE	30	0	0	--	--	--	10	61	--	--	NA
4-METHYL-2-PENTANONE	30	0	0	--	--	--	10	61	--	--	NA
ACETONE	30	4	13	190	150 J	240 J	10	120	0	0	1,600,000
BENZENE	30	4	13	28	2 J	82	10	61	0	0	600
BROMODICHLOROMETHANE	30	0	0	--	--	--	10	61	0	0	820
BROMOFORM	30	0	0	--	--	--	10	61	0	0	62,000
BROMOMETHANE	30	0	0	--	--	--	10	61	0	0	3,900
CARBON DISULFIDE	30	3	10	2	1 J	2 J	10	61	0	0	360,000
CARBON TETRACHLORIDE	30	0	0	--	--	--	10	61	0	0	250
CHLOROBENZENE	30	1	3	2	2 J	2 J	10	61	0	0	150,000
CHLOROETHANE	30	0	0	--	--	--	10	61	0	0	3,000
CHLOROFORM	30	0	0	--	--	--	10	61	0	0	940 (CAL-modified)
CHLOROMETHANE	30	0	0	--	--	--	10	61	0	0	1,200
CIS-1,3-DICHLOROPROPENE	30	0	0	--	--	--	10	61	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	30	0	0	--	--	--	10	61	0	0	1,100
ETHYLBENZENE	30	11	37	560	3 J	5,100	10	14	0	0	8,900
ETHYLENE DIBROMIDE	6	0	0	--	--	--	6	14	--	--	NA
METHYLENE CHLORIDE	30	0	0	--	--	--	10	61	0	0	9,100
STYRENE	30	0	0	--	--	--	10	61	0	0	1,700,000
TETRACHLOROETHENE	30	0	0	--	--	--	10	61	0	0	1,500
TOLUENE	30	7	23	35	1 J	220	10	61	0	0	520,000
TRANS-1,3-DICHLOROPROPENE	30	0	0	--	--	--	10	61	0	0	780 (not trans)

TABLE 6-5 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TRICHLOROETHENE	30	0	0	--	--	--	10	**61**	0	2	53
VINYL CHLORIDE	30	0	0	--	--	--	10	61	0	0	79 (child or adult)
XYLENE (TOTAL)	30	12	40	3,800	5J	38,000	10	52	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	47	0	0	--	--	--	350	62,000	0	0	650,000
1,2-DICHLOROBENZENE	47	0	0	--	--	--	350	62,000	0	0	370,000
1,3-DICHLOROBENZENE	47	0	0	--	--	--	350	**62,000**	0	1	16,000
1,4-DICHLOROBENZENE	47	0	0	--	--	--	350	**62,000**	0	5	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	47	0	0	--	--	--	350	62,000	--	--	NA
2,4,5-TRICHLOROPHENOL	47	0	0	--	--	--	870	150,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	47	0	0	--	--	--	350	**62,000**	0	4	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	47	0	0	--	--	--	350	62,000	0	0	180,000
2,4-DIMETHYLPHENOL	47	1	2	12,000	12,000J	12,000 J	350	14,000	0	0	1,200,000
2,4-DINITROPHENOL	37	0	0	--	--	--	870	8,800	0	0	120,000
2,4-DINITROTOLUENE	47	0	0	--	--	--	350	62,000	0	0	120,000
2,6-DINITROTOLUENE	47	0	0	--	--	--	350	**62,000**	0	1	61,000
2-CHLORONAPHTHALENE	47	0	0	--	--	--	350	62,000	--	--	NA
2-CHLOROPHENOL	47	0	0	--	--	--	350	62,000	0	0	63,000
2-METHYLNAPHTHALENE	47	10	21	21,000	36J	160,000	350	12,000	--	--	NA
2-METHYLPHENOL	47	0	0	--	--	--	350	62,000	--	--	NA
2-NITROANILINE	47	0	0	--	--	--	870	**150,000**	0	9	1,700
2-NITROPHENOL	47	0	0	--	--	--	350	62,000	--	--	NA
3,3'-DICHLOROBENZIDINE	47	0	0	--	--	--	350	**62,000**	0	8	1,100
3-NITROANILINE	47	0	0	--	--	--	870	150,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	47	0	0	--	--	--	870	150,000	--	--	NA
4-BROMOPHENYL-PHENYLETHER	47	0	0	--	--	--	350	62,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	47	0	0	--	--	--	350	62,000	--	--	NA
4-CHLOROANILINE	47	0	0	--	--	--	350	62,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	47	0	0	--	--	--	350	62,000	--	--	NA
4-METHYLPHENOL	47	0	0	--	--	--	350	62,000	0	0	310,000

TABLE 6-5 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
4-NITROANILINE	47	0	0	--	--	--	870	150,000	--	--	NA
4-NITROPHENOL	47	0	0	--	--	--	870	150,000	--	--	NA
ACENAPHTHENE	47	3	6	100	25 J	250 J	350	62,000	0	0	3,700,000
ACENAPHTHYLENE	47	2	4	68	25 J	110 J	350	62,000	--	--	NA
ANTHRACENE	47	11	23	940	32 J	4,800 J	350	3,600	0	0	22,000,000
BENZO(A)ANTHRACENE	47	4	9	270	82 J	**680**	350	**62,000**	1	9	620
BENZO(A)PYRENE	47	7	15	**450**	35 J	**1,700**	**350**	**62,000**	6	40	62
BENZO(B)FLUORANTHENE	47	8	17	**890**	20 J	**5,100 J**	350	**14,000**	2	6	620
BENZO(G,H,I)PERYLENE	47	8	17	330	18 J	1,600	350	62,000	--	--	NA
BENZO(K)FLUORANTHENE	47	2	4	1,300	**500**	**2,100**	350	**62,000**	2	38	380 (CAL-modified)
BIS(2-CHLOROETHOXY)METHANE	47	0	0	--	--	--	350	62,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	47	0	0	--	--	--	**350**	**62,000**	0	47	210
BIS(2-ETHYLHEXYL)PHTHALATE	47	0	0	--	--	--	350	**62,000**	0	1	35,000
BUTYLBENZYLPHTHALATE	47	0	0	--	--	--	350	62,000	0	0	12,000,000
CARBAZOLE	47	2	4	3,100	270 J	5,900 J	350	14,000	0	0	24,000
CHRYSENE	47	19	40	3,600	20 J	**36,000 J**	350	**11,000**	3	1	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	47	4	9	35	31 J	43 J	350	62,000	--	--	NA
DI-N-OCTYLPHTHALATE	47	0	0	--	--	--	350	62,000	--	--	NA
DIBENZO(A,H)ANTHRACENE	47	4	9	**110**	52 J	**180 J**	**350**	**62,000**	3	43	62
DIBENZOFURAN	47	3	6	2,800	23 J	6,900 J	350	12,000	0	0	290,000
DIETHYLPHTHALATE	47	0	0	--	--	--	350	62,000	0	0	49,000,000
DIMETHYLPHTHALATE	47	0	0	--	--	--	350	62,000	0	0	100,000,000
FLUORANTHENE	47	13	28	860	25 J	3,900 J	350	3,600	0	0	2,300,000
FLUORENE	47	11	23	6,500	42 J	46,000 J	350	3,600	0	0	2,700,000
HEXACHLOROBENZENE	47	0	0	--	--	--	**350**	**62,000**	0	47	300
HEXACHLOROBUTADIENE	47	0	0	--	--	--	350	**62,000**	0	4	6,200
HEXACHLOROCYCLOPENTADIENE	47	0	0	--	--	--	350	62,000	0	0	370,000
HEXACHLOROETHANE	47	0	0	--	--	--	350	**62,000**	0	1	35,000
INDENO(1,2,3-CD)PYRENE	47	6	13	360	50 J	**1,200**	350	**62,000**	1	9	620
ISOPHORONE	47	0	0	--	--	--	350	62,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	47	0	0	--	--	--	**350**	**62,000**	0	47	69

TABLE 6-5 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
N-NITROSODIPHENYLAMINE	47	1	2	4,500	4,500 J	4,500 J	350	62,000	0	0	99,000
NAPHTHALENE	47	11	23	3,900	41 J	30,000 J	330	3,600	0	0	56,000
NITROBENZENE	47	0	0	--	--	--	350	**62,000**	0	1	20,000
PENTACHLOROPHENOL	47	0	0	--	--	--	870	**150,000**	0	8	3,000
PHENANTHRENE	47	18	38	13,000	25 J	140,000	350	3,600	--	--	NA
PHENOL	47	0	0	--	--	--	350	62,000	0	0	37,000,000
PYRENE	47	18	38	2,200	19 J	16,000 J	350	3,600	0	0	2,300,000
Metals (mg/kg)											
ALUMINUM	75	75	100	7,900	493 J	35,700	0.0	0.0	0	0	76,000
ANTIMONY	75	40	53	0.92	0.37 J	4.8 J	0.15	1.5	0	0	31.0
ARSENIC	75	72	96	**4.1**	**1.1**	**19.4**	**1.2**	**3.9**	72	3	0.39
BARIUM	75	75	100	68.9	11.6 J	376	0.0	0.0	0	0	5,400
BERYLLIUM	75	53	71	0.55	0.080 J	2.0	0.050	0.36	0	0	150
CADMIUM	75	47	63	0.55	0.020 J	18.0	0.020	0.10	0	0	37.0
CALCIUM	75	75	100	3,300	363	11,800	0.0	0.0	--	--	NA
CHROMIUM	75	75	100	41.6	3.4 J	**337**	0.0	0.0	1	0	210
COBALT	75	71	95	6.0	2.2 J	20.2	0.15	14.9	0	0	900
COPPER	75	62	83	11.9	1.2 J	47.9 J	4.8	9.4	0	0	3,100
IRON	75	75	100	12,800	1,110 J	**74,800**	0.0	0.0	5	0	23,000
LEAD	75	75	100	32.6	1.0	**431**	0.0	0.0	5	0	150 (CAL-modified)
MAGNESIUM	75	75	100	2,800	153 J	14,400	0.0	0.0	--	--	NA
MANGANESE	75	75	100	151	7.5	679	0.0	0.0	0	0	1,800
MERCURY	75	36	48	0.073	0.010 J	0.40	0.010	0.22	0	0	23.0
MOLYBDENUM	75	4	5	2.1	0.25 J	5.9 J	0.15	4.0	0	0	390
NICKEL	75	73	97	38.9	1.2 J	278	13.8	15.8	0	0	1,600
POTASSIUM	75	70	93	1,050	432 J	4,950	170	654	--	--	NA
SELENIUM	75	45	60	0.58	0.14 J	5.4	0.53	0.77	0	0	390
SILVER	75	4	5	0.68	0.23 J	1.6 J	0.14	1.3	0	0	390
SODIUM	75	75	100	484	69.6 J	4,680	0.0	0.0	--	--	NA
THALLIUM	75	0	0	--	--	--	0.11	1.5	0	0	5.2

TABLE 6-5 SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
VANADIUM	75	75	100	27.0	2.0 J	85.9	0.0	0.0	0	0	550
ZINC	75	75	100	125	5.6 J	7,120	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 6-6 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	56	4	7	14	1	37 J	1	5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	56	0	0	--	--	--	**1**	**5**	0	56	0.06	1
1,1,2-TRICHLOROETHANE	56	0	0	--	--	--	**1**	**5**	0	56	0.2	5
1,1-DICHLOROETHANE	56	0	0	--	--	--	1	**5**	0	1	2 (CAL-modified)	5
1,1-DICHLOROETHENE	56	2	4	5	1 J	9	1	5	0	0	340	6
1,2-DICHLOROETHANE	56	3	5	**1**	**0.8**	**2**	**0.5**	**4**	3	53	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	56	0	0	--	--	--	1	5	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	56	0	0	--	--	--	**1**	**5**	0	56	0.2	5
2-BUTANONE	3	0	0	--	--	--	3	15	--	--	NA	NA
2-HEXANONE	53	0	0	--	--	--	2	10	--	--	NA	NA
4-METHYL-2-PENTANONE	56	1	2	1	1 J	1 J	2	10	--	--	NA	NA
ACETONE	8	2	25	54	47 J	61 J	1	87	0	0	610	NA
BENZENE	56	7	13	**52**	**0.7**	**180**	**0.5**	**1**	7	49	0.3	1
BROMODICHLOROMETHANE	56	0	0	--	--	--	**1**	**5**	0	56	0.2	80
BROMOFORM	56	0	0	--	--	--	1	5	0	0	9	80
BROMOMETHANE	56	0	0	--	--	--	1	**10**	0	1	9	NA
CARBON DISULFIDE	56	0	0	--	--	--	1	5	0	0	1,000	NA
CARBON TETRACHLORIDE	56	0	0	--	--	--	**0.5**	**2**	0	56	0.2	0.5
CHLOROBENZENE	56	0	0	--	--	--	1	5	0	0	110	70
CHLOROETHANE	56	0	0	--	--	--	2	**10**	0	1	5	NA
CHLOROFORM	56	0	0	--	--	--	**1**	**5**	0	56	0.5 (CAL-modified)	80
CHLOROMETHANE	56	0	0	--	--	--	**2**	**10**	0	56	2	NA
CIS-1,3-DICHLOROPROPENE	56	0	0	--	--	--	**0.5**	**2**	0	56	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	56	0	0	--	--	--	**1**	**5**	0	56	0.1	80
ETHYLBENZENE	56	7	13	**31**	1	**130**	1	1	5	0	3	300
ETHYLENE DIBROMIDE	3	0	0	--	--	--	1	1	--	--	NA	0.05
METHYLENE CHLORIDE	56	0	0	--	--	--	1	**5**	0	1	4	NA
STYRENE	56	0	0	--	--	--	1	5	0	0	1,600	100
TETRACHLOROETHENE	56	0	0	--	--	--	**1**	**5**	0	56	0.7	5
TOLUENE	56	3	5	6	0.9 J	8	1	5	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	56	0	0	--	--	--	**0.5**	**2**	0	56	0.4 (not trans)	0.5

TABLE 6-6 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TRICHLOROETHENE	56	0	0	--	--	--	**1**	**5**	0	56	0.03	5
VINYL CHLORIDE	56	0	0	--	--	--	**0.5**	**2**	0	56	0.02 (child or adult)	0.5
XYLENE (TOTAL)	56	6	11	150	0.9J	**530**	1	5	2	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	47	0	0	--	--	--	10	100	0	0	190	5
1,2-DICHLOROBENZENE	47	0	0	--	--	--	5	50	0	0	370	600
1,3-DICHLOROBENZENE	47	0	0	--	--	--	5	**50**	0	1	6	NA
1,4-DICHLOROBENZENE	47	0	0	--	--	--	**5**	**50**	0	47	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	47	0	0	--	--	--	10	100	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	47	0	0	--	--	--	25	250	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	47	0	0	--	--	--	**10**	**100**	0	47	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	47	1	2	7	7J	7J	10	100	0	0	110	NA
2,4-DIMETHYLPHENOL	47	0	0	--	--	--	10	100	0	0	730	NA
2,4-DINITROPHENOL	36	0	0	--	--	--	25	**250**	0	1	73	NA
2,4-DINITROTOLUENE	47	0	0	--	--	--	10	**100**	0	1	73	NA
2,6-DINITROTOLUENE	47	0	0	--	--	--	10	**100**	0	1	36	NA
2-CHLORONAPHTHALENE	47	0	0	--	--	--	10	100	--	--	NA	NA
2-CHLOROPHENOL	47	0	0	--	--	--	10	**100**	0	1	30	NA
2-METHYLNAPHTHALENE	47	7	15	21	0.9J	130	10	10	--	--	NA	NA
2-METHYLPHENOL	47	0	0	--	--	--	10	100	0	0	1,800	NA
2-NITROANILINE	47	0	0	--	--	--	**25**	**250**	0	47	1	NA
2-NITROPHENOL	47	0	0	--	--	--	10	100	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	47	0	0	--	--	--	**10**	**100**	0	47	0.2	NA
3-NITROANILINE	47	0	0	--	--	--	25	250	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	47	0	0	--	--	--	25	250	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	47	0	0	--	--	--	10	100	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	47	1	2	0.7	0.7J	0.7J	10	100	--	--	NA	NA
4-CHLOROANILINE	47	0	0	--	--	--	10	100	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	47	0	0	--	--	--	10	100	--	--	NA	NA
4-METHYLPHENOL	47	0	0	--	--	--	10	100	0	0	180	NA

TABLE 6-6 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-NITROANILINE	47	0	0	--	--	--	25	250	--	--	NA	NA
4-NITROPHENOL	47	0	0	--	--	--	25	250	--	--	NA	NA
ACENAPHTHENE	47	0	0	--	--	--	10	100	0	0	370	NA
ACENAPHTHYLENE	47	0	0	--	--	--	10	100	--	--	NA	NA
ANTHRACENE	47	0	0	--	--	--	10	100	0	0	1,800	NA
BENZO(A)ANTHRACENE	47	0	0	--	--	--	**10**	**100**	0	47	0.09	0.1
BENZO(A)PYRENE	47	0	0	--	--	--	**10**	**100**	0	47	0.009	0.2
BENZO(B)FLUORANTHENE	47	0	0	--	--	--	**10**	**100**	0	47	0.09	NA
BENZO(G,H,I)PERYLENE	47	0	0	--	--	--	10	100	--	--	NA	NA
BENZO(K)FLUORANTHENE	47	0	0	--	--	--	**10**	**100**	0	47	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	47	0	0	--	--	--	10	100	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	47	0	0	--	--	--	**10**	**100**	0	47	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	47	0	0	--	--	--	4	**40**	0	3	5	NA
BUTYLBENZYLPHTHALATE	47	0	0	--	--	--	10	100	0	0	7,300	NA
CARBAZOLE	47	1	2	0.6	0.6J	0.6J	**10**	**100**	0	46	3	NA
CHRYSENE	47	0	0	--	--	--	**10**	**100**	0	47	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	47	0	0	--	--	--	10	100	--	--	NA	NA
DI-N-OCTYLPHTHALATE	47	0	0	--	--	--	10	100	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	47	0	0	--	--	--	**10**	**100**	0	47	0.009	NA
DIBENZOFURAN	47	0	0	--	--	--	10	**100**	0	1	24	NA
DIETHYLPHTHALATE	47	0	0	--	--	--	10	100	0	0	29,000	NA
DIMETHYLPHTHALATE	47	0	0	--	--	--	10	100	0	0	360,000	NA
FLUORANTHENE	47	0	0	--	--	--	10	100	0	0	1,500	NA
FLUORENE	47	3	6	0.9	0.8J	1J	10	100	0	0	240	NA
HEXACHLOROBENZENE	47	0	0	--	--	--	**10**	**100**	0	47	0.04	1
HEXACHLOROBUTADIENE	47	0	0	--	--	--	**10**	**100**	0	47	0.9	NA
HEXACHLOROCYCLOPENTADIENE	47	0	0	--	--	--	10	100	0	0	220	NA
HEXACHLOROETHANE	47	0	0	--	--	--	**10**	**100**	0	47	5	NA
INDENO(1,2,3-CD)PYRENE	47	0	0	--	--	--	**10**	**100**	0	47	0.09	NA
ISOPHORONE	47	0	0	--	--	--	10	**100**	0	1	71	NA
N-NITROSO-DI-N-PROPYLAMINE	47	0	0	--	--	--	**10**	**100**	0	47	0.01	NA

TABLE 6-6 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Semivolatile Organic Compounds (µg/L)												
N-NITROSODIPHENYLAMINE	47	1	2	0.7	0.7J	0.7J	10	**100**	0	1	14	NA
NAPHTHALENE	47	7	15	**36**	2J	**200**	**10**	**10**	5	40	6	NA
NITROBENZENE	47	0	0	--	--	--	**10**	**100**	0	47	3	NA
PENTACHLOROPHENOL	47	2	4	**4**	**0.6J**	**7J**	**25**	**250**	2	45	0.6	1
PHENANTHRENE	47	0	0	--	--	--	10	100	--	--	NA	NA
PHENOL	47	2	4	4	0.9J	8J	10	10	0	0	22,000	NA
PYRENE	47	0	0	--	--	--	10	100	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	40	0	0	--	--	--	0.1	0.2	0	0	0.3	NA
4,4'-DDE	40	0	0	--	--	--	0.1	0.2	0	0	0.2	NA
4,4'-DDT	40	0	0	--	--	--	0.1	0.2	0	0	0.2	NA
ALDRIN	40	0	0	--	--	--	**0.05**	**0.1**	0	40	0.004	NA
ALPHA-BHC	40	0	0	--	--	--	0.05	0.1	--	--	NA	NA
ALPHA-CHLORDANE	40	0	0	--	--	--	0.05	0.1	0	0	0.2 (chlordane)	NA
AROCLOR-1016	40	0	0	--	--	--	0.5	**1**	0	1	1	NA
AROCLOR-1221	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
AROCLOR-1232	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
AROCLOR-1242	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
AROCLOR-1248	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
AROCLOR-1254	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
AROCLOR-1260	40	0	0	--	--	--	**0.5**	**1**	0	40	0.03	NA
BETA-BHC	40	0	0	--	--	--	0.05	0.1	--	--	NA	NA
DELTA-BHC	40	0	0	--	--	--	0.05	0.1	--	--	NA	NA
DIELDRIN	40	0	0	--	--	--	**0.1**	**0.2**	0	40	0.004	NA
ENDOSULFAN I	40	0	0	--	--	--	0.05	0.1	0	0	220	NA
ENDOSULFAN II	40	0	0	--	--	--	0.1	0.2	--	--	NA	NA
ENDOSULFAN SULFATE	40	0	0	--	--	--	0.1	0.2	--	--	NA	NA
ENDRIN	40	0	0	--	--	--	0.1	0.2	0	0	11	2
ENDRIN ALDEHYDE	40	0	0	--	--	--	0.1	0.2	--	--	NA	NA
ENDRIN KETONE	40	0	0	--	--	--	0.1	0.2	--	--	NA	NA

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
PCBs/Pesticides (µg/L)												
GAMMA-BHC (LINDANE)	40	0	0	--	--	--	0.05	0.1	--	--	NA	NA
GAMMA-CHLORDANE	40	0	0	--	--	--	0.05	0.1	0	0	0.2 (chlordane)	NA
HEPTACHLOR	40	0	0	--	--	--	**0.05**	**0.1**	0	40	0.02	0.01
HEPTACHLOR EPOXIDE	40	0	0	--	--	--	**0.01**	**0.02**	0	40	0.007	0.01
METHOXYCHLOR	40	0	0	--	--	--	0.5	1	0	0	180	30
TOXAPHENE	40	0	0	--	--	--	**3**	**6**	0	40	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	58	8	14	80.2	25.0J	297	8.4	1,230	0	0	36,000	NA
ANTIMONY	51	5	10	5.8	3.1	8.6J	2.2	11.2	0	0	15.0	6.0
ARSENIC	51	20	39	**12.1**	**4.5J**	**38.9**	**2.6**	**13.6**	20	31	0.045	10.0
BARIUM	58	48	83	102	7.6J	421	6.7	49.5	0	0	2,600	1,000
BERYLLIUM	51	14	27	1.5	1.0J	2.2J	0.10	1.1	0	0	73.0	4.0
CADMIUM	51	6	12	0.84	0.39J	1.7J	0.30	0.80	0	0	18.0	5.0
CALCIUM	58	57	98	79,400	9,590	253,000	89.8	89.8	--	--	NA	NA
CHROMIUM	51	9	18	2.6	1.1J	4.0J	0.40	3.2	--	--	NA	50.0
COBALT	51	1	2	4.2	4.2J	4.2J	3.8	7.7	0	0	730	NA
COPPER	58	2	3	15.4	3.3	27.5	2.5	42.5	0	0	1,500	1,300
IRON	58	26	45	3,280	9.3J	**30,900**	3.2	429	1	0	11,000	NA
LEAD	51	1	2	1.1	1.1J	1.1J	1.0	8.4	--	--	NA	15.0
MAGNESIUM	58	57	98	42,600	110J	177,000J	32.4	32.4	--	--	NA	NA
MANGANESE	58	56	97	1,520	2.5J	**11,000**	1.2	2.0	21	0	880	NA
MERCURY	51	1	2	0.22	0.22J	0.22J	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	51	4	8	39.7	9.1J	106J	7.9	28.6	0	0	180	NA
NICKEL	51	3	6	11.0	8.2J	14.7J	7.5	16.3	0	0	730	100
POTASSIUM	58	53	91	9,460	1,030J	69,200	763	2,340	--	--	NA	NA
SELENIUM	51	0	0	--	--	--	2.4	6.0	0	0	180	50.0
SILVER	50	0	0	--	--	--	0.90	4.6	0	0	180	NA
SODIUM	58	58	100	196,000	351J	1,560,000	0.0	0.0	--	--	NA	NA
THALLIUM	51	2	4	**7.0**	**4.0J**	**10.0J**	2.3	**7.6**	2	43	2.4	2.0
VANADIUM	51	4	8	9.7	7.7J	12.1J	3.7	13.9	0	0	260	NA

TABLE 6-6 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
ZINC	58	6	10	22.3	5.8J	68.2	2.2	42.4	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 6-7: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	8	0	0	--	--	--	1	1	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.06	1
1,1,2-TRICHLOROETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	5
1,1-DICHLOROETHANE	8	0	0	--	--	--	1	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	340	6
1,2,4-TRICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	190	5
1,2-DIBROMO-3-CHLOROPROPANE	8	0	0	--	--	--	**1**	**1**	0	8	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	370	600
1,2-DICHLOROETHANE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.1	0.5
1,2-DICHLOROPROPANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	5
1,3-DICHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	6	NA
1,4-DICHLOROBENZENE	8	0	0	--	--	--	**1**	**1**	0	8	0.5	5
2-HEXANONE	4	0	0	--	--	--	5	5	--	--	NA	NA
4-METHYL-2-PENTANONE	8	0	0	--	--	--	5	5	--	--	NA	NA
BENZENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.3	1
BROMOCHLOROMETHANE	8	0	0	--	--	--	1	1	--	--	NA	NA
BROMODICHLOROMETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.2	80
BROMOFORM	8	0	0	--	--	--	1	1	0	0	9	80
BROMOMETHANE	8	0	0	--	--	--	1	1	0	0	9	NA
CARBON DISULFIDE	8	0	0	--	--	--	1	1	0	0	1,000	NA
CARBON TETRACHLORIDE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.2	0.5
CHLOROBENZENE	8	0	0	--	--	--	1	1	0	0	110	70
CHLOROETHANE	8	0	0	--	--	--	1	1	0	0	5	NA
CHLOROFORM	8	0	0	--	--	--	**1**	**1**	0	8	0.5 (CAL-modified)	80
CHLOROMETHANE	8	0	0	--	--	--	1	1	0	0	2	NA
CIS-1,2-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	8	0	0	--	--	--	**1**	**1**	0	8	0.1	80
ETHYLBENZENE	8	0	0	--	--	--	1	1	0	0	3	300
ETHYLENE DIBROMIDE	8	0	0	--	--	--	1	1	--	--	NA	0.05
METHYLENE CHLORIDE	8	0	0	--	--	--	2	2	0	0	4	NA

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Volatile Organic Compounds (µg/L)												
STYRENE	8	0	0	--	--	--	1	1	0	0	1,600	100
TETRACHLOROETHENE	8	0	0	--	--	--	**1**	**1**	0	8	0.7	5
TOLUENE	8	0	0	--	--	--	1	1	0	0	720	150
TRANS-1,2-DICHLOROETHENE	8	0	0	--	--	--	1	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.4 (not trans)	0.5
TRICHLOROETHENE	8	0	0	--	--	--	**1**	**1**	0	8	0.03	5
VINYL CHLORIDE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.02 (child or adult)	0.5
XYLENE (TOTAL)	8	0	0	--	--	--	1	1	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	4	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	4	0	0	--	--	--	5	5	0	0	370	600
1,3-DICHLOROBENZENE	4	0	0	--	--	--	5	5	0	0	6	NA
1,4-DICHLOROBENZENE	4	0	0	--	--	--	**5**	**5**	0	4	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	4	0	0	--	--	--	10	10	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	4	0	0	--	--	--	25	25	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	4	0	0	--	--	--	**10**	**10**	0	4	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	4	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	4	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	4	0	0	--	--	--	25	25	0	0	73	NA
2,4-DINITROTOLUENE	4	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	4	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	4	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	4	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	4	0	0	--	--	--	10	10	--	--	NA	NA
2-METHYLPHENOL	4	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	4	0	0	--	--	--	**25**	**25**	0	4	1	NA
2-NITROPHENOL	4	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	4	0	0	--	--	--	**10**	**10**	0	4	0.2	NA
3-NITROANILINE	4	0	0	--	--	--	25	25	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	4	0	0	--	--	--	25	25	--	--	NA	NA

TABLE 6-7: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-BROMOPHENYL-PHENYLETHER	4	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	4	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	4	0	0	--	--	--	10	10	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	4	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	4	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	4	0	0	--	--	--	25	25	--	--	NA	NA
4-NITROPHENOL	4	0	0	--	--	--	25	25	--	--	NA	NA
ACENAPHTHENE	4	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	4	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	4	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	4	0	0	--	--	--	**10**	**10**	0	4	0.09	0.1
BENZO(A)PYRENE	4	0	0	--	--	--	**10**	**10**	0	4	0.009	0.2
BENZO(B)FLUORANTHENE	4	0	0	--	--	--	**10**	**10**	0	4	0.09	NA
BENZO(G,H,I)PERYLENE	4	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	4	0	0	--	--	--	**10**	**10**	0	4	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	4	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	4	0	0	--	--	--	**10**	**10**	0	4	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	4	0	0	--	--	--	4	4	0	0	5	NA
BUTYLBENZYLPHTHALATE	4	0	0	--	--	--	10	10	0	0	7,300	NA
CARBAZOLE	4	0	0	--	--	--	**10**	**10**	0	4	3	NA
CHRYSENE	4	0	0	--	--	--	**10**	**10**	0	4	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	4	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	4	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	4	0	0	--	--	--	**10**	**10**	0	4	0.009	NA
DIBENZOFURAN	4	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	4	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	4	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	4	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	4	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	4	0	0	--	--	--	**10**	**10**	0	4	0.04	1
HEXACHLOROBUTADIENE	4	0	0	--	--	--	**10**	**10**	0	4	0.9	NA

TABLE 6-7: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
HEXACHLOROCYCLOPENTADIENE	4	0	0	--	--	--	10	10	0	0	220	NA
HEXACHLOROETHANE	4	0	0	--	--	--	**10**	**10**	0	4	5	NA
INDENO(1,2,3-CD)PYRENE	4	0	0	--	--	--	**10**	**10**	0	4	0.09	NA
ISOPHORONE	4	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	4	0	0	--	--	--	**10**	**10**	0	4	0.01	NA
N-NITROSODIPHENYLAMINE	4	0	0	--	--	--	10	10	0	0	14	NA
NAPHTHALENE	4	0	0	--	--	--	**10**	**10**	0	4	6	NA
NITROBENZENE	4	0	0	--	--	--	**10**	**10**	0	4	3	NA
PENTACHLOROPHENOL	4	0	0	--	--	--	**25**	**25**	0	4	0.6	1
PHENANTHRENE	4	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	4	0	0	--	--	--	10	10	0	0	22,000	NA
PYRENE	4	0	0	--	--	--	10	10	0	0	180	NA
Metals (µg/L)												
Filtered												
ALUMINUM	6	2	33	231	206	255	12.2	51.1	0	0	36,000	NA
ANTIMONY	6	0	0	--	--	--	0.65	1.5	0	0	15.0	6.0
ARSENIC	6	3	50	**5.3**	**1.4 J**	**7.9**	**0.80**	**5.0**	3	3	0.045	10.0
BARIUM	6	6	100	144	39.5 J	321	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	6	0	0	--	--	--	0.10	0.15	0	0	73.0	4.0
CADMIUM	6	2	33	0.37	0.22 J	0.51 J	0.15	0.40	0	0	18.0	5.0
CALCIUM	6	6	100	50,700	31,700	62,200	0.0	0.0	--	--	NA	NA
CHROMIUM	6	2	33	1.2	1.1 J	1.3 J	0.30	1.1	--	--	NA	50.0
COBALT	6	2	33	1.8	1.2 J	2.3 J	0.25	1.5	0	0	730	NA
COPPER	6	0	0	--	--	--	0.65	3.7	0	0	1,500	1,300
IRON	6	5	83	1,320	104	4,870	44.1	44.1	0	0	11,000	NA
LEAD	6	0	0	--	--	--	0.50	1.1	--	--	NA	15.0
MAGNESIUM	6	6	100	18,400	8,580	24,200	0.0	0.0	--	--	NA	NA
MANGANESE	6	5	83	1,660	77.7	**3,090**	2.8	2.8	3	0	880	NA
MERCURY	6	0	0	--	--	--	0.10	0.10	0	0	11.0	2.0
MOLYBDENUM	6	1	17	2.6	2.6 J	2.6 J	0.25	2.6	0	0	180	NA
NICKEL	6	2	33	2.8	1.8 J	3.8 J	1.3	6.3	0	0	730	100

TABLE 6-7: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
POTASSIUM	6	6	100	5,740	1,970J	10,500	0.0	0.0	--	--	NA	NA
SELENIUM	5	2	40	1.4	1.2J	1.6J	0.80	0.85	0	0	180	50.0
SILVER	6	2	33	0.50	0.31J	0.68J	0.15	0.35	0	0	180	NA
SODIUM	6	6	100	28,700	12,600	48,100	0.0	0.0	--	--	NA	NA
THALLIUM	6	0	0	--	--	--	0.90	1.4	0	0	2.4	2.0
VANADIUM	6	1	17	2.8	2.8J	2.8J	0.30	1.8	0	0	260	NA
ZINC	6	4	67	60.7	8.5J	118	10.2	13.0	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

MCL Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Micrograms per liter

TABLE 6-8 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1,2-TETRACHLOROETHANE	2	0	0	--	--	--	**1**	**1**	0	2	0.4	NA
1,1,1-TRICHLOROETHANE	16	0	0	--	--	--	1	4	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	16	0	0	--	--	--	**1**	**2**	0	16	0.06	1
1,1,2-TRICHLOROETHANE	16	0	0	--	--	--	**1**	**4**	0	16	0.2	5
1,1-DICHLOROETHANE	16	0	0	--	--	--	0.5	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	16	0	0	--	--	--	1	4	0	0	340	6
1,2-DICHLOROBENZENE	16	1	6	0.4	0.4J	0.4J	1	4	0	0	370	600
1,2-DICHLOROETHANE	16	0	0	--	--	--	**0.5**	**1**	0	16	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	14	0	0	--	--	--	2	4	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	14	0	0	--	--	--	**2**	**4**	0	14	0.2	5
1,3-DICHLOROBENZENE	16	0	0	--	--	--	1	4	0	0	6	NA
1,4-DICHLOROBENZENE	16	1	6	0.4	0.4J	0.4J	**1**	**4**	0	15	0.5	5
2-BUTANONE	14	0	0	--	--	--	1	4	--	--	NA	NA
2-HEXANONE	14	0	0	--	--	--	2	4	--	--	NA	NA
4-METHYL-2-PENTANONE	14	0	0	--	--	--	2	4	--	--	NA	NA
ACETONE	14	0	0	--	--	--	3	29	0	0	610	NA
BENZENE	16	0	0	--	--	--	**0.5**	**1**	0	16	0.3	1
BROMODICHLOROMETHANE	14	0	0	--	--	--	**2**	**4**	0	14	0.2	80
BROMOFORM	14	0	0	--	--	--	2	4	0	0	9	80
BROMOMETHANE	14	0	0	--	--	--	2	4	0	0	9	NA
CARBON DISULFIDE	14	1	7	0.5	0.5J	0.5J	2	4	0	0	1,000	NA
CARBON TETRACHLORIDE	14	0	0	--	--	--	**0.5**	**1**	0	14	0.2	0.5
CHLOROBENZENE	16	1	6	0.6	0.6J	0.6J	1	4	0	0	110	70
CHLOROETHANE	16	0	0	--	--	--	1	4	0	0	5	NA
CHLOROFORM	14	0	0	--	--	--	**2**	**4**	0	14	0.5 (CAL-modified)	80
CHLOROMETHANE	16	0	0	--	--	--	1	**4**	0	14	2	NA
CIS-1,2-DICHLOROETHENE	2	0	0	--	--	--	1	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	14	0	0	--	--	--	**0.5**	**1**	0	14	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	14	0	0	--	--	--	**2**	**4**	0	14	0.1	80
ETHYLBENZENE	16	0	0	--	--	--	1	**4**	0	1	3	300
M,P-XYLENE	2	0	0	--	--	--	1	1	0	0	210 (xylenes)	NA

TABLE 6-8 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
METHYL-T-BUTYL ETHER	16	0	0	--	--	--	1	**10**	0	1	6 (CAL-modified)	13
METHYLENE CHLORIDE	16	0	0	--	--	--	1	4	0	0	4	NA
NAPHTHALENE	2	0	0	--	--	--	1	1	0	0	6	NA
O-XYLENE	2	0	0	--	--	--	1	1	0	0	210 (xylenes)	NA
STYRENE	14	0	0	--	--	--	2	4	0	0	1,600	100
TETRACHLOROETHENE	16	0	0	--	--	--	**1**	**4**	0	16	0.7	5
TOLUENE	16	0	0	--	--	--	1	4	0	0	720	150
TRANS-1,2-DICHLOROETHENE	2	0	0	--	--	--	1	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	14	0	0	--	--	--	**0.5**	**1**	0	14	0.4 (not trans)	0.5
TRICHLOROETHENE	16	1	6	**0.6**	**0.6J**	**0.6J**	**1**	**4**	1	15	0.03	5
VINYL CHLORIDE	16	0	0	--	--	--	**0.5**	**1**	0	16	0.02 (child or adult)	0.5
XYLENE (TOTAL)	14	1	7	0.3	0.3J	0.3J	2	4	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	14	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	14	0	0	--	--	--	5	5	0	0	370	600
1,3-DICHLOROBENZENE	14	0	0	--	--	--	5	5	0	0	6	NA
1,4-DICHLOROBENZENE	14	0	0	--	--	--	**5**	**5**	0	14	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	14	0	0	--	--	--	10	10	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	14	0	0	--	--	--	25	25	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	14	0	0	--	--	--	**10**	**10**	0	14	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	14	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	14	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	14	0	0	--	--	--	25	50	0	0	73	NA
2,4-DINITROTOLUENE	14	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	14	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	14	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	14	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	14	1	7	41	41	41	10	10	--	--	NA	NA
2-METHYLPHENOL	14	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	14	0	0	--	--	--	**25**	**25**	0	14	1	NA

TABLE 6-8 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
2-NITROPHENOL	14	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	14	0	0	--	--	--	**12**	**12**	0	14	0.2	NA
3-NITROANILINE	14	0	0	--	--	--	25	25	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	14	0	0	--	--	--	25	25	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	14	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	14	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	14	0	0	--	--	--	17	19	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	14	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	14	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	14	0	0	--	--	--	25	25	--	--	NA	NA
4-NITROPHENOL	14	0	0	--	--	--	25	25	--	--	NA	NA
ACENAPHTHENE	14	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	14	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	14	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	14	0	0	--	--	--	**10**	**10**	0	14	0.09	0.1
BENZO(A)PYRENE	14	0	0	--	--	--	**0.2**	**3**	0	14	0.009	0.2
BENZO(B)FLUORANTHENE	14	0	0	--	--	--	**10**	**10**	0	14	0.09	NA
BENZO(G,H,I)PERYLENE	14	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	14	0	0	--	--	--	**10**	**10**	0	14	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	14	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	14	0	0	--	--	--	**10**	**10**	0	14	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	14	0	0	--	--	--	4	4	0	0	5	NA
BUTYLBENZYLPHTHALATE	14	0	0	--	--	--	10	10	0	0	7,300	NA
CARBAZOLE	14	0	0	--	--	--	**10**	**14**	0	14	3	NA
CHRYSENE	14	0	0	--	--	--	**10**	**10**	0	14	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	14	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	14	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	14	0	0	--	--	--	**20**	**20**	0	14	0.009	NA
DIBENZOFURAN	14	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	14	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	14	0	0	--	--	--	10	10	0	0	360,000	NA

TABLE 6-8 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
FLUORANTHENE	14	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	14	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	14	0	0	--	--	--	**10**	**10**	0	14	0.04	1
HEXACHLOROBUTADIENE	14	0	0	--	--	--	**10**	**10**	0	14	0.9	NA
HEXACHLOROCYCLOPENTADIENE	14	0	0	--	--	--	11	16	0	0	220	NA
HEXACHLOROETHANE	14	0	0	--	--	--	**10**	**10**	0	14	5	NA
INDENO(1,2,3-CD)PYRENE	14	0	0	--	--	--	**10**	**10**	0	14	0.09	NA
ISOPHORONE	14	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	14	0	0	--	--	--	**10**	**10**	0	14	0.01	NA
N-NITROSODIPHENYLAMINE	14	0	0	--	--	--	10	**18**	0	9	14	NA
NAPHTHALENE	14	1	7	**89**	**89**	**89**	**10**	**10**	1	13	6	NA
NITROBENZENE	14	0	0	--	--	--	**10**	**10**	0	14	3	NA
PENTACHLOROPHENOL	14	0	0	--	--	--	**25**	**25**	0	14	0.6	1
PHENANTHRENE	14	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	14	0	0	--	--	--	10	10	0	0	22,000	NA
PYRENE	14	0	0	--	--	--	10	10	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	13	1	8	61	61	61	5	5	0	0	370	NA
ACENAPHTHYLENE	13	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	13	0	0	--	--	--	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	0.1
BENZO(A)PYRENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.009	0.2
BENZO(B)FLUORANTHENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	NA
BENZO(G,H,I)PERYLENE	13	1	8	0.6	0.6	0.6	0.2	1	--	--	NA	NA
BENZO(K)FLUORANTHENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.06 (CAL-modified)	NA
CHRYSENE	13	1	8	0.5	0.5	0.5	0.2	**1**	0	1	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	13	1	8	**0.5**	**0.5J**	**0.5J**	**0.5**	**3**	1	12	0.009	NA
FLUORANTHENE	13	1	8	0.2	0.2J	0.2J	0.2	1	0	0	1,500	NA
FLUORENE	13	0	0	--	--	--	1	5	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	NA

TABLE 6-8 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Polynuclear Aromatic Hydrocarbons (µg/L)												
NAPHTHALENE	13	1	8	**60**	**60**	**60**	5	5	1	0	6	NA
PHENANTHRENE	13	0	0	--	--	--	1	5	--	--	NA	NA
PYRENE	13	1	8	0.1	0.1 J	0.1 J	0.2	1	0	0	180	NA

NOTES

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

MCL Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Micrograms per liter

TABLE 6-9 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1,2-TETRACHLOROETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.4	NA
1,1,1-TRICHLOROETHANE	22	0	0	--	--	--	0.5	0.5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.06	1
1,1,2-TRICHLOROETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.2	5
1,1-DICHLOROETHANE	22	0	0	--	--	--	0.5	0.5	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	22	0	0	--	--	--	0.5	0.5	0	0	340	6
1,1-DICHLOROPROPENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.006	NA
1,2,4-TRICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	190	5
1,2,4-TRIMETHYLBENZENE	22	1	5	2	2	2	0.5	0.5	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	370	600
1,2-DICHLOROETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.1	0.5
1,2-DICHLOROPROPANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.2	5
1,3,5-TRIMETHYLBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	12	NA
1,3-DICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	6	NA
1,3-DICHLOROPROPANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,4-DICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	0.5	5
2,2-DICHLOROPROPANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-BUTANONE	22	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROTOLUENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-HEXANONE	22	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROTOLUENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
4-METHYL-2-PENTANONE	22	0	0	--	--	--	10	10	--	--	NA	NA
ACETONE	22	9	41	18	0.7J	99J	0.4	10	0	0	610	NA
BENZENE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.3	1
BROMOBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	20	NA
BROMOCHLOROMETHANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
BROMODICHLOROMETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.2	80
BROMOFORM	22	0	0	--	--	--	1	1	0	0	9	80

TABLE 6-9 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
BROMOMETHANE	22	2	9	0.6	0.5J	0.6J	1	1	0	0	9	NA
CARBON DISULFIDE	22	2	9	0.8	0.3J	1	0.5	0.5	0	0	1,000	NA
CARBON TETRACHLORIDE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.2	0.5
CHLOROBENZENE	22	1	5	0.2	0.2J	0.2J	0.5	0.5	0	0	110	70
CHLOROETHANE	22	0	0	--	--	--	1	1	0	0	5	NA
CHLOROFORM	22	0	0	--	--	--	0.5	0.5	0	0	0.5 (CAL-modified)	80
CHLOROMETHANE	22	1	5	0.3	0.3J	0.3J	1	1	0	0	2	NA
CIS-1,2-DICHLOROETHENE	22	0	0	--	--	--	0.5	0.5	0	0	61	6
DIBROMOCHLOROMETHANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.1	80
DIBROMOMETHANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	22	0	0	--	--	--	1	1	0	0	390	NA
DIISOPROPYL ETHER	22	1	5	0.8	0.8J	0.8J	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	22	1	5	1	1	1	0.2	0.5	0	0	3	300
ETHYLENE DIBROMIDE	22	0	0	--	--	--	0.5	0.5	--	--	NA	0.05
HEXACHLOROBUTADIENE	22	0	0	--	--	--	0.5	0.5	0	0	0.9	NA
ISOPROPYLBENZENE	22	4	18	1	0.3J	3	0.5	0.5	--	--	NA	NA
M,P-XYLENE	22	1	5	2	2	2	0.5	0.5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	22	0	0	--	--	--	0.1	0.5	0	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	22	0	0	--	--	--	0.1	**5**	0	18	4	NA
N-BUTYLBENZENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	22	3	14	0.6	0.3J	0.8	0.5	0.5	0	0	240	NA
NAPHTHALENE	22	5	23	**83**	1J	**210**	2	2	3	0	6	NA
O-XYLENE	22	1	5	0.2	0.2J	0.2J	0.5	0.5	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	22	3	14	0.3	0.2J	0.3J	0.5	0.5	--	--	NA	NA
SEC-BUTYLBENZENE	22	3	14	0.9	0.2J	1	0.5	0.5	0	0	240	NA
STYRENE	22	0	0	--	--	--	0.5	0.5	0	0	1,600	100
TERT-AMYL METHYL ETHER	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	22	1	5	4	4J	4J	10	20	--	--	NA	NA
TERT-BUTYLBENZENE	22	2	9	0.7	0.5J	0.8	0.5	0.5	0	0	240	NA
TETRACHLOROETHENE	22	0	0	--	--	--	0.5	0.5	0	0	0.7	5

TABLE 6-9 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TOLUENE	22	0	0	--	--	--	0.5	0.5	0	0	720	150
TRANS-1,2-DICHLOROETHENE	22	0	0	--	--	--	0.5	0.5	0	0	120	10
TRICHLOROETHENE	22	3	14	**0.6**	**0.2 J**	**1**	**0.5**	**0.5**	3	19	0.03	5
TRICHLOROFLUOROMETHANE	22	0	0	--	--	--	1	1	--	--	NA	NA
VINYL CHLORIDE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.02 (child or adult)	0.5
Metals (µg/L)												
Filtered												
ALUMINUM	18	12	67	50.8	4.6 J	260	100	100	0	0	36,000	NA
ANTIMONY	18	13	72	0.22	0.051 J	0.54 J	0.093	**50.0**	0	1	15.0	6.0
ARSENIC	18	16	89	**15.4**	**0.21 J**	**96.0**	**1.4**	**1.7**	16	2	0.045	10.0
BARIUM	18	18	100	159	37.0	530	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	18	1	6	0.14	0.14 J	0.14 J	2.0	2.0	0	0	73.0	4.0
CADMIUM	18	2	11	0.16	0.065 J	0.26 J	0.069	5.0	0	0	18.0	5.0
CALCIUM	18	18	100	82,600	14,000	230,000	0.0	0.0	--	--	NA	NA
CHROMIUM	18	12	67	1.9	0.090 J	7.2 J	10.0	10.0	--	--	NA	50.0
COBALT	18	14	78	2.7	0.10 J	27.0	0.093	1.6	0	0	730	NA
COPPER	18	17	94	3.0	0.57 J	21.0	10.0	10.0	0	0	1,500	1,300
IRON	18	14	78	11,900	7.4 J	**60,000**	79.0	140	4	0	11,000	NA
LEAD	18	6	33	1.5	0.13 J	6.7	0.022	3.0	--	--	NA	15.0
MAGNESIUM	18	18	100	40,900	12,000	150,000	0.0	0.0	--	--	NA	NA
MANGANESE	18	18	100	2,010	1.4 J	**7,800**	0.0	0.0	10	0	880	NA
MERCURY	18	2	11	0.049	0.046 J	0.052 J	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	18	8	44	1.5	0.41 J	3.3 J	0.56	20.0	0	0	180	NA
NICKEL	18	8	44	3.9	1.6 J	7.7 J	20.0	20.0	0	0	730	100
POTASSIUM	18	18	100	6,170	680	29,000	0.0	0.0	--	--	NA	NA
SELENIUM	18	6	33	1.0	0.36 J	2.4 J	5.0	5.0	0	0	180	50.0
SILVER	18	2	11	0.063	0.037 J	0.089 J	0.10	5.0	0	0	180	NA
SODIUM	18	18	100	75,200	31,000	140,000	0.0	0.0	--	--	NA	NA
THALLIUM	18	0	0	--	--	--	0.037	2.0	0	0	2.4	2.0
VANADIUM	18	15	83	3.6	0.33 J	11.0	10.0	10.0	0	0	260	NA
ZINC	18	13	72	8.7	0.84 J	25.0 J	20.0	20.0	0	0	11,000	NA

TABLE 6-9 SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 6-10: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES

Basewide Polynuclear Aromatic Hydrocarbon Investigation, 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (mg/kg)											
2-METHYLNAPHTHALENE	323	160	50	38	0.001 J	1,700	0.005	55	--	--	NA
ACENAPHTHENE	323	66	20	19	0.003 J	350	0.01	110	0	0	3,700
ACENAPHTHYLENE	323	90	28	20	0.002 J	720	0.01	110	--	--	NA
ANTHRACENE	323	122	38	36	0.001 J	1,200	0.005	110	0	0	22,000
BENZ(A)ANTHRACENE	323	194	60	79	0.002 J	4,300	0.005	55	--	--	NA
BENZO(A)PYRENE	323	187	58	**82**	0.002 J	**5,200**	0.005	**110**	146	56	0.06
BENZO(B)FLUORANTHENE	323	182	56	**63**	0.002 J	**3,200**	0.005	**55**	127	49	0.6
BENZO(G,H,I)PERYLENE	323	198	61	52	0.002 J	2,900	0.005	55	--	--	NA
BENZO(K)FLUORANTHENE	323	146	45	**63**	0.003 J	**3,500**	0.005	**55**	116	65	0.4 (CAL-modified)
CHRYSENE	323	199	62	**120**	0.002 J	**4,900**	0.005	**55**	101	37	4 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	323	132	41	25	0.002 J	840	0.005	55	--	--	NA
FLUORANTHENE	323	185	57	100	0.002 J	**7,400**	0.005	55	1	0	2,300
FLUORENE	323	105	33	54	0.002 J	1,500	0.01	110	0	0	2,700
INDENO(1,2,3-CD)PYRENE	323	149	46	**59**	0.002 J	**3,300**	0.005	**110**	102	72	0.6
NAPHTHALENE	323	141	44	20	0.001 J	**600**	0.01	**110**	11	1	56
PHENANTHRENE	323	192	59	88	0.002 J	3,700	0.005	55	--	--	NA
PYRENE	323	187	58	130	0.002 J	**7,100**	0.005	55	3	0	2,300

NOTES:

Bold denotes values elevated above the PRG

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

TABLE 6-11: SITE 13 ANALYTICAL DATA FOR FREE PRODUCT TARRY REFINERY WASTE

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Petroleum Hydrocarbon Constituents (mg/kg)							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
TPH-gasoline	980	3,000	470	4,500[g]	2,800[e]	910[c]	580
TPH-diesel	17,000[b]	61,000[e]	26,000[e]	16,000	9,700[e]	5,000[f]	140,000[d]
TPH-motor oil	12,000[b]	52,000[e]	21,000[e]	6,600	2,200[e]	440[f]	110,000[d]
Benzene	5	31	0.8	ND	ND	ND	1.3
Toluene	27	130	4.5	ND	ND	ND	4.3
Ethylbenzene	81	36	1.4	60	13	4.7	3.1
Xylenes (total)	48	220	18.7	163	15.3	2.9	14.5

Polynuclear Aromatic Hydrocarbon Concentrations in TRW (mg/kg)							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
Naphthalene	28	83	21	9	ND	ND	100
Ancenaphthalene	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	2.7 J	7.3	8.3	1.2	0.99 J	ND	12 J
Fluorene	28	59	27	3.7	1.7	0.57	140
Phenanthrene	98	210	220	10	5.1	0.59	510
Anthracene	4.9	7.5	34	2	0.68 J	0.16	23
Fluoranthene	3	12	35	1.2	ND	0.12	19
Pyrene	11	23	120	3.6	1 J	0.36	64
Benzo(a)anthracene	8.8	14	110	3.5	0.89 J	0.30	37
Chrysene	23	44	200	4.9	1.2 J	0.51	120
Benzo(b)fluoranthene	11	ND	38	1.8	ND	0.021	49
Benzo(k)fluoranthene	1.2 J	ND	12	0.21 J	ND	0.025 J	6.5 J
Benzo(a)pyrene	3.1	5.6	37	0.48 J	ND	0.072	15
Indeno(1,2,3-cd)pyrene	ND	ND	42 J	ND	ND	ND	3.9 J
Dibenz(a,h)anthracene	1.6	ND	2.1 J	ND	ND	ND	7.9 J
Benzo(g,h,I)perylene	ND	ND	7.2	ND	ND	ND	7.9 J

pH and Lead Concentrations in TRW							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
Lead, mg/kg	630	2,000	900	3.5	1.9	9.2	220
pH	1.7	1.4	1.5	5.7	6.7	6.4	1.1

Notes:

[a] Dilution factor of 5
[b] Dilution factor of 10
[c] Dilution factor of 20
[d] Dilution factor of 40
[e] Dilution factor of 50
[f] Dilution factor of 100
[g] Dilution factor of 200
mg/kg Milligram per kilogram
ND Analyte was not detected
J Estimated value
TPH Total petroleum hydrocarbons
TRW Tarry refinery waste

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Dioxins (µg/kg)											
1234678-HEPTACHLORINATED DIBEN	1	0	0	--	--	--	24	24	--	--	NA
123478-HEXACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
1234789-HEPTACHLORINATED DIBEN	1	0	0	--	--	--	24	24	--	--	NA
123678-HEXACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
12378-PENTACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
123789-HEXACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
234678-HEXACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
23478-PENTACHLORINATED DIBENZO	1	0	0	--	--	--	24	24	--	--	NA
2378-TETRACHLORINATED DIBENZO-	1	0	0	--	--	--	10	10	--	--	NA
2378-TETRACHLORINATED DIBENZOF	1	0	0	--	--	--	10	10	--	--	NA
OCTACHLORINATED DIBENZO-P-DIOX	1	0	0	--	--	--	48	48	--	--	NA
OCTACHLORINATED DIBENZOFURAN	1	0	0	--	--	--	48	48	--	--	NA
TOTAL HEPTACHLORODIBENZO-P-DIO	1	0	0	--	--	--	24	24	--	--	NA
TOTAL HEPTACHLORODIBENZOFURAN	1	0	0	--	--	--	24	24	--	--	NA
TOTAL HEXACHLORODIBENZOFURAN	1	0	0	--	--	--	24	24	--	--	NA
TOTAL PENTACHLORODIBENZO-P-DIO	1	0	0	--	--	--	24	24	--	--	NA
TOTAL PENTACHLORODIBENZOFURAN	1	0	0	--	--	--	24	24	--	--	NA
TOTAL TETRACHLORODIBENZO-P-DIO	1	0	0	--	--	--	10	10	--	--	NA
TOTAL TETRACHLORODIBENZOFURAN	1	0	0	--	--	--	10	10	--	--	NA
Oil and Grease (mg/kg)											
OIL & GREASE	1	1	100	410	410	410	0.0	0.0	--	--	NA
Organotins (µg/kg)											
DIBUTYL TIN	1	0	0	--	--	--	1	1	--	--	NA
MONOBUTYL TIN	1	0	0	--	--	--	1	1	--	--	NA
TETRABUTYL TIN	1	0	0	--	--	--	1	1	--	--	NA
TRIBUTYL TIN	1	0	0	--	--	--	1	1	--	--	NA
Organic Lead (mg/kg)											
LEAD, ORGANIC	1	0	0	--	--	--	0.6	0.6	--	--	NA

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Percent Moisture (%MST)											
PERCENT MOISTURE	1	1	100	15	15	15	0.0	0.0	--	--	NA
PCBs/Pesticides (µg/kg)											
AROCLOR-1016	1	0	0	--	--	--	39	39	0	0	3,900
AROCLOR-1221	1	0	0	--	--	--	79	79	0	0	220
AROCLOR-1232	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1242	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1248	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1254	1	0	0	--	--	--	39	39	0	0	220
AROCLOR-1260	1	0	0	--	--	--	39	39	0	0	220
pH (UNITS)											
PH	1	1	100	7.4	7.4	7.4	0.0	0.0	--	--	NA
Reactivity (mg/kg)											
CYANIDE	1	0	0	--	--	--	0.1	0.1	--	--	NA
SULFIDE	1	0	0	--	--	--	29	29	--	--	NA
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	1	1	100	43	43 J	43 J	0.0	0.0	--	--	NA
ACENAPHTHENE	1	0	0	--	--	--	390	390	0	0	3,700,000
ACENAPHTHYLENE	1	0	0	--	--	--	390	390	--	--	NA
ANTHRACENE	1	0	0	--	--	--	390	390	0	0	22,000,000
BENZO(A)ANTHRACENE	1	0	0	--	--	--	390	390	0	0	620
BENZO(A)PYRENE	1	0	0	--	--	--	**390**	**390**	0	1	62
BENZO(B)FLUORANTHENE	1	0	0	--	--	--	390	390	0	0	620
BENZO(G,H,I)PERYLENE	1	0	0	--	--	--	390	390	--	--	NA
BENZO(K)FLUORANTHENE	1	0	0	--	--	--	**390**	**390**	0	1	380 (CAL-modified)
CHRYSENE	1	0	0	--	--	--	390	390	0	0	3,800 (CAL-modified)
DIBENZO(A,H)ANTHRACENE	1	0	0	--	--	--	**390**	**390**	0	1	62
FLUORANTHENE	1	0	0	--	--	--	390	390	0	0	2,300,000
FLUORENE	1	0	0	--	--	--	390	390	0	0	2,700,000
INDENO(1,2,3-CD)PYRENE	1	0	0	--	--	--	390	390	0	0	620

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (µg/kg)											
NAPHTHALENE	1	1	100	34	34 J	34 J	0.0	0.0	0	0	56,000
PHENANTHRENE	1	0	0	--	--	--	390	390	--	--	NA
PYRENE	1	1	100	28	28 J	28 J	0.0	0.0	0	0	2,300,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	650,000
1,2-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	370,000
1,3-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	16,000
1,4-DICHLOROBENZENE	1	0	0	--	--	--	390	390	0	0	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	1	0	0	--	--	--	390	390	--	--	NA
2,4,5-TRICHLOROPHENOL	1	0	0	--	--	--	940	940	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	180,000
2,4-DIMETHYLPHENOL	1	0	0	--	--	--	390	390	0	0	1,200,000
2,4-DINITROPHENOL	1	0	0	--	--	--	940	940	0	0	120,000
2,4-DINITROTOLUENE	1	0	0	--	--	--	390	390	0	0	120,000
2,6-DINITROTOLUENE	1	0	0	--	--	--	390	390	0	0	61,000
2-CHLORONAPHTHALENE	1	0	0	--	--	--	390	390	--	--	NA
2-CHLOROPHENOL	1	0	0	--	--	--	390	390	0	0	63,000
2-METHYLPHENOL	1	0	0	--	--	--	390	390	--	--	NA
2-NITROANILINE	1	0	0	--	--	--	940	940	0	0	1,700
2-NITROPHENOL	1	0	0	--	--	--	390	390	--	--	NA
3,3'-DICHLOROBENZIDINE	1	0	0	--	--	--	390	390	0	0	1,100
3-NITROANILINE	1	0	0	--	--	--	940	940	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	1	0	0	--	--	--	940	940	--	--	NA
4-BROMOPHENYL-PHENYLETHER	1	0	0	--	--	--	390	390	--	--	NA
4-CHLORO-3-METHYLPHENOL	1	0	0	--	--	--	390	390	--	--	NA
4-CHLOROANILINE	1	0	0	--	--	--	390	390	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	1	0	0	--	--	--	390	390	--	--	NA
4-METHYLPHENOL	1	0	0	--	--	--	390	390	0	0	310,000
4-NITROANILINE	1	0	0	--	--	--	940	940	--	--	NA
4-NITROPHENOL	1	0	0	--	--	--	940	940	--	--	NA
BIS(2-CHLOROETHOXY)METHANE	1	0	0	--	--	--	390	390	--	--	NA

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
BIS(2-CHLOROETHYL)ETHER	1	0	0	--	--	--	**390**	**390**	0	1	210
BIS(2-ETHYLHEXYL)PHTHALATE	1	0	0	--	--	--	390	390	0	0	35,000
BUTYLBENZYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	12,000,000
CARBAZOLE	1	0	0	--	--	--	390	390	0	0	24,000
DI-N-BUTYLPHTHALATE	1	1	100	69	69 J	69 J	0.0	0.0	--	--	NA
DI-N-OCTYLPHTHALATE	1	1	100	25	25 J	25 J	0.0	0.0	--	--	NA
DIBENZOFURAN	1	0	0	--	--	--	390	390	0	0	290,000
DIETHYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	49,000,000
DIMETHYLPHTHALATE	1	0	0	--	--	--	390	390	0	0	100,000,000
HEXACHLOROBENZENE	1	0	0	--	--	--	**390**	**390**	0	1	300
HEXACHLOROBUTADIENE	1	0	0	--	--	--	390	390	0	0	6,200
HEXACHLOROCYCLOPENTADIENE	1	0	0	--	--	--	390	390	0	0	370,000
HEXACHLOROETHANE	1	0	0	--	--	--	390	390	0	0	35,000
ISOPHORONE	1	0	0	--	--	--	390	390	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	1	0	0	--	--	--	**390**	**390**	0	1	69
N-NITROSODIPHENYLAMINE	1	0	0	--	--	--	390	390	0	0	99,000
NITROBENZENE	1	0	0	--	--	--	390	390	0	0	20,000
PENTACHLOROPHENOL	1	0	0	--	--	--	940	940	0	0	3,000
PHENOL	1	0	0	--	--	--	390	390	0	0	37,000,000
California Title 26 Metals (mg/kg)											
ANTIMONY	1	0	0	--	--	--	3.5	3.5	0	0	31.0
ARSENIC	1	1	100	**7.2**	**7.2**	**7.2**	0.0	0.0	1	0	0.39
BARIUM	1	1	100	79.7	79.7	79.7	0.0	0.0	0	0	5,400
BERYLLIUM	1	1	100	0.43	0.43	0.43	0.0	0.0	0	0	150
CADMIUM	1	1	100	0.54	0.54	0.54	0.0	0.0	0	0	37.0
CHROMIUM	1	1	100	33.8	33.8	33.8	0.0	0.0	0	0	210
COBALT	1	1	100	7.1	7.1	7.1	0.0	0.0	0	0	900
COPPER	1	1	100	16.8	16.8	16.8	0.0	0.0	0	0	3,100
LEAD	1	1	100	23.8	23.8	23.8	0.0	0.0	0	0	150 (CAL-modified)
MERCURY	1	0	0	--	--	--	0.12	0.12	0	0	23.0
MOLYBDENUM	1	0	0	--	--	--	1.2	1.2	0	0	390
NICKEL	1	1	100	29.1	29.1	29.1	0.0	0.0	0	0	1,600

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
California Title 26 Metals (mg/kg)											
SELENIUM	1	0	0	--	--	--	0.30	0.30	0	0	390
SILVER	1	0	0	--	--	--	0.59	0.59	0	0	390
THALLIUM	1	0	0	--	--	--	0.30	0.30	0	0	5.2
VANADIUM	1	1	100	27.3	27.3	27.3	0.0	0.0	0	0	550
ZINC	1	1	100	41.5	41.5	41.5	0.0	0.0	0	0	23,000
Total Petroleum Hydrocarbons (mg/kg)											
DIESEL RANGE ORGANICS	1	1	100	2,000	2,000	2,000	0.0	0.0	--	--	NA
GASOLINE RANGE ORGANICS	1	1	100	45	45	45	0.0	0.0	--	--	NA
MOTOR OIL RANGE ORGANICS	1	0	0	--	--	--	1,500	1,500	--	--	NA
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	1	0	0	--	--	--	29	29	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	1	0	0	--	--	--	29	29	0	0	410
1,1,2-TRICHLOROETHANE	1	0	0	--	--	--	29	29	0	0	730
1,1-DICHLOROETHANE	1	0	0	--	--	--	29	29	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	1	0	0	--	--	--	29	29	0	0	120,000
1,2-DICHLOROETHANE	1	0	0	--	--	--	29	29	0	0	280
1,2-DICHLOROPROPANE	1	0	0	--	--	--	29	29	0	0	340
2-BUTANONE	1	0	0	--	--	--	59	59	--	--	NA
2-HEXANONE	1	0	0	--	--	--	59	59	--	--	NA
4-METHYL-2-PENTANONE	1	0	0	--	--	--	59	59	--	--	NA
ACETONE	1	0	0	--	--	--	120	120	0	0	1,600,000
BENZENE	1	0	0	--	--	--	29	29	0	0	600
BROMODICHLOROMETHANE	1	0	0	--	--	--	29	29	0	0	820
BROMOFORM	1	0	0	--	--	--	29	29	0	0	62,000
BROMOMETHANE	1	0	0	--	--	--	59	59	0	0	3,900
CARBON DISULFIDE	1	0	0	--	--	--	29	29	0	0	360,000
CARBON TETRACHLORIDE	1	0	0	--	--	--	29	29	0	0	250
CHLOROBENZENE	1	0	0	--	--	--	29	29	0	0	150,000
CHLOROETHANE	1	0	0	--	--	--	59	59	0	0	3,000
CHLOROFORM	1	0	0	--	--	--	29	29	0	0	940 (CAL-modified)
CHLOROMETHANE	1	0	0	--	--	--	59	59	0	0	1,200

TABLE 6-12 SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

Environmental Baseline Survey Phase 2A

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
CIS-1,2-DICHLOROETHENE	1	0	0	--	--	--	29	29	0	0	43,000
CIS-1,3-DICHLOROPROPENE	1	0	0	--	--	--	29	29	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	1	0	0	--	--	--	29	29	0	0	1,100
ETHYLBENZENE	1	0	0	--	--	--	29	29	0	0	8,900
HEXANE	1	0	0	--	--	--	29	29	0	0	110,000 (n-hexane)
METHYLENE CHLORIDE	1	0	0	--	--	--	120	120	0	0	9,100
O-XYLENE	1	0	0	--	--	--	29	29	0	0	270,000 (xylenes)
STYRENE	1	0	0	--	--	--	29	29	0	0	1,700,000
TETRACHLOROETHENE	1	0	0	--	--	--	29	29	0	0	1,500
TOLUENE	1	0	0	--	--	--	29	29	0	0	520,000
TRANS-1,2-DICHLOROETHENE	1	0	0	--	--	--	29	29	0	0	69,000
TRANS-1,3-DICHLOROPROPENE	1	0	0	--	--	--	29	29	0	0	780 (not trans)
TRICHLOROETHENE	1	0	0	--	--	--	29	29	0	0	53
TRICHLOROFLUOROMETHANE	1	0	0	--	--	--	29	29	0	0	390,000
VINYL ACETATE	1	0	0	--	--	--	300	300	0	0	430,000
VINYL CHLORIDE	1	0	0	--	--	--	59	59	0	0	79 (child or adult)
XYLENE (TOTAL)	1	0	0	--	--	--	29	29	0	0	270,000

NOTES:

Bold denotes values elevated above the PRG

Polynuclear aromatic hydrocarbons compounds were analyzed under semivolatile organic compound method.

%	Percent
--	Not detected
J	Estimated value
mg/kg	Milligram per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Microgram per kilogram

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Percent Moisture (%MST)											
PERCENT MOISTURE	36	36	100	16	7	54	0.0	0.0	--	--	NA
PCBs/Pesticides (µg/kg)											
4,4'-DDD	3	0	0	--	--	--	4	19	0	0	2,400
4,4'-DDE	3	0	0	--	--	--	4	19	0	0	1,700
4,4'-DDT	3	0	0	--	--	--	4	19	0	0	1,700
ALDRIN	3	0	0	--	--	--	2	10	0	0	29
ALPHA-BHC	3	0	0	--	--	--	2	10	--	--	NA
ALPHA-CHLORDANE	3	0	0	--	--	--	2	10	0	0	1,600 (chlordane)
AROCLOR-1016	3	0	0	--	--	--	18	92	0	0	3,900
AROCLOR-1221	3	0	0	--	--	--	18	92	0	0	220
AROCLOR-1232	3	0	0	--	--	--	18	92	0	0	220
AROCLOR-1242	3	0	0	--	--	--	18	92	0	0	220
AROCLOR-1248	3	0	0	--	--	--	18	92	0	0	220
AROCLOR-1254	3	0	0	--	--	--	18	92	0	0	220
AROCLOR-1260	3	0	0	--	--	--	18	92	0	0	220
BETA-BHC	3	0	0	--	--	--	2	10	--	--	NA
DELTA-BHC	3	0	0	--	--	--	2	10	--	--	NA
DIELDRIN	3	0	0	--	--	--	4	19	0	0	30
ENDOSULFAN I	3	0	0	--	--	--	2	10	0	0	370,000
ENDOSULFAN II	3	0	0	--	--	--	4	19	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	3	0	0	--	--	--	4	19	--	--	NA
ENDRIN	3	0	0	--	--	--	4	19	0	0	18,000
ENDRIN ALDEHYDE	3	0	0	--	--	--	4	19	--	--	NA
ENDRIN KETONE	3	0	0	--	--	--	4	19	--	--	NA
GAMMA-BHC (LINDANE)	3	0	0	--	--	--	2	10	--	--	NA
GAMMA-CHLORDANE	3	0	0	--	--	--	2	10	0	0	1,600 (chlordane)
HEPTACHLOR	3	0	0	--	--	--	0.3	2	0	0	110
HEPTACHLOR EPOXIDE	3	0	0	--	--	--	0.3	2	0	0	53
METHOXYCHLOR	3	0	0	--	--	--	19	97	0	0	310,000
TOXAPHENE	3	0	0	--	--	--	94	**490**	0	2	440

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
pH ()											
PH	3	3	100	8.5	8.1 J	8.9 J	0.0	0.0	--	--	NA
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	3	0	0	--	--	--	37	1,900	--	--	NA
ACENAPHTHENE	3	0	0	--	--	--	37	1,900	0	0	3,700,000
ACENAPHTHYLENE	3	0	0	--	--	--	37	1,900	--	--	NA
ANTHRACENE	3	1	33	220	220 J	220 J	37	1,900	0	0	22,000,000
BENZO(A)ANTHRACENE	3	1	33	390	390 J	390 J	37	**1,900**	0	1	620
BENZO(A)PYRENE	3	1	33	**300**	**300 J**	**300 J**	37	**1,900**	1	1	62
BENZO(B)FLUORANTHENE	3	1	33	320	320 J	320 J	37	**1,900**	0	1	620
BENZO(G,H,I)PERYLENE	3	0	0	--	--	--	37	1,900	--	--	NA
BENZO(K)FLUORANTHENE	3	0	0	--	--	--	37	**1,900**	0	2	380 (CAL-modified)
CHRYSENE	3	1	33	430	430 J	430 J	37	1,900	0	0	3,800 (CAL-modified)
DIBENZO(A,H)ANTHRACENE	3	0	0	--	--	--	37	**1,900**	0	2	62
FLUORANTHENE	3	1	33	770	770 J	770 J	37	1,900	0	0	2,300,000
FLUORENE	3	0	0	--	--	--	37	1,900	0	0	2,700,000
INDENO(1,2,3-CD)PYRENE	3	0	0	--	--	--	37	**1,900**	0	2	620
NAPHTHALENE	3	0	0	--	--	--	37	1,900	0	0	56,000
PHENANTHRENE	3	1	33	700	700 J	700 J	37	1,900	--	--	NA
PYRENE	3	1	33	980	980 J	980 J	37	1,900	0	0	2,300,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	3	0	0	--	--	--	37	1,900	0	0	650,000
1,2-DICHLOROBENZENE	3	0	0	--	--	--	18	920	0	0	370,000
1,3-DICHLOROBENZENE	3	0	0	--	--	--	18	920	0	0	16,000
1,4-DICHLOROBENZENE	3	0	0	--	--	--	18	920	0	0	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	3	0	0	--	--	--	37	1,900	--	--	NA
2,4,5-TRICHLOROPHENOL	3	0	0	--	--	--	89	4,600	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	3	0	0	--	--	--	37	1,900	0	0	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	3	0	0	--	--	--	37	1,900	0	0	180,000
2,4-DIMETHYLPHENOL	3	0	0	--	--	--	37	1,900	0	0	1,200,000
2,4-DINITROPHENOL	1	0	0	--	--	--	89	89	0	0	120,000
2,4-DINITROTOLUENE	3	0	0	--	--	--	37	1,900	0	0	120,000

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
2,6-DINITROTOLUENE	3	0	0	--	--	--	37	1,900	0	0	61,000
2-CHLORONAPHTHALENE	3	0	0	--	--	--	37	1,900	--	--	NA
2-CHLOROPHENOL	3	0	0	--	--	--	37	1,900	0	0	63,000
2-METHYLPHENOL	3	0	0	--	--	--	37	1,900	--	--	NA
2-NITROANILINE	3	0	0	--	--	--	89	**4,600**	0	2	1,700
2-NITROPHENOL	3	0	0	--	--	--	37	1,900	--	--	NA
3,3'-DICHLOROBENZIDINE	3	0	0	--	--	--	37	**1,900**	0	2	1,100
3-NITROANILINE	3	0	0	--	--	--	89	4,600	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	1	0	0	--	--	--	89	89	--	--	NA
4-BROMOPHENYL-PHENYLETHER	3	0	0	--	--	--	37	1,900	--	--	NA
4-CHLORO-3-METHYLPHENOL	3	0	0	--	--	--	37	1,900	--	--	NA
4-CHLOROANILINE	3	0	0	--	--	--	37	1,900	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	3	0	0	--	--	--	37	1,900	--	--	NA
4-METHYLPHENOL	3	0	0	--	--	--	37	1,900	0	0	310,000
4-NITROANILINE	3	0	0	--	--	--	89	4,600	--	--	NA
4-NITROPHENOL	3	0	0	--	--	--	89	4,600	--	--	NA
BIS(2-CHLOROETHOXY)METHANE	3	0	0	--	--	--	37	1,900	--	--	NA
BIS(2-CHLOROETHYL)ETHER	3	0	0	--	--	--	37	**1,900**	0	2	210
BIS(2-ETHYLHEXYL)PHTHALATE	3	0	0	--	--	--	14	750	0	0	35,000
BUTYLBENZYLPHTHALATE	3	0	0	--	--	--	37	1,900	0	0	12,000,000
CARBAZOLE	3	0	0	--	--	--	37	1,900	0	0	24,000
DI-N-BUTYLPHTHALATE	3	0	0	--	--	--	37	1,900	--	--	NA
DI-N-OCTYLPHTHALATE	3	0	0	--	--	--	37	1,900	--	--	NA
DIBENZOFURAN	3	0	0	--	--	--	37	1,900	0	0	290,000
DIETHYLPHTHALATE	3	0	0	--	--	--	37	1,900	0	0	49,000,000
DIMETHYLPHTHALATE	3	0	0	--	--	--	37	1,900	0	0	100,000,000
HEXACHLOROBENZENE	3	0	0	--	--	--	37	**1,900**	0	2	300
HEXACHLOROBUTADIENE	3	0	0	--	--	--	37	1,900	0	0	6,200
HEXACHLOROCYCLOPENTADIENE	3	0	0	--	--	--	37	1,900	0	0	370,000
HEXACHLOROETHANE	3	0	0	--	--	--	37	1,900	0	0	35,000
ISOPHORONE	3	0	0	--	--	--	37	1,900	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	3	0	0	--	--	--	37	**1,900**	0	2	69
N-NITROSODIPHENYLAMINE	3	0	0	--	--	--	37	1,900	0	0	99,000

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
NITROBENZENE	3	0	0	--	--	--	37	1,900	0	0	20,000
PENTACHLOROPHENOL	3	0	0	--	--	--	89	**4,600**	0	2	3,000
PHENOL	3	0	0	--	--	--	37	1,900	0	0	37,000,000
Metals (mg/kg)											
ALUMINUM	3	3	100	7,220	5,370	8,690	0.0	0.0	0	0	76,000
ANTIMONY	3	1	33	0.55	0.55 J	0.55 J	0.42	0.44	0	0	31.0
ARSENIC	3	2	67	**1.6**	**1.5 J**	**1.7 J**	**1.3**	**1.3**	2	1	0.39
BARIUM	3	3	100	45.3	25.3 J	55.8	0.0	0.0	0	0	5,400
BERYLLIUM	3	0	0	--	--	--	0.044	0.046	0	0	150
CADMIUM	3	0	0	--	--	--	0.044	0.046	0	0	37.0
CALCIUM	3	3	100	9,180	2,630	17,200	0.0	0.0	--	--	NA
CHROMIUM	3	3	100	31.5	28.2	34.0	0.0	0.0	0	0	210
COBALT	3	3	100	6.6	5.7 J	7.7 J	0.0	0.0	0	0	900
COPPER	3	2	67	11.5	9.9	13.1	6.1	6.1	0	0	3,100
IRON	3	3	100	11,800	9,430	13,800	0.0	0.0	0	0	23,000
LEAD	36	24	67	46.9	1.2	**280**	2.5	21.0	1	0	150 (CAL-modified)
MAGNESIUM	3	3	100	3,820	2,500	5,300	0.0	0.0	--	--	NA
MANGANESE	3	3	100	210	110	263	0.0	0.0	0	0	1,800
MERCURY	3	0	0	--	--	--	0.10	0.11	0	0	23.0
MOLYBDENUM	3	0	0	--	--	--	0.22	0.23	0	0	390
NICKEL	3	3	100	27.9	25.6	29.7	0.0	0.0	0	0	1,600
POTASSIUM	3	3	100	664	509 J	777 J	0.0	0.0	--	--	NA
SELENIUM	3	0	0	--	--	--	0.36	0.46	0	0	390
SILVER	3	0	0	--	--	--	0.088	0.092	0	0	390
SODIUM	3	0	0	--	--	--	26.2	546	--	--	NA
THALLIUM	3	0	0	--	--	--	0.39	0.41	0	0	5.2
VANADIUM	3	3	100	26.2	23.1	28.7	0.0	0.0	0	0	550
ZINC	3	3	100	27.4	19.8	32.4	0.0	0.0	0	0	23,000
Total Petroleum Hydrocarbons (mg/kg)											
DIESEL RANGE ORGANICS	36	25	69	6,100	5 J	36,000	1	110	--	--	NA
GASOLINE RANGE ORGANICS	36	17	47	5,200	3 J	40,000 J	0.5	500	--	--	NA

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Total Petroleum Hydrocarbons (mg/kg)											
JP5 RANGE ORGANICS	16	7	44	180	14	720	10	110	--	--	NA
MOTOR OIL RANGE ORGANICS	36	24	67	7,600	18	30,000	11	250	--	--	NA
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	16	0	0	--	--	--	10	200	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	16	0	0	--	--	--	10	200	0	0	410
1,1,2-TRICHLOROETHANE	16	0	0	--	--	--	10	200	0	0	730
1,1-DICHLOROETHANE	16	0	0	--	--	--	10	200	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	16	0	0	--	--	--	10	200	0	0	120,000
1,2,4-TRIMETHYLBENZENE	13	7	54	1,500	21	7,700	10	10	0	0	52,000
1,2-DICHLOROETHANE	16	0	0	--	--	--	10	200	0	0	280
1,2-DICHLOROETHENE (TOTAL)	3	0	0	--	--	--	11	11	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	16	0	0	--	--	--	10	200	0	0	340
1,3,5-TRIMETHYLBENZENE	13	7	54	170	15	660	10	10	0	0	21,000
2-BUTANONE	3	0	0	--	--	--	11	11	--	--	NA
2-HEXANONE	3	0	0	--	--	--	11	11	--	--	NA
4-METHYL-2-PENTANONE	3	0	0	--	--	--	11	11	--	--	NA
ACETONE	3	0	0	--	--	--	11	11	0	0	1,600,000
BENZENE	36	10	28	100	7 J	290	10	61	0	0	600
BROMODICHLOROMETHANE	16	0	0	--	--	--	10	200	0	0	820
BROMOFORM	16	0	0	--	--	--	10	200	0	0	62,000
BROMOMETHANE	16	0	0	--	--	--	10	200	0	0	3,900
CARBON DISULFIDE	3	0	0	--	--	--	11	11	0	0	360,000
CARBON TETRACHLORIDE	16	0	0	--	--	--	10	200	0	0	250
CHLOROBENZENE	36	0	0	--	--	--	10	200	0	0	150,000
CHLOROETHANE	16	0	0	--	--	--	10	200	0	0	3,000
CHLOROFORM	16	0	0	--	--	--	10	200	0	0	940 (CAL-modified)
CHLOROMETHANE	16	0	0	--	--	--	10	200	0	0	1,200
CIS-1,2-DICHLOROETHENE	13	0	0	--	--	--	10	200	0	0	43,000
CIS-1,3-DICHLOROPROPENE	16	0	0	--	--	--	10	200	0	0	780 (not cis)
DIBROMOCHLOROMETHANE	16	0	0	--	--	--	10	200	0	0	1,100
ETHYLBENZENE	36	14	39	110	9	400	10	22	0	0	8,900
M,P-XYLENE	20	9	45	220	8 J	1,300	11	61	0	0	270,000 (xylenes)

TABLE 6-13: SITE 13 STATISTICAL SUMMARY OF SOIL (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
METHYL-T-BUTYL ETHER	33	0	0	--	--	--	10	200	0	0	17,000 (CAL-modified)
METHYLENE CHLORIDE	16	0	0	--	--	--	10	200	0	0	9,100
O-XYLENE	20	8	40	220	18 J	650	11	22	0	0	270,000 (xylenes)
STYRENE	16	0	0	--	--	--	10	200	0	0	1,700,000
TETRACHLOROETHENE	16	0	0	--	--	--	10	200	0	0	1,500
TOLUENE	36	8	22	150	16	570	10	61	0	0	520,000
TRANS-1,2-DICHLOROETHENE	13	0	0	--	--	--	10	200	0	0	69,000
TRANS-1,3-DICHLOROPROPENE	16	0	0	--	--	--	10	200	0	0	780 (not trans)
TRICHLOROETHENE	16	0	0	--	--	--	10	**200**	0	2	53
VINYL CHLORIDE	16	0	0	--	--	--	10	**200**	0	2	79 (child or adult)
XYLENE (TOTAL)	16	5	31	2,500	46	11,000	10	1,700	0	0	270,000

Bold denotes values elevated above the PRG

Polynuclear aromatic hydrocarbons compounds were analyzed under semivolatile organic compound method.

%	Percent
--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
mg/kg	Milligram per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Microgram per kilogram

TABLE 6-14: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Tap Water PRG	MCL
Alkalinity (µg/l)												
BICARBONATE ALKALINITY	4	4	100	1,300,000	870,000	2,400,000	0.0	0.0	--	--	NA	NA
CARBONATE ALKALINITY	4	0	0	--	--	--	5,000	5,000	--	--	NA	NA
HYDROXIDE ALKALINITY	4	0	0	--	--	--	5,000	5,000	--	--	NA	NA
TOTAL ALKALINITY	4	4	100	1,300,000	870,000	2,400,000	0.0	0.0	--	--	NA	NA
Anions (µg/l)												
CHLORIDE	4	4	100	296,000	19,000	840,000	0.0	0.0	--	--	NA	NA
NITRATE	4	0	0	--	--	--	50.0	500	--	--	NA	NA
SULFATE	4	3	75	17,500	1,600	27,000	2,500	2,500	--	--	NA	NA
Dissolved Gases (µg/l)												
METHANE	4	4	100	2,600	42 J	4,200 J	0.0	0.0	--	--	NA	NA
Metals (µg/l)												
Filtered												
LEAD	22	4	18	47.4	3.5 J	86.0	3.0	3.0	--	--	NA	15.0
Total Petroleum Hydrocarbons (mg/l)												
DIESEL RANGE ORGANICS	22	20	91	32	0.3	510	0.1	0.1	--	--	NA	NA
GASOLINE RANGE ORGANICS	22	16	73	8	0.4 J	72 J	0.05	0.3	--	--	NA	NA
JP5 RANGE ORGANICS	8	7	88	0.7	0.2	1	0.1	0.1	--	--	NA	NA
MOTOR OIL RANGE ORGANICS	22	14	64	63	0.5	570	0.5	0.5	--	--	NA	NA
TOTAL PETROLEUM HYDROCARBONS				ND	ND	ND			--	--		
Volatile Organic Compounds (µg/l)												
1,1,1-TRICHLOROETHANE	13	0	0	--	--	--	1	20	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	13	0	0	--	--	--	**1**	**20**	0	13	0.06	1
1,1,2-TRICHLOROETHANE	13	0	0	--	--	--	**1**	**20**	0	13	0.2	5
1,1-DICHLOROETHANE	13	0	0	--	--	--	1	**20**	0	3	2 (CAL-modified)	5
1,1-DICHLOROETHENE	13	0	0	--	--	--	1	20	0	0	340	6
1,2,4-TRIMETHYLBENZENE	13	6	46	**17**	6	**40**	1	10	3	0	12	NA
1,2-DICHLOROETHANE	13	0	0	--	--	--	**1**	**20**	0	13	0.1	0.5
1,2-DICHLOROPROPANE	13	0	0	--	--	--	**1**	**20**	0	13	0.2	5
1,3,5-TRIMETHYLBENZENE	13	4	31	9	2	**16**	1	**20**	1	1	12	NA

TABLE 6-14: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/l)												
BENZENE	23	12	52	**360**	**0.5**	**1,400**	**0.5**	**3**	12	11	0.3	1
BROMODICHLOROMETHANE	13	0	0	--	--	--	**1**	**20**	0	13	0.2	80
BROMOFORM	13	0	0	--	--	--	1	**20**	0	3	9	80
BROMOMETHANE	13	0	0	--	--	--	5	**100**	0	2	9	NA
CARBON TETRACHLORIDE	13	0	0	--	--	--	**1**	**20**	0	13	0.2	0.5
CHLOROBENZENE	23	1	4	25	25	25	1	20	0	0	110	70
CHLOROETHANE	13	0	0	--	--	--	**5**	**100**	0	13	5	NA
CHLOROFORM	13	0	0	--	--	--	**1**	**20**	0	13	0.5 (CAL-modified)	80
CHLOROMETHANE	13	0	0	--	--	--	**5**	**100**	0	13	2	NA
CIS-1,2-DICHLOROETHENE	13	0	0	--	--	--	1	20	0	0	61	6
CIS-1,3-DICHLOROPROPENE	13	0	0	--	--	--	**1**	**20**	0	13	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	13	0	0	--	--	--	**1**	**20**	0	13	0.1	80
ETHYLBENZENE	23	12	52	**28**	0.8J	**96**	1	**20**	10	2	3	300
M,P-XYLENE	14	8	57	43	0.5J	120	1	5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	23	0	0	--	--	--	2	**40**	0	8	6 (CAL-modified)	13
METHYLENE CHLORIDE	13	0	0	--	--	--	2	**100**	0	9	4	NA
O-XYLENE	14	8	57	30	0.6J	76	1	1	0	0	210 (xylenes)	NA
STYRENE	13	0	0	--	--	--	1	20	0	0	1,600	100
TETRACHLOROETHENE	13	0	0	--	--	--	**1**	**20**	0	13	0.7	5
TOLUENE	23	9	39	20	1	65	1	20	0	0	720	150
TRANS-1,2-DICHLOROETHENE	13	0	0	--	--	--	1	20	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	13	0	0	--	--	--	**1**	**20**	0	13	0.4 (not trans)	0.5
TRICHLOROETHENE	13	1	8	**0.6**	**0.6 J**	**0.6 J**	**1**	**20**	1	12	0.03	5
VINYL CHLORIDE	13	0	0	--	--	--	**0.5**	**10**	0	13	0.02 (child or adult)	0.5
XYLENE (TOTAL)	9	6	67	110	4	**450**	1	1	1	0	210	1,800

TABLE 6-14: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
mg/l	Milligram per liter
NA	No criteria available
ND	None detected
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Microgram per liter

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	120	0	0	--	--	--	5	2,900	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	120	0	0	--	--	--	5	**5,900**	0	8	410
1,1,2-TRICHLOROETHANE	120	0	0	--	--	--	5	**2,900**	0	5	730
1,1-DICHLOROETHANE	120	0	0	--	--	--	5	**2,900**	0	1	2,800 (CAL-modified)
1,1-DICHLOROETHENE	123	0	0	--	--	--	3	2,900	0	0	120,000
1,2-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	370,000
1,2-DICHLOROETHANE	123	0	0	--	--	--	3	**2,900**	0	8	280
1,2-DICHLOROETHENE (TOTAL)	109	0	0	--	--	--	5	2,900	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	120	0	0	--	--	--	5	**2,900**	0	8	340
1,3-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	16,000
1,4-DICHLOROBENZENE	56	0	0	--	--	--	5	2,900	0	0	3,400
2-BUTANONE	123	0	0	--	--	--	5	5,900	--	--	NA
2-CHLOROETHYLVINYLETHER	66	0	0	--	--	--	10	5,900	--	--	NA
2-HEXANONE	120	0	0	--	--	--	5	5,900	--	--	NA
4-METHYL-2-PENTANONE	120	1	1	41	41 J	41 J	5	5,900	--	--	NA
ACETONE	120	5	4	250	150 J	470 J	5	5,900	0	0	1,600,000
BENZENE	137	18	13	150	0.4 J	**1,000**	1	**2,900**	2	4	600
BROMODICHLOROMETHANE	120	0	0	--	--	--	5	**2,900**	0	1	820
BROMOFORM	120	0	0	--	--	--	5	2,900	0	0	62,000
BROMOMETHANE	120	0	0	--	--	--	10	**5,900**	0	1	3,900
CARBON DISULFIDE	120	3	3	2	1 J	2 J	5	2,900	0	0	360,000
CARBON TETRACHLORIDE	123	0	0	--	--	--	3	**2,900**	0	8	250
CHLOROBENZENE	123	1	1	2	2 J	2 J	1	2,900	0	0	150,000
CHLOROETHANE	120	0	0	--	--	--	10	**5,900**	0	1	3,000
CHLOROFORM	123	0	0	--	--	--	3	**2,900**	0	1	940 (CAL-modified)
CHLOROMETHANE	120	0	0	--	--	--	10	**5,900**	0	7	1,200
CIS-1,2-DICHLOROETHENE	1	0	0	--	--	--	29	29	0	0	43,000
CIS-1,2-DICHLOROPROPENE	10	0	0	--	--	--	5	500	--	--	NA
CIS-1,3-DICHLOROPROPENE	110	0	0	--	--	--	5	**2,900**	0	2	780 (not cis)
DIBROMOCHLOROMETHANE	120	0	0	--	--	--	5	**2,900**	0	1	1,100
ETHYLBENZENE	134	24	18	470	0.7 J	5,100	0.3	790	0	0	8,900

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
ETHYLENE DIBROMIDE	6	0	0	--	--	--	6	14	--	--	NA
HEXANE	1	0	0	--	--	--	29	29	0	0	110,000 (n-hexane)
METHYLENE CHLORIDE	120	0	0	--	--	--	5	5,900	0	0	9,100
O-XYLENE	1	0	0	--	--	--	29	29	0	0	270,000 (xylenes)
STYRENE	120	0	0	--	--	--	5	2,900	0	0	1,700,000
TETRACHLOROETHENE	123	0	0	--	--	--	2	**2,900**	0	1	1,500
TOLUENE	134	77	57	210	1 J	9,100 J	5	2,900	0	0	520,000
TRANS-1,2-DICHLOROETHENE	11	0	0	--	--	--	5	500	0	0	69,000
TRANS-1,3-DICHLOROPROPENE	120	0	0	--	--	--	5	**2,900**	0	2	780 (not trans)
TRICHLOROETHENE	123	0	0	--	--	--	3	**2,900**	0	12	53
TRICHLOROFLUOROMETHANE	67	0	0	--	--	--	5	2,900	0	0	390,000
VINYL ACETATE	85	0	0	--	--	--	5	5,900	0	0	430,000
VINYL CHLORIDE	123	0	0	--	--	--	5	**5,900**	0	9	79 (child or adult)
XYLENE (TOTAL)	134	23	17	3,900	1 J	38,000	5	2,900	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	157	0	0	--	--	--	330	62,000	0	0	650,000
1,2-DICHLOROBENZENE	157	0	0	--	--	--	330	62,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	81	0	0	--	--	--	340	**7,900**	0	11	610
1,3-DICHLOROBENZENE	157	0	0	--	--	--	330	**62,000**	0	2	16,000
1,4-DICHLOROBENZENE	160	0	0	--	--	--	10	**62,000**	0	11	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	62	0	0	--	--	--	330	62,000	--	--	NA
2,4,5-TRICHLOROPHENOL	160	0	0	--	--	--	30	170,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	160	0	0	--	--	--	45	**62,000**	0	7	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	157	0	0	--	--	--	330	62,000	0	0	180,000
2,4-DIMETHYLPHENOL	157	3	2	4,400	140 J	12,000 J	330	34,000	0	0	1,200,000
2,4-DINITROPHENOL	144	0	0	--	--	--	870	**170,000**	0	1	120,000
2,4-DINITROTOLUENE	160	0	0	--	--	--	20	62,000	0	0	120,000
2,6-DINITROTOLUENE	157	0	0	--	--	--	330	**62,000**	0	1	61,000
2-CHLORONAPHTHALENE	157	0	0	--	--	--	330	62,000	--	--	NA
2-CHLOROPHENOL	157	0	0	--	--	--	330	62,000	0	0	63,000

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
2-METHYLPHENOL	160	1	1	10	10	10	20	62,000	--	--	NA
2-NITROANILINE	157	0	0	--	--	--	870	**170,000**	0	87	1,700
2-NITROPHENOL	157	0	0	--	--	--	340	62,000	--	--	NA
3,3'-DICHLOROBENZIDINE	157	0	0	--	--	--	350	**68,000**	0	39	1,100
3-METHYL PHENOL	3	1	33	19	19	19	20	20	--	--	NA
3-NITROANILINE	157	0	0	--	--	--	870	170,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	155	0	0	--	--	--	870	170,000	--	--	NA
4-BROMOPHENYL-PHENYLETHER	157	0	0	--	--	--	330	62,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	157	0	0	--	--	--	340	62,000	--	--	NA
4-CHLOROANILINE	157	0	0	--	--	--	330	62,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	157	0	0	--	--	--	330	62,000	--	--	NA
4-METHYLPHENOL	160	1	1	14	14	14	20	62,000	0	0	310,000
4-NITROANILINE	157	0	0	--	--	--	870	170,000	--	--	NA
4-NITROPHENOL	156	0	0	--	--	--	390	170,000	--	--	NA
ANILINE	50	0	0	--	--	--	330	6,900	0	0	85,000
AZOBENZENE	10	0	0	--	--	--	330	1,000	0	0	4,400
BENZIDINE	10	0	0	--	--	--	**330**	**1,000**	0	10	2
BENZOIC ACID	105	0	0	--	--	--	1,600	170,000	0	0	100,000,000
BENZYL ALCOHOL	105	0	0	--	--	--	330	34,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	157	0	0	--	--	--	330	62,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	157	0	0	--	--	--	**330**	**62,000**	0	157	210
BIS(2-ETHYLHEXYL)PHTHALATE	157	0	0	--	--	--	330	**62,000**	0	1	35,000
BUTYLBENZYLPHTHALATE	157	0	0	--	--	--	330	62,000	0	0	12,000,000
CARBAZOLE	52	4	8	1,700	130 J	5,900 J	350	14,000	0	0	24,000
DI-N-BUTYLPHTHALATE	157	5	3	42	31 J	69 J	330	62,000	--	--	NA
DI-N-OCTYLPHTHALATE	157	1	1	25	25 J	25 J	330	62,000	--	--	NA
DIBENZOFURAN	157	4	3	2,200	23 J	6,900 J	330	34,000	0	0	290,000
DIETHYLPHTHALATE	157	0	0	--	--	--	330	62,000	0	0	49,000,000
DIMETHYLPHTHALATE	157	0	0	--	--	--	330	62,000	0	0	100,000,000
HEXACHLOROBENZENE	160	0	0	--	--	--	20	**62,000**	0	157	300
HEXACHLOROBUTADIENE	160	0	0	--	--	--	20	**62,000**	0	9	6,200

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
HEXACHLOROCYCLOPENTADIENE	155	0	0	--	--	--	330	62,000	0	0	370,000
HEXACHLOROETHANE	160	0	0	--	--	--	15	**62,000**	0	1	35,000
ISOPHORONE	157	0	0	--	--	--	330	62,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	156	0	0	--	--	--	**330**	**62,000**	0	156	69
N-NITROSODIMETHYLAMINE	50	0	0	--	--	--	**330**	**6,900**	0	50	10
N-NITROSODIPHENYLAMINE	156	33	21	310	42 J	4,500 J	330	62,000	0	0	99,000
NITROBENZENE	159	0	0	--	--	--	10	**62,000**	0	2	20,000
PENTACHLOROPHENOL	160	4	3	520	170 J	1,000 J	100	**170,000**	0	28	3,000
PHENOL	157	0	0	--	--	--	330	62,000	0	0	37,000,000
PYRIDINE	3	0	0	--	--	--	15	15	--	--	NA
Polynuclear Aromatic Hydrocarbons (mg/kg)											
2-METHYLNAPHTHALENE	323	160	50	38	0.001 J	1,700	0.005	55	--	--	NA
ACENAPHTHENE	323	66	20	19	0.003 J	350	0.01	110	0	0	3,700
ACENAPHTHYLENE	323	90	28	20	0.002 J	720	0.01	110	--	--	NA
ANTHRACENE	323	122	38	36	0.001 J	1,200	0.005	110	0	0	22,000
BENZ(A)ANTHRACENE	323	194	60	79	0.002 J	4,300	0.005	55	--	--	NA
BENZO(A)PYRENE	323	187	58	**82**	0.002 J	**5,200**	0.005	**110**	146	56	0.06
BENZO(B)FLUORANTHENE	323	182	56	**63**	0.002 J	**3,200**	0.005	**55**	127	49	0.6
BENZO(G,H,I)PERYLENE	323	198	61	52	0.002 J	2,900	0.005	55	--	--	NA
BENZO(K)FLUORANTHENE	323	146	45	**63**	0.003 J	**3,500**	0.005	**55**	116	65	0.4 (CAL-modified)
CHRYSENE	323	199	62	**120**	0.002 J	**4,900**	0.005	**55**	101	37	4 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	323	132	41	25	0.002 J	840	0.005	55	--	--	NA
FLUORANTHENE	323	185	57	100	0.002 J	**7,400**	0.005	55	1	0	2,300
FLUORENE	323	105	33	54	0.002 J	1,500	0.01	110	0	0	2,700
INDENO(1,2,3-CD)PYRENE	323	149	46	**59**	0.002 J	**3,300**	0.005	**110**	102	72	0.6
NAPHTHALENE	323	141	44	20	0.001 J	**600**	0.01	**110**	11	1	56
PHENANTHRENE	323	192	59	88	0.002 J	3,700	0.005	55	--	--	NA
PYRENE	323	187	58	130	0.002 J	**7,100**	0.005	55	3	0	2,300

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
PCBs/Pesticides (ug/kg)											
4,4'-DDD	96	2	2	7	5	9	2	470	0	0	2,400
4,4'-DDE	96	5	5	24	4	35	2	470	0	0	1,700
4,4'-DDT	96	7	7	30	2	160	2	470	0	0	1,700
ALDRIN	96	0	0	--	--	--	1	**240**	0	4	29
ALPHA-BHC	96	0	0	--	--	--	1	240	--	--	NA
ALPHA-CHLORDANE	36	0	0	--	--	--	4	**2,400**	0	1	1,600 (chlordane)
AROCLOR-1016	96	0	0	--	--	--	26	2,400	0	0	3,900
AROCLOR-1221	96	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1232	96	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1242	96	0	0	--	--	--	26	**2,400**	0	13	220
AROCLOR-1248	96	0	0	--	--	--	17	**2,400**	0	7	220
AROCLOR-1254	96	0	0	--	--	--	17	**4,700**	0	11	220
AROCLOR-1260	96	0	0	--	--	--	17	**4,700**	0	11	220
BETA-BHC	96	2	2	3	2	4	1	240	--	--	NA
CHLORDANE	59	0	0	--	--	--	10	530	0	0	1,600
DELTA-BHC	96	0	0	--	--	--	1	240	--	--	NA
DIELDRIN	96	0	0	--	--	--	1	**470**	0	5	30
ENDOSULFAN I	96	0	0	--	--	--	2	240	0	0	370,000
ENDOSULFAN II	96	0	0	--	--	--	2	470	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	96	0	0	--	--	--	2	470	--	--	NA
ENDRIN	94	0	0	--	--	--	2	470	0	0	18,000
ENDRIN ALDEHYDE	60	0	0	--	--	--	2	100	--	--	NA
ENDRIN KETONE	36	0	0	--	--	--	8	470	--	--	NA
GAMMA-BHC (LINDANE)	95	0	0	--	--	--	1	240	--	--	NA
GAMMA-CHLORDANE	36	0	0	--	--	--	4	**2,400**	0	1	1,600 (chlordane)
HEPTACHLOR	94	0	0	--	--	--	1	**240**	0	1	110
HEPTACHLOR EPOXIDE	92	1	1	5	5	5	1	**240**	0	2	53
METHOXYCHLOR	96	0	0	--	--	--	5	2,400	0	0	310,000
TOXAPHENE	95	0	0	--	--	--	52	**4,700**	0	13	440

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
ALUMINUM	173	173	100	7,730	45.8	35,700	0.0	0.0	0	0	76,000
ANTIMONY	184	65	35	2.5	0.37 J	8.2	0.15	7.8	0	0	31.0
ARSENIC	183	106	58	**4.3**	**1.1**	**20.0**	**1.2**	**13.0**	106	77	0.39
BARIUM	183	177	97	62.8	9.6	376	21.0	61.0	0	0	5,400
BERYLLIUM	184	74	40	0.48	0.080 J	2.0	0.050	1.3	0	0	150
CADMIUM	184	91	49	0.60	0.020 J	18.0	0.020	2.4	0	0	37.0
CALCIUM	173	173	100	3,150	363	26,500	0.0	0.0	--	--	NA
CHROMIUM	183	183	100	37.5	3.4 J	**337**	0.0	0.0	1	0	210
COBALT	184	151	82	6.0	1.4	20.2	0.15	14.9	0	0	900
COPPER	183	169	92	15.2	1.2 J	160	4.8	9.4	0	0	3,100
IRON	173	173	100	12,300	1,110 J	**74,800**	0.0	0.0	8	0	23,000
LEAD	212	144	68	64.1	1.0	**2,240**	2.5	6.5	9	0	150 (CAL-modified)
MAGNESIUM	173	173	100	3,000	153 J	14,400	0.0	0.0	--	--	NA
MANGANESE	173	173	100	156	7.5	702	0.0	0.0	0	0	1,800
MERCURY	89	41	46	0.11	0.010 J	0.86	0.010	0.22	0	0	23.0
MOLYBDENUM	184	4	2	2.1	0.25 J	5.9 J	0.15	6.5	0	0	390
NICKEL	183	181	99	36.3	1.2 J	278	13.8	15.8	0	0	1,600
POTASSIUM	173	162	94	962	270	4,950	170	654	--	--	NA
SELENIUM	183	53	29	1.8	0.14 J	15.0	0.29	13.0	0	0	390
SILVER	184	4	2	0.68	0.23 J	1.6 J	0.14	6.5	0	0	390
SODIUM	173	136	79	566	69.6 J	4,680	60.8	650	--	--	NA
THALLIUM	183	1	1	2.7	2.7	2.7	0.11	**13.0**	0	43	5.2
TITANIUM	94	94	100	413	42.6	655	0.0	0.0	--	--	NA
VANADIUM	183	183	100	34.1	2.0 J	**1,780**	0.0	0.0	1	0	550
ZINC	183	183	100	78.1	5.6 J	7,120	0.0	0.0	0	0	23,000

TABLE 6-15: SITE 13 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
mg/kg	Milligrams per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter

TABLE 6-16: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	24	0	0	--	--	--	**0.5**	**1**	0	24	0.4	NA
1,1,1-TRICHLOROETHANE	108	4	4	14	1	37 J	0.5	50	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	108	0	0	--	--	--	**0.5**	**50**	0	108	0.06	1
1,1,2-TRICHLOROETHANE	108	0	0	--	--	--	**0.5**	**50**	0	108	0.2	5
1,1-DICHLOROETHANE	108	0	0	--	--	--	0.5	**50**	0	7	2 (CAL-modified)	5
1,1-DICHLOROETHENE	108	2	2	5	1 J	9	0.5	50	0	0	340	6
1,1-DICHLOROPROPENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	22	0	0	--	--	--	**0.5**	**0.5**	0	22	0.006	NA
1,2,4-TRICHLOROBENZENE	30	0	0	--	--	--	0.5	1	0	0	190	5
1,2,4-TRIMETHYLBENZENE	22	1	5	2	2	2	0.5	0.5	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	30	0	0	--	--	--	**0.5**	**1**	0	30	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	46	1	2	0.4	0.4 J	0.4 J	0.5	4	0	0	370	600
1,2-DICHLOROETHANE	108	3	3	**1**	**0.8**	**2**	**0.5**	**50**	3	105	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	75	0	0	--	--	--	1	25	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	106	0	0	--	--	--	**0.5**	**50**	0	106	0.2	5
1,3,5-TRIMETHYLBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	12	NA
1,3-DICHLOROBENZENE	46	0	0	--	--	--	0.5	4	0	0	6	NA
1,3-DICHLOROPROPANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,4-DICHLOROBENZENE	46	1	2	0.4	0.4 J	0.4 J	0.5	**4**	0	23	0.5	5
2,2-DICHLOROPROPANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-BUTANONE	45	0	0	--	--	--	1	100	--	--	NA	NA
2-CHLOROETHYLVINYLETHER	1	0	0	--	--	--	100	100	--	--	NA	NA
2-CHLOROTOLUENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-HEXANONE	99	0	0	--	--	--	2	100	--	--	NA	NA
4-CHLOROTOLUENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
4-METHYL-2-PENTANONE	106	1	1	1	1 J	1 J	2	100	--	--	NA	NA
ACETONE	50	11	22	24	0.7 J	99 J	0.4	100	0	0	610	NA
BENZENE	108	9	8	**130**	**0.7**	**440**	**0.5**	**5**	9	99	0.3	1
BROMOBENZENE	22	0	0	--	--	--	0.5	0.5	0	0	20	NA
BROMOCHLOROMETHANE	30	0	0	--	--	--	0.5	1	--	--	NA	NA

TABLE 6-16: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMODICHLOROMETHANE	106	0	0	--	--	--	**0.5**	**50**	0	106	0.2	80
BROMOFORM	106	0	0	--	--	--	1	**50**	0	2	9	80
BROMOMETHANE	106	2	2	0.6	0.5J	0.6J	1	**100**	0	7	9	NA
CARBON DISULFIDE	106	3	3	0.7	0.3J	1	0.5	50	0	0	1,000	NA
CARBON TETRACHLORIDE	106	0	0	--	--	--	**0.5**	**50**	0	106	0.2	0.5
CHLOROBENZENE	108	2	2	0.4	0.2J	0.6J	0.5	50	0	0	110	70
CHLOROETHANE	108	0	0	--	--	--	1	**100**	0	7	5	NA
CHLOROFORM	106	0	0	--	--	--	0.5	**50**	0	84	0.5 (CAL-modified)	80
CHLOROMETHANE	108	1	1	0.3	0.3J	0.3J	1	**100**	0	76	2	NA
CIS-1,2-DICHLOROETHENE	32	0	0	--	--	--	0.5	1	0	0	61	6
CIS-1,2-DICHLOROPROPENE	1	0	0	--	--	--	50	50	--	--	NA	NA
CIS-1,3-DICHLOROPROPENE	83	0	0	--	--	--	**0.5**	**25**	0	83	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	106	0	0	--	--	--	**0.5**	**50**	0	106	0.1	80
DIBROMOMETHANE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	22	0	0	--	--	--	1	1	0	0	390	NA
DIISOPROPYL ETHER	22	1	5	0.8	0.8J	0.8J	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	108	9	8	**28**	1	**130**	0.2	**50**	6	6	3	300
ETHYLENE DIBROMIDE	33	0	0	--	--	--	0.5	1	--	--	NA	0.05
HEXACHLOROBUTADIENE	22	0	0	--	--	--	0.5	0.5	0	0	0.9	NA
ISOPROPYLBENZENE	22	4	18	1	0.3J	3	0.5	0.5	--	--	NA	NA
M,P-XYLENE	24	1	4	2	2	2	0.5	1	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	38	0	0	--	--	--	0.1	**10**	0	1	6 (CAL-modified)	13
METHYLENE CHLORIDE	108	0	0	--	--	--	0.1	**50**	0	25	4	NA
N-BUTYLBENZENE	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	22	3	14	0.6	0.3J	0.8	0.5	0.5	0	0	240	NA
NAPHTHALENE	24	5	21	**83**	1J	**210**	1	2	3	0	6	NA
O-XYLENE	24	1	4	0.2	0.2J	0.2J	0.5	1	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	22	3	14	0.3	0.2J	0.3J	0.5	0.5	--	--	NA	NA
SEC-BUTYLBENZENE	22	3	14	0.9	0.2J	1	0.5	0.5	0	0	240	NA
STYRENE	106	0	0	--	--	--	0.5	50	0	0	1,600	100

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Volatile Organic Compounds (µg/L)												
TERT-AMYL METHYL ETHER	22	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	22	1	5	4	4 J	4 J	10	20	--	--	NA	NA
TERT-BUTYLBENZENE	22	2	9	0.7	0.5 J	0.8	0.5	0.5	0	0	240	NA
TETRACHLOROETHENE	108	0	0	--	--	--	0.5	**50**	0	86	0.7	5
TOLUENE	108	3	3	6	0.9 J	8	0.5	50	0	0	720	150
TRANS-1,2-DICHLOROETHENE	33	0	0	--	--	--	0.5	50	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	84	0	0	--	--	--	**0.5**	**50**	0	84	0.4 (not trans)	0.5
TRICHLOROETHENE	108	4	4	**0.6**	**0.2 J**	**1**	**0.5**	**50**	4	104	0.03	5
TRICHLOROFLUOROMETHANE	23	0	0	--	--	--	1	50	--	--	NA	NA
VINYL ACETATE	6	0	0	--	--	--	5	100	0	0	410	NA
VINYL CHLORIDE	108	0	0	--	--	--	**0.5**	**100**	0	108	0.02 (child or adult)	0.5
XYLENE (TOTAL)	84	8	10	110	0.3 J	**530**	1	50	2	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	71	0	0	--	--	--	5	100	0	0	190	5
1,2-DICHLOROBENZENE	71	0	0	--	--	--	5	50	0	0	370	600
1,3-DICHLOROBENZENE	71	0	0	--	--	--	5	**50**	0	6	6	NA
1,4-DICHLOROBENZENE	71	0	0	--	--	--	**5**	**50**	0	71	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	66	0	0	--	--	--	5	100	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	71	0	0	--	--	--	25	250	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	71	0	0	--	--	--	**5**	**100**	0	71	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	71	1	1	7	7 J	7 J	5	100	0	0	110	NA
2,4-DIMETHYLPHENOL	71	0	0	--	--	--	5	100	0	0	730	NA
2,4-DINITROPHENOL	60	0	0	--	--	--	25	**250**	0	1	73	NA
2,4-DINITROTOLUENE	71	0	0	--	--	--	5	**100**	0	1	73	NA
2,6-DINITROTOLUENE	71	0	0	--	--	--	5	**100**	0	1	36	NA
2-CHLORONAPHTHALENE	71	0	0	--	--	--	5	100	--	--	NA	NA
2-CHLOROPHENOL	71	0	0	--	--	--	5	**100**	0	1	30	NA
2-METHYLNAPHTHALENE	71	9	13	23	0.9 J	130	5	10	--	--	NA	NA
2-METHYLPHENOL	71	0	0	--	--	--	5	100	0	0	1,800	NA
2-NITROANILINE	71	0	0	--	--	--	**25**	**250**	0	71	1	NA

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Semivolatile Organic Compounds (ug/L)												
2-NITROPHENOL	71	0	0	--	--	--	10	100	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	71	0	0	--	--	--	**10**	**100**	0	71	0.2	NA
3-NITROANILINE	71	0	0	--	--	--	25	250	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	71	0	0	--	--	--	25	250	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	71	0	0	--	--	--	5	100	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	71	1	1	0.7	0.7J	0.7J	10	100	--	--	NA	NA
4-CHLOROANILINE	71	0	0	--	--	--	5	100	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	71	0	0	--	--	--	5	100	--	--	NA	NA
4-METHYLPHENOL	71	0	0	--	--	--	5	100	0	0	180	NA
4-NITROANILINE	71	0	0	--	--	--	25	250	--	--	NA	NA
4-NITROPHENOL	71	0	0	--	--	--	25	250	--	--	NA	NA
ACENAPHTHENE	71	0	0	--	--	--	5	100	0	0	370	NA
ACENAPHTHYLENE	71	0	0	--	--	--	5	100	--	--	NA	NA
ANILINE	1	0	0	--	--	--	5	5	--	--	NA	NA
ANTHRACENE	71	0	0	--	--	--	5	100	0	0	1,800	NA
AZOBENZENE	1	0	0	--	--	--	5	5	--	--	NA	NA
BENZIDINE	1	0	0	--	--	--	5	5	--	--	NA	NA
BENZO(A)ANTHRACENE	71	0	0	--	--	--	**5**	**100**	0	71	0.09	0.1
BENZO(A)PYRENE	71	0	0	--	--	--	**0.2**	**100**	0	71	0.009	0.2
BENZO(B)FLUORANTHENE	71	0	0	--	--	--	**5**	**100**	0	71	0.09	NA
BENZO(G,H,I)PERYLENE	71	0	0	--	--	--	10	100	--	--	NA	NA
BENZO(K)FLUORANTHENE	71	0	0	--	--	--	**5**	**100**	0	71	0.06 (CAL-modified)	NA
BENZOIC ACID	6	0	0	--	--	--	25	50	0	0	150,000	NA
BENZYL ALCOHOL	6	0	0	--	--	--	5	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	71	0	0	--	--	--	5	100	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	71	0	0	--	--	--	**5**	**100**	0	71	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	71	0	0	--	--	--	4	**40**	0	9	5	NA
BUTYLBENZYLPHTHALATE	71	0	0	--	--	--	5	100	0	0	7,300	NA
CARBAZOLE	65	1	2	0.6	0.6J	0.6J	**10**	**100**	0	64	3	NA
CHRYSENE	71	0	0	--	--	--	**5**	**100**	0	71	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	71	0	0	--	--	--	5	100	--	--	NA	NA

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Semivolatile Organic Compounds (µg/L)												
DI-N-OCTYLPHTHALATE	71	0	0	--	--	--	5	100	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	71	0	0	--	--	--	**10**	**100**	0	71	0.009	NA
DIBENZOFURAN	71	0	0	--	--	--	5	**100**	0	1	24	NA
DIETHYLPHTHALATE	71	0	0	--	--	--	5	100	0	0	29,000	NA
DIMETHYLPHTHALATE	71	0	0	--	--	--	5	100	0	0	360,000	NA
FLUORANTHENE	71	0	0	--	--	--	5	100	0	0	1,500	NA
FLUORENE	71	4	6	1	0.8J	2J	10	100	0	0	240	NA
HEXACHLOROBENZENE	71	0	0	--	--	--	**5**	**100**	0	71	0.04	1
HEXACHLOROBUTADIENE	71	0	0	--	--	--	**5**	**100**	0	71	0.9	NA
HEXACHLOROCYCLOPENTADIENE	71	0	0	--	--	--	5	100	0	0	220	NA
HEXACHLOROETHANE	71	0	0	--	--	--	**5**	**100**	0	71	5	NA
INDENO(1,2,3-CD)PYRENE	71	0	0	--	--	--	**10**	**100**	0	71	0.09	NA
ISOPHORONE	71	0	0	--	--	--	5	**100**	0	1	71	NA
N-NITROSO-DI-N-PROPYLAMINE	71	0	0	--	--	--	**5**	**100**	0	71	0.01	NA
N-NITROSODIMETHYLAMINE	1	0	0	--	--	--	5	5	--	--	NA	NA
N-NITROSODIPHENYLAMINE	71	1	1	0.7	0.7J	0.7J	5	**100**	0	10	14	NA
NAPHTHALENE	71	9	13	**40**	2J	**200**	5	**10**	7	61	6	NA
NITROBENZENE	71	0	0	--	--	--	**5**	**100**	0	71	3	NA
PENTACHLOROPHENOL	71	2	3	**4**	**0.6J**	**7J**	**25**	**250**	2	69	0.6	1
PHENANTHRENE	71	1	1	4	4J	4J	10	100	--	--	NA	NA
PHENOL	71	3	4	15	0.9J	37	10	10	0	0	22,000	NA
PYRENE	71	0	0	--	--	--	5	100	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	13	1	8	61	61	61	5	5	0	0	370	NA
ACENAPHTHYLENE	13	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	13	0	0	--	--	--	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	0.1
BENZO(A)PYRENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.009	0.2
BENZO(B)FLUORANTHENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	NA
BENZO(G,H,I)PERYLENE	13	1	8	0.6	0.6	0.6	0.2	1	--	--	NA	NA

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Polynuclear Aromatic Hydrocarbons (ug/L)												
BENZO(K)FLUORANTHENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.06 (CAL-modified)	NA
CHRYSENE	13	1	8	0.5	0.5	0.5	0.2	**1**	0	1	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	13	1	8	**0.5**	**0.5J**	**0.5J**	**0.5**	**3**	1	12	0.009	NA
FLUORANTHENE	13	1	8	0.2	0.2J	0.2J	0.2	1	0	0	1,500	NA
FLUORENE	13	0	0	--	--	--	1	5	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	13	0	0	--	--	--	**0.2**	**1**	0	13	0.09	NA
NAPHTHALENE	13	1	8	**60**	**60**	**60**	5	5	1	0	6	NA
PHENANTHRENE	13	0	0	--	--	--	1	5	--	--	NA	NA
PYRENE	13	1	8	0.1	0.1J	0.1J	0.2	1	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	42	0	0	--	--	--	0.02	0.2	0	0	0.3	NA
4,4'-DDE	42	0	0	--	--	--	0.02	0.2	0	0	0.2	NA
4,4'-DDT	42	1	2	0.08	0.08	0.08	0.02	0.2	0	0	0.2	NA
ALDRIN	42	0	0	--	--	--	**0.02**	**0.1**	0	42	0.004	NA
ALPHA-BHC	42	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ALPHA-CHLORDANE	40	0	0	--	--	--	0.05	0.1	0	0	0.2 (chlordane)	NA
AROCLOR-1016	42	0	0	--	--	--	0.3	**1**	0	1	1	NA
AROCLOR-1221	42	0	0	--	--	--	**0.3**	**1**	0	42	0.03	NA
AROCLOR-1232	42	0	0	--	--	--	**0.3**	**1**	0	42	0.03	NA
AROCLOR-1242	42	0	0	--	--	--	**0.3**	**1**	0	42	0.03	NA
AROCLOR-1248	42	0	0	--	--	--	**0.3**	**1**	0	42	0.03	NA
AROCLOR-1254	42	0	0	--	--	--	**0.5**	**1**	0	42	0.03	NA
AROCLOR-1260	42	0	0	--	--	--	**0.5**	**1**	0	42	0.03	NA
BETA-BHC	42	0	0	--	--	--	0.02	0.1	--	--	NA	NA
CHLORDANE	2	0	0	--	--	--	**0.3**	**0.3**	0	2	0.2	NA
DELTA-BHC	42	0	0	--	--	--	0.02	0.1	--	--	NA	NA
DIELDRIN	42	0	0	--	--	--	**0.02**	**0.2**	0	42	0.004	NA
ENDOSULFAN I	42	0	0	--	--	--	0.02	0.1	0	0	220	NA
ENDOSULFAN II	45	0	0	--	--	--	0.02	0.2	--	--	NA	NA
ENDOSULFAN SULFATE	42	0	0	--	--	--	0.02	0.2	--	--	NA	NA

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PCBs/Pesticides (µg/L)												
ENDRIN	42	0	0	--	--	--	0.02	0.2	0	0	11	2
ENDRIN ALDEHYDE	45	0	0	--	--	--	0.02	0.2	--	--	NA	NA
ENDRIN KETONE	40	0	0	--	--	--	0.1	0.2	--	--	NA	NA
GAMMA-BHC (LINDANE)	42	0	0	--	--	--	0.02	0.1	--	--	NA	NA
GAMMA-CHLORDANE	40	0	0	--	--	--	0.05	0.1	0	0	0.2 (chlordane)	NA
HEPTACHLOR	42	0	0	--	--	--	**0.02**	**0.1**	0	42	0.02	0.01
HEPTACHLOR EPOXIDE	45	0	0	--	--	--	**0.01**	**0.02**	0	45	0.007	0.01
METHOXYCHLOR	42	0	0	--	--	--	0.05	1	0	0	180	30
TOXAPHENE	42	0	0	--	--	--	**1**	**6**	0	42	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	85	25	29	11,800	4.6 J	**244,000**	8.4	1,230	2	0	36,000	NA
ANTIMONY	79	19	24	3.2	0.051 J	**30.0**	0.093	**60.0**	1	4	15.0	6.0
ARSENIC	79	40	51	**12.8**	**0.21 J**	**96.0**	**0.80**	**200**	40	39	0.045	10.0
BARIUM	86	76	88	150	7.6 J	1,700	6.7	49.5	0	0	2,600	1,000
BERYLLIUM	79	16	20	1.7	0.14 J	6.0	0.10	10.0	0	0	73.0	4.0
CADMIUM	79	10	13	0.61	0.065 J	1.7 J	0.069	10.0	0	0	18.0	5.0
CALCIUM	85	84	99	79,800	9,590	253,000	89.8	89.8	--	--	NA	NA
CHROMIUM	79	25	32	36.8	0.090 J	720	0.30	10.0	--	--	NA	50.0
COBALT	79	18	23	12.0	0.10 J	170	0.093	50.0	0	0	730	NA
COPPER	86	21	24	15.4	0.57 J	190	0.65	42.5	0	0	1,500	1,300
IRON	85	48	56	13,600	7.4 J	**300,000**	3.2	429	7	0	11,000	NA
LEAD	83	12	14	167	0.13 J	1,770	0.022	50.0	--	--	NA	15.0
MAGNESIUM	85	84	99	44,700	110 J	322,000	32.4	32.4	--	--	NA	NA
MANGANESE	85	82	96	1,700	1.4 J	**11,000**	1.2	2.8	37	0	880	NA
MERCURY	77	3	4	0.11	0.046 J	0.22 J	0.10	1.0	0	0	11.0	2.0
MOLYBDENUM	78	13	17	13.3	0.41 J	106 J	0.25	50.0	0	0	180	NA
NICKEL	79	17	22	72.6	1.6 J	**920**	1.3	20.0	1	0	730	100
POTASSIUM	85	80	94	10,000	680	115,000	763	2,340	--	--	NA	NA
SELENIUM	78	9	12	14.3	0.36 J	120	0.80	100	0	0	180	50.0
SILVER	78	4	5	0.28	0.037 J	0.68 J	0.10	20.0	0	0	180	NA

TABLE 6-16: SITE 13 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
SODIUM	85	85	100	194,000	351 J	3,060,000	0.0	0.0	--	--	NA	NA
THALLIUM	79	2	3	**7.0**	**4.0 J**	**10.0J**	0.037	**100**	2	47	2.4	2.0
TITANIUM	2	2	100	3,450	1,300	5,600	0.0	0.0	--	--	NA	NA
VANADIUM	79	24	30	34.1	0.33 J	**550**	0.30	13.9	1	0	260	NA
ZINC	86	26	30	47.4	0.84 J	560	2.2	42.4	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 6-17: SITE 13 STATISTICAL SUMMARY OF SOIL GAS

Supplemental RI Data Gap Sampling, 2001

Remedial Investigation Report for CERCLA Sites 6, 7, 8, and 16, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentrations	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Limits Over PRG	Ambient Air PRG
Volatile Organic Compounds (µg/m^3)										
1,1,1-TRICHLOROETHANE	2	0	0	--	--	--	17.75	18.31	0	2,300
1,1,2,2-TETRACHLOROETHANE	2	1	50	**70.79**	**70.79**	**70.79**	**22.33**	**22.33**	1	0.033
1,1,2-TRICHLOROETHANE	2	1	50	**222.67**	**222.67**	**222.67**	**17.75**	**17.75**	1	0.12
1,1-DICHLOROETHANE	2	0	0	--	--	--	**13.16**	**13.58**	2	1.2 (CAL-modified)
1,1-DICHLOROETHENE	2	0	0	--	--	--	12.9	13.3	0	210
1,2-DICHLOROBENZENE	2	0	0	--	--	--	19.55	20.18	0	210
1,2-DICHLOROETHANE	2	1	50	**27.61**	**27.61**	**27.61**	**13.16**	**13.16**	1	0.074
1,3-DICHLOROBENZENE	2	0	0	--	--	--	**19.55**	**20.18**	2	3.3
1,4-DICHLOROBENZENE	2	0	0	--	--	--	**19.55**	**20.18**	2	0.31
BENZENE	2	2	100	**41.36**	**30.72**	**52**	--	--	--	0.23
CHLOROETHANE	2	0	0	--	--	--	**8.58**	**8.86**	2	2.3
CHLOROMETHANE	2	0	0	--	--	--	**6.72**	**6.93**	2	1.1
CIS-1,2-DICHLOROETHENE	2	0	0	--	--	--	12.9	13.3	0	37
ETHYLBENZENE	2	2	100	**33.09**	**17.91**	**48.27**	--	--	--	1.7
M-XYLENE	2	2	100	**142.09**	74.56	**209.61**	--	--	--	110
NAPHTHALENE	2	0	0	--	--	--	170.5	175.91	--	NA
O-XYLENE	2	2	100	25.19	14.75	35.62	--	--	--	110
TETRACHLOROETHENE	2	2	100	**31.35**	**28.83**	**33.86**	--	--	--	0.67
TOLUENE	2	2	100	**621.49**	304.82	**938.15**	--	--	--	400
TRANS-1,2-DICHLOROETHENE	2	0	0	--	--	--	12.9	13.3	0	73
TRICHLOROETHENE	2	0	0	--	--	--	**17.48**	**18.03**	2	0.017
VINYL CHLORIDE	2	0	0	--	--	--	**8.31**	**8.58**	2	0.11

NOTES:

Bold denotes value elevated above the PRG

-- Not detected

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/m^3 Micrograms per cubic meter

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
23	the release	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 6.1.2, Page 6-4. SulTech 2005.

15 pounds per square inch (psi) of pressure from an initial 100 psi in about 20 minutes (PRC and JMM 1992). This loss of pressure was considered a minor leak by the NAS Fuel Department. The location of the leak was not known, and the pipe continued to be used. The fuel line was removed in October 1998 (Tetra Tech and R&M 2000). Results of confirmation sampling are discussed in Section 6.3.

In early 1991, between 3,500 to 17,000 gallons of JP-5 were released from Building 397. It is believed that the release occurred when a small drain valve on a fuel supply line in the fuel room of Building 397 was left open. A flexible hose attached to the open drain valve ran into a floor drain leading to an OWS. The flexible tubing obscured the release of fuel from the supply line to the floor drain. The floor drain emptied to three OWSs (OWS 397A, 397B, and 397C) located at the eastern end of Building 397, which in turn drained to the storm sewer system. The release occurred over an unknown period of time from January 21, 1991, to March 1, 1991, when an investigation by NADEP discovered the drain valve on the supply line open (PRC and JMM 1992). Immediate cleanup involved pumping floating free product from the OWS, manholes, and storm water lines that contained free product. The EBS conducted by IT in 2001 concluded that jet fuel contamination at Site 13 would be addressed as part of the basewide TPH strategy. Currently, the site is part of CAA-13, and remediation is being handled under the TPH program.

Floor drains in Building 397 discharged to OWS and then to storm sewer systems installed during base development. In 1991, the Navy conducted a storm sewer inspection, cleaning, and replacement project at Site 13. The following storm sewers were addressed:

- East-west storm sewer line that parallels the southern side of West Oriskany Avenue to Outfall J and crosses Site 13 was cleaned and inspected
- North-south sewer line beneath Skyhawk Street that crosses Site 13 was cleaned and inspected
- One section of storm sewer line was replaced at Site 13
- East-west storm sewer line located along West Pacific Avenue was replaced with PVC pipe

Building 397 is currently used by the City of Alameda for storage, and the self storage area is still in operation.

6.1.3 Site 13 Regulatory History

Several facilities and areas within Site 13 are regulated by different programs. These programs include the CERCLA program, the TPH program, and the RCRA program. This section briefly describes each program at Site 13.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
24	Site Characterization and Analysis Penetrometer System (SCAPS) Laser Induced Flouresence (LIF)	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.

3.2.2 IR Site 13

3.2.2.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most chemicals reported at IR Site 13 are consistent with historical activities known to occur at the site, which included the former oil refinery and the aircraft storage, overhaul, and defueling area. Physical features of IR Site 13, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results from these investigations were evaluated. Of the potential sources, the following physical features and site activities were considered likely sources at IR Site 13:

Former oil refinery activities

Solid Waste Management Unit (SWMU) Area of Concern (AOC) 009 consisting of ASTs 324 through 328

Building 397 and associated OWSs 397A, 397B, 397D, and 397D

Fill material containing PAHs

3.2.2.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 13:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

TRW Investigation Using Laser-Induced Fluorescence (Richard Brady & Associates 2008)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b), TRW Investigation report (Richard Brady & Associates 2008), and the Data Gap Study report (Tetra Tech EC 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels in soil from 0 feet to 8 feet bgs are summarized in Table 3-4.

These results indicated the following:

None of the reported SVOCs, pesticides, and PCBs in IR Site 13 soil exceeded the screening levels.

Concentrations of the metals arsenic, chromium, cobalt, iron, lead, and vanadium in IR Site 13 soil exceeded screening levels at limited number of locations.

Four out of 192 soil samples (4 to 4.5 feet bgs) reported arsenic at concentrations exceeding the statistically derived background value of 16.55 mg/kg (which is

based on the 95th quantile of the blue background dataset documented in Appendix A of the OU-2A RI – Sul Tech 2005[b]). These reported concentrations were within the concentration ranges reported in the background dataset. The reasonable maximum exposure point concentration (EPC) based on the 192 soil samples analyzed for arsenic was estimated to be 3.9 mg/kg, which is less than the background value of 16.55 mg/kg. Elevated concentrations of arsenic in soil are unrelated to storm sewers, buildings, or other site features, which suggests that these elevated concentrations of arsenic occur randomly across the site with no apparent site related source and may be naturally occurring.

One out of 192 soil samples reported chromium, cobalt, iron (112 soil samples), and vanadium at concentrations exceeding their screening level at only one location. The reasonable maximum EPC of these soil samples analyzed for chromium (35 mg/kg), cobalt (5.5 mg/kg), iron (12,552 mg/kg), and vanadium (51 mg/kg) was estimated to be less than their respective screening levels

Seven out of 215 soil samples reported lead at concentrations greater than its screening level of 207 mg/kg from the northern and eastern portions of IR Site 13 (see Figure 3-4). These exceedances are mainly located at depths greater than 4 feet and have overlying soils with lead concentrations less than the screening level of 207 mg/kg. The reasonable maximum EPC of the 215 soil samples analyzed for lead was estimated to be 91 mg/kg, which is less than its screening level of 207 mg/kg.

- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a maximum reported value of 7.6 mg/kg in IR Site 13 soil. The PAH results also include samples collected within areas associated with the TRW. These results indicate relatively low PAH concentrations are present within the TRW with the majority of the waste characterized as highly degraded, solid long chain alkanes with a very low volatile fraction. The reasonable maximum EPC based on the 382 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.27 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The exceedances of PAHs, expressed as B(a)P equivalent concentrations, mainly occur at depths greater than or up to 4 feet bgs which may be associated with the use of fill material to construct the island. These exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg (see Figure 3-5).

- The SCAPS LIF TRW investigation reported TPH in the diesel range (17,000 mg/kg), TPH in the motor oil range (24,000 mg/kg), and PAHs in soil in the area east of the TRW boundary. In addition, benzene and ethylbenzene were reported at maximum concentrations in soil of 14 mg/kg and 13 mg/kg, respectively at a depth of 8 feet to 9.5 feet bgs at location AP13-48, east of the inferred TRW boundary. VOCs were not reported above their respective screening levels within the TRW area. To the east of TRW, VOCs in soil are likely attributed to petroleum groundwater plume in the eastern portion of IR Site 13 designated as Plume 2 (Richard Brady and Associates 2008). Based on the SCAPS LIF investigation (Richard Brady & Associates 2008), VOCs and TPH reported in groundwater at IR Site 13 to the east of the TRW boundary appear to be unrelated to TRW (refinery waste that has been in-place for over 100 years), and contain compounds normally associated with fuel releases. The petroleum soil and groundwater plume are being addressed under the Petroleum Program. However, VOCs (including benzene) in groundwater are being addressed as part of this FS.

  The soil samples collected within the TRW-impacted mass during SCAPS TRW investigation reported TPH in the diesel range (6,000 mg/kg). None of the reported soil samples within the TRW area contained PAHs expressed as benzo(a)pyrene equivalents above the screening level of 0.62 mg/kg. Metals were not reported above their respective screening levels. Soil samples

were analyzed for pH as a part of SCAPS TRW investigation based on historic refinery operations and the occurrence of low pH in soil samples previously collected at OU-2A. Near neutral pH values were reported between 6.75 and 8.97 in 15 of the 16 soil samples collected during this investigation. Sample AP13-169-S-02 had a pH of 4.09 and is in an area east of IR Site 13 that is inferred to not contain TRW. Thus it appears the low pH conditions reported in previous investigations are localized and may have been removed during previous trenching operations at the site. Based on the results of SCAPS TRW investigation and previous investigations at the site, it was concluded that the TRW contains very low volatile or semi-volatile fraction as expected from a refinery waste that has been in-place for over 100 years. The TRW appears to be mainly comprised of solid long chain alkanes. In addition, it should be noted that based on boring logs prepared during basewide soil PAH investigation conducted in 2003 as part of the RI (SulTech 2005b), TRW occurs mainly at a depth greater than 5 feet bgs and is mainly below the water table. As reported in the Final Semiannual Groundwater Monitoring Report (ITSI 2009b), depth to water at IR Site 13 generally ranges from 4.03 to 6.51 feet bgs, with water table as high as 0.25 feet bgs as observed at MWOR-3 in March 2005. Although TRW mainly occurs at depth and below the water table, surface manifestations of this asphalt-like refining residue have been observed at several locations within IR Site 13.

3.2.3 IR Site 19

3.2.3.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI Report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 19 are consistent with historical activities that occurred at the site, which included hazardous material storage at Building 616 and Yard D-13. Physical features of IR Site 19, along with specific details on the hazardous waste storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil, and the analytical results were evaluated. The following physical features and site activities were considered likely sources at IR Site 19:

- Yard D-13 (hazardous waste storage yard),
- Building 616 (hazardous materials storage area), and
- Fill material containing PAHs.

3.2.3.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 19:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P

Table 3-3: Summary of Chemicals in IR Site 9 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
None							

Notes:
mg/kg = milligrams per kilogram

Table 3-4: Summary of Chemicals in IR Site 13 Exceeding the Screening Levels (0-8 feet bgs)

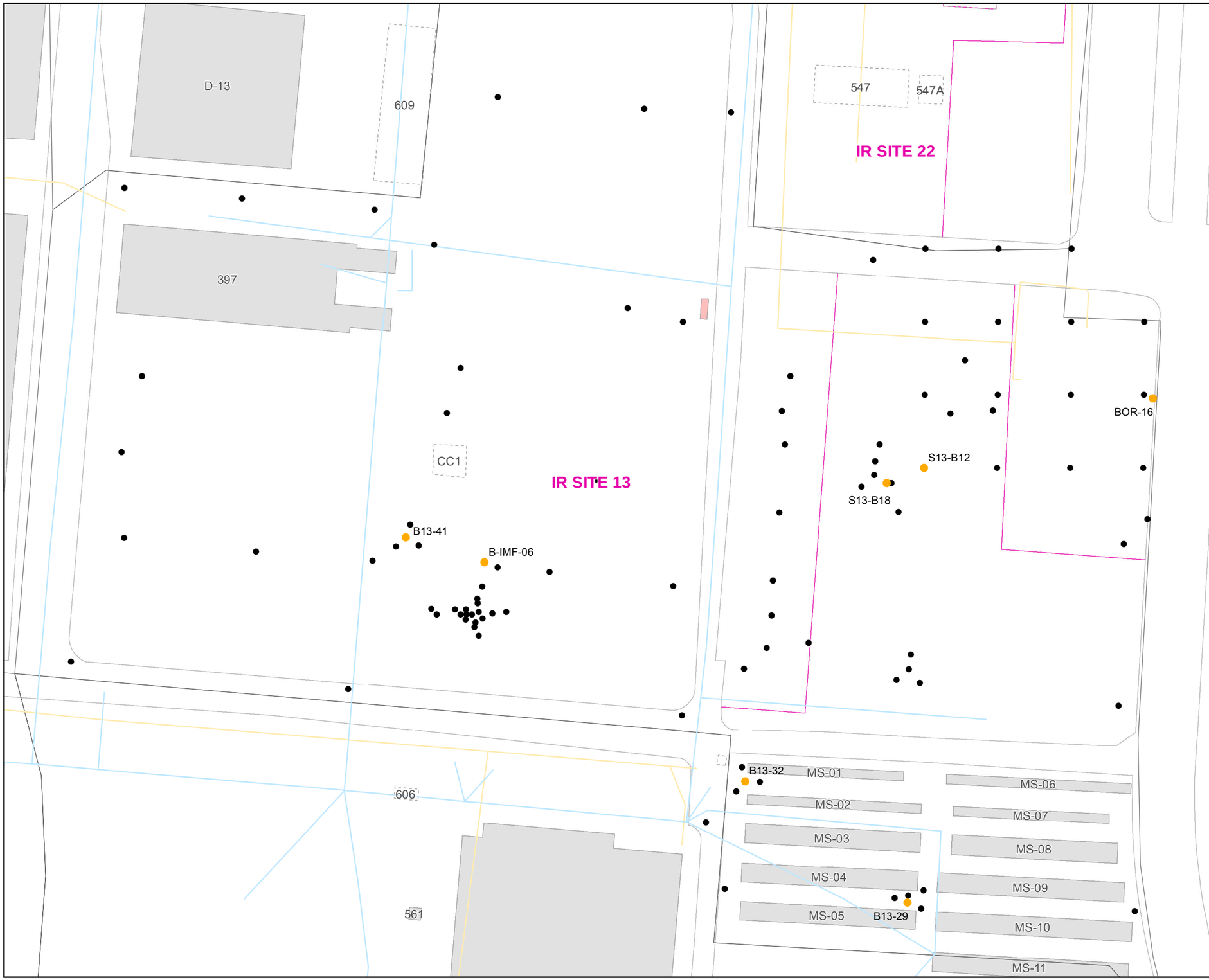
Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Volatile Organic Compounds (VOCs) (mg/kg)							
Benzene	1.1	24/137	1	AP13-148	04-Dec-07	5.5-7	1.9
Ethylbenzene	5.7	27/137	1	AP13-148	04-Dec-07	5.5-7	6.4
Metals (mg/kg)							
Arsenic	16.55	151/192	4	S13-B18	13-Sep-07	4-4.5	20.3
Chromium	280	192/192	1	B13-30	09-Dec-94	1-2	337
Cobalt	23	165/192	1	S13-B30	04-Oct-07	0.5-1	28.9
Iron	55,000	112/112	1	B13-32	12-Aug-94	0.5-1.5	74,800
Lead	207	180/215	7	S13-B12	11-Sep-07	4.7-5.2	815
Vanadium	550	192/192	1	MWOR-4	19-Jul-90	7-7.5	1,780
PAHs (mg/kg)							
B(a)P equivalents	0.62	237/382	13	C3S0133B051	30-Jul-03	4-8	7.6

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-5: Summary of Chemicals in IR Site 19 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	53/78	2	S19-B07	03-Oct-07	4.5-5	1.1
Metals (mg/kg)							
Lead	207	28/51	1	BD13-13	11-July-90	2-2.5	303

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram



Legend

- Lead Locations Exceeding the Screening Level of 207 mg/kg
- Lead Locations Less Than 207 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Paved

IR Site 13, OU2A, Lead Concentrations Greater than Screening Levels

Location	Sample Date	Sample Depth Range (feet bgs)	Lead (mg/kg)
B13-41	05-Apr-94	0.5-1	4.7
	05-Apr-94	4.5-5	1.1
	05-Apr-94	7-7.5	**413**
B-IMF-06	19-Jul-91	4-4.5	**602**/41.3 (duplicate)
B13-29	09-Dec-94	1-1.5	**378**
	09-Dec-94	1.5-2	148
	09-Dec-94	2.5-3.5	39.8
	09-Dec-94	5-5.5	4.3
S13-B12	11-Sep-07	0.7-.12	6.8
	11-Sep-07	4.7-5.2	**815**
S13-B18	13-Sep-07	1-1.5	6.1
	13-Sep-07	4-4.5	**758**
B13-32	12-Aug-94	0.5-1.5	**431**
	12-Aug-94	2.0-3.0	79.6
	12-Aug-94	4.0-5.0	3.3
BOR-16	23-Jul-90	0.5-1	**260**
	23-Jul-90	2.5-3	5.7
	23-Jul-90	7-7.5	6

Concentrations in **bold font** indicate values greater than the screening level.

*Max Depth to Groundwater - 6.45 feet bgs

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION

N

100 50 0 100 Feet

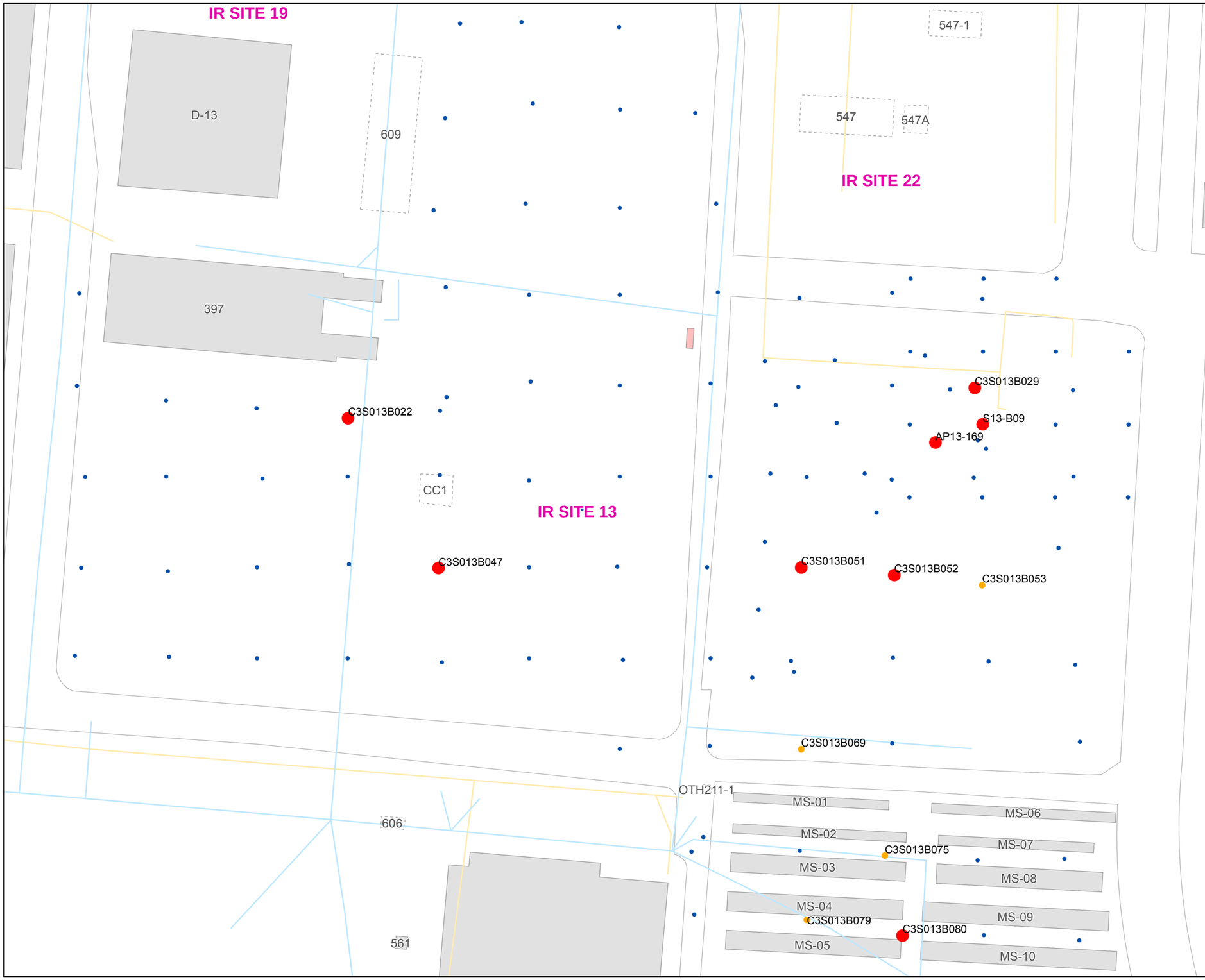
OU-2A FS — Final

Nature and Extent of Lead in Soil at IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-4

OTIE Oneida Total Integrated Enterprises

AECOM



Legend

- Total Benzo(a) Pyrene Equivalents > 1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road

IR Site 13, OU2A, Benzo(a)Pyrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) Pyrene Equivalents (mg/kg)
AP13-169	04-Dec-07	5.5-7	2.5
C3S013B022	29-Jul-03	0.5-2	3.5
C3S013B029	29-Jul-03	0-0.5	1.2
C3S013B029	29-Jul-03	0.5-2	0.67
C3S013B047	28-Jul-03	0-0.5	1.1
C3S013B051	30-Jul-03	4-8	7.6
C3S013B052	30-Jul-03	4-8	1.8
C3S013B053	30-Jul-03	0.5-2	0.91
C3S013B069	30-Jul-03	2-4	1.0
C3S013B075	30-Jul-03	0-0.5	0.85
C3S013B079	30-Jul-03	4-8	0.97
C3S013B080	30-Jul-03	2-4	2.5
S13-B09	11-Sep-07	4-4.5	1.9

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
PAH - POLYCYCLIC AROMATIC HYDROCARBON

N

100 50 0 100 Feet

OU-2A FS — Final

Nature and Extent of PAHs in Soil at IR Site 13

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-5

OTIE Oneida Total Integrated Enterprises

AECOM

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
25	Data Gap Investigation	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.

3.2.2 IR Site 13

3.2.2.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most chemicals reported at IR Site 13 are consistent with historical activities known to occur at the site, which included the former oil refinery and the aircraft storage, overhaul, and defueling area. Physical features of IR Site 13, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results from these investigations were evaluated. Of the potential sources, the following physical features and site activities were considered likely sources at IR Site 13:

Former oil refinery activities

Solid Waste Management Unit (SWMU) Area of Concern (AOC) 009 consisting of ASTs 324 through 328

Building 397 and associated OWSs 397A, 397B, 397D, and 397D

Fill material containing PAHs

3.2.2.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 13:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

TRW Investigation Using Laser-Induced Fluorescence (Richard Brady & Associates 2008)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b), TRW Investigation report (Richard Brady & Associates 2008), and the Data Gap Study report (Tetra Tech EC 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels in soil from 0 feet to 8 feet bgs are summarized in Table 3-4.

These results indicated the following:

None of the reported SVOCs, pesticides, and PCBs in IR Site 13 soil exceeded the screening levels.

Concentrations of the metals arsenic, chromium, cobalt, iron, lead, and vanadium in IR Site 13 soil exceeded screening levels at limited number of locations.

Four out of 192 soil samples (4 to 4.5 feet bgs) reported arsenic at concentrations exceeding the statistically derived background value of 16.55 mg/kg (which is

based on the 95th quantile of the blue background dataset documented in Appendix A of the OU-2A RI – Sul Tech 2005[b]). These reported concentrations were within the concentration ranges reported in the background dataset. The reasonable maximum exposure point concentration (EPC) based on the 192 soil samples analyzed for arsenic was estimated to be 3.9 mg/kg, which is less than the background value of 16.55 mg/kg. Elevated concentrations of arsenic in soil are unrelated to storm sewers, buildings, or other site features, which suggests that these elevated concentrations of arsenic occur randomly across the site with no apparent site related source and may be naturally occurring.

One out of 192 soil samples reported chromium, cobalt, iron (112 soil samples), and vanadium at concentrations exceeding their screening level at only one location. The reasonable maximum EPC of these soil samples analyzed for chromium (35 mg/kg), cobalt (5.5 mg/kg), iron (12,552 mg/kg), and vanadium (51 mg/kg) was estimated to be less than their respective screening levels

Seven out of 215 soil samples reported lead at concentrations greater than its screening level of 207 mg/kg from the northern and eastern portions of IR Site 13 (see Figure 3-4). These exceedances are mainly located at depths greater than 4 feet and have overlying soils with lead concentrations less than the screening level of 207 mg/kg. The reasonable maximum EPC of the 215 soil samples analyzed for lead was estimated to be 91 mg/kg, which is less than its screening level of 207 mg/kg.

- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a maximum reported value of 7.6 mg/kg in IR Site 13 soil. The PAH results also include samples collected within areas associated with the TRW. These results indicate relatively low PAH concentrations are present within the TRW with the majority of the waste characterized as highly degraded, solid long chain alkanes with a very low volatile fraction. The reasonable maximum EPC based on the 382 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.27 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The exceedances of PAHs, expressed as B(a)P equivalent concentrations, mainly occur at depths greater than or up to 4 feet bgs which may be associated with the use of fill material to construct the island. These exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg (see Figure 3-5).

- The SCAPS LIF TRW investigation reported TPH in the diesel range (17,000 mg/kg), TPH in the motor oil range (24,000 mg/kg), and PAHs in soil in the area east of the TRW boundary. In addition, benzene and ethylbenzene were reported at maximum concentrations in soil of 14 mg/kg and 13 mg/kg, respectively at a depth of 8 feet to 9.5 feet bgs at location AP13-48, east of the inferred TRW boundary. VOCs were not reported above their respective screening levels within the TRW area. To the east of TRW, VOCs in soil are likely attributed to petroleum groundwater plume in the eastern portion of IR Site 13 designated as Plume 2 (Richard Brady and Associates 2008). Based on the SCAPS LIF investigation (Richard Brady & Associates 2008), VOCs and TPH reported in groundwater at IR Site 13 to the east of the TRW boundary appear to be unrelated to TRW (refinery waste that has been in-place for over 100 years), and contain compounds normally associated with fuel releases. The petroleum soil and groundwater plume are being addressed under the Petroleum Program. However, VOCs (including benzene) in groundwater are being addressed as part of this FS.

  The soil samples collected within the TRW-impacted mass during SCAPS TRW investigation reported TPH in the diesel range (6,000 mg/kg). None of the reported soil samples within the TRW area contained PAHs expressed as benzo(a)pyrene equivalents above the screening level of 0.62 mg/kg. Metals were not reported above their respective screening levels. Soil samples

were analyzed for pH as a part of SCAPS TRW investigation based on historic refinery operations and the occurrence of low pH in soil samples previously collected at OU-2A. Near neutral pH values were reported between 6.75 and 8.97 in 15 of the 16 soil samples collected during this investigation. Sample AP13-169-S-02 had a pH of 4.09 and is in an area east of IR Site 13 that is inferred to not contain TRW. Thus it appears the low pH conditions reported in previous investigations are localized and may have been removed during previous trenching operations at the site. Based on the results of SCAPS TRW investigation and previous investigations at the site, it was concluded that the TRW contains very low volatile or semi-volatile fraction as expected from a refinery waste that has been in-place for over 100 years. The TRW appears to be mainly comprised of solid long chain alkanes. In addition, it should be noted that based on boring logs prepared during basewide soil PAH investigation conducted in 2003 as part of the RI (SulTech 2005b), TRW occurs mainly at a depth greater than 5 feet bgs and is mainly below the water table. As reported in the Final Semiannual Groundwater Monitoring Report (ITSI 2009b), depth to water at IR Site 13 generally ranges from 4.03 to 6.51 feet bgs, with water table as high as 0.25 feet bgs as observed at MWOR-3 in March 2005. Although TRW mainly occurs at depth and below the water table, surface manifestations of this asphalt-like refining residue have been observed at several locations within IR Site 13.

3.2.3 IR Site 19

3.2.3.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI Report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 19 are consistent with historical activities that occurred at the site, which included hazardous material storage at Building 616 and Yard D-13. Physical features of IR Site 19, along with specific details on the hazardous waste storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil, and the analytical results were evaluated. The following physical features and site activities were considered likely sources at IR Site 19:

- Yard D-13 (hazardous waste storage yard),
- Building 616 (hazardous materials storage area), and
- Fill material containing PAHs.

3.2.3.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 19:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P

Table 3-3: Summary of Chemicals in IR Site 9 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
None							

Notes:
mg/kg = milligrams per kilogram

Table 3-4: Summary of Chemicals in IR Site 13 Exceeding the Screening Levels (0-8 feet bgs)

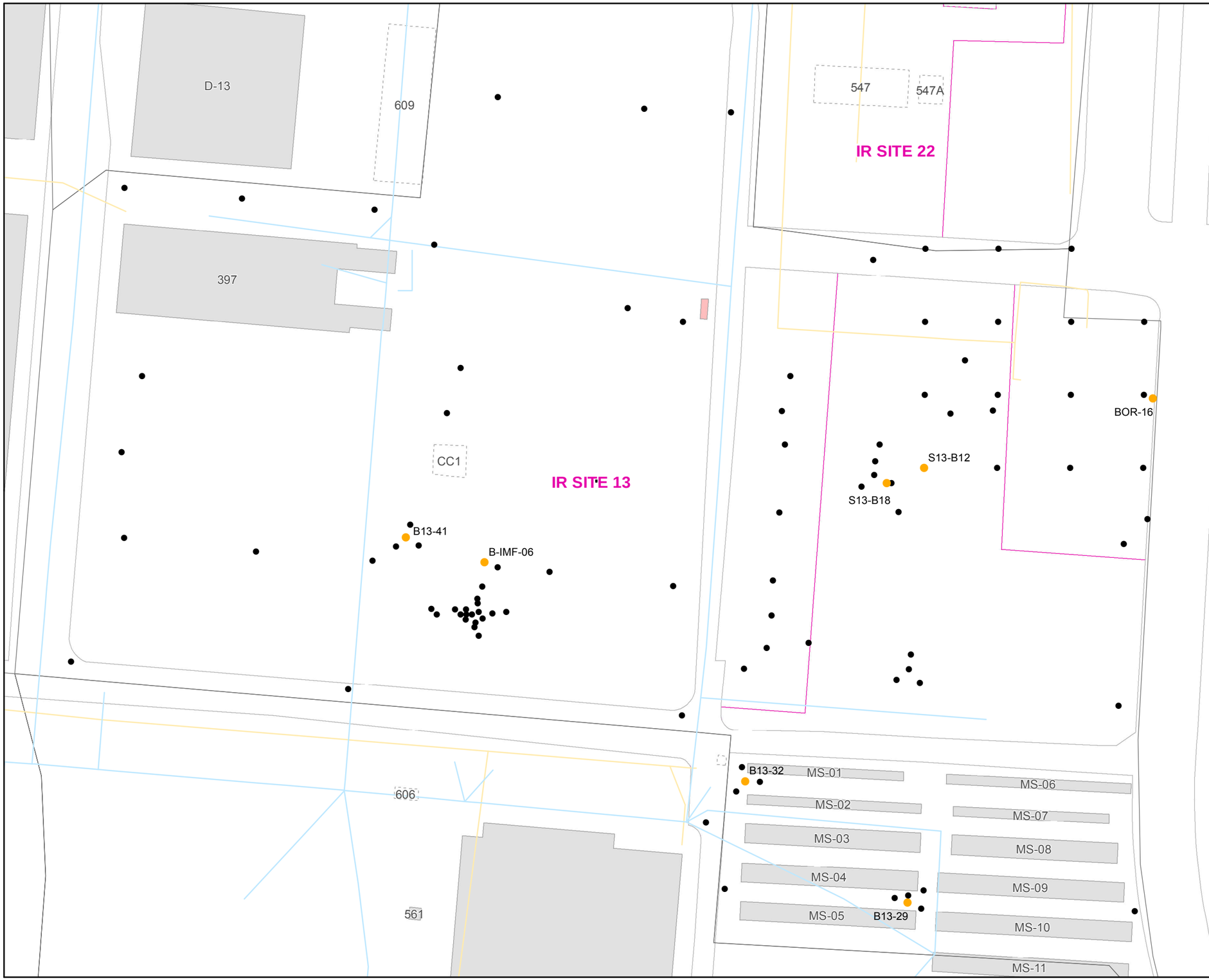
Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Volatile Organic Compounds (VOCs) (mg/kg)							
Benzene	1.1	24/137	1	AP13-148	04-Dec-07	5.5-7	1.9
Ethylbenzene	5.7	27/137	1	AP13-148	04-Dec-07	5.5-7	6.4
Metals (mg/kg)							
Arsenic	16.55	151/192	4	S13-B18	13-Sep-07	4-4.5	20.3
Chromium	280	192/192	1	B13-30	09-Dec-94	1-2	337
Cobalt	23	165/192	1	S13-B30	04-Oct-07	0.5-1	28.9
Iron	55,000	112/112	1	B13-32	12-Aug-94	0.5-1.5	74,800
Lead	207	180/215	7	S13-B12	11-Sep-07	4.7-5.2	815
Vanadium	550	192/192	1	MWOR-4	19-Jul-90	7-7.5	1,780
PAHs (mg/kg)							
B(a)P equivalents	0.62	237/382	13	C3S0133B051	30-Jul-03	4-8	7.6

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-5: Summary of Chemicals in IR Site 19 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	53/78	2	S19-B07	03-Oct-07	4.5-5	1.1
Metals (mg/kg)							
Lead	207	28/51	1	BD13-13	11-July-90	2-2.5	303

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram



Legend

- Lead Locations Exceeding the Screening Level of 207 mg/kg
- Lead Locations Less Than 207 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Paved

IR Site 13, OU2A, Lead Concentrations Greater than Screening Levels

Location	Sample Date	Sample Depth Range (feet bgs)	Lead (mg/kg)
B13-41	05-Apr-94	0.5-1	4.7
	05-Apr-94	4.5-5	1.1
	05-Apr-94	7-7.5	**413**
B-IMF-06	19-Jul-91	4-4.5	**602**/41.3 (duplicate)
B13-29	09-Dec-94	1-1.5	**378**
	09-Dec-94	1.5-2	148
	09-Dec-94	2.5-3.5	39.8
	09-Dec-94	5-5.5	4.3
S13-B12	11-Sep-07	0.7-.12	6.8
	11-Sep-07	4.7-5.2	**815**
S13-B18	13-Sep-07	1-1.5	6.1
	13-Sep-07	4-4.5	**758**
B13-32	12-Aug-94	0.5-1.5	**431**
	12-Aug-94	2.0-3.0	79.6
	12-Aug-94	4.0-5.0	3.3
BOR-16	23-Jul-90	0.5-1	**260**
	23-Jul-90	2.5-3	5.7
	23-Jul-90	7-7.5	6

Concentrations in **bold font** indicate values greater than the screening level.

*Max Depth to Groundwater - 6.45 feet bgs

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION

N

100 50 0 100 Feet

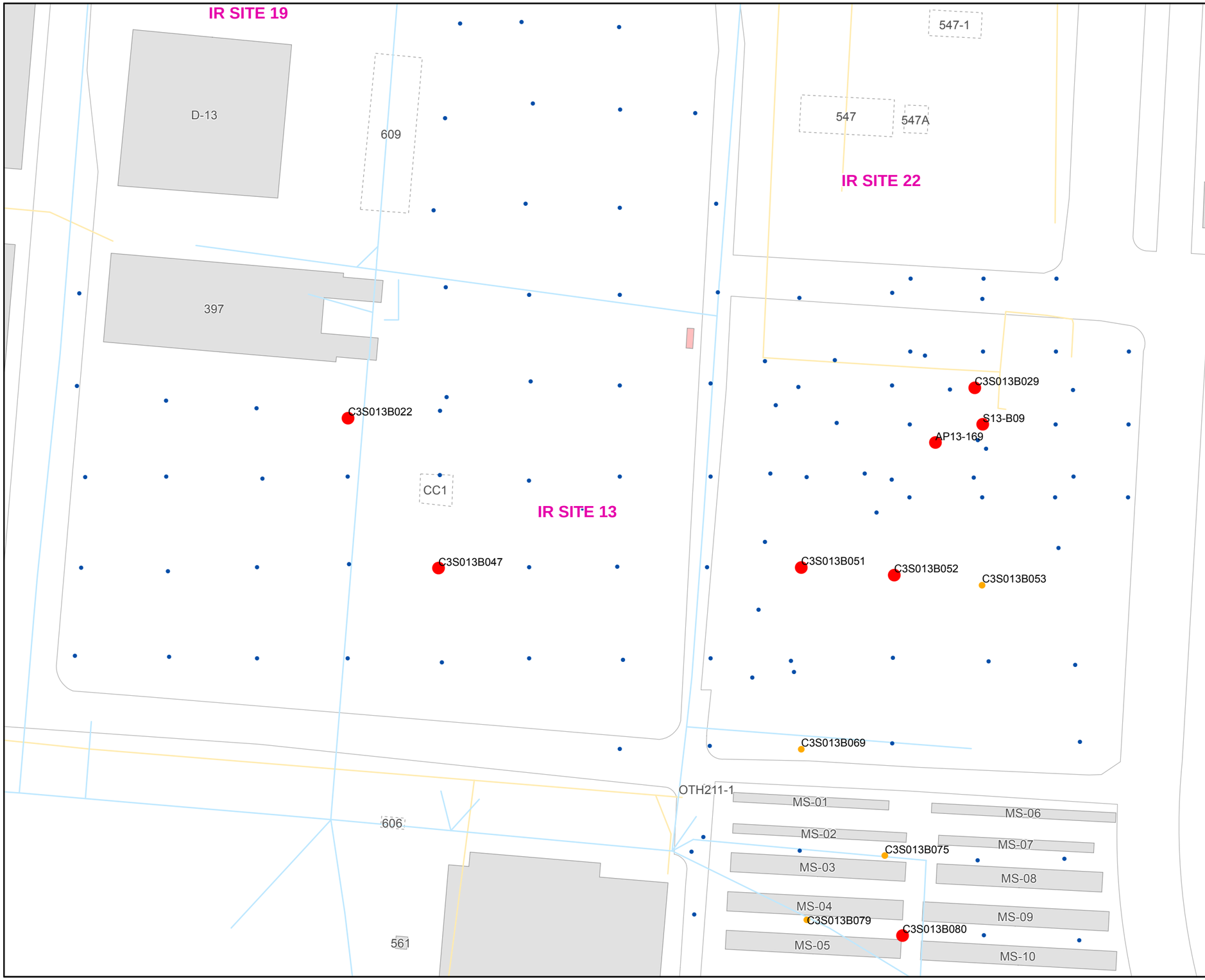
OU-2A FS — Final

Nature and Extent of Lead in Soil at IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-4

OTIE Oneida Total Integrated Enterprises

AECOM



Legend

- Total Benzo(a) Pyrene Equivalents > 1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road

IR Site 13, OU2A, Benzo(a)Pyrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) Pyrene Equivalents (mg/kg)
AP13-169	04-Dec-07	5.5-7	2.5
C3S013B022	29-Jul-03	0.5-2	3.5
C3S013B029	29-Jul-03	0-0.5	1.2
C3S013B029	29-Jul-03	0.5-2	0.67
C3S013B047	28-Jul-03	0-0.5	1.1
C3S013B051	30-Jul-03	4-8	7.6
C3S013B052	30-Jul-03	4-8	1.8
C3S013B053	30-Jul-03	0.5-2	0.91
C3S013B069	30-Jul-03	2-4	1.0
C3S013B075	30-Jul-03	0-0.5	0.85
C3S013B079	30-Jul-03	4-8	0.97
C3S013B080	30-Jul-03	2-4	2.5
S13-B09	11-Sep-07	4-4.5	1.9

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
PAH - POLYCYCLIC AROMATIC HYDROCARBON

N

100 50 0 100 Feet

OU-2A FS — Final

Nature and Extent of PAHs in Soil at IR Site 13

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-5

OTIE Oneida Total Integrated Enterprises

AECOM

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
26	FS Report Appendix B	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B. Oneida Total Integrated Enterprises LLC 2011.

Appendix B
Human-Health Risk Assessments

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ATTACHMENTS

Attachment A OU-2A Lead Spreadsheet

Attachment B Summary Statistics of Detected and Non-Detected Analytes, Soil and Groundwater

Attachment C Back-up Data - J&E Vapor Intrusion Model Input Parameters

ACRONYMS/ABBREVIATIONS

ACFCWCD	Alameda County Flood Control and Water Conservation District
B(a)P	benzo(a)pyrene
bgs	below ground surface
Cal-EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COCs	chemicals of concern
COPCs	chemicals of potential concern
CSFs	cancer slope factor
CSM	conceptual site model
CTE	central tendency exposure
DoD	Department of Defense
DTSC	Department of Toxic Substance Control
EPC	exposure point concentration
FS	Feasibility Study
g/day	grams per day
g/kg	grams per kilograms
g/kg-day	grams per kilograms per day
HHRA	Human-Health Risk Assessment
HI	health index
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
ITRC	Interstate Technology and Regulatory Council
J & E	Johnson & Ettinger
kg	kilograms
MCL	maximum contaminant level
NAS	Naval Air Station
Navy	United States Department of Navy
NCEA	reference dose
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PPRTV	Provisional Peer Reviewed Toxicity Value
PRGs	Preliminary Remediation Goals
R & D	research and development
RAGS	Risk Assessment Guidance for Superfund
RI	Remedial Investigation
RSL	Regional Screening Level
RME	reasonable maximum exposure
SQL	sample quantitation limits
SVOC	semi-volatile organic compound
US EPA	United States Environmental Protection Agency
UCL	upper confidence limit
µg/L	micrograms per liter

VOC	volatile organic compound

1. INTRODUCTION AND BACKGROUND

The U.S. Department of the Navy (Navy) is conducting a feasibility study (FS) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Environmental Protection Agency [USEPA] 1988). The CERCLA IR Sites 9, 13, 19, 22, and 23 comprise Operable Unit 2A (OU-2A) at Alameda Point (formerly Naval Air Station [NAS] Alameda), located in Alameda, California. A revised human-health risk assessment (HHRA) and summary of results for OU-2A are presented in this report. An initial HHRA was conducted during the preparation of the RI report (SulTech 2005). There is no revision to the ecological risk assessment conducted during the preparation of the RI Report (SulTech 2005).

The organization of the HHRA and methodology used to evaluate human-health risks are in accordance with the "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (USEPA 1989) as well as subsequent Risk Assessment Guidance for Superfund (RAGS) Part D (USEPA 2001c) for standard table presentation and format.

During evaluation of the RI and HHRA for OU 2A, number of potential chemicals of concern (COPCs) were identified that were not identified as risk drivers under the residential scenario in the human-health risk assessment in groundwater, but were present at concentrations above USEPA's 2004 tap water preliminary remediation goals (PRG) or 2004 maximum contaminant level (MCL). Therefore, as part of Appendix E of the Draft FS report for OU-2A (SulTech 2005), an evaluation of COPCs for exclusion or inclusion as chemicals of concern (COCs) was performed. However, the regulatory agencies recommended that Appendix E as presented in the Draft FS be excluded from the revised draft FS report. They recommended that the data obtained from the data gap sampling (TetraTech 2009) be combined with previous RI data to evaluate the full suite of site-related contaminants, range of concentrations, and frequency of detection. Another recommendation was to revise the relevant risk assessments and alternative analysis in the Draft FS to reflect the inclusion of residential units in the planned reuse (ARRA 2006). The regulatory agencies also commented that the soil background data set for NAS Alameda had yet to be finalized. Therefore, they recommended that risk management decisions should be based on the estimates of total risk and/or hazard until final soil background data set is available.

A revised HHRA was performed as part of this FS to address regulatory agency concerns. The following sections present the results of the revised HHRA that addresses the concerns of the regulatory agencies.

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2. DATA SELECTION

Soil and groundwater sampling data were collected within and near the sites through several sampling efforts. In addition to the results of the data gap sampling effort, groundwater data collected since 2002 were used to characterize the risk at these sites.

All chemicals reported in at least one sample collected during the RI as well as historical data were included in the HHRA. The HHRA also included evaluation of PAHs in soil. All reported metals were included in the list of HHRA COPCs regardless of whether the concentrations were above or below background. The data selection process produced separate datasets for surface soils (0- to 2-foot bgs soil depth interval) and subsurface soils (0- to 8-foot bgs soil depth interval) to allow for risk managers to evaluate two future reuse scenarios. Soil data were compiled from all CERCLA investigations including the results of the data gap sampling investigations (TetraTech 2009). In addition to the results of the data gap sampling investigations (TetraTech 2009), the groundwater HHRA included data collected from 2002. Data collected from 2002 was considered to be more representative of the current concentrations and distribution, and therefore, the risk estimated will be more representative of the current site conditions.

2.1 DATA REDUCTION RULES

In general, the data were collected and analyzed in accordance with USEPA's Contract Laboratory Program (CLP) procedures, and detection limits (sample quantitation limits [SQL]) were sufficiently low to permit identification of potential health risks. Independent reviewers validated all data used in this HHRA and assigned data qualifiers with respect to laboratory blanks and quality control samples. Samples were analyzed for inorganic chemicals, semivolatile organic chemicals (SVOC), volatile organic chemicals (VOC), pesticides, and polychlorinated biphenyls. Section 3 of the RI report (SulTech 2005) describes the results of the sampling and analysis. Only validated data sets for soil and groundwater were used in the HHRA for the OU-2A sites; no data that were rejected (R-qualified) by the laboratory or the independent data validator were used in the HHRA.

2.2 BACKGROUND COMPARISON

The presence of a constituent at a concentration lower than the natural background concentration was not used as a criterion for elimination of any metals from HHRA. Consistent with USEPA guidance for characterizing human-health risks, inorganic compounds below background were retained for a total risk assessment.

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3. EXPOSURE ASSESSMENT

The exposure assessment evaluates the ways in which people may come in contact with chemicals at the site now and in the future. An exposure assessment is a multistage process. First, the receptors (i.e., individuals with current or potential access to the site) are identified. Second, the complete exposure pathways by which these human receptors may be exposed are identified. Finally, the chemical concentrations at the point of exposure, the exposure point concentration (EPC), and the daily intake rates associated with each exposure pathway are quantified.

The conceptual site model (CSM) depicts potential release and transport mechanisms from each primary source (Figure 3-1 and Table 3-1). The following components are included in the CSM: the identification of known or suspected sources of impact, potential chemical transport and exposure pathways, and receptors with associated routes of intake. Tracking of chemical migration from sources to human-health receptors is an important use of the CSM and forms one basis from which risk-based decisions are evaluated.

An evaluation of all possible human exposures is necessary to identify receptors that are in current contact with or that could contact Alameda Point environmental media in the future. The principal objective of this evaluation is to identify reasonable maximum exposure (RME) at Alameda Point (USEPA 1992b). As defined by USEPA (1989), the RME is the maximum exposure that is reasonably expected to occur at a site. For this reason, average or central tendency exposures (CTE) are not calculated as part of this revised HHRA.

It is also important that intake variable values for each RME exposure pathway should be "selected so that the combination of all intake variables results in an estimate of the reasonable maximum exposure for that pathway" (USEPA 1989). In other words, the most conservative intake variables for each parameter for a given pathway are not necessarily used together. A combination of average and upper-bound values should be combined to estimate exposures that are meaningful and represent the actual reasonable maximum exposure for the site.

3.1 EXPOSURE SETTING AND POTENTIAL RECEPTORS

According to USEPA (1989), the first step in identifying current or potential future chemical exposures is an evaluation of the physical characteristics of the site, such as climate, vegetation, soil type, and hydrology of surface water and groundwater that are pertinent to the risk assessment. Soil and groundwater are the only media of concern at the IR Sites 9, 13, 19, 22, and 23, because surface water and sediment are not present within the boundaries of these sites. The HHRA only assessed risk to human-health from exposure to chemicals in soil and groundwater.

3.1.1 Groundwater Use

Although groundwater has been evaluated individually for each site, historical data indicate that shallow groundwater in the East Bay Plain area is affected by high nitrate concentrations and saltwater intrusion (Alameda County Flood Control and Water Conservation District [ACFCWCD] 1988). According to the Alameda Point Preliminary Development Concept (ARRA 2006), OU-2A is planned for commercial mixed use and other commercial uses including: office, research and development (R&D), warehousing, light industrial, maritime industrial, manufacturing, service-commercial, retail, and where appropriate residential uses. After consideration of the factors that determine beneficial uses of groundwater and property reuse, the Alameda Point BRAC closure team (BCT) concluded that the groundwater beneath IR Sites 9, 13, 19, 22, and 23 is unlikely to be used as a potential drinking water source. Consequently, the groundwater is not reasonably expected to serve as a public drinking water supply; however, beneficial use of groundwater for drinking water, irrigation, or industrial uses is not prohibited.

The most conservative of these potential hypothetical uses (residential whole-house use, including residential ingestion) was retained for evaluation in this HHRA. In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

3.1.2 Current Land Use

Although the installation has been closed, some security, administrative, and maintenance personnel remain. Occasional recreational activities at the base may consist of jogging, walking, and picnicking, but these do not occur at CERCLA sites. Although not associated with IR Sites 9, 13, 19, 22, and 23, residential housing is located in the northeastern corner of the base. Some buildings on Alameda Point are leased for commercial or industrial use, but not on OU-2A.

These general exposure scenarios cover the range of current exposure scenarios at Alameda Point. Because the future exposure scenarios associated with Alameda Point involve a greater extent and duration of exposure than current exposures, only future exposure parameters were used to evaluate risks associated with these scenarios (that is, only future scenarios were evaluated).

3.1.3 Future Land Use

OU-2A is planned for commercial mixed use and other commercial uses including: office, research and development (R&D), warehousing, light industrial, maritime industrial, manufacturing, service-commercial, retail, and where appropriate residential uses (ARRA 2006).

Commercial/industrial exposures are the most reasonable exposure scenarios for future land use at IR Sites 9, 13, 19, 22, and 23. Construction worker exposures are also possible.

However, although the five sites are likely to be developed for mixed land uses, residential land use was evaluated for soil and groundwater for these sites. In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

Even though there are no planned parks in the inner harbor area (with the exception of the southern shoreline area, which does not include OU-2A), recreational receptor has also been identified for OU-2A but will not be evaluated in this HHRA. This determination was based, in part, on the fact that no primarily recreational areas are located on OU-2A as well as the fact that the residential assessment is more conservative (as compared to commercial, construction or recreational reuse), given its increased exposure frequencies and durations relative to a recreational scenario.

3.1.4 Potential Receptors

For IR Sites 9, 13, 19, 22, and 23, the residential, commercial/industrial, and construction worker exposure scenarios are considered potentially complete based on reuse plans developed for Alameda Point. Exposures to chemicals in soil, and groundwater were evaluated for each potential receptor on a site-specific basis.

The current and future receptors at OU-2A, IR Sites 9, 13, 19, 22, and 23 are resident (child and adult), construction worker, onsite worker (commercial/industrial), and recreational user (potentially complete pathways but negligible). However, in order to conduct these risk assessments, the following simplifications were made to USEPA's baseline risk assessment process.

- Baseline risks were evaluated for residential receptors for soil and groundwater and for commercial receptors for groundwater.
- Baseline risks were evaluated for reasonable maximum exposure (RME).

3.2 EXPOSURE PATHWAYS

Exposure pathways were identified by analysis of the distribution of COPCs in the environment and the physical and chemical properties of each COPC. For an exposure pathway to be complete, there must be a chemical source, a mechanism for chemical release to the environment, an environmental transport medium (soil, groundwater, or air), and an exposure route (e.g., ingestion or inhalation). A scenario is a group of exposure pathways associated with a particular activity or land use. Several exposure pathways for the residential scenario at OU-2A IR Sites 9, 13, 19, 22, and 23 are considered complete for this risk assessment (Figure 3-1 and Table 3-1). Future residents could potentially come into contact with chemicals in surface soil (0 to 2 feet bgs) or subsurface soil (0 to 8 feet bgs). Depth to groundwater at the OU2A sites ranges from 2 feet to 7 feet bgs. During future site activities, deeper soil that is above the water table could be brought to the surface during construction, landscaping, and gardening.

Although it is considered unlikely that groundwater at these sites would be used as a domestic water supply for drinking and showering, the hypothetical exposure pathways associated with residential use of groundwater were included in the HHRA to provide additional information for risk management decisions. In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

Specific exposure pathways for soil and groundwater evaluated for a future resident include the following:

1. incidental ingestion of soil
2. dermal contact with soil
3. inhalation of soil particulates and vapors from soil in outdoor air
4. inhalation of vapors from soil and groundwater that may migrate to indoor air
5. ingestion of produce grown in local soil
6. residential use of groundwater for sites with groundwater data (ingestion, inhalation of vapors and dermal contact while showering)

Specific exposure pathways for groundwater evaluated for commercial use include the following:

1. inhalation of vapors in indoor air originating from groundwater

3.3 QUANTIFICATION OF EXPOSURE

Exposure quantification is a two-step process that involves estimating EPCs and estimating daily intake rates. The goal of exposure quantification is to identify the combination of exposure assumptions that result in the maximum exposures that may be reasonably expected to occur.

3.3.1 Exposure Point Concentration

The EPC is the concentration in soil or groundwater that represents the level of exposure for a human lifetime. The USEPA recommends using the 95 percent UCL of the arithmetic mean or the maximum concentration, whichever is lower. In cases where there are fewer than ten samples, the maximum concentration was used.

The USEPA model ProUCL, version 4.00.04 (USEPA 2009) was used to calculate the 95 percent UCL. An upper bound average value was derived for the concentrations of the chemicals detected at these sites by calculating the 95 percent upper confidence limit of the mean (95 percent UCL) for each constituent. The EPCs based on ProUCL are included in tables in Attachment B of this Appendix. In

some cases, the value calculated for the 95 percent UCL was greater than the maximum detected concentration. This can occur for several reasons. For example, if the distribution of the data is skewed by the presence of abnormally high or low values, the variance for those data become inflated to the extent that the upper bound average is over-estimated and no longer reflects a true estimate of the mean. In these cases, the maximum detected value was used for the assessment. In other cases, some chemicals were detected only once, and thus there are insufficient data available to calculate average values. In these cases (e.g., for benzene), the maximum detected values for these chemicals were used as conservative estimates of their upper bound concentrations.

Indoor air concentrations were estimated using the USEPA Johnson & Ettinger (J&E) Models (i.e., Soil-Advanced and Groundwater Advanced) for Subsurface Vapor Intrusion into Buildings (version 3.1) based on the EPCs calculated for soil and groundwater.

3.3.2 Quantification of Daily Intake

Daily intake is the amount of a chemical that a person could take into his or her body averaged over the period that he or she could be exposed. Daily intake is estimated by combining variables including contact rate, body weight, exposure duration, and averaging time with the EPC. The calculation using these variables results in an estimate of daily intake for each exposure pathway.

Daily intakes for RME were calculated. The RME represents the upper end of exposure. Table 3-2 presents the equations and exposure parameters that were used to estimate daily intake, or dose, for residential for RME assumptions. Site-specific values, USEPA default values, and Cal-EPA default values for exposure parameters were used in this risk assessment. Chemical-specific variables used in the exposure calculations are provided in Table 3-3 (dermal factors for contact with soil), Table 3-4 (dermal factors for contact with groundwater), and Table 3-5 (uptake factors for homegrown produce).

The general equation for calculating soil intake is shown below:

$$D = (C \times CR \times EF \times ED) / (BW \times AT)$$

Where,

D = Daily Intake (mg/kg-day)

C = exposure point concentration (mg/kg)

CR = contact rate (kg per day)

EF = exposure frequency (days per year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (days)

The equations and intake rates used for calculating residential cancer risk and hazard quotient (HQ) due to soil and groundwater are presented in Table 3-2

Equations for dermal contact with soil have additional exposure parameters of adherence and absorption factors. Adherence factors indicate the amount of soil that adheres to the skin. Absorption factors (Table 3-3) reflect absorption of the chemical from soil across the skin membrane. According to Cal-EPA Department of Toxic Substances Control (DTSC) (Cal-EPA 1994) and USEPA Region 9 guidance (USEPA 2009), the dermal absorption factors were used in conjunction with toxicity values unadjusted

for gastrointestinal absorption. Additional parameters from USEPA sources for dermal contact with groundwater while showering are shown in Table 3-4.

The Johnson and Ettinger model, using site-specific input parameters, was used to calculate EPCs for inhalation of vapors in indoor air originating in soil and groundwater.

The USEPA Region 9 volatilization factors and particulate emission factor presented in the RSLs were used to calculate EPCs for inhalation of vapors and particulates in outdoor air originating in soil.

Ingestion of homegrown produce was evaluated for the residential exposure scenario. Direct measurements of chemical concentrations in homegrown produce are not available for OU-2A because homegrown produce is not currently grown at Alameda Point. Site-specific assumptions were developed for ingestion of homegrown produce. Exposure point concentrations in homegrown produce for the residential exposure scenario were estimated based on chemical concentrations of COPCs in soil using soil-to-plant uptake factors (UF) that estimate the root uptake of chemicals from soil and translocation of chemicals to the edible plant parts. UFs for nonvolatile organic chemicals were developed using DTSC methodology (DTSC 1993), and UFs for inorganic chemicals were obtained from USEPA (USEPA 1996). The USEPA guidance provides UFs for 6 inorganic chemicals: arsenic, cadmium, mercury, nickel, selenium, and zinc. For PAHs, field data are used from studies that measured the concentrations in the soil and in produce (Samsφe-Petersen et al. 2002). The uptake factors are presented in Table 3-5. Volatile chemicals are not included in this pathway because they are not known to accumulate appreciably in plants or vegetables. Also, volatile chemicals are not likely to be persistent in shallow soils where the roots of plants would be able to absorb them.

The exposure frequency for ingestion of homegrown produce was calculated using 20 percent of the total days of exposure frequency for the residential scenario (resulting in 70 days per year). Ingestion rates were selected from USEPA guidance (USEPA 1997a). The USEPA estimates that homegrown fruits and vegetables account for 4 percent and 6.8 percent, respectively, of receptor diets. Using the 95th percentile of fruit and vegetable intakes (12 grams per kilogram [g/kg] per day [g/kg-day], and 10 g/kg-day, respectively), a 70-kg adult would ingest 33.6 and 47.6 grams per day (g/day) of homegrown fruit and vegetables, respectively, and a 15-kg child would ingest 7.2 and 10.2 g/day, respectively. These values were summed to provide the total daily intake of homegrown produce. Accordingly, the corresponding RME homegrown produce consumption rates (the total of fruit and vegetable consumption rates) are 81.2 grams per day for the adult resident, and 17.4 grams per day for the child resident. These values are for total produce intake, and represent the edible portions of the produce (USEPA 1997a). These homegrown intake values were considered to be representative as documented in Appendix G of this FS.

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4. HHRA TOXICITY ASSESSMENT

The objective of the toxicity assessment is to assess the relationship between daily intake and toxic response. The toxicity assessment identifies toxicity values for each chemical and the type of effect each chemical is capable of producing. Toxicological effects fall into two categories: those that could potentially cause cancer (carcinogens) and those that cause other types of adverse health effects (noncarcinogens).

The toxicity value for carcinogenic effects is called a cancer slope factor (CSF), and the toxicity value for noncarcinogenic effects is called a reference dose (RfD). Chemicals that show a potential for both carcinogenic and noncarcinogenic health effects are assigned both CSFs and RfDs. Toxicity values are presented in Table 3-6.

Toxicity values are specific to the route of exposure (i.e., oral, inhalation, or dermal routes) (Tables 3-3, 3-4, 3-6, 3-7, and 3-8). Oral toxicity values were used in a route-to-route extrapolation for dermal values consistent with practices by USEPA Region 9 (USEPA 2009).

4.1 TOXICITY VALUES FOR CARCINOGENS

CSFs express the relationship between daily intake and the potential for an increase in cancer in people or a response associated with cancer in animals. CSFs are developed by the USEPA with a mathematical model that uses data from the results of human epidemiological studies or laboratory animal studies.

Most of the CSFs are developed from data on laboratory animals that are exposed to the maximum dose that they can tolerate for relatively short periods. This is intended to be protective, as human receptors are more often exposed to much lower levels over long periods of time. To account for any uncertainty in calculating CSFs using this method, the USEPA uses the 95 percent UCL of the mean CSF to assure that any actual risk will be less than the estimated risk.

4.2 TOXICITY VALUES FOR NONCARCINOGENIC EFFECTS

Each RfD is associated with a specific adverse health effect (e.g., central nervous system damage). The RfD is a concentration below which there is little potential for adverse health effects over the exposure period. RfDs are derived from either human or animal studies and are adjusted using uncertainty factors. The RfD is calculated from the highest long-term exposure level that did not cause adverse effects. An uncertainty factor is applied to the RfD to allow for any uncertainty, such as using data from animals to predict effects on humans. Uncertainty factors range from 10 to 10,000, depending on the confidence level associated with the data.

4.3 SOURCES OF TOXICITY CRITERIA

The hierarchy of human-health toxicity values used by USEPA Region 9 in their RSLs follows Directive 9285.7-53, issued by USEPA's Office of Solid Waste and Emergency Response:

- Tier 1 – USEPA's IRIS database
- Tier 2 – USEPA's PPRTVs
- Tier 3 – Health Effects Assessment Summary Tables (USEPA 1997b) and NCEA

The toxicity values used in this risk assessment were obtained from the table of RSLs published by USEPA Region 9 (USEPA 2009). Values from IRIS are confirmed through a review of the USEPA IRIS database (USEPA 2006) to check for updates that have occurred since the publication of the PRGs. Toxicity values are presented in Table 3-6.

Toxicity values are compiled from USEPA Region 9 RSLs because PPRTVs and values from NCEA are provisional and not available to the public. Therefore, any updates to PPRTVs since publication of the PRGs are not available for inclusion.

Toxicity values developed by Cal-EPA were also used in the risk assessment. The Cal-EPA CSFs for carcinogens are listed in the Office of Environmental Health and Hazard Assessment toxicity database (Cal-EPA 2005b). Use of Cal-EPA toxicity values in addition to the USEPA toxicity values results in the creation of a separate risk assessment incorporating the Cal-EPA toxicity values. However, it should be noted that the Navy agrees at this time to evaluate Cal-EPA toxicity values and estimate associated risk, but clearly and expressly reserves the right to evaluate the legal and technical justification for these values, and accept or reject them, before or at the time of the Navy cleanup decisions.

When no toxicity value was available for a chemical, a value for another chemical was assigned based on chemical or structural similarity as shown in Table 3-6.

5. HHRA RISK CHARACTERIZATION

The final step in any risk assessment is the combination of daily intake and toxicity values to calculate potential cancer and noncancer health risks. According to the USEPA directive, Memorandum Regarding the Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (USEPA 1991a),

> Where cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncarcinogenic HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts.

5.1 CANCER RISK CHARACTERIZATION

The cancer risk is calculated as follows for an HHRA:

$$\text{Cancer risk} = \text{daily intake} \times \text{CSF}$$

The cancer risks are added across all the exposure pathways for each chemical and then across chemicals to estimate overall risk. Cancer risks are discussed in the context of a risk management range of 1 in 1,000,000 (10^{-6}) to 1 in 10,000 (10^{-4}). For risks between 10^{-6} and 10^{-4}, site-specific factors are considered when making decisions about whether or not action is required to reduce risk.

The total cancer risk includes chemicals that are found at or below background concentrations.

A current and reasonable future use residential scenario is discussed in this revised risk assessment that includes exposure to chemicals in soil and indoor air (from incidental ingestion of soil, dermal contact with soil, inhalation of soil particulates and vapors from soil in outdoor air, inhalation of vapors from soil and groundwater in indoor air, ingestion of produce grown in local soil, and residential use of groundwater). In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

5.2 NONCANCER RISK CHARACTERIZATION

Noncancer health effects are evaluated based on an HQ for individual chemicals. An HQ value of 1 indicates that lifetime exposure has limited potential for causing an adverse effect in sensitive populations, and values of less than 1 can generally be considered acceptable. Adding HQ values into a single cumulative HI value across chemicals is a preliminary estimate of the highest possible noncancer risk. HI values of less than 1 can generally be considered acceptable. Values greater than 1 are usually given closer attention.

$$\text{noncancer risk} = \text{daily intake} / \text{RfD}$$

5.3 LEAD RISK CHARACTERIZATION

The risks associated with exposure to lead at OU-2A via dietary intake, drinking water, soil and dust ingestion, inhalation, and dermal contact were evaluated using the Department of Toxic Substances Control (DTSC) Lead Risk Assessment Spreadsheet, Version 7 (January 2009). This spreadsheet was used to calculate the blood lead level of concern for children, and compared with the target blood lead level of 10 micrograms per deciliter (µg/dL). The following input parameters were used in calculating a lead soil concentration that is protective of a residential-child-exposure scenario:

- Lead in Air: A value of 0.017 microgram per cubic meter (µg/m^3) was used for the lead in air, which is the highest concentration in San Francisco region, based on the 2007 California Air Resources Board monitoring data. http://www.arb.ca.gov/adam/toxics/sitesubstance.html.
- Lead in Water: DTSC's HERD uses a default value of 15 micrograms per liter (µg/L) to estimate exposure to lead through drinking water based on the California MCL for lead. HERD stated that this value may be replaced with valid monitoring data from the utility supplying water to the site.
    - For OU-2A, lead was reported in only 6 of the 46 groundwater samples analyzed between 2002 and December 2008 and the maximum reported value of 5.6 µg/L was used. These values are consistent with drinking water data from East Bay Municipal Utility District, which has a 90 percentile value for lead of 4 µg/L.
- *Percent Home-grown Produce*: DTSC's HERD uses a default value of 7 percent. However, a value of 6 percent was used which is consistent with the value used for calculating the lead cleanup level for the petroleum strategy at Alameda Point.
- Respirable Dust: The default value of 1.5 µg/m^3 suggested by DTSC's HERD was used, which is based on the USEPA's 1996 soil screening guidance.

For OU-2A, these input values result in soil lead concentration that is protective of a residential child exposure scenario of 207 mg/kg based on the 99th percentile limit.

5.4 HHRA Risk Characterization without Metals at Concentrations Below Background

Generally for the calculation of risk without metals below background, the chemical list is refined to eliminate metals in soil or groundwater with maximum concentrations at or below the 95th percentile in the Alameda Point pink background data set (Tetra Tech 2001b and results of background analysis were presented in Appendix A of the RI report). The risk associated background constituents was evaluated and noted as appropriate for each of the sites. The risk estimates includes metals below background values.

6. SCREENING LEVEL VAPOR INTRUSION ASSESSMENT

Volatilization of VOCs present in groundwater and subsequent mass transport of these vapors into indoor spaces constitutes a potentially complete inhalation exposure pathway for potential future receptors at OU-2A sites. The screening-level assessment of risks due to vapor intrusion into indoor air at OU-2A was performed in accordance with the general framework presented in the Department of Defense (DoD) Vapor Intrusion Handbook (TSERAWG 2009) and the California Department of Toxic Substances Control (DTSC) Vapor Intrusion Guidance Document (DTSC 2004). The DoD Vapor Intrusion Handbook has been developed with consideration of the USEPA's 2002 draft guidance on vapor intrusion (USEPA 2002) and portions of the guidance are cited in this Handbook as providing useful information in evaluating potential vapor intrusion pathways. The DoD Handbook also incorporates several other relevant vapor intrusion documents, including the following:

- Guide for the Assessment of the Vapor Intrusion Pathway. U.S. Air Force, Air Force Institute for Operational Health. February 2006.
- Draft Navy Guidance for Evaluating the Vapor Intrusion Pathway. Naval Facilities Engineering Command. 15 November 2007.
- Navy/Marine Corps Policy on Vapor Intrusion, 29 April 2008.
- Interim Vapor Intrusion Policy for Environmental Response Actions, Department of the Army, Office of the Assistant Secretary (Installations and Environment). 6 November 2006.
- Vapor Intrusion Pathway: A Practical Guide. Interstate Technology and Regulatory Council (ITRC). January 2007.

In accordance with the DoD Vapor Intrusion Handbook, the screening-level evaluation of vapor-intrusion pathway for OU-2A groundwater included the following:

- *Initial Steps of the Screening Assessment:* This included confirmation that chemicals with sufficient volatility and toxicity have been detected in OU-2A groundwater, there is the potential for a complete exposure pathway, and that acute risks to local building occupants have been evaluated.
- *Review of Conceptual Site Model:* The conceptual site model summarized in Section 3.0 was reviewed.
- Assessment of the quality of existing data used in the screening-level assessment
- Identification of chemicals of potential concern (COPCs) for vapor intrusion assessment
- Screening-level assessment of vapor intrusion risk

6.1 INITIAL STEPS OF SCREENING ASSESSMENT

The initial steps of the screening assessment are conducted to evaluate if OU-2A is a candidate for vapor intrusion.

6.2 CONFIRMATION OF DETECTION OF CHEMICALS WITH SUFFICIENT VOLATILITY AND TOXICITY

The chemicals detected in OU-2A groundwater in sampling events from 2002, including groundwater data collected as part of the data gap sampling effort were compared to the following lists to evaluate if they are sufficiently volatile and toxic to present potential vapor intrusion risk:

- Table A-1 in Appendix A of the DoD Vapor Intrusion Handbook (TSERAWG 2009). This table was developed using an approach similar to the method used to develop the table documented in Appendix D of USEPA's 2002 Draft Vapor Intrusion Guidance (USEPA 2002).
- Table 1 of the DTSC Vapor Intrusion Guidance Document (DTSC 2004). This table was generated from the chemicals listed in the USEPA's 2002 Draft Vapor Intrusion Guidance (USEPA 2002) with addition of fuel oxygenates and two PCB congeners.

Based on the above comparison, it was confirmed that chemicals with sufficient volatility and toxicity have been detected in groundwater at least once at IR Sites 9, 13, 19, 22, and 23 that may contribute to potential indoor air risks when complete exposure pathways exist. These chemicals are listed by site in Tables 6-1 through 6-5.

6.3 Existence of Current or Potential Future Receptors

Alameda Point has been closed and the buildings at all Sites in OU-2A are no longer used in a regular manner. Therefore, no further consideration of the vapor intrusion pathway is required under the current use scenario. However, the land overlying the OU-2A groundwater plume is planned to be developed for mixed use including commercial and residential. Therefore, there is potential for buildings (commercial and/or residential) to exist in the area overlying the impacted groundwater at OU-2A and consequently the evaluation of the vapor intrusion pathway is required.

6.4 Review of Conceptual Site Model

The CSM for OU-2A groundwater is summarized in Section 3.0. This CSM presents the location and nature of source of volatile chemicals, nature and extent of contamination, geology and hydrogeology, fate and transport, and potential exposure pathways.

Based on the planned reuse of land overlying OU-2A, the future commercial or residential receptors may potentially get exposed to vapors of volatile compounds in indoor air emanating from impacted groundwater.

6.5 General Data Screening and Identification of Vapor Intrusion COPCs

The maximum reported concentrations of chemicals listed in Tables 6-1 through 6-5 from the investigation conducted from 2002 were compared to the generic screening levels presented in Table 2c of the USEPA's 2002 draft guidance on vapor intrusion (USEPA 2002). The chemicals exceeding these screening levels were identified as vapor intrusion COPCs and were carried forward to site-specific screening-level evaluation of the vapor intrusion risk (see Tables 6-6 through 6-10).

6.6 Data Used in Screening-Level Assessment

Various investigations have been conducted at OU-2A to delineate the nature and extent of impacted groundwater at OU-2A. These investigations are summarized in the RI Report for OU-2A (SulTech 2005), pilot studies/removal action field summary reports, and data gap investigation (Tetra Tech 2009). The data used for assessment of risks due to vapor intrusion pathway included the groundwater monitoring results from the investigations conducted from 2002. The groundwater samples collected during these monitoring events were collected from monitoring wells locations and are representative of aquifer conditions at OU-2A.

6.7 SITE-SPECIFIC SCREENING EVALUATION

The site-specific screening evaluation of vapor intrusion risks was performed using the USEPA version and the Cal-EPA modified version of the Johnson and Ettinger (J&E) Model. Based on the Preliminary Development Concept by the City of Alameda Reuse and Redevelopment Authority (ARRA 2006), the two reuse scenarios pertinent to the vapor intrusion exposure pathway are residential and commercial. Therefore, risks due to potential vapor intrusion were calculated for residential and commercial receptors.

A summary of site-specific parameters used in the J&E Model along with the basis for each is presented in Table 6-11 (groundwater) and Table 6-12 (soil). For each chemical and residential exposure scenario, risks were calculated using both USEPA and Cal-EPA toxicity values.

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7. HHRA UNCERTAINTY ANALYSIS

Uncertainty and limitations are inherent in the risk assessment process. The level of certainty associated with the conclusions of the this revised HHRA is conditional upon the quality of data and models used to identify COPCs and estimate EPCs, the assumptions made in estimating exposure conditions, and the methods used to develop toxicity factors. Uncertainties in the risk assessment process could result in an overestimation or underestimation of risk. This risk assessment has been developed to be protective, rather than accurately predictive. As a result, the risk assessment is believed to represent a substantial overestimation of cancer risk and noncancer hazard. This section presents a discussion of some of the uncertainties inherent in the risk assessment with focus on key factors believed to influence the risk assessment process and application to risk management activities. Uncertainties involved in each major step of the risk assessment process (i.e., exposure assessment, toxicity assessment, and risk characterization) are discussed separately below.

7.1 DATA EVALUATION

The validity of any risk assessment is dependent on the adequacy of the site characterization. Sample collection at OU-2A was biased to areas known or suspected to have chemical impacts. This bias helps to offset the uncertainty. By design, the risk assessment uses the lesser of maximum concentration or the statistically derived EPC, in instances where there the frequency of detection is low the calculated risk overestimate the overall site risk. This over estimate may be further compounded when high concentrations, which may be anomolus, are also associated with low frequency which leads to estimated risks that are not representative of the overall site risk.

Chemicals with Minimum Reporting Limits Above the Screening Criteria: Several chemicals were not reported in the soil and groundwater media; however, their reporting limits were greater than the screening criteria. Because these chemicals were not detected and therefore not evaluated, potential risks/hazards could potentially be underestimated. These chemicals are listed in tables in Attachment B of this appendix.

7.2 EXPOSURE ASSESSMENT

Uncertainty in the exposure assessment is a function of several factors. Such factors include but are not limited to; the completeness/representativeness of the site data, identification of COPCs, assumptions regarding actual current and/or future site land use, identification of relevant receptor groups and activities, and even the extent to which certain chemicals are physiologically retained and transferred to target organs of the selected receptors. Uncertainties are also associated with the parameters presented as exposure and in the quantification of exposure. Each exposure assumption is designed to estimate the potential risk to assure that any actual risk will be less than the estimated risk.

Land Use Considerations: For this evaluation, assumptions have been made to both ensure conservatism and attempt to realistically characterize current and future site use. Conservativeness is embodied in this revised HHRA that compares EPC to residential land use. This assumption overestimates risk but provides useful information to facilitate reasonable land use considerations. Overall, therefore, selection and evaluation of the land uses in the risk assessment will tend, in general, to overestimate risks.

Commercial/industrial exposures are the most reasonable exposure scenarios for future land use at IR Sites 9, 13, 19, 22, and 23. Construction worker exposures are also possible. However, although the five sites are likely to be developed for mixed land uses, residential land use has been evaluated for these soil and groundwater sites. In this risk assessment, for example, it was assumed that residents would engage regularly in activities that would result in exposure to site chemicals over 30 years. It was also assumed that the individual would be exposed for 24 hours per day for the entire 30-year duration.

Although this scenario is unlikely, due to frequency of relocation and time spent indoors, it provides a protective estimate of exposure that would overestimate any actual risk. For ingestion of locally grown produce, the uptake of organic chemicals (except PAHs) was estimated from theoretical equations rather than from field studies; therefore, uptake may be overestimated. PAH uptake is based on field studies that show that uptake is minimal. Alameda Point–specific studies found no uptake of PAHs in homegrown produce (USEPA 2005).

Judgmental Sampling: At OU-2A, the data that have been collected are believed to be reasonably representative of current site conditions. Several samples have been collected in a judgmental (i.e., biased) fashion over a period of time at different depths in order to characterize the extent of contamination. The biased sampling procedures are likely to overestimate exposure and associated risk. COPCs have been selected based on prior knowledge of the site and an understanding of conditions that are likely to influence chemical fate and transport.

Receptor Selection and Exposure Factors: Receptor groups have been selected to be consistent with generic and site-specific land uses. Therefore, the risk assessment has assumed that relevant receptor groups consist of residential and industrial receptors. All of the exposure factors that are used to characterize chemical intake are conservatively developed to ensure that, if anything, the risk is overestimated.

Exposure Point Concentrations: The exposure point concentration seeks to quantify with confidence the "average" exposure condition. The inherent variability of sample collection, sample analysis, and environmental distributions can complicate the determination of an exposure point concentration representing that average exposure. USEPA exposure point concentration guidance allows the use of the "lesser" of the maximum detected concentration and the 95 percent UCL. When samples are collected defining a data set and when the variability among the observations is great, the 95 percent UCL will likely be greater than the maximum concentration. Defaulting to the lesser of the two concentrations helps to minimize the overestimation of risk, but does not eliminate the potential to overestimate the risk based on the "average" exposure condition. The EPC could, in fact, yield an over- or underestimate of risk depending on the truly underlying distribution of the data/chemical concentrations.

In summary, based on the assessment of sampling, land use, receptor selection, and associated activities and exposure factors, the exposure assessment is believed to overestimate risk.

7.3 TOXICITY ASSESSMENT

Toxicity assessment involves the selection of noncancer toxicity indices (i.e., RfDs) and cancer slope factors.

Chemicals Without Toxicity Values: When chemicals do not have available toxicity factors, then the chemicals cannot be evaluated and potential contribution to the risk/hazard estimates cannot be completed. In all likelihood, the detection of chemicals without toxicity values will yield an underestimate of risk because the chemicals would not be included in the cumulative risk/hazard estimates. In this assessment, provisional toxicity values were used for many chemicals for which the USEPA has not yet completed the scientific review process. Also, HI values are only additive for chemicals that impact the same target organ. For this risk assessment, HI values were added together to represent a conservative estimate of noncancer health effects.

Reference Doses (RfDs): RfDs are developed using animal data that must be applied to human receptors for the risk assessment. The process typically involves application of several uncertainty factors and modifying factors to animal test data that lower the RfD, given extrapolation from animal tests to human-health risk assessment. For instance, uncertainty factors of 10 are often applied to animal data to

reduce a threshold dose ten-fold to arrive at the RfD. This application of the UFs is likely to overestimate non-carcinogenic toxicity as noted by Dourson et. al. (1997).

Surrogate Toxicity Data: When a chemical does not have a toxicity factor, the available toxicity factor for a similar chemical may be used. The use of surrogate toxicity data (i.e., toxicity data used in lieu of COPC toxicity information) introduces uncertainty to the toxicity assessment. In many cases, toxicity values obtained under one route of exposure (i.e., oral) are used to represent toxicity values for another exposure route. When this is done, an effort is made to conservatively assume that the toxicity value is at least as conservative to that of the surrogate. There is biological data supporting the theory that toxic responses in animals are similar to those in humans. However, the variability in responses to contaminant exposure can be large due to species differences in pharmacokinetic mechanisms such as absorption, distribution, metabolism, and excretion (Rodricks 1992). The use, therefore, of surrogate toxicity data on the part of USEPA for development of toxicity data will typically likely overestimate risk.

Toxicity values have been developed to be protective of the most sensitive potential receptors. However, for some COPCs, CSFs and RfDs are not available. Toxicity information for surrogate compounds (based on chemical or structural similarity) was substituted. This may result in an underestimation or overestimation of risk. The surrogates selected for use in the COPC screening process were all very closely structurally related to the contaminants they were chosen to represent. The degree of uncertainty contributed by the use of surrogates in this manner is unknown but is not expected to result in underestimates of risk. Because of a lack of USEPA 2009 RSLs or toxicity values for screening chemicals to identify COPCs, the surrogates were employed to avoid leaving data gaps in the HHRA. Table 3-6 presents the list of constituents for which a surrogate value has been used.

Chemicals with Updated or Revised Toxicity Values (California) – Naphthalene: In this assessment, naphthalene was evaluated as a carcinogenic chemical since California has listed naphthalene as a carcinogen.

Uncertainty Associated with the Relative Potency Approach for Carcinogenic PAHs: Seven PAHs have been identified as carcinogenic by the USEPA. Consistent with USEPA guidelines (USEPA 1993c), cancer potencies relative to benzo(a)pyrene (B(a)P) were assigned and used to calculate individual cancer slope factors for the remaining six carcinogenic PAHs which may lead to uncertainty in the risk estimate. The assignment of potencies relative to B(a)P implies that the dose response curve for B(a)P is similar to those of the remaining six PAHs but that the dose required to elicit the cancer response is proportionately less than B(a)P. Although the biological relevance of the toxicological endpoint is not expressly stated, the model is able to fit, with reasonable accuracy, the rank order of the cancer incidence in skin painting studies (Clement Associates 1988). The relative potency approach also assumes that the cancer response is additive, proportional to the relative potency factor that has been assigned to the individual chemical carcinogen. Additive and non-additive effects have been observed for PAH mixtures and may depend on the route of exposure and/or presence of other chemicals in the mixture. This is most relevant in instances where chemicals act as promoters rather than direct carcinogens. However, there are limited data to suggest that PAH can act as promoters for other PAHs and thus it has been concluded that the assumptions of additivity are not expected to either over or underestimate cancer risk (USEPA 1986b). Thus, the assumption of additivity is not unreasonable. In summary, while the approach used to determine cancer risk from PAH is dependent on assumed proportionalities in the toxicities of PAH relative to B(a)P, the data supporting the use of these assumptions is substantial and suggests that the use of the relative potency approach has a neutral effect on the magnitude of the risk assessment.

The risk for B(a)P equivalent EPC and for individual PAH constituents have been computed separately for the HHRA for soil at OU-2A. As part of the risk estimation using the EPC of B(a)P equivalents, the B(a)P equivalent concentrations were calculated for the soil samples collected at each of the OU-2A IR Sites 9, 13, 19, 22, and 23 using the potency equivalency factors (PEFs) based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and B(a)P as per the 2005 OEHHA document.

The B(a)P equivalent concentrations were then used in deriving an EPC that was used to estimate the carcinogenic risk at each of these locations due to PAHs. The value of reasonable maximum EPC was estimated by calculating the 95 percent upper confidence limit (UCL) of the mean concentration, and comparing it with its maximum reported concentration; the lesser of the two values (95 percent UCL and maximum reported concentration) was then used as the reasonable maximum EPC for each of the OU-2A sites. The 95 percent UCL of the mean concentration of constituents at OU-2A sites was estimated using the ProUCL program that is based on the USEPA (2002) guidance document.

7.4 RISK CHARACTERIZATION

Although there is some uncertainty associated with risk assessment, the calculated cancer risks and HIs are protective estimates, so that any actual risk, if it exists, will likely be lower than the estimates.

For noncancer hazard, acceptable lifetime exposure levels correspond to HIs equal to or less than 1. The individual HQs for each chemical are added together only for chemicals that affect the same target organ. Therefore, adding all HQs for each chemical into a single HI value represents a protective estimate of the potential for noncancer health effects.

Where cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncarcinogenic HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts.

USEPA guidance indicates that carcinogenic risks and HQs resulting from various multiple chemicals should be considered additive (USEPA 1989a). In the absence of supporting data for synergy or antagonism, the assumption of additivity could overestimate or underestimate potential cancer risk or HQs for receptors.

As noted in the preceding text, arsenic is a predominant COPC that has been included in its entirety in the estimation of risk associated with site-related activities. Arsenic is also a common naturally occurring element found in soils similar to those of the site. The arsenic concentrations detected are consistent with background concentrations at Alameda Point. Additionally, the maximum and RME EPCs of arsenic are below the Station average. Therefore, the inclusion of the contribution of naturally occurring arsenic tends to overestimate risk to both generic and site-specific receptors.

8. RESIDENTIAL HHRA CONCLUSIONS

The section summarizes the findings of the revised residential HHRA (baseline). The total cancer risks and noncancer hazard (i.e., risk that includes metals at concentrations below the Alameda Point background data set) are discussed in a context of the risk management range. The subsections that follow present specific results for the HHRAs that were conducted for IR Sites 9, 13, 19, 22, and 23. The exposure pathways and guidelines used to calculate the cancer risk and noncancer hazard value are presented in detail in Section 5.0. The estimate of cancer risk and noncancer hazards for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors.

The results for cancer risks and noncancer hazard values are presented for the following three exposure groups.

- **Exposure Group 1**. All soil and groundwater pathways (residential development and residential use of groundwater) – for ingestion of soil and groundwater, inhalation of vapors in indoor and outdoor air, inhalation of vapors in indoor air while showering, inhalation of particulates from soil in outdoor air, and dermal contact with soil.
- **Exposure Group 2**. Pathways for soil and vapors from VOCs in groundwater (reasonable current and future use exposure, which includes residential development with the current municipal water supply) – for ingestion of soil and homegrown produce, inhalation of particulates from soil in outdoor air, inhalation of vapors in indoor and outdoor air, and dermal contact with soil.

  These exposure pathways represent the most reasonable current and future use as it is highly unlikely that shallow groundwater at OU-2A would ever be used as a source of drinking water.
- **Exposure Group 3**. Exposure pathways for residential use of groundwater – for ingestion of groundwater, and inhalation of vapors in indoor air while showering.

8.1 IR SITE 9 RISK CHARACTERIZATION

Noncancer hazards and cancer risks calculated for IR Site 9 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Consistent with the exposure assessment, only future residential exposures were evaluated for IR Site 9. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Tables 8-1 through 8-3. A summary of the risk estimates by exposure group are presented in Table 8-16.

8.1.1 IR Site 9 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to surface soil at IR Site 9 for a residential setting are 1×10^{-5} and 2×10^{-5}, respectively (Table 8-1). Majority of the USEPA risk contribution is from the soil ingestion (55 percent) with arsenic contributing approximately 87 percent of the estimated risk. The HI from exposure to surface soil at IR Site 9 is 3, with ingestion of soil pathway contributing 50 percent to the total HI (Table 8-1). Chromium (43 percent), cobalt (12 percent), and iron (11 percent) contributed to the majority of the HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to surface soil IR Site 9 for a residential setting are 2×10^{-6} and 1×10^{-5}, respectively (Table 8-1). The HI, excluding background contribution, from exposure to surface soil at IR Site 9 is 1.

8.1.2 IR Site 9 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to subsurface soil at IR Site 9 for a residential setting are 6×10^{-5} and 1×10^{-4}, respectively (Table 8-2). Majority of the risk contribution is from the ingestion of homegrown produce (85 percent) pathway. Aroclor 1254 (25 percent) and dieldrin (19 percent) contributed to the majority of the estimated cancer risk. The HI from exposure to subsurface soil at IR Site 9 is 6, with ingestion of homegrown produce pathway contributing 49 percent of the HI (Table 8-2). Aroclor 1254 (31 percent), chromium (15 percent), naphthalene (14 percent), and aroclor 1260 (13 percent) contributed to the majority of the total HI. Aroclor 1254 and Aroclor 1260 were reported in only one soil sample collected at location S9-B03 in 2007, and these reported concentrations were less their respective screening levels, i.e. EPA residential RSLs. Subsequent to the issuance of the Draft Final FS and based on regulatory agency comments and discussions, additional soil sampling was conducted to characterize PCBs at IR Site 9, and all these results were not reported or less than their respective screening levels (see Appendix G).

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to subsurface soil at IR Site 9 for a residential setting is 5×10^{-5} and 1×10^{-4}, respectively (Table 8-2). The HI, excluding background contribution, from exposure to surface soil at IR Site 9 is 5.

8.1.3 IR Site 9 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater at IR Site 9 are 1×10^{-3} and 5×10^{-4}, respectively (Table 8-3). Ninety nine percent of the risk contribution is from ingestion of groundwater pathway with vinyl chloride, arsenic, and 1,2,3-trichloropropane contributing 52, 31 and 14 percent of the total risk, respectively. The total HI from exposure to groundwater at IR Site 9 is 76. Majority of the contribution is from ingestion of groundwater pathway (98 percent) with cobalt contributing to 65 percent of the total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 9 is 1×10^{-3} and 5×10^{-4}, respectively (Table 8-3). The HI, excluding background contribution, from exposure groundwater at IR Site 9 is 62.

The total USEPA, Cal-EPA carcinogenic risks and HI at IR Site 9 *from exposure to groundwater via vapor intrusion only* is 2×10^{-6}, 4×10^{-5} and 0.2, respectively (Table 8-3). Majority of the cancer risk contribution is from vinyl chloride.

8.1.4 IR Site 9 Summary

The total cancer risk estimates by exposure group are presented in Table 8-16. Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil at IR Site 9, a majority of the risk is associated with ingestion and homegrown produce pathways. In addition, lead was not reported above the screening threshold of 207 mg/kg. For groundwater, VC is the primary contributor to carcinogenic risk primarily due groundwater ingestion pathway.

Metals, in particular, arsenic are a significant contributor to the carcinogenic risk. This risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. Although arsenic concentrations at selected locations at this site and throughout OU-2A are above background value, these concentrations are generally within the range observed in the background dataset. In addition, large fluctuations in arsenic concentrations have been observed with arsenic concentrations from more recent sampling events being generally lower. In addition, there are no clear indications as to the source of the elevated concentrations suggesting that they are consistent with ambient concentrations and may be an artifact of the fill placed at the site.

Other metals in groundwater such as cobalt, manganese, thallium and iron contribute to elevated hazard indices; these metals are also generally within ambient ranges found at Alameda Point. An analysis of distribution of metals in groundwater at IR Site 9 indicates that most of the relatively high concentrations of cobalt, manganese, and iron are present within the former ISCO removal action area. These concentrations are expected to decrease as the redox conditions in the aquifer revert back to normal (see Section 5.1.2 of the revised FS text for details).

The Navy presented figures and tables detailing rationale for the selection of soil COCs for OU-2A. The COCs selected based on the collective decision of BCT was documented in the Technical Memorandum that has been appended to this Final FS as Appendix G.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 9. The following COCs were selected for groundwater.

- VC
- 1,2,3-trichloropropane

8.2 IR SITE 13 RISK CHARACTERIZATION

Noncancer hazards and cancer risks calculated for IR Site 13 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Consistent with the exposure assessment, only future residential exposures were evaluated for IR Site 13. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Tables 8-4 through 8-6. A summary of the risk estimates by exposure group are presented in Table 8-16.

8.2.1 IR Site 13 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to surface soil at IR Site 13 for a residential setting are 5×10^{-5} and 6×10^{-5}, respectively (Table 8-4). A majority of the risk contribution is from the ingestion of soil (48 percent) and homegrown produce (40 percent) with arsenic and PAHs expressed as B(a)P equivalent contributing 51 and 27 percent of the total estimated risk, respectively. The HI from exposure to surface soil at IR Site 13 is 3 with ingestion of soil pathway contributing 53 percent of the HI (Table 8-4). Chromium (24 percent), iron (13 percent), arsenic (12 percent) and cobalt (10 percent) contributed to the majority of the HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to surface soil at IR Site 13 for a residential setting are 3×10^{-5} and 4×10^{-5}, respectively (Table 8-4). The HI, excluding background contribution, from exposure to surface soil at IR Site 13 is 3.

8.2.2 IR Site 13 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to subsurface soil at IR Site 13 for a residential setting are 8×10^{-5} and 1×10^{-4}, respectively (Table 8-5). A majority of the risk contribution is from homegrown produce (58 percent) and soil ingestion (28 percent) pathways. Carbazole (40 percent), PAHs expressed as B(a)P equivalent (23 percent), and arsenic (21 percent) contributed to the majority of the EPA cancer risk.

The HI from exposure to subsurface soil at IR Site 13 is 3, with ingestion of soil and inhalation of vapors in indoor air originating from soil pathways contributing approximately 38 and 23 percent of the total HI, respectively (Table 8-5). Naphthalene (20 percent) and chromium (16 percent) contributed to the majority of the total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to subsurface soil at IR Site 13 for a residential setting is 6×10^{-5} and 8×10^{-5}, respectively (Table 8-5). The HI, excluding background contribution, from exposure to subsurface soil is 3.

8.2.3 IR Site 13 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater at IR Site 13 are 1×10^{-3} and 1×10^{-3}, respectively (Table 8-6). A majority of the risk contribution is from the ingestion of groundwater pathway (90 percent), with arsenic contributing to 85 percent of the risk and benzene contributing to 12 percent of the risk. The HI from exposure to groundwater at IR Site 13 is 20. A majority of the HI is associated with ingestion of groundwater (98 percent). Arsenic (60 percent), manganese (19 percent), and benzene (12 percent) contributed to the majority of the total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 13 are 1×10^{-3} and 1×10^{-3}, respectively (Table 8-6). The HI, excluding background contribution, from exposure groundwater at IR Site 13 is 20.

The total USEPA, Cal-EPA carcinogenic risks and HI at IR Site 13 *from exposure to groundwater via vapor intrusion only* is 1×10^{-5}, 4×10^{-5} and 0.1, respectively (Table 8-6). Majority of the cancer risk contribution is from benzene.

8.2.4 IR Site 13 Summary

The total cancer risk estimates by exposure group are presented in Table 8-16. The total cancer risk estimates for the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens.

Carbzaole, arsenic, and PAHs are the major contributors to risk due to exposure to soil. Carbazole in the soil risk dataset was reported in only four of the 32 soil samples. Since the frequency of detection was low, the maximum reported concentration of 5.9 mg/kg collected at location B13-41 was used as the EPC. The computation of carcinogenic risk used a value from Health Effects Assessment Summary Table (HEAST) presented in the U.S. EPA PRG table 2004. It is a third tier source according to the Department of Defense and Office of Solid Waste and Emergency Response memos for the selection of toxicity criteria. It is used when there is no other federal or state peer-reviewed source. In this case, there are no Tier 1 or Tier 2 sources, so the HEAST value has been used. The EPC for arsenic in soil is

less than the background value for OU-2A; therefore, risk due to arsenic is attributable to background risk. Extensive sampling within the areas identified as containing the TRW at IR Site 13 indicates that PAHs in shallow soil have an EPC below the Alameda screening value. The PAH concentrations at depths greater than four feet are consistent with other locations on Alameda Point.

Arsenic and benzene are significant contributors to the carcinogenic risk for groundwater. Metals such as arsenic and manganese along with VOCs i.e. mainly benzene contribute to elevated hazard indices. The carcinogenic and non-carcinogenic risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. Although arsenic and manganese concentrations at selected locations at this site and throughout OU-2A are above background value, these concentrations are generally within the range observed in the background dataset. Most of the relatively high concentrations of metals were reported in wells MW13-07 and M07C-06. As explained in Section 3.4 of the revised FS text, reducing conditions exist in the vicinity of these two wells, which is likely the cause of high concentrations of metals in water. The metal concentrations are expected to decrease as the redox conditions in the aquifer revert back to normal.

Based on the revised risk characterization at IR Site 13, the following COCs have been identified and will be evaluated in this FS.

Groundwater:

- Benzene

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 13.

8.3 IR SITE 19 RISK CHARACTERIZATION

Noncancer hazards and cancer risks calculated for IR Site 19 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Consistent with the exposure assessment, only future residential exposures were evaluated for IR Site 19. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Table 8-7 through 8-9. A summary of the risk estimates by exposure group are presented in Table 8-16.

8.3.1 IR Site 19 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to surface soil at IR Site 19 for a residential setting are 3×10^{-5} and 4×10^{-5}, respectively (Table 8-7). A majority of the risk contribution is from the soil ingestion (61 percent) with arsenic and PAHs expressed as B(a)P equivalent contributing 45 and 51 percent, respectively, of the total estimated risk. The HI from exposure to surface soil at IR Site 19 is 3, with ingestion of soil pathway contributing 55 percent of the HI. Thallium, acetone, chromium, and iron account for 22, 21, 13, and 11 percent, respectively, of the total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to surface soil at IR Site 19 for a residential setting are 2×10^{-5} and 3×10^{-5}, respectively (Table 8-7). The HI, excluding background contribution, from exposure to surface soil at IR Site 19 is 1.

8.3.2 IR Site 19 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to subsurface soil at IR Site 19 for a residential setting are 2×10^{-5} and 3×10^{-5} respectively (Table 8-8). A majority of the risk contribution is associated with soil ingestion (57 percent), with arsenic and PAHs expressed as B(a)P equivalent

contributing 49 and 42 percent of the total estimated risk for this pathway, respectively. The HI from exposure to subsurface soil at IR Site 19 is 3 with ingestion of soil pathway contributing 55 percent of the HI. Thallium, 2-chlorophenol, and chromium account for 23, 22, and 16 percent, respectively, of the total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to subsurface soil at IR Site 19 for a residential setting are 1×10^{-5} and 2×10^{-5}, respectively (Table 8-8). The HI, excluding background contribution, from exposure to subsurface soil at IR Site 19 is 1.

8.3.3 IR Site 19 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater at IR Site 19 are both 4×10^{-4} (Table 8-9). A majority of the risk contribution is from the ingestion of groundwater pathway (74 percent) with tetrachloroethene (PCE), arsenic, and VC contributing 71 percent, 21 percent, and 8 percent of this total risk, respectively.

The total HI from exposure to groundwater at IR Site 19 is 4. A majority of the risk is from ingestion of groundwater pathway (93 percent) with arsenic, thallium, and vanadium contributing to 27, 25, and 16 percent, respectively to total HI.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 19 are both 3×10^{-4} (Table 8-9). The HI, excluding background contribution, from exposure groundwater at IR Site 19 is 1.

The total USEPA and Cal-EPA carcinogenic risks at IR Site 19 *from exposure to groundwater via vapor intrusion only* are both 4×10^{-6}, respectively (Table 8-9). Majority of the risk contribution is from trichloroethene.

8.3.4 IR Site 19 Summary

The total cancer risk estimates for the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil, a majority of the risk contribution is from the soil ingestion pathway, with arsenic and B(a)P contributing a significant percentage of the estimated risk. The EPC for arsenic is less than the background value for OU-2A soil; therefore, the risk due to arsenic is attributable to background risk. The EPCs for B(a)P equivalent concentrations were estimated to be 0.13 mg/kg (0 – 2 feet bgs) and 0.15 mg/kg (0 – 8 feet bgs), which are less than the Alameda Point screening level of 0.62 mg/kg.

For groundwater, a majority of the carcinogenic risk is due to PCE, VC, and arsenic. This risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. The EPC of arsenic is less than the background value for OU-2A groundwater; therefore, risk due to arsenic is attributable to background risk.

Based on the revised risk characterization at Site 19, the following COCs have been identified and are evaluated in this FS:

<u>Groundwater:</u>

- PCE
- TCE
- VC

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 19.

8.4 IR SITE 22 RISK CHARACTERIZATION

Noncancer hazards and cancer risks calculated for IR Site 22 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Consistent with the exposure assessment, only future residential exposures were evaluated for IR Site 22. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Tables 8-10 through 8-12. HHRA results by exposure group are presented in Table 8-16.

8.4.1 IR Site 22 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to surface soil at IR Site 22 for a residential setting are 3×10^{-5} and 9×10^{-5}, respectively (Table 8-10). A majority of the USEPA risk contribution is from the soil ingestion pathway (54 percent) with arsenic contributing 68 percent of the estimated risk. The HI from exposure to surface soil at IR Site 22 is 4, with ingestion of soil pathway contributing 43 percent of the HI (Table 8-10). Naphthalene, chromium, and cobalt contributed approximate 35, 14, and 12 percent to the total HI.

Lead exceeds the threshold value of 207 mg/kg at Site 22 with a maximum reported concentration of 9,890 mg/kg at one location (MW547-5) in a soil sample collected during the 1990 investigation. However, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to surface soil at IR Site 22 for a residential setting is 9×10^{-6} and 7×10^{-5}, respectively (Table 8-10). The HI, excluding background contribution, from exposure to surface soil is 2.

8.4.2 IR Site 22 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to subsurface soil at IR Site 22 for a residential setting are 8×10^{-5} and 2×10^{-3}, respectively (Table 8-11). A majority of the USEPA risk contribution is from the inhalation of volatiles in outdoor air (43 percent) and soil ingestion (23 percent) pathways with ethylbenzene, arsenic, benzene, and PAHs expressed as B(a)P equivalents, contributing 47, 18, 13, and 13 percent of the total estimated risk, respectively. The HI from exposure to subsurface soil at IR Site 22 is 20, with inhalation of vapors primarily from petroleum hydrocarbons and naphthalene contributing 63 percent of the HI (Table 8-11). Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to subsurface soil for a residential setting is 8×10^{-5} and 2×10^{-3}, respectively (Table 8-11). The HI, excluding background contribution, from exposure to subsurface soil at IR Site 22 is 19.

8.4.3 IR Site 22 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater at IR Site 22 are 3×10^{-3} and 5×10^{-3}, respectively (Table 8-12). A majority of the USEPA risk contribution is from the ingestion of groundwater (78 percent) pathway. Petroleum hydrocarbons (benzene and ethylbenzene) contributed approximately 79 percent of the total risk and arsenic contributed 19 percent of the total risk. The HI from exposure to groundwater at IR Site 22 is 138 with a majority of the HI (87 percent) associated with ingestion of petroleum–related constituents (benzene, toluene, ethylbenzene and xylenes – 54 percent) and manganese (31 percent).

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 22 are 3×10^{-3} and 5×10^{-3}, respectively (Table 8-12). The HI, excluding background contribution, from exposure groundwater at IR Site 22 is 128.

The total USEPA and Cal-EPA carcinogenic risks at IR Site 22 *from exposure to groundwater via vapor intrusion only* is 2×10^{-4} and 6×10^{-4}, respectively (Table 8-12). Majority of the risk contribution is from benzene and ethylbenzene.

8.4.4 IR Site 22 Summary

The total cancer risk estimates for the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens.

A majority of the USEPA risk contribution is from the soil ingestion pathway with arsenic contributing to a significant percent of the estimated risk. The EPC for arsenic is less than the background value for OU-2A; therefore, the risk due to arsenic is attributable to background risk.

As noted above, lead exceeded the threshold value of 207 mg/kg at Site 22 at a single location however, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program.

For groundwater, benzene (a petroleum hydrocarbon constituent) is a major cancer and non-cancer risk driver. Therefore, a majority of the risk is associated with petroleum hydrocarbon constituents which are being addressed under the Petroleum program.

No COCs requiring CERCLA response action were selected for further evaluation in the revised FS for soil or groundwater at IR Site 22.

8.5 IR SITE 23 RISK CHARACTERIZATION

Noncancer hazards and cancer risks calculated for IR Site 23 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Consistent with the exposure assessment, only future residential exposures were evaluated for IR Site 23. Cancer risks and noncancer adverse health effects are summarized by pathway in Tables 8-13 through 8-15. HHRA results by exposure group are presented in Table 8-16.

8.5.1 IR Site 23 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to surface soil at IR Site 23 for a residential setting are 3×10^{-5} and 5×10^{-5}, respectively (Table 8-13). A majority of the risk contribution is from the ingestion of soil pathway (57 percent) with arsenic and PAHs expressed as B(a)P equivalents contributing 48 and 44 percent of the estimated risk, respectively. The HI from exposure to surface soil at IR Site 23 is 3 with ingestion of soil pathway contributing 52 percent of the HI (Table 8-13). A majority of the risk contribution is from chromium, cadmium, cobalt, and iron contributing 25, 14, 10, and 10 percent of the total estimated hazard, respectively.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to surface soil at IR Site 23 for a residential setting are 2×10^{-5} and 3×10^{-5}, respectively (Table 8-13). The HI, excluding background contribution, from exposure to surface soil at IR Site 23 is 1.

8.5.2 IR Site 23 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA and Cal-EPA carcinogenic risks from exposure to subsurface soil at IR Site 23 for a residential setting are 3×10^{-5} and 5×10^{-5}, respectively (Table 8-14). A majority of the risk contribution is associated with the ingestion of soil pathway (59 percent) with arsenic and PAHs expressed as B(a)P equivalents contributing 35 and 44 percent of the estimated risk, respectively. The HI from exposure to subsurface soil at IR Site 23 is 3, with the ingestion soil pathway contributing 56 percent of the HI (Table 8-14). A majority of the risk contribution is from thallium, chromium, and naphthalene contributing 22, 19, and 12 percent of the total estimated hazard, respectively.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to subsurface soil at IR Site 23 for a residential setting is 2×10^{-5} and 4×10^{-5}, respectively (Table 8-14). The HI, excluding background contribution, from exposure to subsurface soil at IR Site 23 is 1.

8.5.3 IR Site 23 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater via at IR Site 23 are 6×10^{-4} and 1×10^{-3}, respectively (Table 8-15). A majority of the risk is from the groundwater ingestion pathway (66 percent). The majority of the risk is attributable to arsenic at 33 percent and 1,2-dibromo-3-chloropropane contributing 45 percent of the total cancer risk. The total HI from exposure to groundwater at IR Site 23 is 7. The majority of the HI is attributable to arsenic at 37 percent, with manganese contributing 18 percent and 1,2-dibromo-3-chloropropane contributing 14 percent of the total HI. The frequency of detection of 1,2-dibromo-3-chloropropane in the groundwater risk dataset is less than 1 percent with a maximum detected concentration of 2 µg/L. 1,2-dibromo-3-chloropropane was reported in only one groundwater sample collected at well MW530-2 in 2006.

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 23 are 4×10^{-4} and 1×10^{-3}, respectively (Table 8-15). The HI, excluding background contribution, from exposure groundwater at IR Site 23 is 2.

The total USEPA and Cal-EPA carcinogenic risks at IR Site 23 *from exposure to groundwater via vapor intrusion only* is 4×10^{-7} and 1×10^{-7}, respectively (Table 8-15).

8.5.4 IR Site 23 Summary

The total cancer risk estimates by exposure group are presented in Table 8-16. The total cancer risk estimates for the Exposure Group 2 (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil, a majority of the risk contribution is associated with the ingestion of soil pathway with arsenic and PAHs expressed as B(a)P equivalents contributing a significant percent of the estimated risk. The EPC for arsenic in soil is less than the background value for OU-2A; therefore, the risk due to arsenic in soil is attributable to background risk. The EPCs for B(a)P equivalent concentrations were estimated to be 0.23 mg/kg (0 – 2 feet bgs) and 0.17 mg/kg (0 – 8 feet bgs), which are less than the Alameda Point screening level of 0.62 mg/kg.

For groundwater, the majority of the cancer risk is attributable to arsenic and 1,2-dibromo-3-chloropropane. The majority of the HI is attributable to arsenic, manganese, and 1,2-dibromo-3-chloropropane. The frequency of detection of 1,2-dibromo-3-chloropropane in the groundwater risk dataset is less than 1 percent with a maximum reported concentration of 2 µg/L. 1,2-dibromo-3-chloropropane was reported in only one groundwater sample collected at well MW530-2 in 2006.

Similar to other sites, metals, in particular, arsenic is a significant contributor to the carcinogenic risk. This risk is based on the ingestion of groundwater is assumed to be extracted from groundwater beneath the site. The reported concentrations of arsenic at IR Site 23 are within the range observed in the background dataset. In addition, other metals such as manganese, and thallium that contribute to the elevated hazard index were also within ambient ranges found at Alameda Point.

No COCs requiring CERCLA response action were selected for further evaluation in the revised FS for soil or groundwater at IR Site 23.

9. COMMERCIAL HHRA FINDINGS AND CONCLUSIONS - GROUNDWATER

This section summarizes the findings of the commercial risk assessment conducted for groundwater at OU-2A.

9.1 COMMERCIAL RISK - GROUNDWATER

Noncancer hazards and cancer risks calculated for IR Sites 9, 13, 19, 22, and 23 are summarized in this section.

Cancer risks and noncancer adverse health effects for groundwater are summarized in the following text and presented in Tables 9-1 and 9-5.

9.1.1 IR Site 9 Groundwater

The cumulative carcinogenic risks due to vapor intrusion under commercial use using U.S. EPA and Cal-EPA toxicity criteria were estimated to be 8×10^{-7} and 1×10^{-5}, respectively (Table 9-1). The HI due to vapor intrusion under commercial use was estimated to be less than 1.

9.1.2 IR Site 13 Groundwater

The cumulative carcinogenic risks due to vapor intrusion under commercial use using U.S. EPA and Cal-EPA toxicity criteria were estimated to be 4×10^{-6} and 1×10^{-5}, respectively (Table 9-2). Benzene contributed approximately 66 percent of the total USEPA risk. The HI due to vapor intrusion under commercial use was estimated to be less than 1.

9.1.3 IR Site 19 Groundwater

The cumulative carcinogenic risks due to vapor intrusion under commercial use using U.S. EPA and Cal-EPA toxicity criteria were both estimated to be 1×10^{-6} (Table 9-3). The HI due to vapor intrusion under commercial use was estimated to be less than 1.

9.1.4 IR Site 22 Groundwater

The cumulative carcinogenic risks due to vapor intrusion under commercial use using U.S. EPA and Cal-EPA toxicity criteria were estimated to be 6×10^{-5} and 2×10^{-4}, respectively (Table 9-4). Benzene contributed approximately 80 percent of the total USEPA risk. The HI due to vapor intrusion under commercial use was estimated to be less than 1.

9.1.5 IR Site 23 Groundwater

The cumulative carcinogenic risks due to vapor intrusion under commercial use using U.S. EPA and Cal-EPA toxicity criteria were estimated to be 1×10^{-7} and 4×10^{-8}, respectively (Table 9-5). The HI due to vapor intrusion under commercial use was estimated to be less than 1.

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FIGURES

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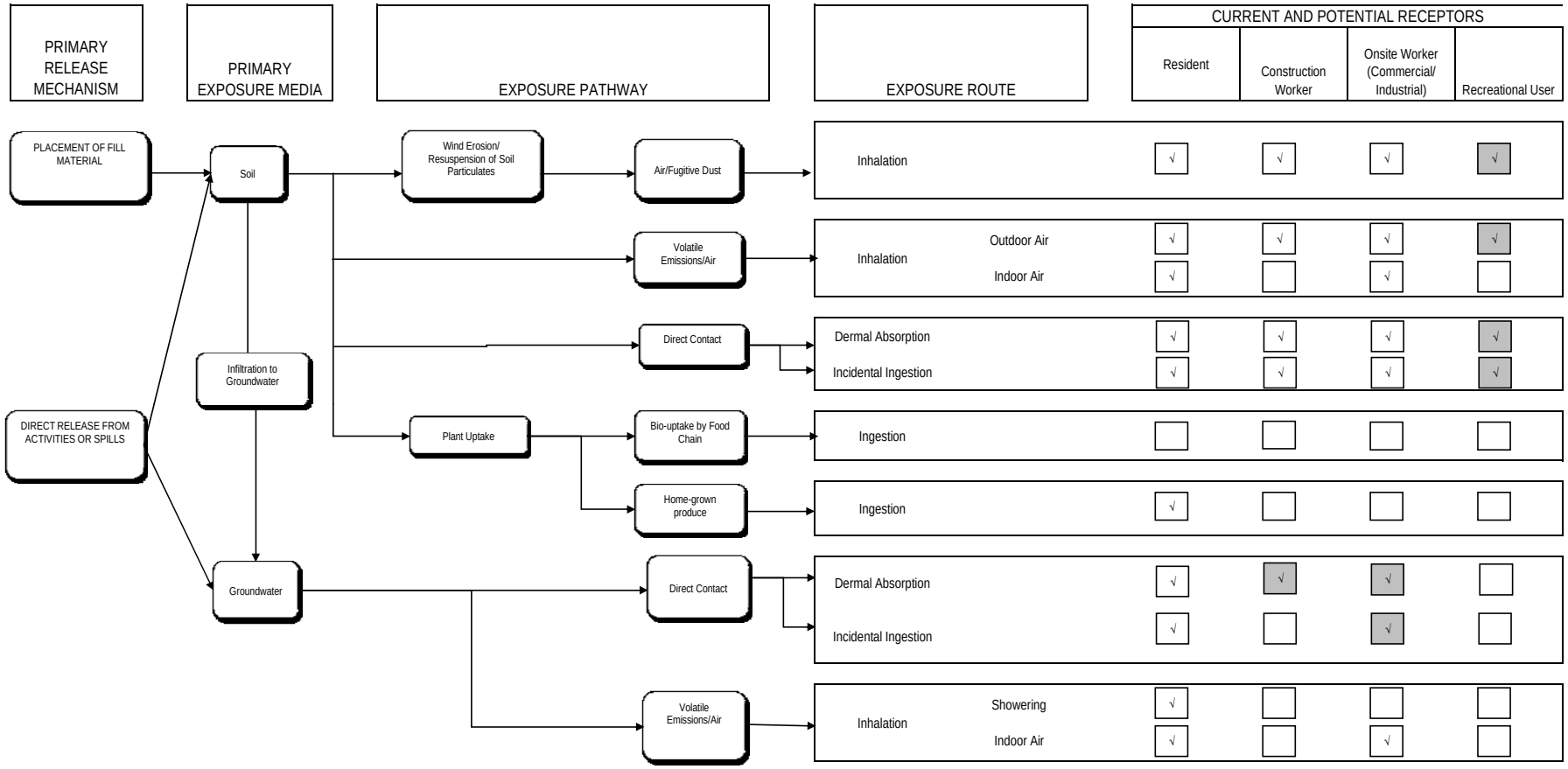
Figure 3-1. Conceptual Site Model for OU2A



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TABLES

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Table 3-1
Selection of Exposure Pathways
IR Sites 9, 13, 19, 22, and 23

Scenario Time Frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil	Vadose zone soil	Outdoor/Indoor	Residential	Child/Adult	Ingestion of soil	Quantitative	Potentially complete
						Dermal contact with soil	Quantitative	Potentially complete
						Inhalation of volatiles in indoor air	Quantitative	Potentially complete
						Inhalation of volatiles in outdoor air	Quantitative	Potentially complete
						Inhalation of particulates in outdoor air	Quantitative	Potentially complete
						Ingestion of homegrown produce	Quantitative	Potentially complete
Current/Future	Groundwater	Groundwater	Outdoor/Indoor	Residential	Child/Adult	Ingestion of groundwater	Quantitative	Potentially complete*
						Inhalation of vapors while showering	Quantitative	Potentially complete*
						Dermal contact while showering	Quantitative	Potentially complete*
						Inhalation of volatiles in indoor air	Quantitative	Potentially complete
Current/Future	Groundwater	Groundwater	Outdoor/Indoor	Commercial	Adult	Ingestion of groundwater	Quantitative	Potentially incomplete
						Inhalation of vapors while showering	Quantitative	Potentially incomplete
						Dermal contact while showering	Quantitative	Potentially incomplete
						Inhalation of volatiles in indoor air	Quantitative	Potentially complete
Current/Future	Groundwater	Groundwater	Outdoor/Indoor	Construction	Adult	Ingestion of groundwater	Quantitative	Negligible
						Inhalation of vapors while showering	Quantitative	Negligible
						Dermal contact while showering	Quantitative	Negligible
						Inhalation of volatiles in indoor air	Quantitative	Negligible

Acronym/Abbreviation:
bgs – below ground surface

Notes:

* For OU-2A Sites, these pathways are potentially incomplete and these hypothetical exposure pathways associated with residential use of groundwater were included in the HHRA to provide additional information for risk management decisions.

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Table 3-2
Reasonable Maximum Exposure Values Used for Residential Cancer Risk and HI Calculations

Equation Parameter		Units	Residential Child[a]		Residential Adult[b]		Residential Cancer Risk Equation	Residential HI Equation
Ingestion of Soil								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		(Cs x CSFo x EF x IFS_{adj} x CF) / (ATc)	(Cs x EF x ED x IRS x CF) / (ATnc x BW x RFDo)
Conversion factor	CF	kg/mg	1.00E-06	U.S. EPA 2009	1.00E-06	U.S. EPA 2009		
Resident Soil Ingestion Rate	IRS	mg/day	200	U.S. EPA 2009	100	U.S. EPA 2009		
Resident Soil Ingestion Rate - Age-adjusted	IFS_{adj}	mg-year/kg-day	80	U.S. EPA 2009	34	U.S. EPA 2009		
Mutagenic Resident Soil Ingestion Rate - Age-adjusted	$IFSM_{adj}$	mg-year/kg-day	427	U.S. EPA 2009	63	U.S. EPA 2009		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
US EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Cal EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-6)	Chemical specific	OEHHA 2009 (See Table 3-6)		
Chronic Oral Reference Dose	RfD_o	mg/kg-day	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Dermal Contact with Soil								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		(Cs x CSFo x EF x DFS_{adj} x ABS x CF) / (ATc x GIABS)	(C_S x EF x ED x SA x AF x ABS x CF) / (BW x ATnc x RfDo x GIABS)
Conversion factor	CF	kg/mg	1.00E-06	U.S. EPA 2009	1.00E-06	U.S. EPA 2009		
Resident soil adherence factor	AF	mg/cm^2	0.2	U.S. EPA 2009	0.07	U.S. EPA 2009		
Resident soil surface area	SA	cm^2/day	2,800	U.S. EPA 2009	5,700	U.S. EPA 2004b U.S. EPA 2009		
Resident soil dermal contact factor- age-adjusted	DFS_{adj}	mg-year/kg-day	224	U.S. EPA 2009	137	U.S. EPA 2004b U.S. EPA 2009		
Mutagenic Resident soil dermal contact factor- age-adjusted	$DFSM_{adj}$	mg-year/kg-day	1,195	U.S. EPA 2009	251	U.S. EPA 2009		
Fraction of contaminant absorbed dermally from soil	ABS	unitless	Chemical specific	See Table 3-3	Chemical specific	See Table 3-3		
Fraction of contaminant absorbed in gastrointestinal tract	GIABS	unitless	Chemical specific	U.S. EPA 2009	Chemical specific	U.S. EPA 2009		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
US EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Cal EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-6)	Chemical specific	OEHHA 2009 (See Table 3-6)		
Chronic Oral Reference Dose	RfD_o	mg/kg-day	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Ingestion of Homegrown Produce								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		(C_S x UF x IRS x EF x EDx CSFo) / (BW x ATc)	(C_S x UF x IRS x EF x ED) / (BW x ATnc x RfDo)
Uptake factor	UF	—	Chemical specific	See Table 3-5	Chemical specific	See Table 3-5		
Ingestion rate	IRS	kg/day	0.0174	U.S. EPA 1997	0.0812	U.S. EPA 1997		
Exposure frequency	EF	days/year	70	Site Specific	70	Site Specific		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
US EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Cal EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-6)	Chemical specific	OEHHA 2009 (See Table 3-6)		
Chronic Oral Reference Dose	RfD_o	mg/kg-day	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		

Table 3-2
Reasonable Maximum Exposure Values Used for Residential Cancer Risk and HI Calculations

Equation Parameter		Units	Residential Child[a]		Residential Adult[b]		Residential Cancer Risk Equation	Residential HI Equation
Inhalation of Soil Particulates from Soil								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		(Cs x IUR x CF x EF x ED) / (ATc x PEF)	(Cs x EF x ED) / (ATnc x PEF x RfC)
Particulate emission factor	PEF	m^3/kg	1.36×10^9	U.S. EPA 2009	1.36×10^9	U.S. EPA 2009		
EPA Chronic Inhalation Unit Risk	IUR	$(ug/m3)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-7)	Chemical specific	U.S. EPA 2009 (See Table 3-7)	For mutangenic constituents for child receptor:	
Cal/EPA Chronic Inhalation Unit Risk	IUR	$(ug/m3)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-7)	Chemical specific	OEHHA 2009 (See Table 3-7)	(Cs x IUR x CF x EF x 32) / (ATc x PEF)	
Chronic Inhalation Reference Concentration	RfC	(mg/m^3)	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Conversion factor	CF	µg/mg	1.00E+03	U.S. EPA 2009	1.00E+03	U.S. EPA 2009	For mutangenic constituents for adult receptor:	
Exposure time	ET	hours/day	24	U.S. EPA 2009	24	U.S. EPA 2009	(Cs x IUR x CF x EF x 44) / (ATc x PEF)	
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Inhalation of Vapors in Outdoor Air Originating from Soil								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		(Cs x IUR x CF x EF x ED) / (ATc x VF)	(Cs x EF x ED) / (ATnc x VF x RfC)
EPA Chronic Inhalation Unit Risk	IUR	$(ug/m3)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-7)	Chemical specific	U.S. EPA 2009 (See Table 3-7)		
Cal/EPA Chronic Inhalation Unit Risk	IUR	$(ug/m3)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-7)	Chemical specific	OEHHA 2009 (See Table 3-7)		
Chronic Inhalation Reference Concentration	RfC	(mg/m^3)	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Conversion factor	CF	µg/mg	1.00E+03	U.S. EPA 2009	1.00E+03	U.S. EPA 2009		
Volatilization factor	VF	(m^3/kg)	Chemical specific	See Table 3-8	Chemical specific	See Table 3-8		
Exposure time	ET	hours/day	24	U.S. EPA 2009	24	U.S. EPA 2009		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Inhalation of Vapors in Indoor Air								
Concentration in soil	C_S	mg/kg	Chemical specific		Chemical specific		Calculated Using the J&E Model (EPA 2004a) for all	Calculated Using the J&E Model for all
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009	the constituents listed as voaltile per the U.S. EPA 2009	
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009	For other assumptions used See Table 6-12	
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Inhalation of Vapors in Indoor Air								
Concentration in indoor air based on concentration in groundwater	C_A	mg/m³	Chemical specific	U.S. EPA 2004a	Chemical specific	U.S. EPA 2004b	Calculated Using the J&E Model (EPA 2004a)	Calculated Using the J&E Model
Intake rate	IRA	m³/hour	0.42	U.S. EPA 2009	0.83	U.S. EPA 2009		
Exposure time	ET	hours/day	24	U.S. EPA 2009	24	U.S. EPA 2009		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
US EPA Inhalation Slope Factor	Sfi	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009	Chemical specific	U.S. EPA 2009		
Cal EPA Inhalation Slope Factor	SFi	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009	Chemical specific	OEHHA 2009		
Chronic Inhalation Reference Dose	RfDi	mg/kg-day	Chemical specific	U.S. EPA 2009	Chemical specific	U.S. EPA 2009		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Ingestion of Groundwater								
Concentration in Groundwater	C_{GW}	mg/L	Chemical specific		Chemical specific		(C_{GW} x IFW_{adj} x CSF_o x EF) / (AT)	(C_{GW} x IRW x EF x ED) / (BW x AT x RfDo)
Ingestion rate	IRW	L/day	1	U.S. EPA 2009	2	U.S. EPA 2009		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	30	U.S. EPA 2009		
US EPA Oral Slope Factor	CSFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Cal EPA Oral Slope Factor	CSFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-6)	Chemical specific	OEHHA 2009 (See Table 3-6)		
Chronic Oral Reference Dose	RfD_o	mg/kg-day	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
Ingestion Rate - Age adjusted	IFWadj	L-year/kg-day	2	U.S. EPA 2009	2	U.S. EPA 2009		

Table 3-2
Reasonable Maximum Exposure Values Used for Residential Cancer Risk and HI Calculations

Equation Parameter		Units	Residential Child[a]		Residential Adult[b]		Residential Cancer Risk Equation	Residential HI Equation
Mutagenic Ingestion Rate - Age adjusted	IFWMadj	L-year/kg-day	3.39	U.S. EPA 2009	3.39	U.S. EPA 2009		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Inhalation of Groundwater Vapors								
Concentration in Groundwater	C_{GW}	mg/L	Chemical specific		Chemical specific		(C_{GW} x ET x EF x ED x IUR x K) / (AT)	(C_{GW} x ET x EF x ED x K) / (RfC x AT x ED)
Exposure time	ET	hours/day	0.25	U.S. EPA 2004b	0.25	U.S. EPA 2004b		
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009		
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
Chronic Inhalation Unit Risk	IUR	$(\mu g/m3)^{-1}$	Chemical specific	U.S. EPA 2009	Chemical specific	U.S. EPA 2009		
Chronic Inhalation Reference Conc	RfC	mg/m3	Chemical specific	U.S. EPA 2009	Chemical specific	U.S. EPA 2009		
Andelmann Volatilization Factor	L/m3	kg	0.5	U.S. EPA 1991b	0.5	U.S. EPA 1991b		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009		
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		
Dermal Contact with Groundwater								
Concentration in Groundwater	C_{GW}	mg/cm³	Chemical specific		Chemical specific		(DAevent x SA x EF x ED x SFo) / (BW x AT)	(DAevent x SA x EF x ED) / (BW x AT x RfDo)
Absorbed dose per event per area of skin exposed	DA_{event}	mg/cm²-event	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b	Where for Organics:	
Event duration	t_{event}	hours/event	0.58	U.S. EPA 2004b	0.58	U.S. EPA 2004b	If tevent > t*,	
Time to reach steady state	t*	hours	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b		
Skin permeability constant for compounds in water	Kp	cm/hour	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b	$DA_{event} = FA \times K_p \times C_w \times \left[\frac{t_{event}}{1+B} + 2\tau\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$	
Lag time per event	τ	hours/event	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b		
Dimensionless ratio of the permeability of the stratum corneum relative to the permeability across the viable epidermis, = Kp*SQRT(molecular weight) / 2.6	B	cm/hour	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b		
Fraction absorbed	FA	---	Chemical specific	U.S. EPA 2004b	Chemical specific	U.S. EPA 2004b	and	
Exposed skin area	SA	cm²/day	6,600	U.S. EPA 2004b	18,000	U.S. EPA 2004b	If tevent < t*,	
Exposure frequency	EF	days/year	350	U.S. EPA 2009	350	U.S. EPA 2009	$DA_{event} = 2FA \times K_p \times C_w \times \sqrt{\frac{6\tau \times t_{event}}{\pi}}$	
Exposure duration	ED	years	6	U.S. EPA 2009	24	U.S. EPA 2009		
US EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Cal EPA Oral Slope Factor	SFo	$(mg/kg\text{-}day)^{-1}$	Chemical specific	OEHHA 2009 (See Table 3-6)	Chemical specific	OEHHA 2009 (See Table 3-6)		
Chronic Oral Reference Dose	RfD_o	mg/kg-day	Chemical specific	U.S. EPA 2009 (See Table 3-6)	Chemical specific	U.S. EPA 2009 (See Table 3-6)		
Body weight	BW	kg	15	U.S. EPA 2009	70	U.S. EPA 2009		
Averaging time (cancer)	AT_C	days	25,550	U.S. EPA 2009	25,550	U.S. EPA 2009	Where for Metals: $DA_{event} = K_p \times C_w \times t_{event}$	
Averaging time (noncancer)	AT_{NC}	days	2,190	U.S. EPA 2009	8,760	U.S. EPA 2009		

Notes:
[a] residential child age is 0 to 6 years
[b] residental carcinogenic exposure was assumed for a total of 30 years; 6 years as a child and 24 years as an adult; residential noncarcinogenic exposure was assumed for a total of 6 years as a child

Acronyms/Abbreviations:
cm/hour – centimeters per hour
cm²/day – square centimeters per day
days/year – days per year
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
hours/day – hours per day
hours/event – hours per event
kg – kilograms
kg/day – kilograms per day
kg/mg – kilograms per milligram
m³/hour – cubic meters per hour
m³/kg – cubic meters per kilogram
mg/cm² – milligrams per square centimeter
mg/cm³ – milligrams per cubic centimeter
mg/day – milligrams per day
mg/kg – milligrams per kilogram
mg/m³ – milligrams per cubic meter
U.S. EPA – United States Environmental Protection Agency

References:

DTSC 1994. Preliminary Endangerment Assessment Guidance Manual. January.
U.S. EPA 1997. Exposure Factors Handbook. August.
U.S. EPA 2004a. Software Implementation of Johnson and Ettinger Model. Version 3.0. February.
U.S. EPA 2004b. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005. July
U.S. EPA 2009. Residential Screening Levels. May.
OEHHA Website for Toxicity Values. July 2009. http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

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Table 3-3
Chemical-Specific Values Used to Evaluate the
Dermal Contact with Soil Exposure Pathway

CAS Number	Chemical	ABSORPTION FACTORS FOR SOIL DTSC	U.S. EPA	Most Conservative
Volatile Organic Compounds				
83-32-9	acenaphthene	0.15	0.13	0.15
208-96-8	acenaphthylene	0.15	—	0.15
67-64-1	acetone	0.1	—	0.1
120-12-7	anthracene	0.15	0.13	0.15
71-43-2	benzene	0.1	—	0.1
191-24-2	benzo(g,h,i)perylene	0.15	—	0.15
74-83-9	bromomethane	0.1	—	0.1
78-93-3	2-butanone	0.1	—	0.1
135-98-8	sec-butylbenzene	0.1	—	0.1
75-15-0	carbon disulfide	0.1	—	0.1
108-90-7	chlorobenzene	0.1	—	0.1
67-66-3	chloroform	0.1	—	0.1
74-87-3	chloromethane	0.1	—	0.1
95-57-8	2-chlorophenol	0.1	—	0.1
132-64-9	dibenzofuran	0.03	—	0.03
95-50-1	1,2-dichlorobenzene	0.1	—	0.1
75-35-4	1,1-dichloroethene	0.1	—	0.1
156-59-2	cis-1,2-dichloroethene	0.1	—	0.1
156-60-5	trans-1,2-dichloroethene	0.1	—	0.1
71-55-6	1,1,1-Trichloroethane	—	0.1	0.1
541-73-1	1,3-Dichlorobenzene	—	0.1	0.1
75-00-3	Chloroethane	—	0.1	0.1
540-59-0	1,2-Dichloroethene	—	0.1	0.1
95-57-8	2-Chlorophenol	0.1	—	0.1
108-10-1	4-Methyl-2-pentanone	0.1	—	0.1
86-73-7	fluorene	0.15	0.13	0.15
98-82-8	isopropylbenzene	0.1	—	0.1
99-87-6	p-isopropyltoluene	0.1	—	0.1
1634-04-4	methyl tert-butyl ether	0.1	—	0.1
75-09-2	methylene chloride	0.1	—	0.1
91-57-6	2-methylnaphthalene	0.15	—	0.15
108-10-1	4-methyl-2-pentanone	0.1	—	0.1
91-20-3	naphthalene	0.15	0.13	0.15
85-01-8	phenanthrene	0.15	—	0.15
103-65-1	n-propylbenzene	0.1	—	0.1
129-00-0	pyrene	0.15	0.13	0.15
79-34-5	1,1,2,2-tetrachloroethane	0.1	—	0.1
127-18-4	tetrachloroethene	0.1	—	0.1
108-88-3	toluene	0.1	—	0.1
87-61-6	1,2,3-trichlorobenzene	0.1	—	0.1
120-82-1	1,2,4-trichlorobenzene	0.1	—	0.1
79-01-6	trichloroethene	0.1	—	0.1
95-63-6	1,2,4-Trimethylbenzene	—	0.1	0.1
75-01-4c	vinyl chloride (child)	0.1	—	0.1
75-01-4a	vinyl chloride (adult)	0.1	—	0.1
7816-60-0	m-, p-xylene	0.1	0.1	0.1
108-67-8	1,3,5-trimethylbenzene	—	0.1	0.1
100-41-4	ethylbenzene	—	0.1	0.1
95-47-6	0-xylene	—	0.1	0.1
1330-20-7	xylenes (total)	—	0.1	0.1
Semivolatile Organic Compounds				
56-55-3	benz(a)anthracene	0.15	0.13	0.15
205-99-2	benzo(b)fluoranthene	0.15	0.13	0.15
207-08-9	benzo(k)fluoranthene	0.15	0.13	0.15
50-32-8	benzo(a)pyrene	0.15	0.13	0.15
117-81-7	bis(2-ethylhexyl)phthalate	0.1	0.1	0.1
75-25-2	bromoform	0.1	0.1	0.1
85-68-7	butyl benzyl phthalate	0.1	0.1	0.1
86-74-8	carbazole	0.1	0.1	0.1
59-50-7	4-chloro-3-methylphenol	0.1	0.1	0.1
218-01-9	chrysene	0.15	0.13	0.15
53-70-3	dibenz(a,h)anthracene	0.15	0.13	0.15
84-74-2	di-n-butyl phthalate	0.1	0.1	0.1
131-11-3	dimethyl phthalate	0.1	0.1	0.1
117-84-0	di-n-octyl phthalate	0.1	0.1	0.1
206-44-0	fluoranthene	0.15	0.13	0.15
193-39-5	indeno(1,2,3-cd)pyrene	0.15	0.13	0.15
100-02-7	4-nitrophenol	0.1	0.1	0.1
105-67-9	2,4-Dimethylphenol	—	0.1	0.1
95-48-7	2-Methylphenol (O-Cresol)	—	0.1	0.1
106-44-5	4-Methylphenol (P-Cresol)	—	0.1	0.1
86-30-6	N-Nitrosodiphenylamine	—	0.1	0.1
87-86-5	pentachlorophenol	0.25	0.25	0.25
84-66-2	Diethyl Phthalate	—	0.1	0.1
108-95-2	phenol	0.1	0.1	0.1

Table 3-3
Chemical-Specific Values Used to Evaluate the
Dermal Contact with Soil Exposure Pathway

CAS Number	Chemical	ABSORPTION FACTORS FOR SOIL DTSC	U.S. EPA	Most Conservative
Pesticides/Polychlorinated Biphenyls				
309-00-2	aldrin	0.05	0.1	0.1
11097-69-1	Aroclor 1254	0.15	0.14	0.15
11096-82-5	Aroclor 1260	0.15	0.14	0.15
319-84-6	alpha-BHC	0.05	0.04	0.05
319-85-7	beta-BHC	0.05	0.04	0.05
319-86-8	delta-BHC	0.05	0.04	0.05
58-89-9	gamma-BHC (lindane)	0.05	0.04	0.05
5103-71-9	alpha-chlordane	0.05	0.04	0.05
5103-74-2	beta-chlordane	0.05	—	0.05
5566-34-7	gamma-chlordane	0.05	0.04	0.05
57-74-9	chlordane	0.05	—	0.05
72-54-8	4,4'-DDD	0.05	0.03	0.05
72-55-9	4,4'-DDE	0.05	0.03	0.05
50-29-3	4,4'-DDT	0.05	0.03	0.05
60-57-1	dieldrin	0.05	0.1	0.1
959-98-8	endosulfan I	0.05	0.1	0.1
33213-65-9	endosulfan II	0.05	0.1	0.1
1031-07-8	endosulfan sulfate	0.05	0.1	0.1
72-20-8	endrin	0.05	0.1	0.1
7421-93-4	endrin aldehyde	0.05	0.1	0.1
53494-70-5	endrin ketone	0.05	0.1	0.1
76-44-8	heptachlor	0.05	0.1	0.1
1024-57-3	heptachlor epoxide	0.05	0.1	0.1
72-43-5	Methoxychlor	0.05	0.1	0.1
8001-35-2	toxaphene	0.05	0.1	0.1
Metals				
7429-90-5	aluminum	0.01	—	0.01
7440-36-0	antimony	0.01	—	0.01
7440-38-2	arsenic	0.03	0.03	0.03
7440-39-3	barium	0.01	—	0.01
7440-41-7	beryllium	0.01	—	0.01
7440-43-9	cadmium	0.001	0.001	0.001
7440-47-3	chromium	0.01	—	0.01
18540-29-9	chromium, hexavalent	—	—	—
7440-48-4	cobalt	0.01	—	0.01
7440-50-8	copper	0.01	—	0.01
7439-89-6	iron	0.01	—	0.01
7439-92-1	lead	0.01	—	0.01
7439-96-5	manganese	0.01	—	0.01
7439-97-6	mercury	0.01	—	0.01
7439-98-7	molybdenum	0.01	—	0.01
7440-02-0	nickel	0.01	—	0.01
7782-49-2	selenium	0.01	—	0.01
7440-22-4	silver	0.01	—	0.01
7440-28-0	thallium	0.01	—	0.01
7440-62-2	vanadium	0.01	—	0.01
7440-66-6	zinc	0.01	—	0.01

Note:
* not considered for the dermal pathway

Acronyms/Abbreviations:
BHC – benzene hexachloride
CAS – Chemical Abstract Services
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Contr
U.S. EPA – United States Environmental Protection Agenc

References:

DTSC 1994. Preliminary Endangerment Assessment Guidance Manual. January.
U.S. EPA 2009. Rresidential Screening Levels. May.

Table 3-4
Chemical-Specific Values Used to Evaluate the Dermal Contact with Groundwater Exposure Pathway

CAS Number	Chemical	MW	t hour/event	t* hour	Kp cm/hour
Volatile Organic Compounds					
83-32-9	acenaphthene	154.21	0.76	6	1.33E-01
208-96-8	acenaphthylene	152.20	0.74	6	1.41E-01
120-12-7	anthracene	178.24	1.1	5.6	2.25E-01
71-43-2	benzene	78.11	0.26	0.63	2.07E-02
191-24-2	benzo(g,h,i)perylene	276.34	4.2	20	2.00E+00
78-93-3	2-butanone	72.11	0.24	0.58	1.11E-03
98-06-6	tert-butylbenzene	134.22	0.58	4	2.40E-01
75-15-0	carbon disulfide	76.13	0.25	0.61	1.56E-02
95-50-1	1,2-dichlorobenzene	147.00	0.69	3.4	6.59E-02
541-73-1	1,3-dichlorobenzene	147.00	0.69	3.8	7.75E-02
75-34-3	1,1-dichloroethane	98.96	0.35	0.84	8.86E-03
107-06-2	1,2-dichloroethane	98.96	0.35	0.84	5.34E-03
156-59-2	cis-1,2-dichloroethene	96.94	0.34	0.82	1.49E-02
156-60-5	trans-1,2-dichloroethene	96.94	0.34	0.82	1.49E-02
100-41-4	ethylbenzene	106.17	0.39	1.3	7.39E-02
86-73-7	fluorene	166.22	0.9	5.6	1.71E-01
98-82-8	isopropylbenzene	120.20	0.47	3	1.40E-01
99-87-6	p-isopropyltoluene	134.22	0.58	4.2	2.36E-01
1634-04-4	methyl tert-butyl ether	88.15	0.3	0.72	2.57E-03
91-57-6	2-methylnaphthalene	142.20	0.64	4.9	1.42E-01
91-20-3	naphthalene	128.18	0.53	2.2	6.94E-02
85-01-8	phenanthrene	178.24	1.1	5.6	2.29E-01
129-00-0	pyrene	202.26	1.5	7.3	3.24E-01
127-18-4	tetrachloroethene	165.83	0.9	4.3	4.81E-02
108-88-3	toluene	92.14	0.32	0.77	4.53E-02
120-82-1	1,2,4-trichlorobenzene	181.45	1.1	9.5	1.07E-01
79-01-6	trichloroethene	131.39	0.55	1.3	1.57E-02
95-63-6	1,2,4-trimethylbenzene	120.20	0.47	2.9	1.33E-01
108-67-8	1,3,5-trimethylbenzene	120.20	0.47	2.3	9.44E-02
75-01-4c	vinyl chloride (child)	62.50	0.21	0.51	1.13E-02
75-01-4a	vinyl chloride (adult)	62.50	0.21	0.51	1.13E-02
7816-60-0	m,p-xylene	106.17	0.39	1.2	7.04E-02
95-47-6	o-xylene	106.17	0.39	1.2	7.04E-02
1330-20-7	total xylenes	106.17	0.39	1.2	7.04E-02
Semivolatile Organic Compounds					
56-55-3	benz(a)anthracene	228.30	2.2	10	9.48E-01
205-99-2	benzo(b)fluoranthene	252.32	3	14	6.99E-01
50-32-8	benzo(a)pyrene	252.32	3	14	1.24E+00
85-68-7	butyl benzyl phthalate	312.37	7	35	5.41E-02
218-01-9	chrysene	228.30	2.2	10	1.03E+00
123-91-1	1,4-dioxane	88.11	0.3	0.72	3.56E-04
206-44-0	fluoranthene	202.26	1.5	7.2	5.13E-01
193-39-5	indeno(1,2,3-cd)pyrene	276.34	4.2	20	2.23E+00
Pesticides/Polychlorinated Biphenyls					
12674-11-2	Aroclor-1016	257.55	3.3	15	5.00E-01
11096-82-5	Aroclor-1260	395.33	23	110	5.48E+00
319-84-6	alpha-BHC	290.83	5.2	34	2.79E-02
58-89-9	gamma-BHC (lindane)	290.83	5.2	34	2.79E-02

Table 3-4
Chemical-Specific Values Used to Evaluate the Dermal Contact with Groundwater Exposure Pathway

CAS Number	Chemical	MW	t hour/event	t* hour	Kp cm/hour
5103-71-9	alpha-chlordane	409.78	28	130	1.57E-01
5566-34-7	gamma-chlordane	409.78	28	130	5.63E-01
72-55-9	4,4'-DDE	318.03	7.6	36	9.16E-01
50-29-3	4,4'-DDT	354.49	13	60	1.06E+00
60-57-1	dieldrin	380.91	18	88	4.50E-02
959-98-8	endosulfan I	406.92	27	200	3.29E-03
33213-65-9	endosulfan II	406.92	27	200	3.29E-03
1031-07-8	endosulfan sulfate	422.92	33	210	1.99E-03
7421-93-4	endrin aldehyde	380.91	18	90	2.33E-02
76-44-8	heptachlor	373.32	17	78	2.16E-01
1024-57-3	heptachlor epoxide	389.32	21	100	2.76E-02
Metals					
7429-90-5	aluminum	30.01	NA	NA	2.14E-03
7440-38-2	arsenic	77.95	NA	NA	1.93E-03
7440-39-3	barium	137.33	NA	NA	4.03E-04
7440-41-7	beryllium	9.01	NA	NA	6.60E-04
7440-43-9	cadmium	112.41	NA	NA	3.50E-04
7440-47-3	chromium	52.00	NA	NA	1.33E-03
7440-48-4	cobalt	58.93	NA	NA	1.21E-03
7440-50-8	copper	63.55	NA	NA	3.07E-04
7439-89-6	iron	55.85	NA	NA	2.47E-04
7439-92-1	lead	207.20	NA	NA	3.42E-04
7439-96-5	manganese	54.94	NA	NA	1.28E-03
7439-97-6	mercury	200.59	NA	NA	3.14E-04
7439-98-7	molybdenum	95.94	NA	NA	7.20E-04
7440-02-0	nickel	58.69	NA	NA	3.29E-04
7782-49-2	selenium	80.98	NA	NA	9.03E-04
7440-22-4	silver	107.87	NA	NA	9.03E-04
7440-28-0	thallium	204.38	NA	NA	9.03E-04
7440-62-2	vanadium	50.94	NA	NA	1.35E-03
7440-66-6	zinc	67.41	NA	NA	3.42E-04

Source:
U.S. EPA Dermwin v1.42; downloaded from http://www.epa.gov/opptintr/exposure/docs/episuite.htm

Acronyms/Abbreviations:
CAS – Chemical Abstract Services
cm/hour – centimeters per hour
τ – lag time per event
t* – time to reach steady state
Kp – skin permeability constant for chemicals in water
MW – molecular weight
NA – not applicable
U.S. EPA – United States Environmental Protection Agency

Table 3-5
Uptake Factors Used to Evaluate the Ingestion of Homegrown Produce Exposure Pathway

$$\text{Uptake Factor (DTSC 1993, unitless)} = \frac{0.03 \times Kow^{0.77} + 0.82}{Koc \times foc}$$

where:

Kow = octonal/water partition coefficient (chemical-specific)
Koc = organic carbon partition coefficient (chemical-specific)
foc = fraction of organic carbon in upper two feet of soil (0.0018, site specific)

CAS Number	Chemical	Volatility[a]	Log Kow[b]	Kow	Koc[c]	Uptake Factor	Source
Volatile Organic Compounds							
83-32-9	acenaphthene	1	—[d]	—	—	—	Not applicable for volatile compounds
67-64-1	acetone	1	—	—	—	—	Not applicable for volatile compounds
120-12-7	anthracene	1	—	—	—	—	Not applicable for volatile compounds
71-43-2	benzene	1	—	—	—	—	Not applicable for volatile compounds
74-83-9	bromomethane	1	—	—	—	—	Not applicable for volatile compounds
78-93-3	2-butanone	1	—	—	—	—	Not applicable for volatile compounds
75-15-0	carbon disulfide	1	—	—	—	—	Not applicable for volatile compounds
108-90-7	chlorobenzene	1	—	—	—	—	Not applicable for volatile compounds
67-66-3	chloroform	1	—	—	—	—	Not applicable for volatile compounds
74-87-3	chloromethane	1	—	—	—	—	Not applicable for volatile compounds
95-57-8	2-chlorophenol	1	—	—	—	—	Not applicable for volatile compounds
95-50-1	1,2-dichlorobenzene	1	—	—	—	—	Not applicable for volatile compounds
75-35-4	1,1-dichloroethene	1	—	—	—	—	Not applicable for volatile compounds
156-59-2	cis-1,2-dichloroethene	1	—	—	—	—	Not applicable for volatile compounds
156-60-5	trans-1,2-dichloroethene	1	—	—	—	—	Not applicable for volatile compounds
86-73-7	fluorene	1	—	—	—	—	Not applicable for volatile compounds
98-82-8	isopropylbenzene	1	—	—	—	—	Not applicable for volatile compounds
1634-04-4	methyl tert-butyl ether	1	—	—	—	—	Not applicable for volatile compounds
75-09-2	methylene chloride	1	—	—	—	—	Not applicable for volatile compounds
91-57-6	2-methylnaphthalene	1	—	—	—	—	Not applicable for volatile compounds
108-10-1	4-methyl-2-pentanone	1	—	—	—	—	Not applicable for volatile compounds
91-20-3	naphthalene	1	—	—	—	—	Not applicable for volatile compounds
540-59-0	1,2-Dichloroethene	1	—	—	—	—	Not applicable for volatile compounds
71-55-6	1,1,1-Trichloroethane	1	—	—	—	—	Not applicable for volatile compounds
75-00-3	Chloroethane	1	—	—	—	—	Not applicable for volatile compounds
129-00-0	pyrene	1	—	—	—	—	Not applicable for volatile compounds
79-34-5	1,1,2,2-tetrachloroethane	1	—	—	—	—	Not applicable for volatile compounds
127-18-4	tetrachloroethene	1	—	—	—	—	Not applicable for volatile compounds
108-88-3	toluene	1	—	—	—	—	Not applicable for volatile compounds
120-82-1	1,2,4-trichlorobenzene	1	—	—	—	—	Not applicable for volatile compounds
79-01-6	trichloroethene	1	—	—	—	—	Not applicable for volatile compounds
95-63-6	1,2,4-Trimethylbenzene	1	—	—	—	—	Not applicable for volatile compounds
100-41-4	ethylbenzene	1	—	—	—	—	Not applicable for volatile compounds
95-47-6	0-xylene	1	—	—	—	—	Not applicable for volatile compounds
1330-20-7	xylenes (total)	1	—	—	—	—	Not applicable for volatile compounds

Table 3-5
Uptake Factors Used to Evaluate the Ingestion of Homegrown Produce Exposure Pathway

CAS Number	Chemical	Volatility[a]	Log Kow[b]	Kow	Koc[c]	Uptake Factor	Source
108-67-8	1,3,5-trimethylbenzene	1	—	—	—	—	Not applicable for volatile compounds
Semivolatile Organic Compounds							
56-55-3	benz(a)anthracene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002 (B[a]P as a surrogate)
205-99-2	benzo(b)fluoranthene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002 (B[a]P as a surrogate)
207-08-9	benzo(k)fluoranthene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002 (B[a]P as a surrogate)
50-32-8	benzo(a)pyrene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002
117-81-7	bis(2-ethylhexyl)phthalate	0	7.60	3.98E+07	2.96E+07	4.01E-01	DTSC 1993
75-25-2	bromoform	0	2.40	2.51E+02	2.29E+02	7.12E+00	DTSC 1993
85-68-7	butyl benzyl phthalate	0	4.73	5.37E+04	4.47E+04	1.65E+00	DTSC 1993
86-74-8	carbazole	0	3.72	5.25E+03	4.54E+03	2.79E+00	DTSC 1993
59-50-7	4-chloro-3-methylphenol	0	—	—	—	—	Ionizing chemicals not available
208-96-8	acenaphthylene	0	—	—	—	—	No values available
191-24-2	benzo(g,h,i)perylene	0	—	—	—	—	No values available
191-24-2	benzo(g,h,i)perylene	0	—	—	—	—	No values available
132-64-9	dibenzofuran	0	—	—	—	—	No values available
85-01-8	phenanthrene	0	—	—	—	—	No values available
218-01-9	chrysene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002 (B[a]P as a surrogate)
53-70-3	dibenz(a,h)anthracene	0	—	—	—	2.06E-03	Samsφe-Petersen et al. 2002 (B[a]P as a surrogate)
84-74-2	di-n-butyl phthalate	0	4.50	3.16E+04	2.65E+04	1.85E+00	DTSC 1993
84-66-2	diethyl phthalate	0	2.42	2.63E+02	2.39E+02	6.99E+00	DTSC 1993
131-11-3	dimethyl phthalate	0	1.6	3.98E+01	3.74E+01	1.98E+01	DTSC 1993
121-14-2	2,4-dinitrotoluene	0	1.98	9.55E+01	8.84E+01	1.15E+01	DTSC 1993
117-84-0	di-n-octyl phthalate	0	8.10	1.26E+08	9.17E+07	3.14E-01	DTSC 1993
206-44-0	fluoranthene	0	—	—	—	4.79E-03	Samsφe-Petersen et al. 2002
193-39-5	indeno(1,2,3-cd)pyrene	0	—	—	—	2.94E-03	Samsφe-Petersen et al. 2002
100-02-7	4-nitrophenol	0	—	—	—	—	Ionizing chemicals not available
105-67-9	2,4-Dimethylphenol	0	2.3	2.00E+02	1.80E+01	1.76E+00	RAIS 2009
95-48-7	2-Methylphenol (O-Cresol)	0	1.95	8.91E+01	1.03E+02	3.00E+00	RAIS 2009
106-44-5	4-Methylphenol (P-Cresol)	0	1.94	8.71E+01	4.90E+01	3.00E+00	RAIS 2009
86-30-6	N-Nitrosodiphenylamine	0	3.13	1.35E+03	1.20E+03	6.56E-01	RAIS 2009
87-86-5	pentachlorophenol	0	—	—	—	—	Ionizing chemicals not available
108-95-2	phenol	0	—	—	—	—	Ionizing chemicals not available
Pesticides/Polychlorinated Biphenyls							
309-00-2	aldrin	0	6.50	3.16E+06	2.45E+06	6.87E-01	DTSC 1993
11097-69-1	Aroclor 1254	0	6.79	6.17E+06	4.73E+06	5.96E-01	DTSC 1993
11096-82-5	Aroclor 1260	0	8.27	1.86E+08	1.35E+08	2.88E-01	DTSC 1993
319-84-6	alpha-BHC	0	4.14	1.38E+04	1.17E+04	2.23E+00	DTSC 1993
319-85-7	beta-BHC	0	4.14	1.38E+04	1.17E+04	2.23E+00	DTSC 1993
319-86-8	delta-BHC	0	4.14	1.38E+04	1.17E+04	2.23E+00	DTSC 1993
58-89-9	gamma-BHC (lindane)	0	4.14	1.38E+04	1.17E+04	2.23E+00	DTSC 1993
5103-71-9	alpha-chlordane	0	6.22	1.66E+06	1.30E+06	7.89E-01	DTSC 1993
5103-74-2	beta-chlordane	0	6.22	1.66E+06	1.30E+06	7.89E-01	DTSC 1993
5566-34-7	gamma-chlordane	0	7.00	1.00E+07	7.61E+06	5.38E-01	DTSC 1993
72-54-8	4,4'-DDD	0	6.02	1.05E+06	8.28E+05	8.70E-01	DTSC 1993
72-55-9	4,4'-DDE	0	6.51	3.24E+06	2.51E+06	6.84E-01	DTSC 1993

Table 3-5
Uptake Factors Used to Evaluate the Ingestion of Homegrown Produce Exposure Pathway

CAS Number	Chemical	Volatility[a]	Log Kow[b]	Kow	Koc[c]	Uptake Factor	Source
50-29-3	4,4'-DDT	0	6.91	8.13E+06	6.21E+06	5.62E-01	DTSC 1993
60-57-1	dieldrin	0	5.20	1.58E+05	1.29E+05	1.30E+00	DTSC 1993
959-98-8	endosulfan I	0	3.83	6.76E+03	5.82E+03	2.62E+00	DTSC 1993
33213-65-9	endosulfan II	0	3.83	6.76E+03	5.82E+03	2.62E+00	DTSC 1993
72-20-8	endrin	0	5.20	1.58E+05	1.29E+05	1.30E+00	DTSC 1993
7421-93-4	endrin aldehyde	0	4.80	6.31E+04	5.23E+04	1.59E+00	DTSC 1993
76-44-8	heptachlor	0	6.10	1.26E+06	9.92E+05	8.37E-01	DTSC 1993
1024-57-3	heptachlor epoxide	0	4.98	9.55E+04	7.86E+04	1.45E+00	DTSC 1993
8001-35-2	toxaphene	0	5.78	6.03E+05	4.81E+05	6.20E-02	RAIS 2009
Metals							
7429-90-5	aluminum	0	—	—	—	—	U.S. EPA 1996
7440-36-0	antimony	0	—	—	—	—	U.S. EPA 1996
7440-38-2	arsenic	0	—	—	—	1.14E-02	U.S. EPA 1996
7440-39-3	barium	0	—	—	—	—	U.S. EPA 1996
7440-41-7	beryllium	0	—	—	—	—	U.S. EPA 1996
7440-43-9	cadmium	0	—	—	—	1.44E-01	U.S. EPA 1996
7440-47-3	chromium	0	—	—	—	—	U.S. EPA 1996
18540-29-9	chromium, hexavalent	0	—	—	—	—	U.S. EPA 1996
7440-48-4	cobalt	0	—	—	—	—	U.S. EPA 1996
7440-50-8	copper	0	—	—	—	—	U.S. EPA 1996
7439-89-6	iron	0	—	—	—	—	U.S. EPA 1996
7439-92-1	lead	0	—	—	—	—	U.S. EPA 1996
7439-96-5	manganese	0	—	—	—	—	U.S. EPA 1996
7439-97-6	mercury	0	—	—	—	1.76E-02	U.S. EPA 1996
7439-98-7	molybdenum	0	—	—	—	—	U.S. EPA 1996
7440-02-0	nickel	0	—	—	—	1.86E-02	U.S. EPA 1996
7782-49-2	selenium	0	—	—	—	1.83E-02	U.S. EPA 1996
7440-22-4	silver	0	—	—	—	—	U.S. EPA 1996
7440-28-0	thallium	0	—	—	—	—	U.S. EPA 1996
7440-62-2	vanadium	0	—	—	—	—	U.S. EPA 1996
7440-66-6	zinc	0	—	—	—	7.43E-02	U.S. EPA 1996

Notes:
[a] 1=volatile, 0=nonvolatile
[b] Log Kow from U.S. EPA EPI SUITE V3.1, Dermwin Program V1.42, 2000 http://www.epa.gov/oppt/exposure/docs/episuitedl.htm
[c] Koc from the U.S.EPA 1996 formula: LogKoc = 0.00028 + (0.983 x logKow)
[d] not applicable

Acronyms/Abbreviations:
CAS – Chemical Abstract Services
B[a]P – benzo(a)pyrene
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
s – surrogate used
U.S. EPA – United States Environmental Protection Agency

Table 3-5
Uptake Factors Used to Evaluate the Ingestion of Homegrown Produce Exposure Pathway

CAS Number	Chemical	Volatility[a]	Log Kow[b]	Kow	Koc[c]	Uptake Factor	Source

References:

DTSC 1993. Parameter Values and Ranges for CalTOX, California Department of Toxic Substances Control. July.

RAIS 2009. Risk Assessment Information System http://rais.ornl.gov

Samsφe-Petersen, L., E.K. Larsen, P.B. Larsen, and P. Bruun. 2002. Uptake of trace elements and PAHs by fruit and vegetables from contaminated soils. *Environmental Science and Technology 36* (14). June 12.
The average value for each PAH was calculated from the values provided for medium contaminated soils.

U.S. EPA 1996. Soil Screening Guidance: Technical Background Document. May.
The average geometric mean value for each metal was calculated from the values provided on Table G-2 of Appendix G. Data are unavailable for other metals.

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)		
SOIL											
Volatile Organic Compounds											
83-32-9	acenaphthene	NA	—		—		6.00E-02	I	—		
208-96-8	acenaphthylene	D	—		—		6.00E-02	S	—		Surrogate for Acenapthene
67-64-1	acetone	NP	—		—		9.00E-01	I	3.1E+01	A	
120-12-7	anthracene	D	—		—		3.00E-01	I	—		
71-43-2	benzene	A	5.50E-02	I	1.00E-01	C	4.00E-03	I	3.0E-02	I	
191-24-2	benzo(g,h,i)perylene	D	—		—		3.00E-02	S	—		Surrogate for pyrene
106-99-0	1,3-butadiene	NP	3.40E+00	C	3.40E+00	C	5.70E-04		2.00E-03	I	
78-93-3	2-butanone	NP	—		—		6.00E-01	I	5.0E+00	I	
104-51-8	n-butylbenzene	Not in IRIS	—		—		4.00E-02	N	—		
135-98-8	sec-butylbenzene	Not in IRIS	—		—		4.00E-02	N	—		
98-06-6	tert-butylbenzene	Not in IRIS	—		—		4.00E-02	N	—		
75-15-0	carbon disulfide	NA	—		—		1.00E-01	I	7.0E-01	I	
108-90-7	chlorobenzene	D	—		—		2.00E-02	I	5.00E-02	P	
75-00-3	chloroethane	NA	2.90E-03	N	—		4.00E-01	N	1.0E+01	I	
67-66-3	chloroform	B2	3.10E-02	C	3.10E-02	C	1.00E-02	I	9.80E-02	A	
74-87-3	chloromethane	D	—	H	—		2.57E-02		9.00E-02	I	
110-82-7	cyclohexane	NP	—		—		1.71E+00	R	6.00E+00	I	
132-64-9	dibenzofuran	D	—		—		2.00E-03	N	—		
95-50-1	1,2-dichlorobenzene	D	—		—		9.00E-02	I	2.00E-01	H	
541-73-1	1,3-dichlorobenzene	D	—		—		3.00E-02	N	—		
106-46-7	1,4-dichlorobenzene	NA	2.40E-02	H4	5.40E-03	C	7.00E-02	A	8.00E-01	I	
75-71-8	dichlorodifluoromethane	NA	5.40E-03	C	—		2.00E-01	I	2.00E-01	H	
75-34-3	1,1-dichloroethane	C	5.70E-03	C	5.70E-03	C	2.00E-01	P	—		
107-06-2	1,2-dichloroethane	B2	9.10E-02	I	4.70E-02	C	2.00E-02	P	2.40E+00	A	
75-35-4	1,1-dichloroethene	C	—		—		5.00E-02	I	2.00E-01	I	
156-59-2	cis-1,2-dichloroethene	D	—		—		1.00E-02	P	—		
156-60-5	trans-1,2-dichloroethene	NA	—		—		2.00E-02	I	6.00E-02	P	
540-59-0	1,2-dichloroethene	D	—		—		9.00E-03	H	—		
10061-02-6	trans-1,3-dichloropropene	B2	1.00E-01	I	9.10E-02	C	3.00E-02	I	—		
64-17-5	ethanol	Not in IRIS	—		—		5.00E-01	S	—		
100-41-4	ethylbenzene	D	1.10E-02	C	1.10E-02	C	1.00E-01	I	1.0E+00	I	
74-85-1	ethene	Not in IRIS	—		—		—		—		
622-96-8	p-ethyltoluene	D	—		—		2.00E-01	S	—		
86-73-7	fluorene	D	—		—		4.00E-02	I	—		

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)		
142-82-5	n-heptane	D	—		—		1.10E+01	S	—		
110-54-3	n-hexane	NA	—		—		1.10E+01	H4	7.00E-01	I	
591-78-6	2-hexanone	Not in IRIS	—		—		1.10E+01	S	—		
67-63-0	isopropanol	Not in IRIS	—		—		5.00E-01	S	7.00E+00	C	
98-82-8	isopropylbenzene	D	—		—		1.00E-01	I	4.0E-01	I	
99-87-6	p-isopropyltoluene	D	—		—		1.00E-01	S	—		
1634-04-4	methyl tert-butyl ether	NA	1.80E-03	C	1.80E-03	C	8.57E-01	R	3.00E+00	I	
75-09-2	methylene chloride	B2	7.50E-03	I	1.40E-02	C	6.00E-02	I	1.0E+00	A	
91-57-6	2-methylnaphthalene	NP	—		—		4.00E-03	I	—		
91-20-3	naphthalene	C	—		1.20E-01	C	2.00E-02	I	3.0E-03	I	
85-01-8	phenanthrene	D	—		—		3.00E-01	S	—		Surrogate for anthracene
103-65-1	n-propylbenzene	Not in IRIS	—		—		4.00E-02	N			
129-00-0	pyrene	D	—		—		3.00E-02	I	—		
127-18-4	tetrachloroethene	NA	5.40E-01	C	5.40E-01	C	1.00E-02	I	2.70E-01	A	
108-88-3	toluene	D	—		—		8.00E-02	I	5.0E+00	I	
95-57-8	2-Chlorophenol		—		—		5.0E-03	I	—		
108-10-1	4-Methyl-2-pentanone		—		—		8.0E-02	H	3.0E+00	I	
120-82-1	1,2,4-trichlorobenzene	D	3.60E-03	C	—		1.00E-02	I	4.0E-03	P	
71-55-6	1,1,1-trichloroethane	D	—		—		2.00E+00	I	5.00E+00	I	
79-01-6	trichloroethene	NA	1.30E-02	C	1.30E-02	C	3.00E-04	N	—		
95-63-6	1,2,4-trimethylbenzene	Not in IRIS	—		—		—		7.0E-03	P	
108-67-8	1,3,5-trimethylbenzene	Not in IRIS	—		—		5.00E-02	P	6.0E-03	P	
75-01-4c	vinyl chloride (child)	A	1.50E+00	I	2.70E-01	C	3.00E-03	I	—		
75-01-4a	vinyl chloride (adult)	A	7.20E-01	I	2.70E-01	C	3.00E-03	I	—		
7816-60-0	m,p-xylene	NP	—		—		2.00E-01	S	—		Surrogate for xylene
95-47-6	o-xylene	NP	—		—		2.00E-01	H	7.0E-01	C	
1330-20-7	total xylenes	NP	—		—		2.00E-01	I	1.0E-01	I	
Semivolatile Organic Compounds											
56-55-3	benz(a)anthracene	B2	7.30E-01	I	1.20E+00	C	3.00E-01	S	—		Surrogate for anthracene
205-99-2	benzo(b)fluoranthene	B2	7.30E-01	I	1.20E+00	C	4.00E-02	S	—		Surrogate for flouranthene
207-08-9	benzo(k)fluoranthene	B2	7.30E-02	I	1.20E+00	C	4.00E-02	S	—		Surrogate for flouranthene
50-32-8	benzo(a)pyrene	B2	7.30E+00	I	1.20E+01	C	3.00E-02	S	—		Surrogate for pyrene
117-81-7	bis(2-ethylhexyl)phthalate	B2	1.40E-02	I	3.00E-03	C	2.00E-02	I	—		
59-50-7	4-Chloro-3-methylphenol		—		—		—		—		
84-66-2	Diethyl Phthalate		—		—		8.0E-01	I	—		
75-25-2	bromoform	B2	7.90E-03	I	—		2.00E-02	I	—		

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)		
85-68-7	butyl benzyl phthalate	C	1.90E-03	P	—		2.00E-01	I	—		
86-74-8	carbazole	Not in IRIS	2.00E-02	H	—		2.50E-02	S	—		Surrogate for diphenylamine
218-01-9	chrysene	B2	7.30E-03	I	1.20E-01	C	3.00E-01	S	—		Surrogate for chrysene
53-70-3	dibenz(a,h)anthracene	B2	7.30E+00	I	4.10E+00	C	3.00E-01	S	—		Surrogate for anthracene
84-74-2	di-n-butyl phthalate	D	—		—		1.00E-01	I	—		
131-11-3	dimethyl phthalate	D	—		—		1.00E+01	H4	—		
123-91-1	1,4-dioxane	B2	1.10E-02	I	2.70E-02	C	1.00E-01	A	3.60E+00	A	
206-44-0	fluoranthene	D	—		—		4.00E-02	I	—		
193-39-5	indeno(1,2,3-cd)pyrene	B2	7.30E-01	N	1.20E+00	C	4.00E-02	S	—		Surrogate for flouranthene
87-86-5	pentachlorophenol	B2	1.20E-01	I	1.80E-02	C	3.00E-02	I	—		
105-67-9	2,4-Dimethylphenol		—		—		2.0E-02	I	—		
95-48-7	2-Methylphenol (O-Cresol)		—		—		5.0E-02	I	—		
106-44-5	4-Methylphenol (P-Cresol)		—		—		5.0E-03	H	—		
86-30-6	N-Nitrosodiphenylamine	B2	4.9E-03	I	9.00E-03		—		—		
108-95-2	phenol	D	—		—		3.00E-01	I	2.0E-01	C	
Pesticides/Polychlorinated Biphenyls											
12674-11-2	Aroclor 1016	B2	7.00E-02	I	5.00E+00	C	7.00E-05	I	—		
11097-69-1	Aroclor 1254	B2	2.00E+00	I	5.00E+00	C	2.00E-05	I	—		
11096-82-5	Aroclor 1260	B2	2.00E+00	I	5.00E+00	C	2.00E-05	I	—		
319-84-6	alpha-BHC	B2	6.30E+00	I	2.70E+00	C	8.00E-03	A	—		
319-85-7	beta-BHC	C	1.80E+00	I	1.50E+00	C	2.00E-04	N	—		
319-86-8	delta-BHC	D	1.30E+00	S	1.10E+00	S	3.00E-04	S	—		
58-89-9	gamma-BHC (lindane)	NA	1.10E+00	C	1.10E+00	C	3.00E-04	I	—		
5103-71-9	alpha-chlordane	Not in IRIS	3.50E-01	S	1.30E+00	S	5.00E-04	S	—		Surrogate for Chlordane
5103-74-2	beta-chlordane	Not in IRIS	3.50E-01	S	1.30E+00	S	5.00E-04	S	—		Surrogate for Chlordane
5566-34-7	gamma-chlordane	Not in IRIS	3.50E-01	S	1.30E+00	S	5.00E-04	S	—		Surrogate for Chlordane
72-54-8	4,4'-DDD	B2	2.40E-01	I	2.40E-01	C	5.00E-04	S	—		Surrogate for DDT
72-55-9	4,4'-DDE	B2	3.40E-01	I	3.40E-01	C	5.00E-04	S	—		Surrogate for DDT
50-29-3	4,4'-DDT	B2	3.40E-01	I	3.40E-01	C	5.00E-04	I	—		
60-57-1	dieldrin	B2	1.60E+01	I	1.60E+01	C	5.00E-05	I	—		
959-98-8	endosulfan I	Not in IRIS	—		—		6.00E-03	S	—		Surrogate for Endosulfan
33213-65-9	endosulfan II	Not in IRIS	—		—		6.00E-03	S	—		Surrogate for Endosulfan
1031-07-8	endosulfan sulfate	Not in IRIS	—		—		6.00E-03	S	—		Surrogate for Endosulfan
72-20-8	endrin	D	—		—		3.00E-04	I	—		
7421-93-4	endrin aldehyde	Not in IRIS	—		—		3.00E-04	S	—		Surrogate for endrin
76-44-8	heptachlor	B2	4.50E+00	I	4.10E+00	C	5.00E-04	I	—		

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)		
72-43-5	Methoxychlor		—		—		5.0E-03	I	—		
8001-35-2	toxaphene	B2	1.1E+00	I	1.2E+00		—		—		
1024-57-3	heptachlor epoxide	B2	9.10E+00	I	5.50E+00	C	1.30E-05	I	—		
Metals											
7429-90-5	aluminum	Not in IRIS	—		—		1.00E+00	P	5.0E-03	P	
7440-36-0	antimony	NA	—		—		4.00E-04	I	—		
7440-38-2	arsenic	A	1.50E+00	I	1.50E+00	C	3.00E-04	I	1.5E-05	C	
7440-39-3	barium	D	—		—		2.00E-01	I	5.0E-04	H	
7440-41-7	beryllium	B1	—		—		2.00E-03	I	2.0E-05	I	
7440-43-9	cadmium	B1	—		—		1.00E-03	I	1.0E-05	A	
7440-47-3	chromium[b]	A	—		—		3.00E-03	S	—		Surrogate for hexavalent chromium
18540-29-9	hexavalent chromium	A	—		—		3.00E-03	I	8.00E-06		
7440-48-4	cobalt	Not in IRIS	—		—		3.00E-04	P	6.0E-06	P	
7440-50-8	copper	D	—		—		4.00E-02	H	—		
7439-89-6	iron	Not in IRIS	—		—		7.00E-01	P	—		
7439-92-1	lead	B2	—		—		—		—		
7439-96-5	manganese[c]	D	—		—		1.40E-01	I	5.0E-05	I	
7439-97-6	mercury	C	—		—		1.60E-04	C	3.0E-04	I	
7439-98-7	molybdenum	NA	—		—		5.00E-03	I	—		
7440-02-0	nickel	A	—		—		2.00E-02	I	9.0E-05	A	
7782-49-2	selenium	D	—		—		5.00E-03	I	2.0E-02	C	
7440-22-4	silver	D	—		—		5.00E-03	I	—		
7440-28-0	thallium	D	—		—		6.50E-05	I	—		
7440-62-2	vanadium	Not in IRIS	—		—		7.00E-03	H	—		
7440-66-6	zinc	D	—		—		3.00E-01	I	—		
GROUNDWATER											
Volatile Organic Compounds											
630-20-6	1,1,1,2-Tetrachloroethane	C	2.60E-02	I	—		3.00E-02	I	Table 3-7		
71-55-6	1,1,1-Trichloroethane	D	—		—		2.00E+00	I	Table 3-7		
79-34-5	1,1,2,2-Tetrachloroethane	C	2.00E-01	I	2.70E-01	C	4.00E-03	P	Table 3-7		
79-00-5	1,1,2-Trichloroethane	C	5.70E-02	I	7.20E-02	C	4.00E-03	I	Table 3-7		
75-34-3	1,1-Dichloroethane	C	5.70E-03	C	5.70E-03	C	2.00E-01	P	Table 3-7		
75-35-4	1,1-Dichloroethene	C	—		—		5.00E-02	I	Table 3-7		
563-58-6	1,1-Dichloropropene	NL	—		—		—		Table 3-7		
87-61-6	1,2,3-Trichlorobenzene	NL	—		—		—		Table 3-7		

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)	
96-18-4	1,2,3-Trichloropropane	NA	7.00E+00	H	—		6.00E-03	I	Table 3-7	
120-82-1	1,2,4-Trichlorobenzene	D	3.60E-03	C	3.60E-03	C	1.00E-02	I	Table 3-7	
95-63-6	1,2,4-Trimethylbenzene	NL	—		—		7.00E-03	P	Table 3-7	
96-12-8	1,2-Dibromo-3-Chloropropane	NAV	8.00E-01	P	7.00E+00	C	2.00E-04	I	Table 3-7	
106-93-4	1,2-Dibromoethane	B1	2.00E+00	I	3.60E+00	C	9.00E-03	I	Table 3-7	
95-50-1	1,2-Dichlorobenzene	D	—		—		9.00E-02	I	Table 3-7	
107-06-2	1,2-Dichloroethane	B2	9.10E-02	I	4.70E-02	C	2.00E-02	P	Table 3-7	
78-87-5	1,2-Dichloropropane	NA	3.60E-02	C	3.60E-02	C	9.00E-02	A	Table 3-7	
108-67-8	1,3,5-Trimethylbenzene	NL	—		—		5.00E-02	P	Table 3-7	
541-73-1	1,3-Dichlorobenzene	D	—		—		—		Table 3-7	
142-28-9	1,3-Dichloropropane	NL	—		—		2.00E-02	P	Table 3-7	
106-46-7	1,4-Dichlorobenzene	NA	5.40E-03	C	5.40E-03	C	7.00E-02	A	Table 3-7	
594-20-7	2,2-Dichloropropane	NL	—		—		—		Table 3-7	
78-93-3	2-Butanone	C	—		—		6.00E-01	I	Table 3-7	
95-49-8	2-Chlorotoluene	NA	—		—		2.00E-02	I	Table 3-7	
591-78-6	2-Hexanone	NA	—		—		5.00E-03	I	Table 3-7	
106-43-4	4-Chlorotoluene	NL	—		—		7.00E-02	P	Table 3-7	
108-10-1	4-Methyl-2-pentanone	D	—		—		8.00E-02	H	Table 3-7	
67-64-1	Acetone	D	—		—		9.00E-01	I	Table 3-7	
71-43-2	Benzene	A	5.50E-02	I	1.00E-01	C	4.00E-03	I	Table 3-7	
108-86-1	Bromobenzene	NA	—		—		8.00E-03	I	Table 3-7	
74-97-5	Bromochloromethane	D	—		—		—		Table 3-7	
75-27-4	Bromodichloromethane	B2	6.20E-02	I	1.30E-01	C	2.00E-02	I	Table 3-7	
75-25-2	Bromoform	B2	7.90E-03	I	1.10E-02	C	2.00E-02	I	Table 3-7	
75-15-0	Carbon disulfide	NA	—		—		1.00E-01	I	Table 3-7	
56-23-5	Carbon tetrachloride	B2	1.30E-01	I	1.50E-01	C	7.00E-04	I	Table 3-7	
108-90-7	Chlorobenzene	D	—		—		2.00E-02	I	Table 3-7	
75-00-3	Chloroethane	NL	2.90E-03	N	—		—		Table 3-7	
67-66-3	Chloroform	B2	3.10E-02	C	3.10E-02	C	1.00E-02	I	Table 3-7	
74-87-3	Chloromethane	D	—		—		—		Table 3-7	
156-59-2	cis-1,2-Dichloroethene	D	—		—		1.00E-02	P	Table 3-7	
124-48-1	Dibromochloromethane	C	8.40E-02	I	—		2.00E-02	I	Table 3-7	
74-95-3	Dibromomethane	NL	—		—		1.00E-02	H	Table 3-7	
75-71-8	Dichlorodifluoromethane	NA	—		—		2.00E-01	I	Table 3-7	
100-41-4	Ethylbenzene	D	1.10E-02	C	1.10E-02	C	1.00E-01	I	Table 3-7	
87-68-3	Hexachlorobutadiene	C	7.80E-02	I	—		1.00E-03	P	Table 3-7	

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo (mg/kg-day)$^{-1}$		Cal/EPA CSFo (mg/kg-day)$^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)	
108-20-3	Isopropyl Ether	NL	—		—		—		Table 3-7	
98-82-8	Isopropylbenzene	D	—		—		1.00E-01	I	Table 3-7	
1634-04-4	Methyl Tert-Butyl Ether	NA	1.80E-03	C	1.80E-03	C	—		Table 3-7	
75-09-2	Methylene chloride	B2	7.50E-03	I	1.40E-02	C	6.00E-02	I	Table 3-7	
104-51-8	N-Butylbenzene	NL	—		—		—		Table 3-7	
103-65-1	N-Propylbenzene	NL	—		—		—		Table 3-7	
95-47-6	o-Xylene[d]	D	—		—		2.00E-01	I	Table 3-7	
99-87-6	p-Isopropyltoluene	D	—		—		1.00E-01	S	Table 3-7	
135-98-8	Sec-Butylbenzene	NL	—		—		—		Table 3-7	
98-06-6	T-Butylbenzene	NL	—		—		—		Table 3-7	
994-05-8	Tert-Amyl Methyl Ether	NL	—		—		—		Table 3-7	
75-65-0	Tert-Butyl Alcohol	NL	—		—		—		Table 3-7	
127-18-4	Tetrachloroethene	NA	5.40E-01	C	5.40E-01	C	1.00E-02	I	Table 3-7	
108-88-3	Toluene	D	—		—		8.00E-02	I	Table 3-7	
156-60-5	trans-1,2-Dichloroethene	NA	—		—		2.00E-02	I	Table 3-7	
79-01-6	Trichloroethene	NA	5.90E-03	C	5.90E-03	C	—		Table 3-7	
75-69-4	Trichlorofluoromethane	NA	—		—		3.00E-01	I	Table 3-7	
75-01-4c	Vinyl chloride	A	1.50E+00	I	2.70E-01	C	3.00E-03	I	Table 3-7	
75-01-4a	Vinyl chloride	A	7.20E-01	I	2.70E-01	C	3.00E-03	I	Table 3-7	
1330-20-7	Xylenes (total)	D	—		—		2.00E-01	I	Table 3-7	
7816-60-0	Xylenes, m & p[d]	D	—		—		2.00E-01	I	Table 3-7	
Semivolatile Organic Compounds										
123-91-1	1,4-Dioxane (P-Dioxane)	B2	1.10E-02	I	2.70E-02	C	—		Table 3-7	
117-81-7	Bis(2-Ethylhexyl) Phthalate	B2	1.40E-02	I	3.00E-03	C	2.00E-02	I	Table 3-7	
100-42-5	Styrene	NA	—		—		2.00E-01	I	Table 3-7	
PAHs										
50-32-8	Benzo(a)pyrene	B2	7.30E+00	I	1.20E+01	C	—		Table 3-7	
205-99-2	Benzo(b)fluoranthene	B2	7.30E-01	P	1.20E+00	C	—		Table 3-7	
218-01-9	Chrysene	B2	7.30E-03	P	1.20E-01	C	—		Table 3-7	
91-20-3	Naphthalene	C	—		—		2.00E-02	I	Table 3-7	
129-00-0	Pyrene	D	—		—		3.00E-02	I	Table 3-7	
Pesticides										
76-44-8	Heptachlor	B2	4.50E+00	I	4.10E+00	C	5.00E-04	I	Table 3-7	
Metals										
7429-90-5	Aluminum, dissolved	NL	—		—		1.00E+00	P	Table 3-7	

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo $(mg/kg\text{-}day)^{-1}$		Cal/EPA CSFo $(mg/kg\text{-}day)^{-1}$		U.S. EPA RfDo (mg/kg-day)		RfCi (mg/m^3)	
7440-36-0	Antimony, dissolved	NA	—		—		4.00E-04	I	Table 3-7	
7440-38-2	Arsenic, dissolved	A	1.50E+00	I	1.50E+00	C	3.00E-04	I	Table 3-7	
7440-39-3	Barium, dissolved	D	—		—		2.00E-01	I	Table 3-7	
7440-41-7	Beryllium, dissolved	B1	—		—		2.00E-03	I	Table 3-7	
7440-43-9	Cadmium, dissolved	B1	—		—		5.00E-04	I	Table 3-7	
7440-70-2	Calciuim, dissolved	NL	—		—		—		Table 3-7	
7440-47-3	Chromium[b], dissolved	D	—		—		3.00E-03	I	Table 3-7	
7440-48-4	Cobalt, dissolved	NL	—		—		3.00E-04	P	Table 3-7	
7440-50-8	Copper, dissolved	D	—		—		4.00E-02	H	Table 3-7	
7439-89-6	Iron, dissolved	NL	—		—		7.00E-01	P	Table 3-7	
7439-92-1	Lead, dissolved	B2	—		8.50E-03	C	—		Table 3-7	
7439-95-4	Magnesium, dissolved	NL	—		—		—		Table 3-7	
7439-96-5	Manganese, dissolved	D	—		—		2.40E-02	I	Table 3-7	
7439-97-6	Mercury, dissolved	C	—		—		3.00E-04	I	Table 3-7	
7439-98-7	Molybdenum, dissolved	NA	—		—		5.00E-03	I	Table 3-7	
7440-02-0	Nickel, dissolved	NA	—		—		2.00E-02	I	Table 3-7	
7440-09-7	Potassium, dissolved	NL	—		—		—		Table 3-7	
7782-49-2	Selenium, dissolved	D	—		—		5.00E-03	I	Table 3-7	
7440-22-4	Silver, dissolved	D	—		—		5.00E-03	I	Table 3-7	
7440-23-5	Sodium, dissolved	NL	—		—		—		Table 3-7	
7440-28-0	Thallium, dissolved	D	—		—		6.50E-05	I	Table 3-7	
7440-62-2	Vanadium, dissolved	NA	—		—		5.00E-03	I	Table 3-7	
7440-66-6	Zinc, dissolved	D	—		—		3.00E-01	I	Table 3-7	

Note:
[a] a dash indicates that a toxicity value is not available
[b] the Cal/EPA inhalation slope factor for total chromium was calculated per U.S. EPA guidance
[c] IRIS values modified per U.S. EPA guidance
[d] Toxicity values for non-stereo-specific isomer.

Acronyms/Abbreviations:
BHC – benzene hexachloride
Cal/EPA – California Environmental Protection Agency
CAS – chemical abstract services number
CSFi – inhalation cancer slope factor
CSFo – oral cancer slope factor
DDD – dichlorodiphenyldichloroethane
IRIS – Integrated Risk Information System
$(mg/kg\text{-}day)^{-1}$ – kilogram-day per milligrams
mg/kg-day – milligrams per kilogram-day
NCEA – National Center for Environmental Assessment
PPRTV – Provisional Peer Reviewed Toxicity Values
RfDi – inhalation reference dose
RfDo – oral reference dose

Table 3-6
Toxicity Values[a]

CAS Number	Chemical	Cancer Class	U.S. EPA CSFo $(mg/kg\text{-}day)^{-1}$	Cal/EPA CSFo $(mg/kg\text{-}day)^{-1}$	U.S. EPA RfDo (mg/kg-day)	RfCi (mg/m^3)

DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
HEAST – Health Effects Assessment Summary Table

RfCi- Chronic Inhalation Reference Concentration

Reference:
A – ATSDR as listed in U.S. EPA 2009 Residential Screening Levels.
H – HEAST as listed in U.S. EPA 2009 Residential Screening Levels
C – California website source, http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H4 – HEAST as listed in U.S. EPA 2004. Region 9 Preliminary Remediation Goals. October.
I – IRIS, http://www.epa.gov/iris/subst/index.html
N – NCEA as listed in U.S. EPA 2009. Regional Risk-Based Screening Levels. May.
P– PPRTV as listed in U.S. EPA 2009. Regional Risk-Based Screening Levels. May.
R – route-to-route extrapolation as listed in U.S. EPA 2004. Region 9 Preliminary Remediation Goals. October.
S – values based on a surrogate chemical (see Table I5-2)

Cancer class:
A – human carcinogen
B1 – probable human carcinogen with limited human data
B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
C – possible human carcinogen
D – not classifiable as to human carcinogenicity
NA – not assessed
NP – not applicable (not assessed using the 1986 U.S. EPA cancer guidelines)
NAV – not available
NL – analyte is not listed in IRIS

Table 3-7
Inhalation Unit Rates

CAS Number	Chemical	EPA Chronic Inhalation Unit Risk $(\mu g/m^3)^{-1}$		Cal/EPA Chronic Inhalation Unit Risk $(\mu g/m^3)^{-1}$		Chronic Inhalation Reference Conc (RfCi) (mg/m^3)
SOIL						
Metals						
7429-90-5	aluminum	—		—		Table 3-6
7440-36-0	antimony	—		—		Table 3-6
7440-38-2	arsenic	4.3E-03	I	3.3E-03	C	Table 3-6
7440-39-3	barium	—	—	—		Table 3-6
7440-41-7	beryllium	2.4E-03	I	2.4E-03	C	Table 3-6
7440-43-9	cadmium	4.2E-03	C	4.3E-03	C	Table 3-6
7440-47-3	chromium	1.2E-02	I	—		Table 3-6
7440-48-4	cobalt	9.0E-03	P	—		Table 3-6
7440-50-8	copper	—		—		Table 3-6
7439-89-6	iron	—		—		Table 3-6
7439-92-1	lead	—		1.2E-05	C	Table 3-6
7439-96-5	manganese	—		—		Table 3-6
7439-97-6	mercury	—		—		Table 3-6
7439-98-7	molybdenum	—		—		Table 3-6
7440-02-0	nickel	2.6E-04	C	2.6E-04	C	Table 3-6
7782-49-2	selenium	—		—		Table 3-6
7440-22-4	silver	—		—		Table 3-6
7440-28-0	thallium	—		—		Table 3-6
7440-62-2	vanadium	—		—		Table 3-6
7440-66-6	zinc	—		—		Table 3-6
Polynuclear Aromatic Hydrocarbons						
56-55-3	benz(a)anthracene-M	1.1E-04	C	1.1E-04	C	Table 3-6
50-32-8	benzo(a)pyrene-M	1.1E-03	C	1.1E-03	C	Table 3-6
205-99-2	benzo(b)fluoranthene-M	1.1E-04	C	1.1E-04	C	Table 3-6
207-08-9	benzo(k)fluoranthene-M	1.1E-04	C	1.1E-04	C	Table 3-6
218-01-9	chrysene-M	1.1E-05	C	1.1E-05	C	Table 3-6
53-70-3	dibenz(a,h)anthracene-M	1.2E-03	C	1.2E-03	C	Table 3-6
206-44-0	fluoranthene	—		—		Table 3-6
208-96-8	Acenaphthylene	—		—		Table 3-6
191-24-2	Benzo(g,h,i)perylene	—		—		Table 3-6
85-01-8	Phenanthrene	—		—		Table 3-6
193-39-5	indeno(1,2,3-cd)pyrene-M	1.1E-04	C	1.1E-04	C	Table 3-6
Semivolatile Organic Compounds						
117-81-7	bis(2-ethylhexyl)phthalate	2.4E-06	C	2.4E-06	C	Table 3-6
108-95-2	phenol	—		—		Table 3-6
105-67-9	2,4-Dimethylphenol	—		—		Table 3-6
59-50-7	4-Chloro-3-methylphenol	—		—		Table 3-6
84-66-2	Diethyl Phthalate	—		—		Table 3-6
84-74-2	Di-N-Butyl Phthalate	—		—		Table 3-6
87-86-5	Pentachlorophenol	4.6E-06	C	5.1E-06		Table 3-6
95-48-7	2-Methylphenol (O-Cresol)	—		—		Table 3-6
86-74-8	Carbazole	—		—		Table 3-6
106-44-5	4-Methylphenol (P-Cresol)	—		—		Table 3-6
86-30-6	N-Nitrosodiphenylamine	2.6E-06	C	2.6E-06	C	Table 3-6
Volatile Organic Compounds						
91-57-6	2-methylnaphthalene	—		—		Table 3-6

Table 3-7
Inhalation Unit Rates

83-32-9	acenaphthene	—		—		Table 3-6	
120-12-7	anthracene	—		—		Table 3-6	
86-73-7	fluorene	—		—		Table 3-6	
91-20-3	naphthalene	3.4E-05	C	3.4E-05	C	Table 3-6	
129-00-0	pyrene	—		—		Table 3-6	
95-63-6	1,2,4-Trimethylbenzene	—		—		Table 3-6	
120-82-1	1,2,4-Trichlorobenzene	—		—		Table 3-6	
108-67-8	1,3,5-trimethylbenzene	—		—		Table 3-6	
78-93-3	2-butanone	—		—		Table 3-6	
67-64-1	acetone	—		—		Table 3-6	
71-43-2	benzene	7.8E-06	I	2.9E-05	C	Table 3-6	
75-15-0	carbon disulfide	—		—		Table 3-6	
100-41-4	ethylbenzene	2.5E-06	C	2.5E-06	C	Table 3-6	
98-82-8	isopropylbenzene	—		—		Table 3-6	
540-59-0	1,2-Dichloroethene	—		—		Table 3-6	
95-57-8	2-Chlorophenol	—		—		Table 3-6	
108-10-1	4-Methyl-2-pentanone	—		—		Table 3-6	
108-90-7	Chlorobenzene	—		—		Table 3-6	
127-18-4	Tetrachloroethene	5.9E-06	C	5.9E-06	C	Table 3-6	
71-55-6	1,1,1-Trichloroethane	—		—		Table 3-6	
541-73-1	1,3-Dichlorobenzene	—		—		Table 3-6	
75-00-3	Chloroethane	—		—		Table 3-6	
79-01-6	Trichloroethene	2.0E-06	C	2.0E-06	C	Table 3-6	
75-09-2	methylene chloride	4.7E-07	I	1.0E-06	C	Table 3-6	
95-47-6	0-xylene	—		—		Table 3-6	
108-88-3	toluene	—		—		Table 3-6	
1330-20-7	xylenes (total)	—		—		Table 3-6	
PCBs/Pesticides							
11096-82-5	PCB-1260 (Aroclor 1260)	5.7E-04	I	—		Table 3-6	
50-29-3	p,p'-DDT	9.7E-05	I	9.7E-05	I	Table 3-6	
8001-35-2	toxaphene	3.2E-04	I	3.4E-04	I	Table 3-6	
11097-69-1	PCB-1254 (Aroclor 1254)	5.7E-04	I	—		Table 3-6	
60-57-1	Dieldrin	4.6E-03	I	4.6E-03	C	Table 3-6	
72-20-8	Endrin	—		—		Table 3-6	
58-89-9	gamma-BHC (Lindane)	3.1E-04	C	3.1E-04	C	Table 3-6	
1024-57-3	Heptachlor epoxide	2.6E-03	I	—		Table 3-6	
72-43-5	Methoxychlor	—		—		Table 3-6	
72-54-8	p,p'-DDD	6.9E-05	C	6.9E-05	C	Table 3-6	
5103-71-9	alpha-chlordane	—		—		Table 3-6	
5103-74-2	beta-chlordane	—		—		Table 3-6	
72-55-9	p,p'-DDE	9.7E-05	C	9.7E-05	C	Table 3-6	
GROUNDWATER							
VOCs							
630-20-6	1,1,1,2-Tetrachloroethane	7.40E-06	I	—		—	
71-55-6	1,1,1-Trichloroethane	—		—		5.00E+00	I
79-34-5	1,1,2,2-Tetrachloroethane	5.80E-05	I	—		—	
76-13-1	1,1,2-Trichloro-1,2,2-Trifluo	—		—		3.00E+01	H
79-00-5	1,1,2-Trichloroethane	1.60E-05	I	1.60E-05		—	
75-34-3	1,1-Dichloroethane	1.60E-06	C	1.60E-06		—	
75-35-4	1,1-Dichloroethene	—		—		2.00E-01	I
563-58-6	1,1-Dichloropropene	—		—		—	
96-12-8	1,2-Dibromo-3-Chloropropa	6.00E-03	P	—		2.00E-04	I
106-93-4	1,2-Dibromoethane	6.00E-04	I	7.10E-05		9.00E-03	I
87-61-6	1,2,3-Trichlorobenzene	—		—		—	

Table 3-7
Inhalation Unit Rates

96-18-4	1,2,3-Trichloropropane	—		—		—	
120-82-1	1,2,4-Trichlorobenzene	—		—		4.00E-03	P
95-63-6	1,2,4-Trimethylbenzene	—		—		7.00E-03	P
95-50-1	1,2-Dichlorobenzene	—		—		2.00E-01	H
107-06-2	1,2-Dichloroethane	2.60E-05	I	2.10E-05		2.40E+00	A
78-87-5	1,2-Dichloropropane	1.00E-05	C	1.00E-05		4.00E-03	I
108-67-8	1,3,5-Trimethylbenzene	—		—		6.00E-03	P
541-73-1	1,3-Dichlorobenzene	—		—		—	
142-28-9	1,3-Dichloropropane	—		—		—	
106-46-7	1,4-Dichlorobenzene	1.10E-05	C	1.10E-05		8.00E-01	I
594-20-7	2,2-Dichloropropane	—		—		—	
78-93-3	2-Butanone	—		—		5.00E+00	I
95-49-8	2-Chlorotoluene	—		—		—	
591-78-6	2-Hexanone	—		—		—	
106-43-4	4-Chlorotoluene	—		—		—	
108-10-1	4-Methyl-2-pentanone	—		—		3.00E+00	I
67-64-1	Acetone	—		—		3.10E+01	A
71-43-2	Benzene	7.80E-06	I	2.90E-05		3.00E-02	I
108-86-1	Bromobenzene	—		—		1.00E-02	P
74-97-5	Bromochloromethane	—		—		—	
75-27-4	Bromodichloromethane	3.70E-05	C	—		—	
75-25-2	Bromoform	1.10E-06	I	—		—	
74-83-9	Bromomethane	—		—		5.00E-03	I
75-15-0	Carbon disulfide	—		—		7.00E-01	I
56-23-5	Carbon tetrachloride	1.50E-05	I	4.20E-05		1.90E-01	A
108-90-7	Chlorobenzene	—		—		5.00E-02	P
75-00-3	Chloroethane	—		—		1.00E+01	I
67-66-3	Chloroform	2.30E-05	I	5.30E-06		9.80E-02	A
74-87-3	Chloromethane	—		—		9.00E-02	I
156-59-2	cis-1,2-Dichloroethene	—		—		—	
10061-01-5	cis-1,3-Dichloropropene	—		—		—	
124-48-1	Dibromochloromethane	2.70E-05	C	2.70E-05		—	
75-71-8	Dichlorodifluoromethane	—		—		2.00E-01	H
74-95-3	Dibromomethane	—		—		—	
100-41-4	Ethylbenzene	2.50E-06	C	—		1.00E+00	I
87-68-3	Hexachlorobutadiene	2.20E-05	I	—		—	
108-20-3	Isopropyl Ether	—		—		4.00E-01	P
98-82-8	Isopropylbenzene	—		—		4.00E-01	I
1634-04-4	Methyl Tert-Butyl Ether	2.60E-07	C	2.60E-07		3.00E+00	I
75-09-2	Methylene chloride	4.70E-07	I	1.00E-06		1.00E+00	A
104-51-8	N-Butylbenzene	—		—		—	
103-65-1	N-Propylbenzene	—		—		—	
95-47-6	o-Xylene	—		—		7.00E-01	C
99-87-6	p-Isopropyltoluene	—		—		—	
135-98-8	Sec-Butylbenzene	—		—		—	
98-06-6	T-Butylbenzene	—		—		—	
994-05-8	Tert-Amyl Methyl Ether	—		—		—	

Table 3-7
Inhalation Unit Rates

75-65-0	Tert-Butyl Alcohol	—		—		—	
637-92-3	Tert-Butyl Ethyl Ether	—		—		—	
127-18-4	Tetrachloroethene	5.90E-06	C	—		2.70E-01	A
108-88-3	Toluene	—		—		5.00E+00	I
156-60-5	trans-1,2-Dichloroethene	—		—		6.00E-02	P
10061-02-6	trans-1,3-Dichloropropene	—		—		—	
79-01-6	Trichloroethene	2.00E-06	C	—		0.00E+00	0
75-69-4	Trichlorofluoromethane	—		—		7.00E-01	H
108-05-4	Vinyl acetate	—		—		2.00E-01	I
75-01-4	Vinyl chloride (M)	4.40E-06	I	7.80E-05		1.00E-01	I
1330-20-7	Xylenes (total)	—		—		1.00E-01	I
7816-60-0	Xylenes, m & p	—		—		—	
SVOCs							
123-91-1	1,4-Dioxane (P-Dioxane)	7.70E-06	C	7.70E-06		3.60E+00	A
105-67-9	2,4-Dimethylphenol	—		—		—	
95-48-7	2-Methylphenol (O-Cresol)	—		—		—	
106-44-5	4-Methylphenol (P-Cresol)	—		—		—	
65-85-0	Benzoic Acid	—		—		—	
117-81-7	Bis(2-Ethylhexyl) Phthalate	2.40E-06	C	—		—	
108-95-2	Phenol	—		—		2.00E-01	C
100-42-5	Styrene	—		—		1.00E+00	I
PAHs							
91-57-6	2-Methylnaphthalene	—		—		—	
91-20-3	Naphthalene	3.40E-05	C	3.40E-05		3.00E-03	I
Filtered Metals							
7429-90-5	Aluminum, dissolved	—		—		5.00E-03	P
7440-36-0	Antimony, dissolved	—		—		—	
7440-38-2	Arsenic, dissolved	4.30E-03	I	3.30E-03		1.50E-05	C
7440-39-3	Barium, dissolved	—		—		5.00E-04	H
7440-41-7	Beryllium, dissolved	2.40E-03	I	2.40E-03		2.00E-05	I
7440-43-9	Cadmium, dissolved	1.80E-03	I	4.20E-03		1.00E-05	A
7440-70-2	Calciuim, dissolved	—		—		—	
7440-47-3	Chromium, dissolved	1.20E-02	I	—		—	
7440-48-4	Cobalt, dissolved	9.00E-03	P	—		6.00E-06	P
7440-50-8	Copper, dissolved	—		—		—	
7439-89-6	Iron, dissolved	—		—		—	
7439-92-1	Lead, dissolved	0.00E+00	0	1.20E-05		—	
7439-95-4	Magnesium, dissolved	—		—		—	
7439-96-5	Manganese, dissolved	—		—		5.00E-05	I
7439-97-6	Mercury, dissolved	—		—		3.00E-04	I
7439-98-7	Molybdenum, dissolved	—		—		—	
7440-02-0	Nickel, dissolved	2.60E-04	C	—		9.00E-05	A
7440-09-7	Potassium, dissolved	—		—		—	
7782-49-2	Selenium, dissolved	—		—		2.00E-02	C
7440-22-4	Silver, dissolved	—		—		—	
7440-23-5	Sodium, dissolved	—		—		—	
7440-28-0	Thallium, dissolved	—		—		—	
7440-62-2	Vanadium, dissolved	—		—		—	
7440-66-6	Zinc, dissolved	—		—		—	

References:

U.S. EPA 2009. Residential Screening Levels. May.

OEHHA Website for Toxicity Values. July 2009. http://www.oehha.ca.gov/risk/ChemicalDB/index.a

C – California website source, http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

I – IRIS, http://www.epa.gov/iris/subst/index.html

Table 3-8
Chemical-Specific Values Used to Evaluate the Inhalation with Soil Exposure Pathway

CAS Number	Chemical	VOLATILIZATION FACTORS FOR SOIL U.S. EPA	Cal/EPA	Most Conservative
Volatile Organic Compounds				
83-32-9	acenaphthene	2.81E+05	2.19E+05	2.81E+05
208-96-8	acenaphthylene	2.53E+04	NA	2.53E+04
67-64-1	acetone	2.61E+04	1.76E+04	2.61E+04
120-12-7	anthracene	1.00E+06	8.23E+05	1.00E+06
71-43-2	benzene	3.50E+03	5.25E+03	5.25E+03
191-24-2	benzo(g,h,i)perylene	4.05E+07	NA	4.05E+07
74-83-9	bromomethane	2.37E+03	2.13E+03	2.37E+03
78-93-3	2-butanone	1.78E+04	1.69E+04	1.78E+04
135-98-8	sec-butylbenzene	1.07E+04	NA	1.07E+04
75-15-0	carbon disulfide	1.53E+03	1.29E+03	1.53E+03
108-90-7	chlorobenzene	8.03E+03	9.68E+03	9.68E+03
67-66-3	chloroform	3.85E+03	3.81E+03	3.85E+03
74-87-3	chloromethane	2.78E+03	1.71E+03	2.78E+03
95-57-8	2-chlorophenol	3.88E+04	2.09E+05	2.09E+05
132-64-9	dibenzofuran	8.55E+05	NA	8.55E+05
95-50-1	1,2-dichlorobenzene	1.88E+04	1.77E+04	1.88E+04
75-35-4	1,1-dichloroethene	3.72E+03	1.66E+03	3.72E+03
156-59-2	cis-1,2-dichloroethene	2.66E+03	3.65E+03	3.65E+03
156-60-5	trans-1,2-dichloroethene	3.39E+03	2.53E+03	3.39E+03
86-73-7	fluorene	2.21E+05	4.39E+05	4.39E+05
98-82-8	isopropylbenzene	1.39E+04	NA	1.39E+04
99-87-6	p-isopropyltoluene	NA	NA	0.00E+00
1634-04-4	methyl tert-butyl ether	6.05E+03	3.16E+03	6.05E+03
75-09-2	methylene chloride	3.95E+03	6.12E+03	6.12E+03
91-57-6	2-methylnaphthalene	2.42E+05	8.99E+04	2.42E+05
108-10-1	4-methyl-2-pentanone	1.58E+04	1.44E+04	1.58E+04
91-20-3	naphthalene	4.40E+04	7.14E+04	7.14E+04
85-01-8	phenanthrene	6.62E+05	NA	6.62E+05
103-65-1	n-propylbenzene	1.45E+04	NA	1.45E+04
129-00-0	pyrene	4.88E+06	3.77E+06	4.88E+06
79-34-5	1,1,2,2-tetrachloroethane	1.81E+04	2.22E+04	2.22E+04
127-18-4	tetrachloroethene	3.91E+03	3.47E+03	3.91E+03
108-88-3	toluene	5.11E+03	6.41E+03	6.41E+03
87-61-6	1,2,3-trichlorobenzene	NA	NA	0.00E+00
120-82-1	1,2,4-trichlorobenzene	3.47E+04	3.07E+04	3.47E+04
79-01-6	trichloroethene	4.18E+03	3.22E+03	4.18E+03
108-67-8	1,3,5-trimethylbenzene	1.03E+04	1.00E+04	1.03E+04
75-01-4c	vinyl chloride (child)	4.22E+03	1.35E+03	4.22E+03
75-01-4a	vinyl chloride (adult)	4.22E+03	1.35E+03	4.22E+03
7816-60-0	m-, p-xylene	2.00E+03	7.77E+03	7.77E+03
541-73-1	1,3-Dichlorobenzene	9.77E+03	NA	9.77E+03
75-00-3	Chloroethane	1.47E+03	NA	1.47E+03
100-41-4	ethylbenzene	6.50E+03	9.57E+02	6.50E+03
95-47-6	0-xylene	7.40E+03	1.76E+04	1.76E+04
1330-20-7	xylenes (total)	5.90E+03	6.15E+03	6.15E+03
71-55-6	1,1,1-Trichloroethane	1.80E+03	2.87E+03	2.87E+03
540-59-0	1,2-Dichloroethene	2.80E+03	3.02E+03	3.02E+03

Acronyms/Abbreviations:
CAS – Chemical Abstract Services
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
U.S. EPA – United States Environmental Protection Agency

Table 6-1: OU-2A Site 9 Detected Chemicals with Sufficient Volatility and Toxicity[a]

Analyte	Basis
VOCS	
1,1,1-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,2-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,3-Trichloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3,5-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,4-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
2-Butanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
4-Methyl-2-pentanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromodichloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromoform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon disulfide	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
Chloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
cis-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Dibromochloromethane	Table 1 of DTSC Guidance (DTSC 2004)
Dichlorodifluoromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Ethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Isopropyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Isopropylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl Tert-Butyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methylene chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
N-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
N-Propylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
o-Xylene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Sec-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
T-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Amyl Methyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Butyl Alcohol	Table 1 of DTSC Guidance (DTSC 2004)
Tetrachloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
trans-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichlorofluoromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Vinyl chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Xylenes (total)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Metals	
Lead	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
PAHs	
2-Methylnaphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
Naphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
SVOCs	
1,4-Dioxane (P-Dioxane)	Table 1 of DTSC Guidance (DTSC 2004)
2,4-Dimethylphenol	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
2-Methylphenol (O-Cresol)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
4-Methylphenol (P-Cresol)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Benzoic Acid	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Bis(2-Ethylhexyl) Phthalate	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Phenol	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Styrene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

Table 6-2: OU-2A Site 13 Detected Chemicals with Sufficient Volatility and Toxicity[a]

Analyte	Basis
VOCS	
1,1-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3-Dichlorobenzene	Table 1 of DTSC Guidance (DTSC 2004)
1,4-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
2-Butanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
4-Methyl-2-pentanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromomethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon disulfide	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
cis-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Ethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Isopropyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Isopropylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl Tert-Butyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methylene chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
N-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
N-Propylbenzene	Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
o-Xylene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Sec-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
T-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Butyl Alcohol	Table 1 of DTSC Guidance (DTSC 2004)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
trans-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Vinyl chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Metals	
Lead	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Mercury	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
PAHs	
Naphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Pesticides	
none	
SVOCs	
1,4-Dioxane (P-Dioxane)	Table 1 of DTSC Guidance (DTSC 2004)

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2009

Table 6-3: OU-2A Site 19 Detected Chemicals with Sufficient Volatility and Toxicity[a]

Analyte	Basis
VOCS	
1,1,1-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3,5-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3-Dichlorobenzene	Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon disulfide	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
cis-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Ethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl Tert-Butyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
N-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
N-Propylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
o-Xylene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Tetrachloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
trans-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Vinyl chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Metals	
Lead	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Mercury	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
PAHs	
Naphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
SVOCs	
1,4-Dioxane (P-Dioxane)	Table 1 of DTSC Guidance (DTSC 2004)

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

Table 6-4: OU-2A Site 22 Detected Chemicals with Sufficient Volatility and Toxicity[a]

Analyte	Basis
VOCS	
1,1,1-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3,5-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
2-Butanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromomethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon disulfide	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
cis-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Ethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Isopropyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Isopropylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl Tert-Butyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methylene chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
N-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
N-Propylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
o-Xylene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Sec-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Butyl Alcohol	Table 1 of DTSC Guidance (DTSC 2004)
Tetrachloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
Xylenes (total)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Metals	
Lead	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Mercury	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
PAHs	
Naphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
SVOCs	
Styrene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

Table 6-5: OU-2A Site 23 Detected Chemicals with Sufficient Volatility and Toxicity[a]

Analyte	Basis
VOCS	
1,1,1,2-Tetrachloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,1-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,2,2-Tetrachloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1,2-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,1-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,3-Trichloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,4-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dibromo-3-Chloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
1,2-Dibromoethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3,5-Trimethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,3-Dichlorobenzene	Table 1 of DTSC Guidance (DTSC 2004)
1,4-Dichlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
2-Butanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
4-Methyl-2-pentanone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromodichloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromoform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon disulfide	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Carbon tetrachloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Analyte	Basis
Chlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
cis-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Dibromochloromethane	Table 1 of DTSC Guidance (DTSC 2004)
Dibromomethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Dichlorodifluoromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Ethylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Hexachlorobutadiene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Isopropyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Isopropylbenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl Tert-Butyl Ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methylene chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
N-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
N-Propylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
o-Xylene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Sec-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
T-Butylbenzene	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Amyl Methyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Butyl Alcohol	Table 1 of DTSC Guidance (DTSC 2004)
Tert-Butyl Ethyl Ether	Table 1 of DTSC Guidance (DTSC 2004)
Tetrachloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
trans-1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Trichlorofluoromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Vinyl acetate	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Vinyl chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Xylenes (total)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Metals	
Lead	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)

Analyte	Basis
Mercury	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
PAHs	
Naphthalene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
SVOCs	
Styrene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

Table 6-6: OU-2A Site 9 Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level (ug/L)[b]	Max Conc. > EPA Screening Level?
VOCs			
1,1,1-Trichloroethane	5.9	3100	No
1,1,2-Trichloro-1,2,2-Trifluoroethane	2.6	1500	No
1,1,2-Trichloroethane	2.7	5	No
1,1-Dichloroethane	730	2200	No
1,1-Dichloroethene	34	190	No
1,2,3-Trichloropropane	31	290	No
1,2,4-Trimethylbenzene	780	24	**Yes**
1,2-Dichlorobenzene	0.5	2600	No
1,2-Dichloroethane	0.41	5	No
1,2-Dichloropropane	4	35	No
1,3,5-Trimethylbenzene	150	25	**Yes**
1,4-Dichlorobenzene	0.2	8200	No
2-Butanone	750	440000	No
4-Methyl-2-pentanone	5.9	14000	No
Acetone	220	220000	No
Benzene	5.4	5	**Yes**
Bromodichloromethane	2.6	2.1	**Yes**
Bromoform	7.7	0.0083	**Yes**
Carbon disulfide	0.66	560	No
Chlorobenzene	35	390	No
Chloroethane	0.53	28000	No
Chloroform	8.8	80	No
Chloromethane	0.9	6.7	No
cis-1,2-Dichloroethene	60	210	No
Dibromochloromethane	3.9	3.2	**Yes**
Dichlorodifluoromethane	16	14	**Yes**
Ethylbenzene	120	700	No
Isopropylbenzene	93	8.4	**Yes**
Methyl Tert-Butyl Ether	450	120000	No
Methylene chloride	2.8	58	No
N-Butylbenzene	50	260	No
N-Propylbenzene	190	320	No
o-Xylene	15	33000	No
Sec-Butylbenzene	87	250	No
T-Butylbenzene	24	290	No
Tetrachloroethene	6.1	5	**Yes**
Toluene	28	1500	No
trans-1,2-Dichloroethene	1	180	No
Trichloroethene	4.8	5	No
Trichlorofluoromethane	0.24	180	No
Vinyl chloride	280	2	**Yes**
Isopropyl Ether	56	--[c]	No
Tert-Amyl Methyl Ether	0.94	--[c]	No

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level (ug/L)[b]	Max Conc. > EPA Screening Level?
Tert-Butyl Alcohol	200	--[c]	No
Xylenes (total)	380	--[c]	No
Metals			
Lead	0.513	--[c]	No
PAHs			
2-Methylnaphthalene	16	3300	No
Naphthalene	250	150	**Yes**
SVOCs			
Styrene	4.4	8900	No
1,4-Dioxane (P-Dioxane)	26	--[c]	No
2,4-Dimethylphenol	12	--[c]	No
2-Methylphenol (O-Cresol)	500	--[c]	No
4-Methylphenol (P-Cresol)	11	--[c]	No
Benzoic Acid	34	--[c]	No
Bis(2-Ethylhexyl) Phthalate	87	--[c]	No
Phenol	0.33	--[c]	No

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening value does not exist

[d] In accordance with EPA's 2002 Vapor Intrusion guidance, the target soil gas concentration for the chemicals exceeds maximum possible vapor concentration (pathway incomplete)

Table 6-7: OU-2A Site 13 Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level (ug/L)[b]	Max Conc. > EPA Screening Level?
VOCs			
1,1-Dichloroethane	0.38	2200	No
1,2,4-Trimethylbenzene	2.1	24	No
1,2-Dichlorobenzene	0.32	2600	No
1,2-Dichloroethane	1.1	5	No
1,3-Dichlorobenzene	0.2	830	No
1,4-Dichlorobenzene	0.45	8200	No
2-Butanone	2.9	440000	No
4-Methyl-2-pentanone	0.4	14000	No
Acetone	99	220000	No
Benzene	1,500	5	**Yes**
Bromomethane	0.6	20	No
Carbon disulfide	1.2	560	No
Chlorobenzene	0.34	390	No
Chloroform	9.7	80	No
Chloromethane	0.3	6.7	No
cis-1,2-Dichloroethene	2.2	210	No
Ethylbenzene	2,000	700	**Yes**
Isopropylbenzene	3	8.4	No
Methyl Tert-Butyl Ether	0.5	120000	No
Methylene chloride	0.97	58	No
N-Butylbenzene	2.3	260	No
N-Propylbenzene	0.8	320	No
o-Xylene	0.49	33000	No
Sec-Butylbenzene	1.4	250	No
T-Butylbenzene	0.8	290	No
Toluene	890	1500	No
trans-1,2-Dichloroethene	0.26	180	No
Trichloroethene	3.1	5	No
Vinyl chloride	0.64	2	No
Isopropyl Ether	0.8	--[c]	No
Tert-Butyl Alcohol	3.7	--[c]	No
Metals			
Mercury	0.21	0.68	No
Lead	1.53	--[c]	No
PAHs			
Naphthalene	210	150	**Yes**
SVOCs			
1,4-Dioxane (P-Dioxane)	1.1	--[c]	No

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2009.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening value does not exist

[d] In accordance with EPA's 2002 Vapor Intrusion guidance, the target soil gas concentration for the chemicals exceeds maximum possible vapor concentration (pathway incomplete)

Table 6-8: OU-2A Site 19 Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level (ug/L)[b]	Max Conc. > EPA Screening Level?
VOCs			
1,1,1-Trichloroethane	4.7	3100	No
1,1-Dichloroethane	9.8	2200	No
1,1-Dichloroethene	0.5	190	No
1,2,4-Trichlorobenzene	0.2	3400	No
1,2,4-Trimethylbenzene	0.1	24	No
1,3,5-Trimethylbenzene	0.09	25	No
1,3-Dichlorobenzene	0.2	830	No
Acetone	4.4	220000	No
Benzene	0.3	5	No
Carbon disulfide	4.4	560	No
Chloroethane	0.5	28000	No
Chloroform	0.2	80	No
cis-1,2-Dichloroethene	4.2	210	No
Ethylbenzene	0.1	700	No
Methyl Tert-Butyl Ether	0.53	120000	No
N-Butylbenzene	0.2	260	No
N-Propylbenzene	0.1	320	No
o-Xylene	0.1	33000	No
Tetrachloroethene	24	5	**Yes**
Toluene	0.4	1500	No
trans-1,2-Dichloroethene	0.2	180	No
trans-1,2-Dichloroethene	0.2	180	No
trans-1,2-Dichloroethene	0.2	180	No
Trichloroethene	9.1	5	**Yes**
Vinyl chloride	0.9	2	No
Metals			
Mercury	0.064	0.68	No
Lead	0.06	--[c]	No
PAHs			
Naphthalene	3.1	150	No
SVOCs			
1,4-Dioxane (P-Dioxane)	4.1	--[c]	No

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater
and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening value does not exist

[d] In accordance with EPA's 2002 Vapor Intrusion guidance, the target soil gas concentration for the chemicals exceeds maximum possible vapor concentration (pathway incomplete)

Table 6-9: OU-2A Site 22 Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level (ug/L)[b]	Max Conc. > EPA Screening Level?
VOCs			
1,1,1-Trichloroethane	27	3100	No
1,1-Dichloroethane	2.4	2200	No
1,1-Dichloroethene	3.9	190	No
1,2,4-Trimethylbenzene	31	24	**Yes**
1,2-Dichlorobenzene	2.4	2600	No
1,2-Dichloroethane	38	5	**Yes**
1,3,5-Trimethylbenzene	14	25	No
2-Butanone	0.5	440000	No
Acetone	16	220000	No
Benzene	19000	5	**Yes**
Bromomethane	0.6	20	No
Carbon disulfide	1200	560	**Yes**
Chloroform	19	80	No
Chloromethane	0.2	6.7	No
cis-1,2-Dichloroethene	0.09	210	No
Ethylbenzene	3830	700	**Yes**
Isopropylbenzene	140	8.4	**Yes**
Methyl Tert-Butyl Ether	2	120000	No
Methylene chloride	0.1	58	No
N-Butylbenzene	51	260	No
N-Propylbenzene	280	320	No
o-Xylene	3.2	33000	No
Sec-Butylbenzene	30	250	No
Tetrachloroethene	2.6	5	No
Toluene	16000	1500	**Yes**
Trichloroethene	1.9	5	No
Isopropyl Ether	0.3	--[c]	No
Tert-Butyl Alcohol	210	--[c]	No
Xylenes (total)	17000	--[c]	No
Metals			
Mercury	0.15	0.68	No
Lead	5.6	--[c]	No
PAHs			
Naphthalene	460	150	**Yes**
Pesticides			
none			
SVOCs			
Styrene	0.1	8900	No

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening value does not exist

[d] In accordance with EPA's 2002 Vapor Intrusion guidance, the target soil gas concentration for the chemicals exceeds maximum possible vapor concentration (pathway incomplete)

Table 6-10: OU-2A Site 23 Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level[b]	Max Conc. > EPA Screening Level
VOCs			
1,1,1,2-Tetrachloroethane	0.5	3.3	No
1,1,1-Trichloroethane	0.5	3100	No
1,1,2,2-Tetrachloroethane	0.5	3	No
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	1500	No
1,1,2-Trichloroethane	0.5	5	No
1,1-Dichloroethane	0.5	2200	No
1,1-Dichloroethene	0.5	190	No
1,2,3-Trichloropropane	0.5	290	No
1,2,4-Trichlorobenzene	0.5	3400	No
1,2,4-Trimethylbenzene	0.5	24	No
1,2-Dibromo-3-Chloropropane	2	33	No
1,2-Dibromoethane	0.5	0.36	**Yes**
1,2-Dichlorobenzene	0.7	2600	No
1,2-Dichloroethane	0.5	5	No
1,2-Dichloropropane	0.5	35	No
1,3,5-Trimethylbenzene	0.5	25	No
1,3-Dichlorobenzene	0.5	830	No
1,4-Dichlorobenzene	0.5	8200	No
2-Butanone	610	440000	No
4-Methyl-2-pentanone	10	14000	No
Acetone	36	220000	No
Benzene	0.5	5	No
Bromodichloromethane	0.5	2.1	No
Bromoform	1	0.0083	**Yes**
Carbon disulfide	0.75	560	No
Carbon tetrachloride	0.5	5	No
Chlorobenzene	0.5	390	No
Chloroethane	1	28000	No
Chloroform	0.5	80	No
Chloromethane	1	6.7	No
cis-1,2-Dichloroethene	6.9	210	No
Dibromochloromethane	0.5	3.2	No
Dibromomethane	0.5	990	No
Dichlorodifluoromethane	1	14	No
Ethylbenzene	0.5	700	No
Hexachlorobutadiene	0.5	0.33	**Yes**
Isopropylbenzene	0.5	8.4	No
Methyl Tert-Butyl Ether	0.5	120000	No
Methylene chloride	10	58	No
N-Butylbenzene	0.5	260	No
N-Propylbenzene	0.5	320	No
o-Xylene	0.5	33000	No
Sec-Butylbenzene	1.2	250	No
T-Butylbenzene	0.5	290	No

Analyte	Max. Detected Concentration (ug/L)[a]	EPA Screening Level[b]	Max Conc. > EPA Screening Level
Tetrachloroethene	0.5	5	No
Toluene	0.5	1500	No
trans-1,2-Dichloroethene	0.5	180	No
Trichloroethene	0.5	5	No
Trichlorofluoromethane	1	180	No
Vinyl acetate	10	9600	No
Vinyl chloride	0.5	2	No
Isopropyl Ether	0.5	--[c]	No
Tert-Amyl Methyl Ether	0.5	--[c]	No
Tert-Butyl Alcohol	28	--[c]	No
Tert-Butyl Ethyl Ether	0.5	--[c]	No
Xylenes (total)	0.5	--[c]	No
Metals			
Mercury	1.7	0.68	**Yes**
Lead	0.12	--[c]	No
PAHs			
Naphthalene	6.6	150	No
Pesticides			
none			
SVOCs			
Styrene	0.5	8900	No

Notes:

[a] Based on the groundwater sampling data collected from 2002 to 2008.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater
and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening value does not exist

[d] In accordance with EPA's 2002 Vapor Intrusion guidance, the target soil gas concentration for the chemicals
exceeds maximum possible vapor concentration (pathway incomplete)

Table 6-11: Summary of J&E Vapor Intrusion Model Input Parameters - Groundwater

Parameter[a]	Input Value - Residential	Input Value - Commercial	Basis
Soil Parameters			
Average soil/groundwater temperature (degrees C)	18.5	18.5	Based on the data collected at OU-2B during Data Gap Investigation conducted in 2008 (Tetra Tech 2008).
Depth below grade to bottom of enclosed space floor (cm)	15	15	Default value for slab-on-grade construction presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Depth below grade to water table (cm and feet)	182.88 cm (6 feet)	182.88 cm (6 feet)	Based on the data collected at OU-2B during Data Gap Investigation conducted in 2008 (Tetra Tech 2008) and Fall 2007 Basewide Semiannual Monitoring Report (ITSI 2008).
Soil stratum	A	A	One soil stratum was assumed between the soil surface and the top of contamination or groundwater table.
Thickness of soil stratum A (cm)	182.88	182.88	Thickness of stratum A was set to be equal to the depth below grade to groundwater table.
SCS soil type directly above water table/ Soil stratum A SCS soil type	Loamy sand (LS)	Loamy sand (LS)	Based on the sieve analysis data reported in the OU-2B Remedial Investigation (RI) Report (SulTech 2005) and Table 11 of the U.S. EPA Guidance (U.S. EPA 2004). The U.S. EPA Guidance (U.S. EPA 2004) recommends that texture classification for soil with approximately 12 percent to 25 percent fines (smaller than 0.075 mm in size) should be "Loamy Sand." Based on the sieve analysis data reported in the OU-2B RI Report, the average percentage of fines in fifteen soil samples collected from 1 to 5.5 feet bgs is approximately 15 percent.
Stratum A soil dry bulk density (g/cm^3)	1.66	1.66	Average value of dry density based on the geotechnical data reported in the OU-2B RI Report (SulTech 2005). The dry density value used is the average value from eleven samples collected from 0.5 to 5.5 feet below ground surface (bgs).
Stratum A soil total porosity	0.380	0.380	Calculated using the following formula per the U.S. EPA Guidance (U.S. EPA 2004): 1 - (Soil dry bulk density – Soil particle density). Soil particle density was estimated to be 2.68 grams per cubic centimeter based on the specific gravity data reported in the OU-2B RI Report (SulTech 2005) for a sample collected from 4.5 feet bgs.
Stratum A soil water-filled porosity	0.13	0.13	Calculated using the moisture content, dry density and total porosity values reported in the OU-2B RI Report (SulTech 2005). The values for dry density and total porosity are presented above. The moisture content value used is the average value from eleven samples collected from 0.5 to 5.5 feet below ground surface (bgs).
Building Parameters			
Enclosed space floor thickness (cm)	15	15	Equal to the value of the parameters depth below grade to bottom of enclosed space floor, specified above.
Soil-bldg. pressure differential (g/cm-sec^2)	40	40	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor length (cm)	1000	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor width (cm)	1000	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space height (cm)	244	244	Default value for a single storey house without a basement in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Floor-wall seam crack width (cm)	0.1	0.1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Indoor air exchange rate (1/hour)	0.5	1	Based on the recommended air exchange rates in DTSC guidance document (DTSC 2005).
Average vapor flow rate into building (liters per minute)	5	5	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Exposure Parameters			
Averaging time for carcinogens (years)	70	70	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Averaging time for noncarcinogens (years)	30	25	Per the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004), averaging time for noncarcinogens was set equal to the exposure duration.
Exposure duration (years)	30	25	Default value for residential and commercial exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Exposure frequency (days)	350	250	Default value for residential and commercial exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Target risk for carcinogens	1.0E-06	1.0E-06	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004). Lower end of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)-defined cancer risk range.
Target hazard quotient for non-carcinogens	1	1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).

Note:
[a] Values calculated by the model are not listed.
The back-up data for the input parameters is presented in Attachment C.

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Table 6-12: Summary of J&E Vapor Intrusion Model Input Parameters - Soil

Parameter[a]	Input Value - Residential	Basis
Soil Parameters		
Average soil/groundwater temperature (degrees C)	18.5	Based on the data collected at OU-2B during Data Gap Investigation conducted in 2008 (Tetra Tech 2008).
Depth below grade to bottom of enclosed space floor (cm)	15	Default value for slab-on-grade construction presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Depth below grade to top of contamination (cm and feet)	15.24 cm (0.5 feet)	Based on the histroic data collected during the RI (SulTech 2005) and data collected during Data Gap Investigation conducted in 2008 (Tetra Tech 2008).
Depth below grade to bottom of contamination (cm and feet)	182.88 cm (6 feet)	Based on the histroic data collected during the RI (SulTech 2005) and data collected during Data Gap Investigation conducted in 2008 (Tetra Tech 2008).
Thickness of soil stratum A (cm)	182.88	Thickness of stratum A was set to be equal to the depth below grade to groundwater table.
SCS soil type directly above water table/ Soil stratum A SCS soil typ	Loamy sand (LS)	Based on the sieve analysis data reported in the OU-2B Remedial Investigation (RI) Report (SulTech 2005) and Table 11 of the U.S. EPA Guidance (U.S. EPA 2004). The U.S. EPA Guidance (U.S. EPA 2004) recommends that texture classification for soil with approximately 12 percent to 25 percent fines (smaller than 0.075 mm in size) should be "Loamy Sand." Based on the sieve analysis data reported in the OU-2B RI Report, the average percentage of fines in fifteen soil samples collected from 1 to 5.5 feet bgs is approximately 15 percent.
Stratum A soil dry bulk density (g/cm^3)	1.66	Average value of dry density based on the geotechnical data reported in the OU-2B RI Report (SulTech 2005). The dry density value used is the average value from eleven samples collected from 0.5 to 5.5 feet below ground surface (bgs).
Stratum A soil total porosity	0.38	Calculated using the following formula per the U.S. EPA Guidance (U.S. EPA 2004): 1 - (Soil dry bulk density – Soil particle density). Soil particle density was estimated to be 2.68 grams per cubic centimeter based on the specific gravity data reported in the OU-2B RI Report (SulTech 2005) for a sample collected from 4.5 feet bgs.
Stratum A soil water-filled porosity	0.13	Calculated using the moisture content, dry density and total porosity values reported in the OU-2B RI Report (SulTech 2005). The values for dry density and total porosity are presented above. The moisture content value used is the average value from eleven samples collected from 0.5 to 5.5 feet below ground surface (bgs).
Building Parameters		
Enclosed space floor thickness (cm)	15	Equal to the value of the parameters depth below grade to bottom of enclosed space floor, specified above.
Soil-bldg. pressure differential (g/cm-sec^2)	40	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor length (cm)	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor width (cm)	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space height (cm)	244	Default value for a single storey house without a basement in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Floor-wall seam crack width (cm)	0.1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Indoor air exchange rate (1/hour)	0.5	Based on the recommended air exchange rates in DTSC guidance document (DTSC 2005).
Average vapor flow rate into building (liters per minute)	5	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Exposure Parameters		
Averaging time for carcinogens (years)	70	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Averaging time for noncarcinognes (years)	30	Per the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004), averaging time for noncarcinogens was set equal to the exposure duration.
Exposure duration (years)	30	Default value for residential exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Exposure frequency (days)	350	Default value for residential exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Target risk for carcinogens	1.00E-06	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004). Lower end of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)-defined cancer risk range.
Target hazard quotient for non-carcinogens	1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).

Note:

[a] Values calculated by the model are not listed.

The back-up data for the input parameters is presented in Attachment C.

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SulTech. 2005. *Final OU-2B Remedial Investigation Report Sites 3, 4, 11, and 21, Alameda Point, Alameda, California.* August 5.

Tetra Tech EC, Inc. (Tetra Tech). 2008. *Draft Technical Memorandum for Data Gap Sampling at Operable Units 2a and 2b.* September 19.

United States Environmental Protection Agency (U. S. EPA). 1991. Human health evaluation manual, supplemental guidance: "Standard default exposure factors (PDF)". OSWER Directive 9285.6-03.

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Table 8-1: IR Site 9 - Residential HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - Excluding Background					
CAS Number	Chemical	(mg/kg)	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	6.1E+03	—	—	0.09	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.09	4	—	0	—	0	0.00	0
7440-38-2	**arsenic**	2.6E+00	6.2E-06	6.2E-06	0.12	5.9E-07	5.9E-07	0.01	4.3E-06	4.3E-06	0.04	3.4E-09	2.6E-09	0.00	—	—	—	—	—	—	1.1E-05	87	1.1E-05	45	0.18	7	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	**barium**	1.1E+02	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-41-7	**beryllium**	6.4E-01	—	—	0.00	—	—	0.02	—	—	—	4.6E-10	4.6E-10	0.00	—	—	—	—	—	—	4.6E-10	0	4.6E-10	0	0.02	1	0.0E+00	0	0.0E+00	0	0.00	0
7440-43-9	**cadmium**	3.1E-01	—	—	0.00	—	—	0.00	—	—	—	3.9E-10	4.0E-10	0.00	—	—	—	—	—	—	3.9E-10	0	4.0E-10	0	0.00	0	0.0E+00	0	0.0E+00	0	0.00	0
7440-47-3	chromium	7.2E+01	—	—	0.34	—	—	0.76	—	—	—	2.6E-07	—	—	—	—	—	—	—	—	2.6E-07	2	—	0	1.10	43	2.6E-07	16	—	0	1.10	74
7440-48-4	**cobalt**	6.3E+00	—	—	0.30	—	—	0.01	—	—	—	1.7E-08	—	0.00	—	—	—	—	—	—	1.7E-08	0	—	0	0.31	12	0.0E+00	0	—	0	0.00	0
7440-50-8	copper	4.4E+01	—	—	0.02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.02	1
7439-89-6	**iron**	1.3E+04	—	—	0.27	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.28	11	—	0	—	0	0.00	0
7439-92-1	**lead**	1.0E+01	—	—	—	—	—	—	—	—	—	—	3.8E-11	—	—	—	—	—	—	—	—	0	3.8E-11	0	—	0	—	0	0.0E+00	0	—	0
7439-96-5	manganese	4.9E+02	—	—	0.05	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.07	3	—	0	—	0	0.07	4
7439-97-6	**mercury**	4.5E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-98-7	**molybdenum**	7.8E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	**nickel**	4.4E+01	—	—	0.03	—	—	0.02	—	—	0.02	3.5E-09	3.5E-09	0.00	—	—	—	—	—	—	3.5E-09	0	3.5E-09	0	0.07	3	0.0E+00	0	0.0E+00	0	0.00	0
7440-22-4	**silver**	3.1E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-62-2	**vanadium**	2.4E+01	—	—	0.05	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.10	4	—	0	—	0	0.00	0
7440-66-6	**zinc**	5.0E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																																
	Benzo(a)Pyrene Equivalent*	1.7E-02	8.2E-07	1.4E-06	0.00	3.6E-07	6.0E-07	0.00	2.4E-08	4.0E-08	0.00	1.4E-11	1.4E-11	—	—	—	—	—	—	—	1.2E-06	9	2.0E-06	8	0.00	0	1.2E-06	74	2.0E-06	14	0.00	0
Semivolatile Organic Compounds																																
117-81-7	bis(2-ethylhexyl)phthalate	1.8E-01	3.9E-09	8.5E-10	0.00	1.2E-09	2.7E-10	0.00	9.6E-08	2.1E-08	0.00	8.2E-12	8.2E-12	—	—	—	—	—	—	—	1.0E-07	1	2.2E-08	0	0.00	0	1.0E-07	6	2.2E-08	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	5.9E-02	4.6E-10	8.4E-10	—	—	2.6E-10	—	—	—	—	—	—	—	—	—	—	—	—	—	4.6E-10	0	1.1E-09	0	—	0	4.6E-10	0	1.1E-09	0	—	0
Volatile Organic Compounds																																
540-59-0	1,2-Dichloroethene	2.6E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-57-6	2-methylnaphthalene	6.7E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.03	—	0	—	0	0.03	1	—	0	—	0	0.03	2
83-32-9	acenaphthene	7.6E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	1.4E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	1.2E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	1.7E-01	—	3.2E-08	0.00	—	1.5E-08	0.00	—	—	—	—	—	—	3.4E-08	3.4E-08	0.00	—	9.9E-06	0.23	3.4E-08	0	1.0E-05	40	0.23	9	3.4E-08	2	1.0E-05	72	0.23	15
129-00-0	pyrene	4.7E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	2.0E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	ethylbenzene	2.0E-01	3.4E-09	3.4E-09	0.00	1.1E-09	1.1E-09	0.00	—	—	—	—	—	—	3.2E-08	3.2E-08	0.00	—	1.8E-06	0.00	3.6E-08	0	1.8E-06	7	0.00	0	3.6E-08	2	1.8E-06	13	0.00	0
108-88-3	toluene	4.9E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
1330-20-7	xylenes (total)	4.9E+00			0.00			0.00									0.02				—	0	—	0	0.02	1	—	0	—	0	0.02	1
	Totals by Pathway		7.E-06	8.E-06	1	1.E-06	1.E-06	1	4.E-06	4.E-06	0.09	3.E-07	7.E-09	0.02	7.E-08	7.E-08	0.02	0.E+00	1.E-05	0.26	1.E-05		2.E-05		3		2.E-06		1.E-05		1	
	% of Totals		55	31	50	7	5	35	35	18	4	2	0	1	1	0	1	0	47	10												
	Totals by Pathway (Excluding Background)		8.E-07	1.E-06	0.4	4.E-07	6.E-07	1	1.E-07	6.E-08	0.05	3.E-07	2.E-11	0.01	7.E-08	7.E-08	0.02	0.E+00	1.E-05	0.26												
	% of Totals (Excluding Background)		51	10	27	22	4	51	7	0	3	16	0	1	4	0	1	0	85	17												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-2: IR Site 9 - Residential HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - Excluding Background					
CAS Number	Chemical	(mg/kg)	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	5.9E+03	—	—	0.08	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.09	2	—	0	—	0	0.00	0
7440-36-0	**antimony**	5.7E-01	—	—	0.02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.00	0
7440-38-2	**arsenic**	1.9E+00	4.6E-06	4.6E-06	0.09	4.3E-07	4.3E-07	0.01	3.2E-06	3.2E-06	0.03	2.5E-09	1.9E-09	0.00	—	—	—	—	—	—	8.2E-06	14	8.2E-06	7	0.13	2	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	9.0E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7440-41-7	beryllium	4.9E-01	—	—	0.00	—	—	0.01	—	—	—	3.5E-10	3.5E-10	0.00	—	—	—	—	—	—	3.5E-10	0	3.5E-10	0	0.02	0	3.5E-10	0	3.5E-10	0	0.02	0
7440-43-9	cadmium	2.8E-01	—	—	0.00	—	—	0.00	—	—	0.02	3.5E-10	3.6E-10	0.00	—	—	—	—	—	—	3.5E-10	0	3.6E-10	0	0.02	0	3.5E-10	0	3.6E-10	0	0.02	0
7440-47-3	chromium	5.3E+01	—	—	0.25	—	—	0.56	—	—	—	1.9E-07	—	—	—	—	—	—	—	—	1.9E-07	0	—	0	0.82	15	1.9E-07	0	—	0	0.82	16
7440-48-4	cobalt	5.7E+00	—	—	0.27	—	—	0.01	—	—	—	1.5E-08	—	0.00	—	—	—	—	—	—	1.5E-08	0	—	0	0.28	5	1.5E-08	0	—	0	0.28	6
7440-50-8	**copper**	1.9E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-89-6	**iron**	1.0E+04	—	—	0.20	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.21	4	—	0	—	0	0.00	0
7439-92-1	lead	9.3E+00	—	—	—	—	—	—	—	—	—	—	3.4E-11	—	—	—	—	—	—	—	—	0	3.4E-11	0	—	0	—	0	3.4E-11	0	—	0
7439-96-5	**manganese**	2.1E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.00	0
7439-97-6	mercury	1.6E-01	—	—	0.01	—	—	0.00	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
7439-98-7	**molybdenum**	8.1E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	nickel	5.2E+01	—	—	0.04	—	—	0.03	—	—	0.02	4.1E-09	4.1E-09	0.00	—	—	—	—	—	—	4.1E-09	0	4.1E-09	0	0.09	2	4.1E-09	0	4.1E-09	0	0.09	2
7440-22-4	**silver**	1.4E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	1.2E-01	—	—	0.03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.00	0
7440-62-2	**vanadium**	2.2E+01	—	—	0.04	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.10	2	—	0	—	0	0.00	0
7440-66-6	zinc	4.6E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																																
	Benzo(a)Pyrene Equivalent*	2.0E-02	9.9E-07	1.6E-06	0.00	4.4E-07	7.2E-07	0.00	2.9E-08	4.8E-08	0.00	1.7E-11	1.7E-11	—	—	—	—	—	—	—	1.5E-06	3	2.4E-06	2	0.00	0	1.5E-06	3	2.4E-06	2	0.00	0
Semivolatile Organic Compounds																																
117-81-7	bis(2-ethylhexyl)phthalate	2.2E-01	4.8E-09	1.0E-09	0.00	1.5E-09	3.3E-10	0.00	1.2E-07	2.5E-08	0.00	1.7E-12	1.6E-13	—	—	—	—	—	—	—	1.2E-07	0	2.7E-08	0	0.00	0	1.2E-07	0	2.7E-08	0	0.00	0
108-95-2	phenol	4.2E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	6.9E-02	5.3E-10	9.8E-10	—	1.7E-10	3.1E-10	—	—	—	—	—	—	—	—	—	—	—	—	—	7.0E-10	0	1.3E-09	0	—	0	7.0E-10	0	1.3E-09	0	—	0
87-86-5	Pentachlorophenol	4.3E-01	8.1E-08	1.2E-08	0.00	6.4E-08	9.6E-09	0.00	—	—	—	—	—	—	—	—	—	—	—	—	1.4E-07	0	2.2E-08	0	0.00	0	1.4E-07	0	2.2E-08	0	0.00	0
72-43-5	4-chloro-3-methylphenol	5.3E-03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
Volatile Organic Compounds																																
540-59-0	1,2-Dichloroethene	1.3E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-57-6	2-methylnaphthalene	7.5E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.03	—	0	—	0	0.03	1	—	0	—	0	0.03	1
83-32-9	acenaphthene	1.2E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	5.3E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	6.6E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	5.8E-01	—	1.1E-07	0.00	—	5.2E-08	0.00	—	—	—	—	—	—	1.1E-07	1.1E-07	0.01	—	3.3E-05	0.76	1.1E-07	0	3.4E-05	29	0.77	14	1.1E-07	0	3.4E-05	31	0.77	15
129-00-0	pyrene	1.7E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
78-93-3	2-butanone	9.0E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	1.0E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	ethylbenzene	2.1E-02	3.7E-10	3.7E-10	0.00	1.2E-10	1.2E-10	0.00	—	—	—	—	—	—	3.4E-09	3.4E-09	0.00	—	1.9E-07	0.00	3.8E-09	0	1.9E-07	0	0.00	0	3.8E-09	0	1.9E-07	0	0.00	0
127-18-4	Tetrachloroethene	1.0E-03	8.5E-10	8.5E-10	0.00	2.7E-10	2.7E-10	0.00	—	—	—	—	—	—	6.2E-10	6.2E-10	0.00	2.1E-08	2.1E-08	0.00	2.3E-08	0	2.3E-08	0	0.00	0	2.3E-08	0	2.3E-08	0	0.00	0
108-88-3	toluene	6.0E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
1330-20-7	xylenes (total)	3.2E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Pesticides/Polychlorinated Biphenyls																																
11097-69-1	PCB-1254 (Aroclor 1254)	1.2E-01	3.8E-07	9.4E-07	0.08	1.8E-07	4.4E-07	0.04	1.4E-05	3.4E-05	1.59	—	—	—	—	—	—	—	—	—	1.4E-05	25	3.5E-05	30	1.71	31	1.4E-05	29	3.5E-05	32	1.71	34
11096-82-5	PCB-1260 (Aroclor 1260)	1.0E-01	3.1E-07	7.8E-07	0.07	1.5E-07	3.7E-07	0.03	5.5E-06	1.4E-05	0.64	—	—	—	—	—	—	—	—	—	6.0E-06	11	1.5E-05	13	0.74	13	6.0E-06	12	1.5E-05	14	0.74	15
57-74-9	chlordane	1.6E-01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
60-57-1	Dieldrin	5.4E-03	1.4E-07	1.4E-07	0.00	4.3E-08	4.3E-08	0.00	1.1E-05	1.1E-05	0.06	—	—	—	—	—	—	—	—	—	1.1E-05	19	1.1E-05	9	0.06	1	1.1E-05	22	1.1E-05	10	0.06	1
319-86-8	delta-BHC	1.9E-02	3.9E-08	3.3E-08	0.00	—	—	—	5.2E-06	4.4E-06	0.06	—	—	—	—	—	—	—	—	—	5.3E-06	9	4.5E-06	4	0.06	1	5.3E-06	11	4.5E-06	4	0.06	1
1031-07-8	Endosulfan sulfate	3.7E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
72-20-8	Endrin	1.8E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7421-93-4	Endrin aldehyde	2.1E-03	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
58-89-9	gamma-BHC (Lindane)	1.5E-02	2.6E-08	2.6E-08	0.00	4.1E-09	4.1E-09	0.00	3.5E-06	3.5E-06	0.05	—	—	—	—	—	—	—	—	—	3.5E-06	6	3.5E-06	3	0.05	1	3.5E-06	7	3.5E-06	3	0.05	1
1024-57-3	Heptachlor epoxide	4.9E-03	7.0E-08	4.2E-08	0.01	2.2E-08	1.3E-08	0.00	6.2E-06	3.7E-06	0.24	—	—	—	—	—	—	—	—	—	6.3E-06	11	3.8E-06	3	0.25	4	6.3E-06	13	3.8E-06	3	0.25	5
72-43-5	Methoxychlor	5.3E-03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
72-55-9	p,p'-DDE	3.4E-03	1.8E-09	1.8E-09	0.00	5.7E-10	5.7E-10	0.00	7.5E-08	7.5E-08	0.00	—	—	—	—	—	—	—	—	—	7.8E-08	0	7.8E-08	0	0.00	0	7.8E-08	0	7.8E-08	0	0.00	0
50-29-3	p,p'-DDT	1.2E-02	6.4E-09	6.4E-09	0.00	1.0E-09	1.0E-09	0.00	2.2E-07	2.2E-07	0.01	—	—	—	—	—	—	—	—	—	2.3E-07	0	2.3E-07	0	0.01	0	2.3E-07	0	2.3E-07	0	0.01	0
		Totals by Pathway	7.E-06	8.E-06	1	1.E-06	2.E-06	1	5.E-05	7.E-05	3	2.E-07	7.E-09	0.01	1.E-07	1.E-07	0.01	2.E-08	3.E-05	1	6.E-05		1.E-04		6		5.E-05		1.E-04		5	
		% of Totals	12	7	23	2	2	14	85	63	49	0	0	0	0	0	0	0	28	14												
		Totals by Pathway **(Excluding Background)**	2.E-06	4.E-06	1	9.E-07	2.E-06	1	5.E-05	7.E-05	3	2.E-07	5.E-09	0.00	1.E-07	1.E-07	0.01	2.E-08	3.E-05	1												
		% of Totals **(Excluding Background)**	4	3	15	2	2	14	93	64	55	0	0	0	0	0	0	0	31	16												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-3: IR Site 9 - Residential HHRA Summary byPathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																										
7429-90-5	**Aluminum, dissolved**	5.0E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	3.6E-04	—	—	0.07	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.07	0	—	0	—	0	0.00	0
7440-38-2	Arsenic, dissolved	1.5E-02	3.0E-04	3.0E-04	3.70	—	—	—	1.6E-06	1.5E-06	0.02	—	—	—	3.0E-04	31	3.0E-04	62	3.72	5	3.0E-04	31	3.0E-04	62	3.72	6
7440-39-3	**Barium, dissolved**	1.3E-01	—	—	0.05	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.05	0	—	0	—	0	0.00	0
7440-41-7	**Beryllium, dissolved**	2.8E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-43-9	Cadmium, dissolved	4.6E-03	—	—	0.70	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.70	1	—	0	—	0	0.70	1
7440-70-2	Calciuim, dissolved	9.6E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-47-3	Chromium, dissolved	8.8E-03	—	—	0.24	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.24	0	—	0	—	0	0.24	0
7440-48-4	Cobalt, dissolved	2.1E-01	—	—	49.00	—	—	—	—	—	0.30	—	—	—	—	0	—	0	49.30	65	—	0	—	0	49.30	80
7440-50-8	Copper, dissolved	1.2E-01	—	—	0.24	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.24	0	—	0	—	0	0.24	0
7439-89-6	Iron, dissolved	2.4E+01	—	—	2.50	—	—	—	—	—	0.01	—	—	—	—	0	—	0	2.51	3	—	0	—	0	2.51	4
7439-92-1	Lead, dissolved	9.5E-03	—	1.2E-06	0.00	—	—	—	—	6.0E-10	0.00	—	—	—	—	0	1.2E-06	0	0.00	0	—	0	1.2E-06	0	0.00	0
7439-95-4	Magnesium, dissolved	1.0E+02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	2.1E+00	—	—	7.00	—	—	—	—	—	0.03	—	—	—	—	0	—	0	7.03	9	—	0	—	0	0.00	0
7439-98-7	Molybdenum, dissolved	1.4E-02	—	—	0.24	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.24	0	—	0	—	0	0.24	0
7440-02-0	Nickel, dissolved	3.8E-01	—	—	1.30	—	—	—	—	—	0.00	—	—	—	—	0	—	0	1.30	2	—	0	—	0	1.30	2
7440-09-7	Potassium, dissolved	2.8E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7782-49-2	Selenium, dissolved	1.5E-03	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
7440-22-4	Silver, dissolved	6.6E-03	—	—	0.10	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.10	0	—	0	—	0	0.10	0
7440-23-5	Sodium, dissolved	9.3E+02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	6.4E-03	—	—	7.00	—	—	—	—	—	0.03	—	—	—	—	0	—	0	7.03	9	—	0	—	0	0.00	0
7440-62-2	Vanadium, dissolved	3.5E-02	—	—	0.50	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.50	1	—	0	—	0	0.50	1
7440-66-6	**Zinc, dissolved**	1.5E-01	—	—	0.04	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.04	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																										
91-57-6	2-Methylnaphthalene	7.8E-03	—	—	0.13	—	—	—	—	—	0.30	—	—	—	—	0	—	0	0.43	1	—	0	—	0	0.43	1
91-20-3	Naphthalene	8.0E-03	—	—	0.04	—	—	—	—	—	0.02	—	2.5E-07	0.01	—	0	—	0	0.06	0	—	0	—	0	0.06	0
Semivolatile Organic Compounds																										
123-91-1	1,4-Dioxane (P-Dioxane)	1.3E-03	1.8E-07	5.0E-07	0.00	—	—	—	7.0E-10	1.5E-09	0.00	—	—	—	1.8E-07	0	5.0E-07	0	0.00	0	1.8E-07	0	5.0E-07	0	0.00	0
105-67-9	2,4-Dimethylphenol	7.3E-03	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.03	0
95-48-7	2-Methylphenol (O-Cresol)	1.2E-02	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
106-44-5	4-Methylphenol (P-Cresol)	4.2E-02	—	—	0.60	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.60	1	—	0	—	0	0.60	1
65-85-0	Benzoic Acid	1.1E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
117-81-7	Bis(2-Ethylhexyl) Phthalate	1.3E-02	3.0E-06	6.0E-07	0.05	—	—	—	—	—	0.00	—	—	—	3.0E-06	0	6.0E-07	0	0.05	0	3.0E-06	0	6.0E-07	0	0.05	0
108-95-2	Phenol	6.1E-02	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
100-42-5	Styrene	3.6E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Volatile Organic Compounds																										
71-55-6	1,1,1-Trichloroethane	8.9E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	2.2E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-00-5	1,1,2-Trichloroethane	2.7E-03	1.8E-06	3.0E-06	0.05	2.4E-07	2.4E-07	0.00	—	2.7E-07	0.00	—	—	—	2.0E-06	0	3.5E-06	1	0.05	0	2.0E-06	0	3.5E-06	1	0.05	0
75-34-3	1,1-Dichloroethane	5.8E-02	5.0E-06	5.0E-06	0.02	4.9E-07	4.9E-07	0.00	3.4E-07	3.0E-07	0.00	—	—	—	5.8E-06	1	5.8E-06	1	0.03	0	5.8E-06	1	5.8E-06	1	0.03	0
75-35-4	1,1-Dichloroethene	2.4E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
96-18-4	1,2,3-Trichloropropane	1.2E-03	1.3E-04	—	0.01	—	—	0.00	—	—	0.00	—	—	—	1.3E-04	14	—	0	0.01	0	1.3E-04	14	—	0	0.01	0
95-63-6	1,2,4-Trimethylbenzene	2.7E-02	—	—	0.25	—	—	0.08	—	—	0.40	—	—	0.07	—	0	—	0	0.80	1	—	0	—	0	0.80	1
95-50-1	1,2-Dichlorobenzene	3.3E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
107-06-2	1,2-Dichloroethane	4.0E-04	5.0E-07	3.0E-07	0.00	5.0E-08	3.8E-08	0.00	2.4E-08	1.3E-08	0.00	—	—	—	5.7E-07	0	3.5E-07	0	0.00	0	5.7E-07	0	3.5E-07	0	0.00	0
78-87-5	1,2-Dichloropropane	3.7E-04	1.7E-07	1.7E-07	0.00	1.4E-08	1.4E-08	0.00	—	1.5E-08	0.00	—	—	—	1.8E-07	0	2.0E-07	0	0.00	0	1.8E-07	0	2.0E-07	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	9.4E-03	—	—	0.01	—	—	0.04	—	—	0.01	—	—	0.03	—	0	—	0	0.09	0	—	0	—	0	0.09	0
142-28-9	1,3-Dichloropropane	3.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
106-46-7	1,4-Dichlorobenzene	2.0E-04	1.6E-08	1.6E-08	0.00	1.1E-08	1.1E-08	0.00	—	—	0.00	—	—	—	2.7E-08	0	2.7E-08	0	0.00	0	2.7E-08	0	2.7E-08	0	0.00	0
78-93-3	2-Butanone	2.0E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-49-8	2-Chlorotoluene	1.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
591-78-6	2-Hexanone	6.0E-03	—	—	0.10	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.10	0	—	0	—	0	0.10	0
108-10-1	4-Methyl-2-pentanone	4.6E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	Acetone	1.2E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0

Table 8-3: IR Site 9 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
71-43-2	Benzene	5.0E-04	5.0E-07	8.0E-07	0.01	2.4E-08	7.0E-08	0.00	5.6E-08	1.0E-07	0.00	4.4E-08	1.7E-07	0.00	6.2E-07	0	1.1E-06	0	0.01	0	6.2E-07	0	1.1E-06	0	0.01	0
75-27-4	Bromodichloromethane	4.3E-04	4.0E-07	8.0E-07	0.00	8.0E-08	—	0.00	—	6.0E-08	0.00	2.6E-08	2.6E-08	0.00	5.1E-07	0	8.9E-07	0	0.00	0	5.1E-07	0	8.9E-07	0	0.00	0
75-25-2	Bromoform	6.1E-04	8.0E-08	1.0E-07	0.00	3.7E-09	—	0.00	—	6.0E-09	0.00	3.9E-10	3.9E-10	0.00	8.4E-08	0	1.1E-07	0	0.00	0	8.4E-08	0	1.1E-07	0	0.00	0
75-15-0	Carbon disulfide	2.4E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-90-7	Chlorobenzene	1.1E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-00-3	Chloroethane	4.0E-04	1.6E-08	0.0E+00	0.00	—	—	0.00	—	—	0.00	—	—	—	1.6E-08	0	—	0	0.00	0	1.6E-08	0	—	0	0.00	0
67-66-3	Chloroform	1.0E-03	5.0E-07	5.0E-07	0.01	1.1E-07	2.5E-08	0.00	—	—	0.00	—	—	—	6.1E-07	0	5.3E-07	0	0.01	0	6.1E-07	0	5.3E-07	0	0.01	0
74-87-3	Chloromethane	9.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	5.5E-03	—	—	0.05	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.05	0	—	0	—	0	0.05	0
124-48-1	Dibromochloromethane	4.1E-04	5.0E-07	—	0.00	5.0E-08	5.0E-08	0.00	—	—	0.00	9.6E-09	9.6E-09	0.00	5.6E-07	0	6.0E-08	0	0.00	0	5.6E-07	0	6.0E-08	0	0.00	0
75-71-8	Dichlorodifluoromethane	1.6E-02	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.10	—	0	—	0	0.10	0	—	0	—	0	0.10	0
100-41-4	Ethylbenzene	4.6E-03	8.0E-07	8.0E-07	0.00	6.0E-08	—	0.00	4.0E-07	4.0E-07	0.00	—	—	—	1.3E-06	0	1.2E-06	0	0.01	0	1.3E-06	0	1.2E-06	0	0.01	0
108-20-3	Isopropyl Ether	2.9E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-82-8	Isopropylbenzene	3.3E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	0	—	0	0.01	0	—	0	—	0	0.01	0
1634-04-4	Methyl Tert-Butyl Ether	1.4E-02	3.0E-07	3.0E-07	0.00	1.4E-08	1.4E-08	0.00	7.7E-09	7.0E-09	0.00	—	—	—	3.2E-07	0	3.2E-07	0	0.00	0	3.2E-07	0	3.2E-07	0	0.00	0
75-09-2	Methylene chloride	7.5E-04	8.0E-08	1.6E-07	0.00	1.3E-09	3.7E-09	0.00	2.9E-09	6.0E-09	0.00	—	—	—	8.4E-08	0	1.7E-07	0	0.00	0	8.4E-08	0	1.7E-07	0	0.00	0
104-51-8	N-Butylbenzene	2.5E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
103-65-1	N-Propylbenzene	5.9E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-47-6	o-Xylene	1.6E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
99-87-6	p-Isopropyltoluene	7.0E-03	—	—	0.01	—	—	0.00	—	—	0.01	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
135-98-8	Sec-Butylbenzene	3.1E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-06-6	T-Butylbenzene	8.5E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
994-05-8	Tert-Amyl Methyl Ether	8.1E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	1.7E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
127-18-4	Tetrachloroethene	8.8E-04	7.0E-06	7.0E-06	0.01	2.5E-08	—	0.00	3.7E-06	4.0E-06	0.00	1.5E-07	1.5E-07	0.00	1.1E-05	1	1.1E-05	2	0.01	0	1.1E-05	1	1.1E-05	2	0.01	0
108-88-3	Toluene	1.0E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	3.6E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-01-6	Trichloroethene	6.6E-04	6.0E-08	6.0E-08	0.00	6.0E-09	—	0.00	8.7E-09	9.0E-09	0.00	—	—	—	7.5E-08	0	6.9E-08	0	0.00	0	7.5E-08	0	6.9E-08	0	0.00	0
75-69-4	Trichlorofluoromethane	2.4E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-01-4	Vinyl chloride (M)	6.8E-03	5.0E-04	1.1E-04	0.13	5.0E-07	8.0E-06	0.00	—	—	0.00	2.1E-06	3.8E-05	0.01	5.0E-04	52	1.6E-04	32	0.14	0	5.0E-04	52	1.6E-04	32	0.14	0
1330-20-7	Xylenes (total)	1.9E-02	—	—	0.01	—	—	0.00	—	—	0.01	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
7816-60-0	Xylenes, m & p	2.7E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Totals by Pathway		1.E-03	4.E-04	74	2.E-06	9.E-06	0.1	6.E-06	7.E-06	1	2.E-06	4.E-05	0.2	**1.E-03**		**5.E-04**		**76**							
	% of Totals		99	89	98	0	2	0	1	1	2	0	8	0												
	Totals by Pathway **(Excluding Background)**		1.E-03	4.E-04	60	2.E-06	9.E-06	0.1	6.E-06	7.E-06	1	2.E-06	4.E-05	0.2							**1.E-03**		**5.E-04**		**62**	
	% of Totals **(Excluding Background)**		99	89	98	0	2	0	1	1	2	0	8	0												

Table 8-4: IR Site 13 - Residential HHRA Summary by Pathway (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte -**Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	1.0E+04	—	—	0.14	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.15	4	—	0	—	0	0.00	0
7440-36-0	antimony	1.3E+00	—	—	0.05	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.06	2	—	0	—	0	0.06	2
7440-38-2	**arsenic**	6.3E+00	1.5E-05	1.5E-05	0.30	1.4E-06	1.4E-06	0.03	1.0E-05	1.0E-05	0.11	8.1E-09	6.3E-09	0.00	—	—	—	—	—	—	2.6E-05	51	2.6E-05	42	0.43	12	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	9.4E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7440-41-7	beryllium	2.9E-01	—	—	0.00	—	—	0.01	—	—	—	2.1E-10	2.1E-10	0.00	—	—	—	—	—	—	2.1E-10	0	2.1E-10	0	0.01	0	2.1E-10	0	2.1E-10	0	0.01	0
7440-43-9	cadmium	2.0E+00	—	—	0.03	—	—	0.00	—	—	0.13	2.5E-09	2.5E-09	0.00	—	—	—	—	—	—	2.5E-09	0	2.5E-09	0	0.16	5	2.5E-09	0	2.5E-09	0	0.16	6
7440-47-3	chromium	5.4E+01	—	—	0.26	—	—	0.58	—	—	—	2.0E-07	—	—	—	—	—	—	—	—	2.0E-07	0	—	0	0.83	24	2.0E-07	1	—	0	0.83	30
7440-48-4	cobalt	7.3E+00	—	—	0.35	—	—	0.01	—	—	—	2.0E-08	—	0.00	—	—	—	—	—	—	2.0E-08	0	—	0	0.36	10	2.0E-08	0	—	0	0.36	13
7440-50-8	copper	3.2E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7439-89-6	iron	2.2E+04	—	—	0.44	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.45	13	—	0	—	0	0.45	16
7439-92-1	lead	8.7E+01	—	—	—	—	—	—	—	—	—	—	3.2E-10	—	—	—	—	—	—	—	—	0	3.2E-10	0	—	0	—	0	3.2E-10	0	—	0
7439-96-5	**manganese**	2.7E+02	—	—	0.03	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.00	0
7439-97-6	mercury	1.0E-01	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7439-98-7	**molybdenum**	5.1E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	nickel	4.9E+01	—	—	0.03	—	—	0.03	—	—	0.02	3.9E-09	3.9E-09	0.00	—	—	—	—	—	—	3.9E-09	0	3.9E-09	0	0.08	2	3.9E-09	0	3.9E-09	0	0.08	3
7782-49-2	**Selenium**	2.0E+00	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-22-4	**silver**	2.4E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	4.1E-01	—	—	0.09	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.09	3	—	0	—	0	0.00	0
7440-62-2	vanadium	3.1E+01	—	—	0.06	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.13	4	—	0	—	0	0.13	5
7440-66-6	zinc	6.7E+02	—	—	0.03	—	—	0.00	—	—	0.07	—	—	—	—	—	—	—	—	—	—	0	—	0	0.11	3	—	0	—	0	0.11	4
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	1.3E-01	6.3E-07	1.0E-06	0.00	2.8E-07	4.6E-07	0.00	1.8E-08	3.0E-08	0.00	1.1E-11	1.1E-11	—	—	—	—	—	—	—	9.2E-07	2	1.5E-06	2	0.00	0	9.2E-07	4	1.5E-06	4	0.00	0
50-32-8	benzo(a)pyrene-M	1.4E-01	6.9E-06	1.1E-05	0.00	3.1E-06	5.0E-06	0.00	2.0E-07	3.3E-07	0.00	1.2E-10	1.2E-10	—	—	—	—	—	—	—	1.0E-05	20	1.7E-05	26	0.00	0	1.0E-05	40	1.7E-05	45	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.3E-01	6.1E-07	1.0E-06	0.00	2.7E-07	4.5E-07	0.00	1.8E-08	2.9E-08	0.00	1.1E-11	1.1E-11	—	—	—	—	—	—	—	9.0E-07	2	1.5E-06	2	0.00	0	9.0E-07	4	1.5E-06	4	0.00	0
207-08-9	benzo(k)fluoranthene-M	6.6E-02	3.2E-08	5.3E-07	0.00	1.4E-08	2.3E-07	0.00	9.4E-10	1.6E-08	0.00	5.5E-12	5.5E-12	—	—	—	—	—	—	—	4.7E-08	0	7.8E-07	1	0.00	0	4.7E-08	0	7.8E-07	2	0.00	0
218-01-9	chrysene-M	2.4E-01	1.2E-08	1.9E-07	0.00	5.1E-09	8.4E-08	0.00	3.4E-10	5.6E-09	0.00	2.0E-12	2.0E-12	—	—	—	—	—	—	—	1.7E-08	0	2.8E-07	0	0.00	0	1.7E-08	0	2.8E-07	1	0.00	0
53-70-3	dibenz(a,h)anthracene-M	2.2E-02	1.1E-06	6.0E-07	0.00	4.7E-07	2.7E-07	0.00	3.1E-08	1.8E-08	0.00	2.0E-11	2.0E-11	—	—	—	—	—	—	—	1.6E-06	3	8.9E-07	1	0.00	0	1.6E-06	6	8.9E-07	2	0.00	0
206-44-0	fluoranthene	1.5E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	6.9E-02	3.4E-07	5.6E-07	0.00	1.5E-07	2.5E-07	0.00	1.4E-08	2.3E-08	0.00	5.8E-12	5.8E-12	—	—	—	—	—	—	—	5.0E-07	1	8.3E-07	1	0.00	0	5.0E-07	2	8.3E-07	2	0.00	0
	Benzo(a)Pyrene Equivalent*	2.2E-01	1.1E-05	1.8E-05	0.00	4.7E-06	7.8E-06	0.00	3.1E-07	5.1E-07	0.00	1.8E-10	1.8E-10	—	—	—	—	—	—	—	1.6E-05	27	2.6E-05	35	0.00	0	1.6E-05	56	2.6E-05	61	0.00	0
Semivolatile Organic Compounds																																
208-96-8	Acenaphthylene	1.5E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
84-74-2	Di-N-Butyl Phthalate	3.1E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	1.8E-01	1.4E-09	2.6E-09	—	4.4E-10	8.1E-10	—	5.6E-08	1.0E-07	—	1.4E-13	1.4E-13	—	—	—	—	—	—	—	5.8E-08	0	1.1E-07	0	—	0	5.8E-08	0	1.1E-07	0	—	0
87-86-5	Pentachlorophenol	6.4E-01	1.2E-07	1.8E-08	0.00	9.5E-08	1.4E-08	0.00	—	—	—	—	—	—	—	—	—	—	—	—	2.2E-07	0	3.2E-08	0	0.00	0	2.2E-07	1	3.2E-08	0	0.00	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	4.7E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.02	—	0	—	0	0.02	1	—	0	—	0	0.02	1
83-32-9	acenaphthene	7.3E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	2.5E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	1.0E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	1.0E-01	—	1.9E-08	0.00	—	9.2E-09	0.00	—	—	—	—	—	—	2.0E-08	2.0E-08	0.00	—	5.9E-06	0.14	2.0E-08	0	6.0E-06	9	0.14	4	2.0E-08	0	6.0E-06	16	0.14	5
129-00-0	pyrene	2.2E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
78-93-3	2-butanone	9.9E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	4.1E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	6.6E-03	5.7E-10	1.0E-09	0.00	1.8E-10	3.3E-10	0.00	—	—	—	—	—	—	4.1E-09	1.5E-08	0.00	1.8E-07	6.9E-07	0.00	1.9E-07	0	7.0E-07	1	0.00	0	1.9E-07	1	7.0E-07	2	0.00	0
75-15-0	Carbon disulfide	2.0E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	ethylbenzene	2.1E-02	3.5E-10	3.5E-10	0.00	1.1E-10	1.1E-10	0.00	—	—	—	—	—	—	3.3E-09	3.3E-09	0.00	—	1.8E-07	0.00	3.7E-09	0	1.9E-07	0	0.00	0	3.7E-09	0	1.9E-07	1	0.00	0
108-88-3	toluene	3.9E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-09-2	Methylene chloride	2.7E-03	3.2E-11	6.0E-11	0.00	1.0E-11	1.9E-11	0.00	—	—	—	—	—	—	8.6E-11	1.8E-10	0.00	4.6E-09	9.8E-09	0.00	4.7E-09	0	1.0E-08	0	0.00	0	4.7E-09	0	1.0E-08	0	0.00	0
1330-20-7	xylenes (total)	5.4E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																																
1024-57-3	Heptachlor epoxide	5.4E-03	7.7E-08	4.6E-08	0.01	2.4E-08	1.5E-08	0.00	6.8E-06	4.1E-06	0.27	—	—	—	—	—	—	—	—	—	6.9E-06	13	4.2E-06	7	0.28	8	6.9E-06	27	4.2E-06	11	0.28	10
72-55-9	p,p'-DDE	3.1E-02	1.7E-08	1.7E-08	0.00	2.6E-09	2.6E-09	0.00	6.9E-07	6.9E-07	0.02	—	—	—	—	—	—	—	—	—	7.1E-07	1	7.1E-07	1	0.02	1	7.1E-07	3	7.1E-07	2	0.02	1
50-29-3	p,p'-DDT	1.5E-01	7.8E-08	7.8E-08	0.00	1.2E-08	1.2E-08	0.00	2.7E-06	2.7E-06	0.07	—	—	—	—	—	—	—	—	—	2.8E-06	5	2.8E-06	4	0.08	2	2.8E-06	11	2.8E-06	7	0.08	3
	Totals by Pathway		2.E-05	3.E-05	1.85	6.E-06	8.E-06	0.76	2.E-05	2.E-05	0.70	2.E-07	1.E-08	0.01	3.E-08	4.E-08	0.00	2.E-07	7.E-06	0.16	5.E-05		6.E-05		3		3.E-05		4.E-05		3	
	% of Totals		48	48	53	11	13	22	40	29	20	0	0	0	0	0	0	0	11	5												
	Totals by Pathway **(Excluding Background)**		1.E-05	2.E-05	1	4.E-06	7.E-06	1	1.E-05	8.E-06	1	2.E-07	7.E-09	0	3.E-08	4.E-08	0	2.E-07	7.E-06	0												
	% of Totals **(Excluding background)**		39	42	47	17	18	26	42	22	21	1	0	0	0	0	0	1	18	6												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-5: IR Site 13 - Residential HHRA Summary by Pathway (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - Excluding Background					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	7.2E+03	—	—	0.10	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.11	3	—	0	—	0	0.00	0
7440-36-0	antimony	9.9E-01	—	—	0.04	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.04	1
7440-38-2	**arsenic**	3.9E+00	9.2E-06	9.2E-06	0.18	8.7E-07	8.7E-07	0.02	6.4E-06	6.4E-06	0.07	5.1E-09	3.9E-09	0.00	—	—	—	—	—	—	1.6E-05	21	1.6E-05	17	0.27	8	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	6.6E+01	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7440-41-7	beryllium	3.2E-01	—	—	0.00	—	—	0.01	—	—	—	2.3E-10	2.3E-10	0.00	—	—	—	—	—	—	2.3E-10	0	2.3E-10	0	0.01	0	2.3E-10	0	2.3E-10	0	0.01	0
7440-43-9	cadmium	5.3E-01	—	—	0.01	—	—	0.00	—	—	0.03	6.8E-10	6.9E-10	0.00	—	—	—	—	—	—	6.8E-10	0	6.9E-10	0	0.04	1	6.8E-10	0	6.9E-10	0	0.04	2
7440-47-3	chromium	3.5E+01	—	—	0.16	—	—	0.37	—	—	—	1.3E-07	—	—	—	—	—	—	—	—	1.3E-07	0	—	0	0.53	16	1.3E-07	0	—	0	0.53	19
7440-48-4	cobalt	5.4E+00	—	—	0.26	—	—	0.01	—	—	—	1.5E-08	—	0.00	—	—	—	—	—	—	1.5E-08	0	—	0	0.27	8	1.5E-08	0	—	0	0.27	9
7440-50-8	copper	1.9E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7439-89-6	iron	1.3E+04	—	—	0.25	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.26	8	—	0	—	0	0.26	9
7439-92-1	lead	9.1E+01	—	—	—	—	—	—	—	—	—	—	3.3E-10	—	—	—	—	—	—	—	—	0	3.3E-10	0	—	0	—	0	3.3E-10	0	—	0
7439-96-5	**manganese**	1.7E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.00	0
7439-97-6	mercury	7.6E-02	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7439-98-7	**molybdenum**	2.8E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	nickel	3.1E+01	—	—	0.02	—	—	0.02	—	—	0.01	2.5E-09	2.5E-09	0.00	—	—	—	—	—	—	2.5E-09	0	2.5E-09	0	0.05	2	2.5E-09	0	2.5E-09	0	0.05	2
7782-49-2	**Selenium**	5.7E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-22-4	**silver**	1.9E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	2.0E-01	—	—	0.04	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.05	1	—	0	—	0	0.00	0
7440-62-2	vanadium	5.0E+01	—	—	0.10	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.22	7	—	0	—	0	0.22	8
7440-66-6	zinc	1.5E+02	—	—	0.01	—	—	0.00	—	—	0.02	—	—	—	—	—	—	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.02	1
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	2.2E-01	1.1E-06	1.8E-06	0.00	4.7E-07	7.8E-07	0.00	3.1E-08	5.1E-08	0.00	1.8E-11	1.8E-11	—	—	—	—	—	—	—	1.6E-06	2	2.6E-06	3	0.00	0	1.6E-06	3	2.6E-06	3	0.00	0
50-32-8	benzo(a)pyrene-M	1.7E-01	8.5E-06	1.4E-05	0.00	3.8E-06	6.2E-06	0.00	2.5E-07	4.1E-07	0.00	1.5E-10	1.5E-10	—	—	—	—	—	—	—	1.3E-05	16	2.1E-05	21	0.00	0	1.3E-05	20	2.1E-05	25	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.1E-01	5.2E-07	8.6E-07	0.00	2.3E-07	3.8E-07	0.00	1.5E-08	2.5E-08	0.00	9.0E-12	9.0E-12	—	—	—	—	—	—	—	7.7E-07	1	1.3E-06	1	0.00	0	7.7E-07	1	1.3E-06	2	0.00	0
207-08-9	benzo(k)fluoranthene-M	8.0E-02	3.9E-08	6.4E-07	0.00	1.7E-08	2.9E-07	0.00	1.1E-09	1.9E-08	0.00	6.7E-12	6.7E-12	—	—	—	—	—	—	—	5.8E-08	0	9.5E-07	1	0.00	0	5.8E-08	0	9.5E-07	1	0.00	0
218-01-9	chrysene-M	3.4E-01	1.6E-08	2.7E-07	0.00	7.3E-09	1.2E-07	0.00	4.8E-10	7.9E-09	0.00	2.8E-12	2.8E-12	—	—	—	—	—	—	—	2.4E-08	0	4.0E-07	0	0.00	0	2.4E-08	0	4.0E-07	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	3.9E-02	1.9E-06	1.1E-06	0.00	8.4E-07	4.7E-07	0.00	5.6E-08	3.1E-08	0.00	3.6E-11	3.6E-11	—	—	—	—	—	—	—	2.8E-06	4	1.6E-06	2	0.00	0	2.8E-06	5	1.6E-06	2	0.00	0
206-44-0	fluoranthene	2.1E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	7.9E-02	3.9E-07	6.4E-07	0.00	1.7E-07	2.8E-07	0.00	1.6E-08	2.7E-08	0.00	6.7E-12	6.7E-12	—	—	—	—	—	—	—	5.8E-07	1	9.5E-07	1	0.00	0	5.8E-07	1	9.5E-07	1	0.00	0
	Benzo(a)Pyrene Equivalent*	2.7E-01	1.3E-05	2.2E-05	0.00	5.8E-06	9.6E-06	0.00	3.9E-07	6.3E-07	0.00	2.3E-10	2.3E-10	—	—	—	—	—	—	—	1.9E-05	23	3.2E-05	29	0.00	0	1.9E-05	30	3.2E-05	35	0.00	0
Semivolatile Organic Compounds																																
208-96-8	Acenaphthaylene	2.5E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	phenanthrene	4.2E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-74-8	carbazole	5.9E+00	1.8E-07	—	0.00	—	—	—	3.1E-05	—	0.29	—	—	—	—	—	—	—	—	—	3.2E-05	40	—	0	0.30	9	3.2E-05	51	—	0	0.30	10
132-64-9	Dibenzofuran	5.4E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
105-67-9	2,4-Dimethylphenol	1.2E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
117-81-7	bis(2-ethylhexyl)phthalate	3.0E-01	6.5E-09	1.4E-09	0.00	2.0E-09	4.4E-10	0.00	1.6E-07	3.4E-08	0.00	2.1E-13	2.1E-13	—	—	—	—	—	—	—	1.7E-07	0	3.6E-08	0	0.00	0	1.7E-07	0	3.6E-08	0	0.00	0
84-74-2	Di-N-Butyl Phthalate	3.1E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	9.5E-02	7.3E-10	1.3E-09	—	2.3E-10	4.2E-10	—	2.9E-08	5.4E-08	—	7.5E-14	7.5E-14	—	—	—	—	—	—	—	3.0E-08	0	5.5E-08	0	—	0	3.0E-08	0	5.5E-08	0	—	0
87-86-5	Pentachlorophenol	6.1E-01	1.1E-07	1.7E-08	0.00	9.0E-08	1.4E-08	0.00	—	—	—	—	—	—	—	—	—	—	—	—	2.0E-07	0	3.1E-08	0	0.00	0	2.0E-07	0	3.1E-08	0	0.00	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	1.3E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.06	—	0	—	0	0.06	2	—	0	—	0	0.06	2
108-10-1	4-Methyl-2-pentanone	4.1E-02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
83-32-9	acenaphthene	3.5E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	2.5E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	2.5E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	4.9E-01	—	9.3E-08	0.00	—	4.4E-08	0.00	—	—	—	—	—	—	5.86E-08	5.86E-08	0.00	—	2.8E-05	0.65	5.9E-08	0	2.9E-05	29	0.65	20	5.9E-08	0	2.9E-05	35	0.65	23
129-00-0	pyrene	2.9E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
78-93-3	2-butanone	9.5E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	4.4E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	1.4E-01	1.2E-08	2.2E-08	0.00	3.9E-09	7.0E-09	0.00	—	—	—	—	—	—	3.90E-08	1.45E-07	0.00	4.0E-06	1.5E-05	0.04	4.0E-06	5	1.5E-05	15	0.04	1	4.0E-06	6	1.5E-05	18	0.04	1
75-15-0	Carbon disulfide	2.2E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-90-7	Chlorobenzene	2.0E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	ethylbenzene	4.9E-01	8.5E-09	8.5E-09	0.00	2.7E-09	2.7E-09	0.00	—	—	—	—	—	—	1.59E-08	1.59E-08	0.00	—	4.4E-06	0.00	2.7E-08	0	4.4E-06	5	0.00	0	2.7E-08	0	4.4E-06	5	0.00	0
108-88-3	toluene	3.2E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.01	—	0	—	0	0.01	0	—	0	—	0	0.01	0
75-09-2	Methylene chloride	4.1E-03	4.8E-11	8.9E-11	0.00	1.5E-11	2.8E-11	0.00	—	—	—	—	—	—	8.05E-09	1.71E-08	0.00	7.7E-09	1.6E-08	0.00	1.6E-08	0	3.4E-08	0	0.00	0	1.6E-08	0	3.4E-08	0	0.00	0
1330-20-7	xylenes (total)	2.5E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																																
1024-57-3	Heptachlor epoxide	5.4E-03	7.7E-08	4.6E-08	0.01	2.4E-08	1.5E-08	0.00	6.8E-06	4.1E-06	0.27	—	—	—	—	—	—	—	—	—	6.9E-06	9	4.2E-06	4	0.28	8	6.9E-06	11	4.2E-06	5	0.28	10
72-55-9	p,p'-DDE	5.8E-03	3.1E-09	3.1E-09	0.00	4.9E-10	4.9E-10	0.00	1.3E-07	1.3E-07	0.00	—	—	—	—	—	—	—	—	—	1.3E-07	0	1.3E-07	0	0.00	0	1.3E-07	0	1.3E-07	0	0.00	0
50-29-3	p,p'-DDT	1.1E-02	5.9E-09	5.9E-09	0.00	9.3E-10	9.3E-10	0.00	2.0E-07	2.0E-07	0.01	—	—	—	—	—	—	—	—	—	2.1E-07	0	2.1E-07	0	0.01	0	2.1E-07	0	2.1E-07	0	0.01	0
	Totals by Pathway		2.E-05	3.E-05	1	7.E-06	9.E-06	1	5.E-05	1.E-05	1	1.E-07	8.E-09	0	1.E-07	2.E-07	0	4.E-06	5.E-05	1	8.E-05		1.E-04		3		6.E-05		8.E-05		3	
	% of Totals		28	29	38	8	10	17	58	12	22	0	0	0	0	0	0	5	49	23												
	Totals by Pathway **(Excluding Background)**		1.E-05	2.E-05	1	6.E-06	9.E-06	1	4.E-05	5.E-06	1	1.E-07	4.E-09	0	1.E-07	2.E-07	0	4.E-06	5.E-05	1												
	% of Totals **(Excluding background)**		21	24	32	9	11	19	63	6	23	0	0	0	0	0	0	6	59	27												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-6: IR Site 13 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																										
7429-90-5	**Aluminum, dissolved**	5.2E-03	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	7.6E-04	—	—	0.13	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.13	1	—	0	—	0	0.00	0
7440-38-2	Arsenic, dissolved	4.9E-02	1.1E-03	1.1E-03	12.00	—	—	—	3.1E-06	2.9E-06	0.03	—	—	—	1.1E-03	85	1.1E-03	75	12.03	60	1.1E-03	85	1.1E-03	75	12.03	61
7440-39-3	**Barium, dissolved**	5.3E-02	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.00	0
7440-41-7	**Beryllium, dissolved**	2.6E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-43-9	Cadmium, dissolved	2.4E-03	—	—	0.36	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.36	2	—	0	—	0	0.36	2
7440-70-2	Calciuim, dissolved	6.4E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
7440-47-3	**Chromium, dissolved**	1.6E-03	—	—	0.04	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.04	0	—	0	—	0	0.00	0
7440-48-4	Cobalt, dissolved	1.2E-03	—	—	0.35	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.35	2	—	0	—	0	0.35	2
7440-50-8	Copper, dissolved	2.6E-03	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7439-89-6	Iron, dissolved	1.2E-01	—	—	0.01	—	—	—	—	—	0.01	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	0
7439-92-1	**Lead, dissolved**	1.5E-03	—	1.7E-07	—	—	—	—	—	2.8E-11	—	—	—	—	—	0	1.7E-07	0	—	0	—	0	0.0E+00	0	—	0
7439-95-4	Magnesium, dissolved	2.9E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
7439-96-5	Manganese, dissolved	1.3E+00	—	—	3.70	—	—	—	—	—	0.05	—	—	—	—	0	—	0	3.75	19	—	0	—	0	3.75	19
7439-98-7	Molybdenum, dissolved	1.1E-02	—	—	0.13	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.13	1	—	0	—	0	0.13	1
7440-02-0	Nickel, dissolved	4.4E-03	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7440-09-7	Potassium, dissolved	1.0E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
7782-49-2	**Selenium, dissolved**	3.6E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-22-4	Silver, dissolved	3.2E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-23-5	Sodium, dissolved	1.1E+02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
7440-62-2	**Vanadium, dissolved**	1.9E-02	—	—	0.25	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.25	1	—	0	—	0	0.00	0
7440-66-6	**Zinc, dissolved**	1.0E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																										
91-20-3	Naphthalene	3.3E-02	—	—	0.12	—	—	—	—	—	0.08	—	1.0E-06	0.0	—	0	1.0E-06	0	0.22	1	—	0	1.0E-06	0	0.22	1
Semivolatile Organic Compounds																										
123-91-1	1,4-Dioxane (P-Dioxane)	1.1E-03	1.6E-07	5.0E-07	—	—	—	—	5.7E-10	1.4E-09	—	—	—	—	1.6E-07	0	5.0E-07	0	—	0	1.6E-07	0	5.0E-07	0	—	0
Volatile Organic Compounds																										
75-34-3	1,1-Dichloroethane	2.8E-04	9.0E-09	1.9E-08	0.00	2.4E-09	2.4E-09	—	1.7E-09	1.5E-09	0.00	—	—	—	1.3E-08	0	2.3E-08	0	0.00	0	1.3E-08	0	2.3E-08	0	0.00	0
87-61-6	1,2,3-Trichlorobenzene	5.2E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
95-63-6	1,2,4-Trimethylbenzene	2.1E-03	—	—	0.02	—	—	0.01	—	—	0.03	—	—	—	—	0	—	0	0.06	0	—	0	—	0	0.06	0
95-50-1	1,2-Dichlorobenzene	3.2E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
107-06-2	1,2-Dichloroethane	5.3E-04	3.0E-07	3.0E-07	0.00	7.0E-08	5.0E-08	0.00	3.2E-08	1.5E-08	0.00	—	—	—	4.0E-07	0	3.7E-07	0	0.00	0	4.0E-07	0	3.7E-07	0	0.00	0
541-73-1	1,3-Dichlorobenzene	2.0E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
106-46-7	1,4-Dichlorobenzene	4.5E-04	1.0E-08	3.0E-08	0.00	2.5E-08	2.5E-08	0.00	—	—	—	—	—	—	3.5E-08	0	5.5E-08	0	0.00	0	3.5E-08	0	5.5E-08	0	0.00	0
78-93-3	2-Butanone	2.7E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.08	0	—	0	—	0	0.08	0
108-10-1	4-Methyl-2-pentanone	4.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	Acetone	7.8E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	9.4E-02	3.0E-05	1.4E-04	2.30	—	—	0.08	1.1E-04	1.6E-04	—	8.4E-06	3.1E-05	0.08	1.5E-04	12	3.3E-04	23	2.46	12	1.5E-04	12	3.3E-04	23	2.46	12
74-83-9	Bromomethane	6.3E-04	—	—	0.04	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.04	0	—	0	—	0	0.04	0
75-15-0	Carbon disulfide	2.5E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-90-7	Chlorobenzene	2.8E-04	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-66-3	Chloroform	6.2E-04	1.0E-07	3.0E-07	0.00	7.0E-08	1.3E-08	0.00	7.1E-09	—	—	—	—	—	1.8E-07	0	3.1E-07	0	0.00	0	1.8E-07	0	3.1E-07	0	0.00	0
74-87-3	Chloromethane	3.0E-04	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	2.2E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	Ethylbenzene	1.4E-01	8.0E-06	1.8E-05	0.11	1.3E-06	—	0.00	1.1E-07	1.1E-07	0.00	4.3E-06	4.3E-06	0.00	1.4E-05	1	2.2E-05	2	0.12	1	1.4E-05	1	2.2E-05	2	0.12	1
108-20-3	Isopropyl Ether	8.0E-04	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-82-8	Isopropylbenzene	4.4E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	2.7E-04	3.0E-09	8.0E-09	—	3.7E-10	3.7E-10	0.00	1.5E-10	1.4E-10	—	—	—	—	3.5E-09	0	8.5E-09	0	0.00	0	3.5E-09	0	8.5E-09	0	0.00	0
75-09-2	Methylene chloride	6.3E-04	3.0E-08	1.3E-07	0.00	1.3E-09	3.6E-09	0.00	2.4E-09	4.0E-09	0.00	—	—	—	3.4E-08	0	1.4E-07	0	0.00	0	3.4E-08	0	1.4E-07	0	0.00	0
104-51-8	N-Butylbenzene	3.8E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
103-65-1	N-Propylbenzene	3.2E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
95-47-6	o-Xylene	4.6E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
99-87-6	p-Isopropyltoluene	3.1E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
135-98-8	Sec-Butylbenzene	3.4E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
98-06-6	T-Butylbenzene	3.8E-04	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
75-65-0	Tert-Butyl Alcohol	3.7E-03	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
108-88-3	Toluene	5.4E-02	—	—	0.05	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.05	0	—	0	—	0	0.05	0
156-60-5	trans-1,2-Dichloroethene	2.6E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-01-6	Trichloroethene	3.5E-04	1.0E-08	3.0E-08	—	3.7E-09	—	—	3.4E-09	3.0E-09	—	—	—	—	1.7E-08	0	3.3E-08	0	—	0	1.7E-08	0	3.3E-08	0	—	0
75-01-4	Vinyl chloride (M)	6.4E-04	3.0E-05	1.1E-05	0.01	5.0E-08	8.0E-07	0.00	—	—	—	—	—	—	3.0E-05	2	1.2E-05	1	0.01	0	3.0E-05	2	1.2E-05	1	0.01	0
7816-60-0	Xylenes, m & p	1.6E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Totals by Pathway		1.E-03	1.E-03	20	2.E-06	9.E-07	0.1	1.E-04	2.E-04	0.2	1.E-05	4.E-05	0.1	**1.E-03**		**1.E-03**		**20**							
	% of Totals		90	86	98	0	0	0	9	11	1	1	2	1												
	Totals by Pathway **(Excluding Background)**		1.E-03	1.E-03	19	2.E-06	9.E-07	0.1	1.E-04	2.E-04	0.2	1.E-05	4.E-05	0.1							**1.E-03**		**1.E-03**		**20**	
	% of Totals **(Excluding Background)**		90	86	98	0	0	0	9	11	1	1	2	1												

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Table 8-7: IR Site 19 - Residential HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	5.81E+03	—	—	0.08	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.09	3	—	0	—	0	0.00	0
7440-38-2	**arsenic**	3.16E+00	7.4E-06	7.4E-06	0.15	7.0E-07	7.0E-07	0.01	5.2E-06	5.2E-06	0.05	4.1E-09	3.2E-09	0.00	—	—	—	—	—	—	1.3E-05	45	1.3E-05	34	0.22	7	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	**barium**	5.75E+01	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-41-7	**beryllium**	2.05E-01	—	—	0.00	—	—	0.01	—	—	—	1.5E-10	1.5E-10	0.00	—	—	—	—	—	—	1.5E-10	0	1.5E-10	0	0.01	0	0.0E+00	0	0.0E+00	0	0.00	0
7440-43-9	cadmium	1.37E+00	—	—	0.02	—	—	0.00	—	—	0.09	1.7E-09	1.8E-09	0.00	—	—	—	—	—	—	1.7E-09	0	1.8E-09	0	0.11	3	1.7E-09	0	1.8E-09	0	0.11	7
7440-47-3	**chromium**	2.72E+01	—	—	0.13	—	—	0.29	—	—	—	9.9E-08	—	—	—	—	—	—	—	—	9.9E-08	0	—	0	0.42	13	0.0E+00	0	—	0	0.00	0
7440-48-4	**cobalt**	4.60E+00	—	—	0.22	—	—	0.01	—	—	—	1.3E-08	—	0.00	—	—	—	—	—	—	1.3E-08	0	—	0	0.22	7	0.0E+00	0	—	0	0.00	0
7440-50-8	copper	7.49E+01	—	—	0.03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.03	2
7439-89-6	iron	1.76E+04	—	—	0.36	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.37	11	—	0	—	0	0.37	25
7439-92-1	**lead**	6.28E+00	—	—	—	—	—	—	—	—	—	—	2.3E-11	—	—	—	—	—	—	—	—	0	2.3E-11	0	—	0	—	0	0.0E+00	0	—	0
7439-96-5	manganese	4.23E+02	—	—	0.04	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.06	2	—	0	—	0	0.06	4
7439-97-6	**mercury**	4.24E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-02-0	**nickel**	2.49E+01	—	—	0.02	—	—	0.01	—	—	0.01	2.0E-09	2.0E-09	0.00	—	—	—	—	—	—	2.0E-09	0	2.0E-09	0	0.04	1	0.0E+00	0	0.0E+00	0	0.00	0
7440-22-4	**silver**	7.00E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	3.30E+00	—	—	0.72	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.74	22	—	0	—	0	0.00	0
7440-62-2	**vanadium**	2.39E+01	—	—	0.05	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.10	3	—	0	—	0	0.00	0
7440-66-6	zinc	7.02E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	4.96E-02	2.4E-07	4.0E-07	0.00	1.1E-07	1.8E-07	0.00	7.1E-09	1.2E-08	0.00	4.2E-12	4.2E-12	—	—	—	—	—	—	—	3.6E-07	1	5.9E-07	2	0.00	0	3.6E-07	2	5.9E-07	2	0.00	0
50-32-8	benzo(a)pyrene-M	1.77E-01	8.7E-06	1.4E-05	0.00	3.8E-06	6.3E-06	0.00	2.5E-07	4.2E-07	0.00	1.5E-10	1.5E-10	—	—	—	—	—	—	—	1.3E-05	44	2.1E-05	54	0.00	0	1.3E-05	81	2.1E-05	82	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.28E-01	6.3E-07	1.0E-06	0.00	2.8E-07	4.6E-07	0.00	1.8E-08	3.0E-08	0.00	1.1E-11	1.1E-11	—	—	—	—	—	—	—	9.2E-07	3	1.5E-06	4	0.00	0	9.2E-07	6	1.5E-06	6	0.00	0
207-08-9	benzo(k)fluoranthene-M	9.75E-02	4.8E-08	7.8E-07	0.00	2.1E-08	3.5E-07	0.00	1.4E-09	2.3E-08	0.00	8.2E-12	8.2E-12	—	—	—	—	—	—	—	7.0E-08	0	1.2E-06	3	0.00	0	7.0E-08	0	1.2E-06	4	0.00	0
218-01-9	chrysene-M	5.36E-02	2.6E-09	4.3E-08	0.00	1.2E-09	1.9E-08	0.00	7.7E-11	1.3E-09	0.00	4.5E-13	4.5E-13	—	—	—	—	—	—	—	3.9E-09	0	6.3E-08	0	0.00	0	3.9E-09	0	6.3E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	6.94E-03	3.4E-07	1.9E-07	0.00	1.5E-07	8.5E-08	0.00	1.0E-08	5.6E-09	0.00	6.4E-12	6.4E-12	—	—	—	—	—	—	—	5.0E-07	2	2.8E-07	1	0.00	0	5.0E-07	3	2.8E-07	1	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	5.70E-02	2.8E-07	4.6E-07	0.00	1.2E-07	2.0E-07	0.00	—	—	0.00	4.8E-12	4.8E-12	—	—	—	—	—	—	—	4.0E-07	1	6.6E-07	2	0.00	0	4.0E-07	3	6.6E-07	3	0.00	0
208-96-8	Acenaphthylene	3.32E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	6.06E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
206-44-0	fluoranthene	2.44E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phenanthrene	7.90E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.30E-01	6.4E-06	1.0E-05	0.00	2.8E-06	4.6E-06	0.00	1.9E-07	3.1E-07	0.00	1.1E-10	1.1E-10	—	—	—	—	—	—	—	9.4E-06	51	1.5E-05	65	0.00	0	9.4E-06	95	1.5E-05	98	0.00	0
Semivolatile Organic Compounds																																
59-50-7	4-Chloro-3-methylphenol	1.50E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
117-81-7	bis(2-ethylhexyl)phthalate	8.90E-01	2.0E-08	4.2E-09	0.00	6.2E-09	1.3E-09	0.00	4.8E-07	1.0E-07	0.01	6.5E-13	6.5E-13	—	—	—	—	—	—	—	5.0E-07	2	1.1E-07	0	0.01	0	5.0E-07	3	1.1E-07	0	0.01	1
84-66-2	Diethyl Phthalate	6.43E+00	—	—	0.00	—	—	0.00	—	—	0.02	—	—	—	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.03	2
84-74-2	Di-N-Butyl Phthalate	7.30E+00	—	—	0.00	—	—	0.00	—	—	0.06	—	—	—	—	—	—	—	—	—	—	0	—	0	0.06	2	—	0	—	0	0.06	4
86-30-6	N-Nitrosodiphenylamine	8.17E-02	6.3E-10	1.2E-09	—	2.0E-10	3.6E-10	—	2.5E-08	4.6E-08	—	6.4E-14	6.4E-14	—	—	—	—	—	—	—	2.6E-08	0	4.8E-08	0	—	0	2.6E-08	0	4.8E-08	0	—	0
87-86-5	Pentachlorophenol	8.54E-01	1.6E-07	2.4E-08	0.00	1.3E-07	1.9E-08	0.00	—	—	—	1.2E-12	1.3E-12	—	—	—	—	—	—	—	2.9E-07	1	4.3E-08	0	0.00	0	2.9E-07	2	4.3E-08	0	0.00	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	1.39E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-57-8	2-Chlorophenol	1.50E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.01	0	—	0	—	0	0.01	0
83-32-9	acenaphthene	1.21E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	7.04E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	1.40E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	2.2E-07	0.00	—	0	2.2E-07	1	0.00	0	—	0	2.2E-07	1	0.00	0
91-20-3	naphthalene	3.78E-03	—	7.1E-10	0.00	—	3.4E-10	0.00	—	—	—	—	—	—	7.4E-10	7.4E-10	0.00	—	—	0.00	7.4E-10	0	1.8E-09	0	0.00	0	7.4E-10	0	1.8E-09	0	0.00	0
129-00-0	pyrene	2.55E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	2.06E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.71	—	0	—	0	0.71	21	—	0	—	0	0.71	49
108-88-3	toluene	1.41E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.03	—	0	—	0	0.03	1	—	0	—	0	0.03	2
75-09-2	Methylene chloride	4.73E-03	5.6E-11	1.0E-10	0.00	6.5E-11	1.2E-10	0.00	—	—	—	—	—	—	1.5E-10	3.2E-10	0.00	7.9E-09	1.7E-08	0.00	8.2E-09	0	1.7E-08	0	0.00	0	8.2E-09	0	1.7E-08	0	0.00	0
71-55-6	1,1,1-Trichloroethane	1.94E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.90E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	0.0E+00	0.0E+00	0.00	0.0E+00	0	0.0E+00	0	0.00	0	0.0E+00	0	0.0E+00	0	0.00	0
1330-20-7	xylenes (total)	1.90E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	0.0E+00	0.0E+00	0.05	0.0E+00	0	0.0E+00	0	0.05	1	0.0E+00	0	0.0E+00	0	0.05	3
	Totals by Pathway		2.E-05	2.E-05	2	5.E-06	8.E-06	0	6.E-06	6.E-06	0	1.E-07	7.E-09	0	9.E-10	1.E-09	0	8.E-09	2.E-07	1	**3.E-05**		**4.E-05**		**3**		**2.E-05**		**3.E-05**		**1**	
	% of Totals		61	63	55	18	21	13	20	15	8	0	0	0	0	0	0	0	1	24												
	Totals by Pathway **(Excluding Background)**		1.E-05	2.E-05	0	5.E-06	8.E-06	0	8.E-07	6.E-07	0	2.E-09	2.E-09	0	9.E-10	1.E-09	0	8.E-09	2.E-07	1												
	% of Totals **(Excluding background)**		66	67	31	29	30	1	5	2	13	0	0	1	0	0	0	0	1	54												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-8: IR Site 19 - Residential HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Due to Soil			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical	(mg/kg)	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	5.78E+03	—	—	0.08	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.09	3	—	0	—	0	0.00	0
7440-38-2	**arsenic**	2.85E+00	6.7E-06	6.7E-06	0.13	6.3E-07	6.3E-07	0.01	4.6E-06	4.6E-06	0.05	3.7E-09	2.8E-09	0.00	—	—	—	—	—	—	1.2E-05	49	1.2E-05	41	0.19	6	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	1.02E+02	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7440-41-7	**beryllium**	2.03E-01	—	—	0.00	—	—	0.01	—	—	—	1.5E-10	1.5E-10	0.00	—	—	—	—	—	—	1.5E-10	0	1.5E-10	0	0.01	0	0.0E+00	0	0.0E+00	0	0.00	0
7440-43-9	cadmium	6.99E-01	—	—	0.01	—	—	0.00	—	—	0.04	8.9E-10	9.1E-10	0.00	—	—	—	—	—	—	8.9E-10	0	9.1E-10	0	0.06	2	8.9E-10	0	9.1E-10	0	0.06	4
7440-47-3	**chromium**	3.33E+01	—	—	0.16	—	—	0.35	—	—	—	1.2E-07	—	—	—	—	—	—	—	—	1.2E-07	0	—	0	0.51	16	0.0E+00	0	—	0	0.00	0
7440-48-4	**cobalt**	4.78E+00	—	—	0.23	—	—	0.01	—	—	—	1.3E-08	—	0.00	—	—	—	—	—	—	1.3E-08	0	—	0	0.23	7	0.0E+00	0	—	0	0.00	0
7440-50-8	copper	3.99E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7439-89-6	iron	1.51E+04	—	—	0.31	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.32	10	—	0	—	0	0.32	25
7439-92-1	lead	3.90E+01	—	—	—	—	—	—	—	—	—	—	1.4E-10	—	—	—	—	—	—	—	—	0	1.4E-10	0	—	0	—	0	0.0E+00	0	—	0
7439-96-5	**manganese**	3.26E+02	—	—	0.03	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.00	0
7439-97-6	**mercury**	1.00E-01	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-98-7	**molybdenum**	1.60E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	**nickel**	3.02E+01	—	—	0.02	—	—	0.02	—	—	0.01	2.4E-09	2.4E-09	0.00	—	—	—	—	—	—	2.4E-09	0	2.4E-09	0	0.05	2	0.0E+00	0	0.0E+00	0	0.00	0
7440-22-4	**silver**	4.59E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	3.30E+00	—	—	0.72	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.74	23	—	0	—	0	0.00	0
7440-62-2	**vanadium**	2.28E+01	—	—	0.05	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.10	3	—	0	—	0	0.00	0
7440-66-6	zinc	6.49E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	7.64E-02	3.7E-07	6.1E-07	0.00	1.7E-07	2.7E-07	0.00	1.1E-08	1.8E-08	0.00	6.4E-12	6.4E-12	—	—	—	—	—	—	—	5.5E-07	2	9.1E-07	3	0.00	0	5.5E-07	4	9.1E-07	5	0.00	0
50-32-8	benzo(a)pyrene-M	1.09E-01	5.3E-06	8.8E-06	0.00	2.4E-06	3.9E-06	0.00	1.6E-07	2.6E-07	0.00	9.2E-11	9.2E-11	—	—	—	—	—	—	—	7.9E-06	32	1.3E-05	44	0.00	0	7.9E-06	64	1.3E-05	73	0.00	0
205-99-2	benzo(b)fluoranthene-M	9.60E-02	4.7E-07	7.7E-07	0.00	2.1E-07	3.4E-07	0.00	1.4E-08	2.3E-08	0.00	8.1E-12	8.1E-12	—	—	—	—	—	—	—	6.9E-07	3	1.1E-06	4	0.00	0	6.9E-07	6	1.1E-06	6	0.00	0
207-08-9	benzo(k)fluoranthene-M	5.65E-02	2.8E-08	4.5E-07	0.00	1.2E-08	2.0E-07	0.00	8.1E-10	1.3E-08	0.00	4.8E-12	4.8E-12	—	—	—	—	—	—	—	4.1E-08	0	6.7E-07	2	0.00	0	4.1E-08	0	6.7E-07	4	0.00	0
218-01-9	chrysene-M	9.01E-02	4.4E-09	7.3E-08	0.00	2.0E-09	3.2E-08	0.00	1.3E-10	2.1E-09	0.00	7.6E-13	7.6E-13	—	—	—	—	—	—	—	6.5E-09	0	1.1E-07	0	0.00	0	6.5E-09	0	1.1E-07	1	0.00	0
53-70-3	dibenz(a,h)anthracene-M	7.16E-03	3.5E-07	2.0E-07	0.00	1.6E-07	8.7E-08	0.00	1.0E-08	5.8E-09	0.00	6.6E-12	6.6E-12	—	—	—	—	—	—	—	5.2E-07	2	2.9E-07	1	0.00	0	5.2E-07	4	2.9E-07	2	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	8.70E-02	4.3E-07	7.0E-07	0.00	1.9E-07	3.1E-07	0.00	—	—	0.00	7.3E-12	7.3E-12	—	—	—	—	—	—	—	6.1E-07	3	1.0E-06	3	0.00	0	6.1E-07	5	1.0E-06	6	0.00	0
208-96-8	Acenaphthylene	2.58E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	1.04E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
206-44-0	fluoranthene	1.17E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phenanthrene	5.56E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.54E-01	7.5E-06	1.2E-05	0.00	3.3E-06	5.5E-06	0.00	2.2E-07	3.6E-07	0.00	1.3E-10	1.3E-10	—	—	—	—	—	—	—	1.1E-05	42	1.8E-05	58	0.00	0	1.1E-05	83	1.8E-05	97	0.00	0
Semivolatile Organic Compounds																																
59-50-7	4Chloro-3-methylphenol	1.50E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
117-81-7	bis(2-ethylhexyl)phthalate	2.01E-01	4.4E-09	9.4E-10	0.00	1.4E-09	3.0E-10	0.00	1.1E-07	2.3E-08	0.00	1.5E-13	1.5E-13	—	—	—	—	—	—	—	1.1E-07	0	2.4E-08	0	0.00	0	1.1E-07	1	2.4E-08	0	0.00	0
84-66-2	Diethyl Phthalate	6.28E+00	—	—	0.00	—	—	0.00	—	—	0.02	—	—	—	—	—	—	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.02	2
84-74-2	Di-N-Butyl Phthalate	5.31E+00	—	—	0.00	—	—	0.00	—	—	0.04	—	—	—	—	—	—	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.04	4
86-30-6	N-Nitrosodiphenylamine	1.13E-01	8.7E-10	1.6E-09	—	2.7E-10	5.0E-10	—	3.5E-08	6.4E-08	—	8.9E-14	8.9E-14	—	—	—	—	—	—	—	3.6E-08	0	6.6E-08	0	—	0	3.6E-08	0	6.6E-08	0	—	0
87-86-5	Pentachlorophenol	6.50E-01	1.2E-07	1.8E-08	0.00	9.6E-08	1.4E-08	0.00	—	—	—	9.0E-13	1.0E-12	—	—	—	—	—	—	—	2.2E-07	1	3.3E-08	0	0.00	0	2.2E-07	2	3.3E-08	0	0.00	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	1.45E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-57-8	2-Chlorophenol	1.50E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.71	—	0	—	0	0.72	22	—	0	—	0	0.72	57
83-32-9	acenaphthene	1.14E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	4.99E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	1.44E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	4.74E-03	—	8.9E-10	0.00	—	4.2E-10	0.00	—	—	—	—	—	—	9.3E-10	9.3E-10	0.00	—	2.7E-07	0.01	9.3E-10	0	2.7E-07	1	0.01	0	9.3E-10	0	2.7E-07	2	0.01	1
129-00-0	pyrene	1.65E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
78-93-3	2-butanone	1.06E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	1.63E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
127-18-4	Tetrachloroethene	3.93E-03	3.3E-09	3.3E-09	0.00	3.9E-09	3.9E-09	0.00	—	—	—	—	—	—	2.4E-09	2.4E-09	0.00	8.3E-08	8.3E-08	0.00	9.2E-08	0	9.2E-08	0	0.00	0	9.2E-08	1	9.2E-08	1	0.00	0
108-88-3	toluene	7.41E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-09-2	Methylene chloride	6.03E-03	7.1E-11	1.3E-10	0.00	8.2E-11	1.5E-10	0.00	—	—	—	—	—	—	1.9E-10	4.0E-10	0.00	1.0E-08	2.2E-08	0.00	1.0E-08	0	2.2E-08	0	0.00	0	1.0E-08	0	2.2E-08	0	0.00	0
71-55-6	1,1,1-Trichloroethane	4.13E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.90E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—	0	—	0	0.05	1	—	0	—	0	0.05	4
75-00-3	Chloroethane	3.00E-03	1.4E-11	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	8.9E-09	8.9E-09	0.00	8.9E-09	0	8.9E-09	0	0.00	0	8.9E-09	0	8.9E-09	0	0.00	0
79-01-6	Trichloroethene	4.00E-03	8.1E-11	8.1E-11	0.00	2.6E-11	2.6E-11	0.00	—	—	—	—	—	—	7.9E-10	7.9E-10	—	1.6E-06	2.9E-08	0.00	1.6E-06	6	2.9E-08	0	0.00	0	1.6E-06	13	2.9E-08	0	0.00	0
1330-20-7	xylenes (total)	1.33E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
		Totals by Pathway	1.E-05	2.E-05	2	4.E-06	6.E-06	0	5.E-06	5.E-06	0	1.E-07	7.E-09	0	4.E-09	5.E-09	0	2.E-06	4.E-07	1	**2.E-05**		**3.E-05**		**3**		**1.E-05**		**2.E-05**		**1**	
		% of Totals	57	62	55	16	20	15	20	17	6	1	0	0	0	0	0	7	1	24												
		Totals by Pathway **(Excluding Background)**	7.E-06	1.E-05	0	3.E-06	5.E-06	0	3.E-07	4.E-07	0	1.E-09	1.E-09	0	4.E-09	5.E-09	0	2.E-06	4.E-07	1												
		% of Totals **(Excluding background)**	58	66	28	26	29	1	3	2	10	0	0	0	0	0	0	14	2	61												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-9: IR Site 19 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																										
7429-90-5	**Aluminum, dissolved**	2.8E-01	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	9.6E-04	—	—	0.23	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.23	6	—	0	—	0	0.00	0
7440-38-2	**Arsenic, dissolved**	3.5E-03	8.0E-05	8.0E-05	1.00	—	—	—	3.7E-07	4.0E-07	0.01	—	—	—	8.0E-05	21	8.0E-05	22	1.01	27	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	**Barium, dissolved**	2.9E-02	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-41-7	**Beryllium, dissolved**	7.8E-04	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.00	0
7440-43-9	Cadmium, dissolved	8.8E-04	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	3	—	0	—	0	0.12	17
7440-70-2	Calciuim, dissolved	3.0E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	1.5E-03	—	—	0.04	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.00	0
7440-48-4	Cobalt, dissolved	1.1E-04	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.03	4
7440-50-8	**Copper, dissolved**	2.6E-03	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	1
7439-89-6	**Iron, dissolved**	8.1E-02	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-92-1	**Lead, dissolved**	2.2E-04	—	3.0E-08	0.00	—	—	—	—	1.3E-11	0.00	—	—	—	—	0	3.0E-08	0	0.00	0	—	0	—	0	0.00	0
7439-95-4	Magnesium, dissolved	4.5E+00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	3.8E-02	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	3	—	0	—	0	0.00	0
7439-97-6	Mercury, dissolved	9.6E-05	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.02	3
7439-98-7	Molybdenum, dissolved	5.0E-03	—	—	0.07	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.07	2	—	0	—	0	0.07	10
7440-02-0	Nickel, dissolved	2.0E-03	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7440-09-7	Potassium, dissolved	1.1E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	9.3E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-22-4	Silver, dissolved	9.8E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	2
7440-23-5	Sodium, dissolved	1.9E+02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	7.2E-04	—	—	0.90	—	—	—	—	—	0.01	—	—	—	—	0	—	0	0.91	25	—	0	—	0	0.00	0
7440-62-2	**Vanadium, dissolved**	3.8E-02	—	—	0.60	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.60	16	—	0	—	0	0.00	0
7440-66-6	Zinc, dissolved	4.7E-02	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	2
Polynuclear Aromatic Hydrocarbons																										
91-20-3	Naphthalene	1.9E-03	—	—	0.01	—	—	—	—	—	0.00	—	—		—	0	—	0	0.01	0	—	0	—	0	0.01	2
Semivolatile Organic Compounds																										
123-91-1	1,4-Dioxane (P-Dioxane)	3.5E-03	6.0E-07	1.4E-06	0.00	—	—	—	1.9E-09	4.0E-09	0.00	—	—	—	6.0E-07	0	1.4E-06	0	0.00	0	6.0E-07	0	1.4E-06	0	0.00	0
Volatile Organic Compounds																										
71-55-6	1,1,1-Trichloroethane	2.0E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-34-3	1,1-Dichloroethane	6.2E-03	5.0E-07	5.0E-07	0.00	5.0E-08	5.0E-08	0.00	3.7E-08	4.0E-08	0.00	—	—	—	5.9E-07	0	5.9E-07	0	0.00	0	5.9E-07	0	5.9E-07	0	0.00	0
75-35-4	1,1-Dichloroethene	3.5E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-82-1	1,2,4-Trichlorobenzene	2.4E-04	1.3E-08	1.3E-08	0.00	—	—	0.00	1.4E-08	1.4E-08	0.00	—	—	—	2.7E-08	0	2.7E-08	0	0.01	0	2.7E-08	0	2.7E-08	0	0.01	1
95-63-6	1,2,4-Trimethylbenzene	1.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	9.0E-05	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	1.6E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
106-43-4	4-Chlorotoluene	9.0E-05	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	Acetone	3.1E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	2.2E-04	1.7E-07	3.0E-07	0.00	9.0E-09	3.6E-08	0.00	2.4E-08	4.0E-08	0.00	—	—	—	2.0E-07	0	3.8E-07	0	0.01	0	2.0E-07	0	3.8E-07	0	0.01	1
75-15-0	Carbon disulfide	7.7E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-00-3	Chloroethane	5.0E-04	1.8E-08	—	0.00	—	—	0.00	1.1E-09	—	0.00	—	—	—	1.9E-08	0	—	0	0.00	0	1.9E-08	0	—	0	0.00	0
67-66-3	Chloroform	2.0E-04	9.0E-08	9.0E-08	0.00	2.5E-08	5.0E-09	0.00	—	—	0.00	—	—	—	1.2E-07	0	9.5E-08	0	0.00	0	1.2E-07	0	9.5E-08	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	3.1E-03	—	—	0.02	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.03	4
100-41-4	Ethylbenzene	1.1E-04	1.7E-08	1.7E-08	0.00	1.3E-09	0.0E+00	0.00	1.0E-08	1.0E-08	0.00	—	—	—	2.8E-08	0	2.7E-08	0	0.00	0	2.8E-08	0	2.7E-08	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	3.1E-04	8.0E-09	8.0E-09	0.00	3.8E-10	3.8E-10	0.00	1.7E-10	1.5E-10	0.00	—	—	—	8.6E-09	0	8.5E-09	0	0.00	0	8.6E-09	0	8.5E-09	0	0.00	0
104-51-8	N-Butylbenzene	2.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
103-65-1	N-Propylbenzene	1.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-47-6	o-Xylene	1.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
127-18-4	Tetrachloroethene	2.2E-02	1.7E-04	1.7E-04	0.13	6.0E-07	—	0.00	9.4E-05	1.0E-04	0.10	3.7E-06	3.7E-06	0.01	2.7E-04	71	2.7E-04	75	0.24	6	2.7E-04	90	2.7E-04	96	0.24	34
108-88-3	Toluene	4.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	1.9E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-01-6	Trichloroethene	2.8E-03	2.9E-07	2.9E-07	0.00	2.6E-08	—	0.00	3.7E-08	4.0E-08	0.00	1.0E-07	1.0E-07	0.11	4.6E-07	0	4.3E-07	0	0.11	3	4.6E-07	0	4.3E-07	0	0.11	16
75-01-4	Vinyl chloride	4.7E-04	2.9E-05	7.0E-06	0.01	3.0E-08	6.0E-07	0.00	—	—	0.00	—	—	—	2.9E-05	8	7.6E-06	2	0.01	0	2.9E-05	10	7.6E-06	3	0.01	2
7816-60-0	Xylenes, m & p	4.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Totals by Pathway		3.E-04	3.E-04	3	7.E-07	7.E-07	0.0	9.E-05	1.E-04	0.1	4.E-06	4.E-06	0.1	**4.E-04**		**4.E-04**		**4**							
	% of Totals		74	71	93	0	0	0	25	28	3	1	1	3												
	Totals by Pathway **(Excluding Background)**		2.E-04	2.E-04	0.5	7.E-07	7.E-07	0.0	9.E-05	1.E-04	0.1	4.E-06	4.E-06	0.1							**3.E-04**		**3.E-04**		**1**	
	% of Totals **(Excluding Background)**		67	63	66	0	0	1	31	35	16	1	1	17												

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Table 8-10: IR Site 22 - Residential HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte **- Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	1.1E+04	—	—	0.16	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.17	4	—	0	—	0	0.00	0
7440-38-2	**arsenic**	4.6E+00	1.1E-05	1.1E-05	0.22	1.0E-06	—	0.02	7.6E-06	7.6E-06	0.08	6.0E-09	4.6E-09	0.00	—	—	—	—	—	—	2.0E-05	68	1.8E-05	20	0.32	8	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	1.3E+02	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7440-41-7	beryllium	5.2E-01	—	—	0.00	—	—	0.02	—	—	—	3.8E-10	3.8E-10	0.00	—	—	—	—	—	—	3.8E-10	0	3.8E-10	0	0.02	1	3.8E-10	0	3.8E-10	0	0.02	1
7440-43-9	cadmium	8.0E-01	—	—	0.01	—	—	0.00	—	—	0.05	1.0E-09	1.0E-09	0.00	—	—	—	—	—	—	1.0E-09	0	1.0E-09	0	0.06	2	1.0E-09	0	1.0E-09	0	0.06	3
7440-47-3	**chromium**	3.5E+01	—	—	0.17	—	—	0.37	—	—	—	1.3E-07	—	—	—	—	—	—	—	—	1.3E-07	0	—	0	0.54	14	0.0E+00	0	—	0	0.00	0
7440-48-4	cobalt	9.0E+00	—	—	0.42	—	—	0.01	—	—	—	2.4E-08	—	0.00	—	—	—	—	—	—	2.4E-08	0	—	0	0.44	12	2.4E-08	0	—	0	0.44	22
7440-50-8	copper	4.2E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	1
7439-89-6	**iron**	1.4E+04	—	—	0.28	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.29	8	—	0	—	0	0.00	0
7439-92-1	lead	4.7E+03	—	—	—	—	—	—	—	—	—	—	1.7E-08	—	—	—	—	—	—	—	—	0	1.7E-08	0	—	0	—	0	1.7E-08	0	—	0
7439-96-5	**manganese**	2.3E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.00	0
7439-97-6	**mercury**	5.7E-02	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-98-7	**molybdenum**	1.3E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	**nickel**	3.0E+01	—	—	0.02	—	—	0.02	—	—	0.01	2.4E-09	2.4E-09	0.00	—	—	—	—	—	—	2.4E-09	0	2.4E-09	0	0.05	1	0.0E+00	0	0.0E+00	0	0.00	0
7782-49-2	**Selenium**	5.7E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-22-4	**silver**	3.7E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	9.0E-01	—	—	0.20	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.20	5	—	0	—	0	0.00	0
7440-62-2	**vanadium**	3.4E+01	—	—	0.07	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.15	4	—	0	—	0	0.00	0
7440-66-6	zinc	6.5E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	3.8E-02	1.9E-07	3.1E-07	0.00	8.2E-08	1.4E-07	0.00	5.4E-09	9.0E-09	0.00	3.2E-12	3.2E-12	—	—	—	—	—	—	—	2.7E-07	1	4.5E-07	0	0.00	0	2.7E-07	3	4.5E-07	1	0.00	0
50-32-8	benzo(a)pyrene-M	7.2E-02	3.5E-06	5.8E-06	0.00	1.6E-06	2.5E-06	0.00	1.0E-07	1.7E-07	0.00	6.0E-11	6.0E-11	—	—	—	—	—	—	—	5.2E-06	18	8.5E-06	9	0.00	0	5.2E-06	57	8.5E-06	11	0.00	0
205-99-2	benzo(b)fluoranthene-M	5.5E-02	2.7E-07	4.4E-07	0.00	1.2E-07	1.9E-07	0.00	7.8E-09	1.3E-08	0.00	4.6E-12	4.6E-12	—	—	—	—	—	—	—	3.9E-07	1	6.5E-07	1	0.00	0	3.9E-07	4	6.5E-07	1	0.00	0
207-08-9	benzo(k)fluoranthene-M	2.5E-02	1.2E-08	2.0E-07	0.00	5.4E-09	8.8E-08	0.00	3.6E-10	5.8E-09	0.00	2.1E-12	2.1E-12	—	—	—	—	—	—	—	1.8E-08	0	2.9E-07	0	0.00	0	1.8E-08	0	2.9E-07	0	0.00	0
218-01-9	chrysene-M	4.7E-02	2.3E-09	3.8E-08	0.00	1.0E-09	1.7E-08	0.00	6.7E-11	1.1E-09	0.00	3.9E-13	3.9E-13	—	—	—	—	—	—	—	3.4E-09	0	5.5E-08	0	0.00	0	3.4E-09	0	5.5E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	7.9E-03	3.9E-07	2.2E-07	0.00	1.7E-07	9.7E-08	0.00	1.1E-08	6.4E-09	0.00	7.3E-12	7.3E-12	—	—	—	—	—	—	—	5.7E-07	2	3.2E-07	0	0.00	0	5.7E-07	6	3.2E-07	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	5.1E-02	2.5E-07	4.1E-07	0.00	1.1E-07	1.8E-07	0.00	1.0E-08	1.7E-08	0.00	4.3E-12	4.3E-12	—	—	—	—	—	—	—	3.7E-07	1	6.1E-07	1	0.00	0	3.7E-07	4	6.1E-07	1	0.00	0
208-96-8	Acenaphthylene	6.5E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	5.8E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
206-44-0	fluoranthene	1.2E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phenanthrene	7.9E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	9.3E-02	4.5E-06	7.4E-06	0.00	2.0E-06	3.3E-06	0.00	1.3E-07	2.2E-07	0.00	7.8E-11	7.8E-11	—	—	—	—	—	—	—	6.7E-06	24	1.1E-05	12	0.00	0	6.7E-06	75	1.1E-05	15	0.00	0
Semi-Volatile Organic Compounds																																
86-74-8	Carbazole	1.8E-02	5.6E-10	—	0.00	—	—	—	9.6E-08	—	0.00	—	—	—	—	—	—	—	—	—	9.6E-08	0	—	0	0.00	0	9.6E-08	1	—	0	0.00	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	1.4E+00	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.06	—	0	—	0	0.07	2	—	0	—	0	0.07	3
83-32-9	acenaphthene	1.4E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	9.3E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	1.1E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	9.8E-01	—	1.8E-07	0.00	—	8.7E-08	0.00	—	—	—	—	—	—	1.9E-07	1.9E-07	0.01	—	5.6E-05	1.29	1.9E-07	1	5.7E-05	61	1.30	35	1.9E-07	2	5.7E-05	76	1.30	65
129-00-0	pyrene	9.5E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	ethylbenzene	1.2E-01	2.5E-09	2.1E-09	0.00	6.5E-10	6.5E-10	0.00	—	—	—	—	—	—	1.9E-08	1.9E-08	0.00	—	1.1E-06	0.00	2.2E-08	0	1.1E-06	1	0.00	0	2.2E-08	0	1.1E-06	1	0.00	0
1330-20-7	xylenes (total)	8.4E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
ides/Polychlorinated biphenyls																																
72-54-8	p,p'-DDD	9.0E-03	2.4E-09	3.4E-09	0.00	5.3E-10	5.3E-10	0.00	1.8E-07	1.8E-07	0.01	1.9E-13	1.9E-13	—	—	—	—	—	—	—	1.8E-07	1	1.8E-07	0	0.01	0	1.8E-07	2	1.8E-07	0	0.01	0
72-55-9	p,p'-DDE	1.8E-02	9.7E-09	9.7E-09	0.00	1.5E-09	1.5E-09	0.00	4.0E-07	4.0E-07	0.01	5.3E-13	—	—	—	—	—	—	—	—	4.1E-07	1	4.1E-07	0	0.01	0	4.1E-07	5	4.1E-07	1	0.01	1
50-29-3	p,p'-DDT	5.3E-02	2.8E-08	2.8E-08	0.00	4.5E-09	4.5E-09	0.00	—	—	—	1.6E-12	—	—	—	—	—	—	—	—	3.3E-08	0	3.3E-08	0	0.00	0	3.3E-08	0	3.3E-08	0	0.00	0
5103-71-9	alpha-chlordane	2.7E-02	1.5E-08	5.5E-08	0.00	—	—	—	7.1E-07	2.6E-06	0.02	—	—	—	—	—	—	—	—	—	7.3E-07	3	2.7E-06	3	0.02	1	7.3E-07	8	2.7E-06	4	0.02	1
5103-74-2	beta-chlordane	2.2E-02	1.2E-08	4.5E-08	0.00	—	—	—	5.8E-07	2.2E-06	0.02	—	—	—	—	—	—	—	—	—	5.9E-07	2	2.2E-06	2	0.02	0	5.9E-07	7	2.2E-06	3	0.02	1
		Totals by Pathway	2.E-05	2.E-05	2	3.E-06	3.E-06	1	1.E-05	1.E-05	0	2.E-07	3.E-08	0	2.E-07	2.E-07	0	0.E+00	6.E-05	1	**3.E-05**		**9.E-05**		**4**		**9.E-06**		**7.E-05**		**2**	
		% of Totals	54	20	43	11	4	14	34	14	6	1	0	0	1	0	0	0	62	36												
		Totals by Pathway **(Excluding Background)**	5.E-06	8.E-06	0	2.E-06	3.E-06	0	2.E-06	6.E-06	0	3.E-08	2.E-08	0	2.E-07	2.E-07	0	0.E+00	6.E-05	1												
		% of Totals **(Excluding background)**	52	10	24	23	5	2	23	8	6	0	0	0	2	0	1	0	77	68												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-11: IR Site 22 - Residential HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	9.3E+03	—	—	0.13	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.14	1	—	0	—	0	0.00	0
7440-38-2	arsenic	3.4E+00	8.0E-06	8.0E-06	0.16	7.6E-07	7.6E-07	0.01	5.6E-06	5.6E-06	0.06	4.4E-09	3.4E-09	0.00	—	—	—	—	—	—	1.4E-05	18	1.4E-05	1	0.23	1	1.4E-05	18	1.4E-05	1	0.23	1
7440-39-3	barium	8.2E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7440-41-7	beryllium	4.8E-01	—	—	0.00	—	—	0.01	—	—	—	3.5E-10	3.5E-10	0.00	—	—	—	—	—	—	3.5E-10	0	3.5E-10	0	0.02	0	3.5E-10	0	3.5E-10	0	0.02	0
7440-43-9	cadmium	4.2E-01	—	—	0.01	—	—	0.00	—	—	0.03	5.4E-10	5.5E-10	0.00	—	—	—	—	—	—	5.4E-10	0	5.5E-10	0	0.03	0	5.4E-10	0	5.5E-10	0	0.03	0
7440-47-3	**chromium**	3.7E+01	—	—	0.17	—	—	0.39	—	—	—	1.3E-07	—	—	—	—	—	—	—	—	1.3E-07	0	—	0	0.56	3	0.0E+00	0	—	0	0.00	0
7440-48-4	cobalt	6.0E+00	—	—	0.28	—	—	0.01	—	—	—	1.6E-08	—	0.00	—	—	—	—	—	—	1.6E-08	0	—	0	0.29	1	1.6E-08	0	—	0	0.29	2
7440-50-8	**copper**	2.3E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7439-89-6	iron	1.3E+04	—	—	0.27	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.27	1	—	0	—	0	0.27	1
7439-92-1	lead	8.3E+02	—	—	—	—	—	—	—	—	—	—	3.0E-09	—	—	—	—	—	—	—	—	0	3.0E-09	0	—	0	—	0	3.0E-09	0	—	0
7439-96-5	**manganese**	1.8E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.00	0
7439-97-6	mercury	8.8E-02	—	—	0.01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
7439-98-7	**molybdenum**	1.3E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-02-0	nickel	3.3E+01	—	—	0.02	—	—	0.02	—	—	0.01	2.6E-09	2.6E-09	0.00	—	—	—	—	—	—	2.6E-09	0	2.6E-09	0	0.05	0	2.6E-09	0	2.6E-09	0	0.05	0
7782-49-2	**Selenium**	5.9E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-22-4	**silver**	2.5E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	9.0E-01	—	—	0.20	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.20	1	—	0	—	0	0.00	0
7440-62-2	**vanadium**	2.8E+01	—	—	0.06	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.12	1	—	0	—	0	0.00	0
7440-66-6	zinc	5.3E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	6.4E-02	3.1E-07	5.1E-07	0.00	1.4E-07	2.3E-07	0.00	9.1E-09	1.5E-08	0.00	5.4E-12	5.4E-12	—	—	—	—	—	—	—	4.6E-07	1	7.5E-07	0	0.00	0	4.6E-07	1	7.5E-07	0	0.00	0
50-32-8	benzo(a)pyrene-M	1.1E-01	5.2E-06	8.5E-06	0.00	2.3E-06	3.8E-06	0.00	1.5E-07	2.5E-07	0.00	8.9E-11	8.9E-11	—	—	—	—	—	—	—	7.6E-06	9	1.3E-05	1	0.00	0	7.6E-06	10	1.3E-05	1	0.00	0
205-99-2	benzo(b)fluoranthene-M	8.6E-02	4.2E-07	6.9E-07	0.00	1.9E-07	3.0E-07	0.00	1.2E-08	2.0E-08	0.00	7.2E-12	7.2E-12	—	—	—	—	—	—	—	6.2E-07	1	1.0E-06	0	0.00	0	6.2E-07	1	1.0E-06	0	0.00	0
207-08-9	benzo(k)fluoranthene-M	4.9E-02	2.4E-08	4.0E-07	0.00	1.1E-08	1.8E-07	0.00	7.1E-10	1.2E-08	0.00	4.2E-12	4.2E-12	—	—	—	—	—	—	—	3.6E-08	0	5.8E-07	0	0.00	0	3.6E-08	0	5.8E-07	0	0.00	0
218-01-9	chrysene-M	7.2E-02	3.5E-09	5.8E-08	0.00	1.6E-09	2.6E-08	0.00	1.0E-10	1.7E-09	0.00	6.0E-13	6.0E-13	—	—	—	—	—	—	—	5.2E-09	0	8.5E-08	0	0.00	0	5.2E-09	0	8.5E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	1.1E-02	5.3E-07	3.0E-07	0.00	2.4E-07	1.3E-07	0.00	1.6E-08	8.8E-09	0.00	1.0E-11	1.0E-11	—	—	—	—	—	—	—	7.9E-07	1	4.4E-07	0	0.00	0	7.9E-07	1	4.4E-07	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	7.3E-02	3.6E-07	5.9E-07	0.00	1.6E-07	2.6E-07	0.00	1.5E-08	2.5E-08	0.00	6.2E-12	6.2E-12	—	—	—	—	—	—	—	5.3E-07	1	8.8E-07	0	0.00	0	5.3E-07	1	8.8E-07	0	0.00	0
208-96-8	Acenaphthylene	8.7E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	8.9E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
206-44-0	fluoranthene	1.8E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phenanthrene	1.1E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.4E-01	6.6E-06	1.1E-05	0.00	2.9E-06	4.8E-06	0.00	1.9E-07	3.2E-07	0.00	1.1E-10	1.1E-10	—	—	—	—	—	—	—	9.7E-06	13	1.6E-05	1	0.00	0	9.7E-06	13	1.6E-05	1	0.00	0
Semivolatile Organic Compounds																																
59-50-7	4-Chloro-3-methylphenyl	5.7E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	—	0	—	0	—	0	—	0
86-74-8	Carbazole	2.6E-02	8.2E-10	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	—	—	8.2E-10	0	—	0	0.00	0	8.2E-10	0	—	0	0.00	0
108-95-2	phenol	3.0E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	0.0E+00	0	0.00	0	0.0E+00	0	0.0E+00	0	0.00	0
Volatile Organic Compounds																																
120-82-1	1,2,4-Trichlorobenzene	2.0E+00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.03	—	—	3.22	—	0	—	0	3.25	16	—	0	—	0	3.25	17
95-57-8	2-Chlorophenol	3.1E+00	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	1.47	—	0	—	0	1.49	7	—	0	—	0	1.49	8
91-57-6	2-methylnaphthalene	4.2E+00	—	—	0.01	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	0.17	—	0	—	0	0.19	1	—	0	—	0	0.19	1
108-10-1	4-Methyl-2-pentanone	7.2E+01	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	0.00	—	—	0.20	—	0	—	0	0.22	1	—	0	—	0	0.22	1
83-32-9	acenaphthene	1.3E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	2.6E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	2.0E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	4.0E+00	—	7.5E-07	0.00	—	3.6E-07	0.00	—	—	—	—	—	—	7.8E-07	7.8E-07	0.04	—	2.3E-04	5.17	7.8E-07	1	2.3E-04	14	5.21	26	7.8E-07	1	2.3E-04	14	5.21	28
129-00-0	pyrene	2.2E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	acetone	5.4E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	3.7E-01	3.2E-08	5.7E-08	0.00	1.0E-08	1.8E-08	0.00	—	—	—	—	—	—	2.2E-07	8.3E-07	0.00	1.0E-05	3.8E-05	0.10	1.1E-05	13	3.9E-05	2	0.11	1	1.1E-05	13	3.9E-05	2	0.11	1
100-41-4	ethylbenzene	2.1E+02	3.6E-06	3.6E-06	0.03	1.1E-06	1.1E-06	0.01	—	—	—	—	—	—	3.3E-05	3.3E-05	0.06	—	1.3E-03	1.18	3.8E-05	47	1.3E-03	80	1.28	6	3.8E-05	47	1.3E-03	80	1.28	7
108-88-3	toluene	2.7E+02	—	—	0.05	—	—	0.01	—	—	—	—	—	—	—	—	0.02	—	—	5.17	—	0	—	0	5.24	26	—	0	—	0	5.24	28
75-09-2	Methylene chloride	2.7E-03	3.2E-11	5.9E-11	0.00	1.0E-11	1.9E-11	0.00	—	—	—	—	—	—	8.5E-11	1.8E-10	0.00	4.5E-09	9.6E-09	0.00	4.7E-09	0	9.9E-09	0	0.00	0	4.7E-09	0	9.9E-09	0	0.00	0
1330-20-7	xylenes (total)	2.4E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	—	—	—	0.74	—	—	—	—	0	—	0	0.76	4	—	0	—	0	0.76	4
ides/Polychlorinated biphenyls																																
72-43-5	Methoxychlor	1.3E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
5103-71-9	alpha-chlordane	1.4E-01	7.9E-08	2.9E-07	0.00	—	—	—	3.8E-06	1.4E-05	0.10	—	—	—	—	—	—	—	—	—	3.9E-06	5	1.4E-05	1	0.11	1	3.9E-06	5	1.4E-05	1	0.11	1
5103-74-2	beta-chlordane	7.6E-02	4.2E-08	1.5E-07	0.00	—	—	—	2.0E-06	7.4E-06	0.05	—	—	—	—	—	—	—	—	—	2.0E-06	3	7.6E-06	0	0.06	0	2.0E-06	3	7.6E-06	0	0.06	0
72-54-8	p,p'-DDD	9.0E-03	3.4E-09	3.4E-09	0.00	5.3E-10	5.3E-10	0.00	1.8E-07	1.8E-07	0.01	1.9E-13	1.9E-13	—	—	—	—	—	—	—	1.8E-07	0	1.8E-07	0	0.01	0	1.8E-07	0	1.8E-07	0	0.01	0
72-55-9	p,p'-DDE	9.0E-03	4.8E-09	4.8E-09	0.00	7.5E-10	7.5E-10	0.00	2.0E-07	2.0E-07	0.01	2.6E-13	2.6E-13	—	—	—	—	—	—	—	2.0E-07	0	2.0E-07	0	0.01	0	2.0E-07	0	2.0E-07	0	0.01	0
50-29-3	p,p'-DDT	8.8E-03	4.7E-09	4.7E-09	0.00	7.4E-10	7.4E-10	0.00	1.6E-07	1.6E-07	0.00	2.6E-13	—	—	—	—	—	—	—	—	1.7E-07	0	1.7E-07	0	0.00	0	1.7E-07	0	1.7E-07	0	0.00	0
		Totals by Pathway	2.E-05	2.E-05	1	5.E-06	7.E-06	1	1.E-05	3.E-05	0	2.E-07	1.E-08	0	3.E-05	3.E-05	1	1.E-05	2.E-03	17	**8.E-05**		**2.E-03**		**20**		**8.E-05**		**2.E-03**		**19**	
		% of Totals	23	1	7	6	0	3	15	2	1	0	0	0	43	2	4	13	94	84												
	Totals by Pathway **(Excluding Background)**		2.E-05	2.E-05	1	5.E-06	7.E-06	0	1.E-05	3.E-05	0	2.E-08	1.E-08	0	3.E-05	3.E-05	1	1.E-05	2.E-03	17												
	% of Totals **(Excluding background)**		23	1	5	6	0	1	15	2	2	0	0	0	43	2	5	13	94	88												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-12: IR Site 22 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																										
7429-90-5	**Aluminum, dissolved**	4.3E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	2.3E-03	—	—	0.48	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.48	0	—	0	—	0	0.00	0
7440-38-2	Arsenic, dissolved	2.3E-02	5.0E-04	5.0E-04	6.00	—	—	—	2.4E-06	2.7E-06	0.03	—	—	—	5.0E-04	19	5.0E-04	10	6.03	4	5.0E-04	19	5.0E-04	10	6.03	6
7440-39-3	**Barium, dissolved**	3.3E-01	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	0	—	0	—	0	0.00	0
7440-41-7	**Beryllium, dissolved**	4.9E-04	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.00	0
7440-43-9	Cadmium, dissolved	9.0E-04	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	0	—	0	—	0	0.12	0
7440-70-2	Calciuim, dissolved	7.7E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	1.1E-03	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.00	0
7440-48-4	Cobalt, dissolved	5.0E-03	—	—	1.20	—	—	—	—	—	0.01	—	—	—	—	0	—	0	1.21	1	—	0	—	0	1.21	1
7440-50-8	Copper, dissolved	1.4E-02	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.03	0
7439-89-6	Iron, dissolved	9.5E+00	—	—	1.10	—	—	—	—	—	0.01	—	—	—	—	0	—	0	1.11	1	—	0	—	0	1.11	1
7439-92-1	**Lead, dissolved**	4.1E-04	—	5.0E-08	0.00	—	—	—	—	2.7E-11	0.00	—	—	—	—	0	5.0E-08	0	0.00	0	—	0	0.0E+00	0	0.00	0
7439-95-4	Magnesium, dissolved	9.3E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7439-96-5	Manganese, dissolved	1.1E+01	—	—	42.50	—	—	—	—	—	0.17	—	—	—	—	0	—	0	42.67	31	—	0	—	0	42.67	40
7439-98-7	Molybdenum, dissolved	4.0E-03	—	—	0.06	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.06	0	—	0	—	0	0.06	0
7440-02-0	Nickel, dissolved	1.3E-02	—	—	0.05	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.05	0	—	0	—	0	0.05	0
7440-09-7	Potassium, dissolved	2.2E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	1.0E-03	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-22-4	Silver, dissolved	1.7E-03	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.03	0
7440-23-5	Sodium, dissolved	2.3E+02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	7.3E-03	—	—	9.00	—	—	—	—	—	0.05	—	—	—	—	0	—	0	9.05	7	—	0	—	0	0.00	0
7440-62-2	**Vanadium, dissolved**	8.2E-03	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	0	—	0	—	0	0.00	0
7440-66-6	**Zinc, dissolved**	1.2E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																										
91-20-3	Naphthalene	1.3E-01	—	—	0.49	—	—	—	—	—	0.31	—	4.0E-06	0.09	—	0	4.0E-06	0	0.90	1	—	0	4.0E-06	0	0.90	1
Semivolatile Organic Compounds																										
100-42-5	Styrene	1.0E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Volatile Organic Compounds																										
71-55-6	1,1,1-Trichloroethane	2.7E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-34-3	1,1-Dichloroethane	2.4E-03	1.7E-07	1.7E-07	0.00	2.4E-08	2.4E-08	0.00	1.4E-08	1.4E-08	0.00	—	—	—	2.1E-07	0	2.1E-07	0	0.00	0	2.1E-07	0	2.1E-07	0	0.00	0
75-35-4	1,1-Dichloroethene	3.9E-03	—	—	0.01	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
95-63-6	1,2,4-Trimethylbenzene	3.2E-03	—	—	0.04	—	—	0.01	—	—	0.00	—	—	0.01	—	0	—	0	0.05	0	—	0	—	0	0.05	0
95-50-1	1,2-Dichlorobenzene	9.4E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
107-06-2	1,2-Dichloroethane	1.2E-02	1.6E-05	8.0E-06	0.05	1.3E-06	1.3E-06	0.00	7.3E-07	4.0E-07	0.00	8.6E-07	7.0E-07	0.00	1.9E-05	1	1.0E-05	0	0.05	0	1.9E-05	1	1.0E-05	0	0.05	0
108-67-8	1,3,5-Trimethylbenzene	1.7E-03	—	—	0.00	—	—	0.01	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
78-93-3	2-Butanone	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	Acetone	4.4E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	1.7E+00	1.4E-03	2.9E-03	41.69	6.0E-05	2.5E-04	1.40	1.9E-04	3.0E-04	5.00	1.5E-04	5.6E-04	1.51	1.8E-03	67	4.0E-03	82	49.60	36	1.8E-03	67	4.0E-03	82	49.60	47
74-83-9	Bromomethane	6.0E-04	—	—	0.04	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.04	0	—	0	—	0	0.04	0
75-15-0	Carbon disulfide	1.2E+00	—	—	1.00	—	—	0.04	—	—	0.16	—	—	0.29	—	0	—	0	1.49	1	—	0	—	0	1.49	1
67-66-3	Chloroform	7.3E-03	3.0E-06	3.0E-06	0.06	9.0E-07	2.4E-07	0.00	—	—	0.00	—	—	—	3.9E-06	0	3.2E-06	0	0.06	0	3.9E-06	0	3.2E-06	0	0.06	0
74-87-3	Chloromethane	2.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	9.0E-05	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	Ethylbenzene	1.2E+00	1.7E-04	1.7E-04	0.90	1.3E-05	—	0.02	1.0E-04	1.0E-04	0.50	3.7E-05	3.7E-05	0.03	3.2E-04	12	3.1E-04	6	1.45	1	3.2E-04	12	3.1E-04	6	1.45	1
108-20-3	Isopropyl Ether	3.2E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-82-8	Isopropylbenzene	4.7E-02	—	—	0.04	—	—	0.00	—	—	0.00	—	—	0.01	—	0	—	0	0.04	0	—	0	—	0	0.04	0
1634-04-4	Methyl Tert-Butyl Ether	5.3E-04	1.4E-08	1.4E-08	0.00	7.0E-10	7.0E-10	0.00	2.6E-08	2.8E-08	0.00	—	—	—	4.1E-08	0	4.3E-08	0	0.00	0	4.1E-08	0	4.3E-08	0	0.00	0
75-09-2	Methylene chloride	1.0E-04	1.1E-08	1.8E-08	0.00	2.5E-10	5.0E-10	0.00	2.0E-09	4.0E-09	0.00	—	—	—	1.3E-08	0	2.3E-08	0	0.00	0	1.3E-08	0	2.3E-08	0	0.00	0
104-51-8	N-Butylbenzene	8.9E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
103-65-1	N-Propylbenzene	1.6E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-47-6	o-Xylene	6.0E-04	—	—	0.00	—	—	0.00	—	—	0.03	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.03	0
99-87-6	p-Isopropyltoluene	4.1E-04	—	—	0.00	—	—	0.00	—	—	0.29	—	—	—	—	0	—	0	0.29	0	—	0	—	0	0.29	0
135-98-8	Sec-Butylbenzene	8.5E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	8.1E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
127-18-4	Tetrachloroethene	2.6E-03	1.8E-05	1.8E-05	0.02	8.0E-08	—	0.00	3.7E-05	4.0E-05	0.03	—	—	—	5.5E-05	2	5.8E-05	1	0.05	0	5.5E-05	2	5.8E-05	1	0.05	0
108-88-3	Toluene	5.3E+00	—	—	4.90	—	—	0.02	—	—	0.03	—	—	0.03	—	0	—	0	4.98	4	—	0	—	0	4.98	5
79-01-6	Trichloroethene	1.9E-03	1.6E-07	1.6E-07	0.00	2.4E-08	—	0.00	3.4E-08	3.0E-08	0.00	—	—	—	2.2E-07	0	1.9E-07	0	0.00	0	2.2E-07	0	1.9E-07	0	0.00	0

Table 8-12: IR Site 22 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
1330-20-7	Xylenes (total)	2.4E+01	—	—	10.00	—	—	6.00	—	—	1.30	—	—	—	—	0	—	0	17.30	13	—	0	—	0	17.30	16
7816-60-0	Xylenes, m & p	1.7E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Totals by Pathway			2.E-03	4.E-03	120	8.E-05	3.E-04	8	3.E-04	4.E-04	8	2.E-04	6.E-04	2	**3.E-03**		**5.E-03**		**138**							
% of Totals			78	73	87	3	5	5	12	9	6	7	12	1												
Totals by Pathway **(Excluding Background)**			2.E-03	4.E-03	110	8.E-05	3.E-04	8	3.E-04	4.E-04	8	2.E-04	6.E-04	2							**3.E-03**		**5.E-03**		**128**	
% of Totals **(Excluding Background)**			78	73	86	3	5	6	12	9	6	7	12	2												

Table 8-13: IR Site 23 - Residential HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical	(mg/kg)	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	1.2E+04	—	—	0.17	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.18	6	—	0	—	0	0.00	0
7440-36-0	**antimony**	3.6E+00	—	—	0.13	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.15	5	—	0	—	0	0.00	0
7440-38-2	**arsenic**	3.9E+00	9.2E-06	9.2E-06	0.18	8.7E-07	8.7E-07	0.02	6.4E-06	6.4E-06	0.07	5.1E-09	3.9E-09	0.00	—	—	—	—	—	—	1.6E-05	48	1.6E-05	35	0.27	9	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	1.4E+02	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7440-41-7	**beryllium**	1.7E-01	—	—	0.00	—	—	0.01	—	—	—	1.2E-10	1.2E-10	0.00	—	—	—	—	—	—	1.2E-10	0	1.2E-10	0	0.01	0	0.0E+00	0	0.0E+00	0	0.00	0
7440-43-9	cadmium	5.5E+00	—	—	0.08	—	—	0.01	—	—	0.35	7.0E-09	7.2E-09	0.00	—	—	—	—	—	—	7.0E-09	0	7.2E-09	0	0.44	14	7.0E-09	0	7.2E-09	0	0.44	45
7440-47-3	**chromium**	5.0E+01	—	—	0.24	—	—	0.53	—	—	—	1.8E-07	—	—	—	—	—	—	—	—	1.8E-07	1	—	0	0.76	25	0.0E+00	0	—	0	0.00	0
7440-48-4	**cobalt**	6.1E+00	—	—	0.29	—	—	0.01	—	—	—	1.7E-08	—	0.00	—	—	—	—	—	—	1.7E-08	0	—	0	0.30	10	0.0E+00	0	—	0	0.00	0
7440-50-8	copper	7.2E+01	—	—	0.03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.03	3
7439-89-6	**iron**	1.5E+04	—	—	0.31	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.32	10	—	0	—	0	0.00	0
7439-92-1	lead	2.3E+01	—	—	—	—	—	—	—	—	—	—	8.5E-11	—	—	—	—	—	—	—	—	0	8.5E-11	0	—	0	—	0	8.5E-11	0	—	0
7439-96-5	**manganese**	2.5E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.01	—	—	—	—	—	—	—	0	—	0	0.03	1	—	0	—	0	0.00	0
7440-02-0	**nickel**	2.7E+01	—	—	0.02	—	—	0.01	—	—	0.01	2.1E-09	2.1E-09	0.00	—	—	—	—	—	—	2.1E-09	0	2.1E-09	0	0.04	1	0.0E+00	0	0.0E+00	0	0.00	0
7440-22-4	**silver**	3.8E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-62-2	vanadium	4.3E+01	—	—	0.09	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.18	6	—	0	—	0	0.18	19
7440-66-6	**zinc**	4.6E+01	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	1.5E-01	7.2E-07	1.2E-06	0.00	3.2E-07	5.3E-07	0.00	2.1E-08	3.5E-08	0.00	1.2E-11	1.2E-11	—	—	—	—	—	—	—	1.1E-06	3	1.8E-06	4	0.00	0	1.1E-06	6	1.8E-06	6	0.00	0
50-32-8	benzo(a)pyrene-M	1.5E-01	7.1E-06	1.2E-05	0.00	3.1E-06	5.2E-06	0.00	2.1E-07	3.4E-07	0.00	1.2E-10	1.2E-10	—	—	—	—	—	—	—	1.0E-05	30	1.7E-05	37	0.00	0	1.0E-05	59	1.7E-05	57	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.5E-01	7.4E-07	1.2E-06	0.00	3.3E-07	5.4E-07	0.00	2.2E-08	3.6E-08	0.00	1.3E-11	1.3E-11	—	—	—	—	—	—	—	1.1E-06	3	1.8E-06	4	0.00	0	1.1E-06	6	1.8E-06	6	0.00	0
207-08-9	benzo(k)fluoranthene-M	8.6E-02	4.2E-08	6.9E-07	0.00	1.9E-08	3.1E-07	0.00	1.2E-09	2.0E-08	0.00	7.3E-12	7.3E-12	—	—	—	—	—	—	—	6.2E-08	0	1.0E-06	2	0.00	0	6.2E-08	0	1.0E-06	3	0.00	0
218-01-9	chrysene-M	1.7E-01	8.1E-09	1.3E-07	0.00	3.6E-09	5.9E-08	0.00	2.4E-10	3.9E-09	0.00	1.4E-12	1.4E-12	—	—	—	—	—	—	—	1.2E-08	0	2.0E-07	0	0.00	0	1.2E-08	0	2.0E-07	1	0.00	0
53-70-3	dibenz(a,h)anthracene-M	2.5E-02	1.2E-06	7.0E-07	0.00	5.5E-07	3.1E-07	0.00	3.6E-08	2.0E-08	0.00	2.3E-11	2.3E-11	—	—	—	—	—	—	—	1.8E-06	5	1.0E-06	2	0.00	0	1.8E-06	10	1.0E-06	3	0.00	0
206-44-0	fluoranthene	2.5E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	1.1E-01	5.1E-07	8.4E-07	0.00	2.3E-07	3.7E-07	0.00	2.1E-08	3.5E-08	0.00	—	—	—	—	—	—	—	—	—	7.6E-07	2	1.3E-06	3	0.00	0	7.6E-07	4	1.3E-06	4	0.00	0
208-96-8	Acenaphthylene	3.1E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	1.1E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phananthrene	1.1E-01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	2.3E-01	1.1E-05	1.9E-05	0.00	5.0E-06	8.2E-06	0.00	3.3E-07	5.4E-07	0.00	1.9E-10	1.9E-10	—	—	—	—	—	—	—	1.7E-05	44	2.7E-05	52	0.00	0	1.7E-05	86	2.7E-05	80	0.00	0
Semivolatile Organic Compounds																																
105-67-9	2,4-Dimethylphenol	5.2E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-48-7	2-Methylphenol (O-Cresol)	2.1E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
106-44-5	4-Methylphenol (P-Cresol)	4.8E-02	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
86-30-6	N-Nitrosodiphenylamine	2.1E-01	1.6E-09	2.9E-09	—	5.0E-10	9.3E-10	—	6.4E-08	1.2E-07	—	—	—	—	—	—	—	—	—	—	6.6E-08	0	1.2E-07	0	—	0	6.6E-08	0	1.2E-07	0	—	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	2.9E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.01	—	0	—	0	0.01	0	—	0	—	0	0.01	1
83-32-9	acenaphthene	4.0E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	2.4E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	3.4E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	2.7E-03	—	5.0E-10	0.00	—	2.4E-10	0.00	—	—	—	—	—	—	5.2E-10	5.2E-10	0.00	—	1.6E-07	0.00	5.2E-10	0	1.6E-07	0	0.00	0	5.2E-10	0	1.6E-07	1	0.00	0
129-00-0	pyrene	2.1E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
ides/Polychlorinated biphenyls																																
11096-82-5	PCB-1260 (Aroclor 1260)	3.8E-02	1.2E-07	3.0E-07	0.03	5.6E-08	1.4E-07	0.01	2.1E-06	5.2E-06	0.24	—	—	—	—	—	—	—	—	—	2.3E-06	7	5.7E-06	12	0.28	9	2.3E-06	13	5.7E-06	19	0.28	29
50-29-3	p,p'-DDT	5.4E-03	2.9E-09	2.9E-09	0.00	4.5E-10	4.5E-10	0.00	9.8E-08	9.8E-08	0.00	—	—	—	—	—	—	—	—	—	1.0E-07	0	1.0E-07	0	0.00	0	1.0E-07	1	1.0E-07	0	0.00	0
		Totals by Pathway	2.E-05	3.E-05	2	6.E-06	8.E-06	1	9.E-06	1.E-05	1	2.E-07	1.E-08	0	5.E-10	5.E-10	0	0.E+00	2.E-07	0	**3.E-05**		**5.E-05**		**3**		**2.E-05**		**3.E-05**		**1**	
		% of Totals	57	56	52	16	18	24	26	26	23	1	0	0	0	0	0	0	0	0												
		Totals by Pathway **(Excluding Background)**	1.E-05	2.E-05	0	5.E-06	7.E-06	0	3.E-06	6.E-06	1	7.E-09	7.E-09	0	5.E-10	5.E-10	0	0.E+00	2.E-07	0												
		% of Totals **(Excluding background)**	59	55	23	26	25	13	14	20	63	0	0	0	0	0	0	0	1	1												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-14: IR Site 23 - Residential HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil			Dermal Contact with Soil			Ingestion of Homegrown Produce			Inhalation of Soil Particulates in Outdoor Air			Inhalation of Volatiles in Outdoor Air			Inhalation of Vapors in Indoor Air Originating from Soil			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																																
7429-90-5	**aluminum**	6.9E+03	—	—	0.10	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.10	3	—	0	—	0	0.00	0
7440-36-0	**antimony**	2.3E+00	—	—	0.08	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.10	3	—	0	—	0	0.00	0
7440-38-2	**arsenic**	2.1E+00	4.9E-06	4.9E-06	0.10	4.7E-07	4.7E-07	0.01	3.4E-06	3.4E-06	0.04	2.7E-09	2.1E-09	0.00	—	—	—	—	—	—	8.8E-06	35	8.8E-06	17	0.14	5	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	barium	9.1E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7440-41-7	**beryllium**	1.7E-01	—	—	0.00	—	—	0.00	—	—	—	1.2E-10	1.2E-10	0.00	—	—	—	—	—	—	1.2E-10	0	1.2E-10	0	0.01	0	0.0E+00	0	0.0E+00	0	0.00	0
7440-43-9	cadmium	1.1E+00	—	—	0.02	—	—	0.00	—	—	0.07	1.3E-09	1.4E-09	0.00	—	—	—	—	—	—	1.3E-09	0	1.4E-09	0	0.09	3	1.3E-09	0	1.4E-09	0	0.09	10
7440-47-3	**chromium**	3.7E+01	—	—	0.18	—	—	0.39	—	—	—	1.4E-07	—	—	—	—	—	—	—	—	1.4E-07	1	—	0	0.57	19	0.0E+00	0	—	0	0.00	0
7440-48-4	**cobalt**	4.8E+00	—	—	0.22	—	—	0.01	—	—	—	1.3E-08	—	0.00	—	—	—	—	—	—	1.3E-08	0	—	0	0.23	8	0.0E+00	0	—	0	0.00	0
7440-50-8	copper	3.6E+01	—	—	0.01	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
7439-89-6	**iron**	1.1E+04	—	—	0.22	—	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.22	7	—	0	—	0	0.00	0
7439-92-1	lead	1.7E+01	—	—	—	—	—	—	—	—	—	—	6.3E-11	—	—	—	—	—	—	—	—	0	6.3E-11	0	—	0	—	0	6.3E-11	0	—	0
7439-96-5	**manganese**	1.6E+02	—	—	0.02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	—	—	0	—	0	0.02	1	—	0	—	0	0.00	0
7440-02-0	**nickel**	2.5E+01	—	—	0.02	—	—	0.01	—	—	0.01	2.0E-09	2.0E-09	0.00	—	—	—	—	—	—	2.0E-09	0	2.0E-09	0	0.04	1	0.0E+00	0	0.0E+00	0	0.00	0
7440-22-4	**silver**	3.8E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**thallium**	3.0E+00	—	—	0.64	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.66	22	—	0	—	0	0.00	0
7440-62-2	vanadium	2.7E+01	—	—	0.05	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.11	4	—	0	—	0	0.11	13
7440-66-6	**zinc**	4.2E+01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																																
56-55-3	benz(a)anthracene-M	1.0E-01	5.1E-07	8.4E-07	0.00	2.3E-07	3.7E-07	0.00	1.5E-08	2.5E-08	0.00	8.8E-12	8.8E-12	—	—	—	—	—	—	—	7.5E-07	3	1.2E-06	2	0.00	0	7.5E-07	5	1.2E-06	3	0.00	0
50-32-8	benzo(a)pyrene-M	1.1E-01	5.2E-06	8.6E-06	0.00	2.3E-06	3.8E-06	0.00	1.5E-07	2.5E-07	0.00	9.0E-11	9.0E-11	—	—	—	—	—	—	—	7.7E-06	30	1.3E-05	25	0.00	0	7.7E-06	47	1.3E-05	30	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.1E-01	5.6E-07	9.2E-07	0.00	2.5E-07	4.1E-07	0.00	1.6E-08	2.7E-08	0.00	9.6E-12	9.6E-12	—	—	—	—	—	—	—	8.2E-07	3	1.4E-06	3	0.00	0	8.2E-07	5	1.4E-06	3	0.00	0
207-08-9	benzo(k)fluoranthene-M	6.4E-02	3.1E-08	5.2E-07	0.00	1.4E-08	2.3E-07	0.00	9.2E-10	1.5E-08	0.00	5.4E-12	5.4E-12	—	—	—	—	—	—	—	4.6E-08	0	7.6E-07	1	0.00	0	4.6E-08	0	7.6E-07	2	0.00	0
218-01-9	chrysene-M	1.2E-01	5.7E-09	9.3E-08	0.00	2.5E-09	4.1E-08	0.00	1.7E-10	2.7E-09	0.00	9.8E-13	9.8E-13	—	—	—	—	—	—	—	8.4E-09	0	1.4E-07	0	0.00	0	8.4E-09	0	1.4E-07	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	1.9E-02	9.2E-07	5.2E-07	0.00	4.1E-07	2.3E-07	0.00	2.7E-08	1.5E-08	0.00	1.7E-11	1.7E-11	—	—	—	—	—	—	—	1.4E-06	5	7.6E-07	1	0.00	0	1.4E-06	8	7.6E-07	2	0.00	0
206-44-0	fluoranthene	1.7E-01	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	8.1E-02	4.0E-07	6.5E-07	0.00	1.8E-07	2.9E-07	0.00	1.7E-08	2.7E-08	0.00	6.8E-12	6.8E-12	—	—	—	—	—	—	—	5.9E-07	2	9.7E-07	2	0.00	0	5.9E-07	4	9.7E-07	2	0.00	0
208-96-8	Acenaphthylene	3.4E-03	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	8.4E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
85-01-8	Phananthrene	7.9E-02	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.7E-01	8.3E-06	1.4E-05	0.00	3.7E-06	6.0E-06	0.00	1.5E-07	2.5E-07	0.00	1.4E-10	1.4E-10	—	—	—	—	—	—	—	1.2E-05	44	2.0E-05	35	0.00	0	1.2E-05	68	2.0E-05	42	0.00	0
Semivolatile Organic Compounds																																
105-67-9	2,4-Dimethylphenol	5.2E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-48-7	2-Methylphenol (O-Cresol)	2.1E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
106-44-5	4-Methylphenol (P-Cresol)	4.8E-02	—	—	0.00	—	—	0.00	—	—	0.01	—	—	—	—	—	—	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
86-30-6	N-Nitrosodiphenylamine	1.3E-01	1.0E-09	1.9E-09	—	3.2E-10	6.0E-10	—	4.1E-08	7.5E-08	—	1.1E-13	1.1E-13	—	—	—	—	—	—	—	4.2E-08	0	7.8E-08	0	—	0	4.2E-08	0	7.8E-08	0	—	0
Volatile Organic Compounds																																
91-57-6	2-methylnaphthalene	2.6E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.01	—	0	—	0	0.01	0	—	0	—	0	0.01	1
83-32-9	acenaphthene	5.8E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
120-12-7	anthracene	1.7E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
86-73-7	fluorene	8.9E-03	—	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
91-20-3	naphthalene	2.7E-01	—	5.1E-08	0.00	—	2.4E-08	0.00	—	—	—	—	—	—	5.3E-08	5.3E-08	0.00	—	1.6E-05	0.35	5.3E-08	0	1.6E-05	31	0.36	12	5.3E-08	0	1.6E-05	37	0.36	40
129-00-0	pyrene	1.5E-01	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-88-3	toluene	9.5E-02	—	—	0.00	—	—	0.00	—	—	—	—	—	0.00	—	—	0.00	—	—	0.00	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																																
11096-82-5	PCB-1260 (Aroclor 1260)	3.8E-02	1.2E-07	3.0E-07	0.03	5.6E-08	1.4E-07	0.01	2.1E-06	5.2E-06	0.24	—	—	—	—	—	—	—	—	—	2.3E-06	9	5.7E-06	11	0.28	9	2.3E-06	14	5.7E-06	13	0.28	32
50-29-3	p,p'-DDT	3.8E-03	2.0E-09	—	—	3.2E-10	3.2E-10	0.00	6.8E-08	6.8E-08	0.00	—	—	—	—	—	—	—	—	—	7.1E-08	0	6.9E-08	0	0.00	0	7.1E-08	0	6.9E-08	0	0.00	0
8001-35-2	toxaphene	1.4E+00	2.4E-06	2.6E-06	—	3.8E-07	4.2E-07	—	—	—	—	—	—	—	—	—	—	—	—	—	2.8E-06	11	3.0E-06	6	—	0	2.8E-06	17	3.0E-06	7	—	0
		Totals by Pathway	2.E-05	2.E-05	2	4.E-06	6.E-06	1	6.E-06	9.E-06	0	2.E-07	6.E-09	0	5.E-08	5.E-08	0	0.E+00	2.E-05	0	**3.E-05**		**5.E-05**		**3**		**2.E-05**		**4.E-05**		**1**	
		% of Totals	59	39	56	17	13	18	23	18	13	1	0	0	0	0	0	0	30	12												
		Totals by Pathway **(Excluding Background)**	1.E-05	2.E-05	0	4.E-06	6.E-06	0	2.E-06	6.E-06	0	1.E-09	2.E-09	0	5.E-08	5.E-08	0	0.E+00	2.E-05	0												
		% of Totals **(Excluding background)**	62	36	13	23	14	9	15	14	37	0	0	0	0	0	0	0	37	41												

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

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Table 8-15: IR Site 23 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																										
7429-90-5	**Aluminum, dissolved**	2.8E-02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	4.0E-04	—	—	0.07	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.07	1	—	0	—	0	0.00	0
7440-38-2	**Arsenic, dissolved**	9.4E-03	1.8E-04	1.8E-04	2.40	—	—	—	6.9E-07	7.0E-07	0.00	—	—	—	1.8E-04	33	1.8E-04	16	2.40	37	0.0E+00	0	0.0E+00	0	0.00	0
7440-39-3	**Barium, dissolved**	8.5E-02	—	—	0.04	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.00	0
7440-41-7	**Beryllium, dissolved**	3.3E-04	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.00	0
7440-43-9	Cadmium, dissolved	3.8E-04	—	—	0.06	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.06	1	—	0	—	0	0.06	3
7440-70-2	Calciuim, dissolved	5.4E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	4.6E-03	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	2	—	0	—	0	0.00	0
7440-48-4	Cobalt, dissolved	1.4E-03	—	—	0.36	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.36	6	—	0	—	0	0.36	19
7440-50-8	**Copper, dissolved**	6.2E-02	—	—	0.12	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.12	2	—	0	—	0	0.12	6
7439-89-6	**Iron, dissolved**	7.7E-01	—	—	0.08	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.08	1	—	0	—	0	0.00	0
7439-92-1	**Lead, dissolved**	2.5E-04	—	3.0E-08	0.00	—	—	—	—	1.4E-11	0.00	—	—	—	—	0	—	0	0.00	0	—	0	0.0E+00	0	0.00	0
7439-95-4	Magnesium, dissolved	4.0E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	3.8E-01	—	—	1.20	—	—	—	—	—	0.00	—	—	—	—	0	—	0	1.20	18	—	0	—	0	0.00	0
7439-98-7	Molybdenum, dissolved	4.6E-03	—	—	0.07	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.07	1	—	0	—	0	0.07	4
7440-02-0	Nickel, dissolved	5.7E-03	—	—	0.02	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	1
7440-09-7	Potassium, dissolved	2.7E+01	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	1.9E-03	—	—	0.03	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.03	0	—	0	—	0	0.00	0
7440-22-4	Silver, dissolved	2.9E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-23-5	Sodium, dissolved	7.5E+02	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	4.9E-04	—	—	0.60	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.60	9	—	0	—	0	0.00	0
7440-62-2	**Vanadium, dissolved**	9.5E-03	—	—	0.13	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.13	2	—	0	—	0	0.00	0
7440-66-6	**Zinc, dissolved**	9.5E-03	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons																										
91-20-3	Naphthalene	1.5E-03	—	—	0.01	—	—	—	—	—	0.00	—	—	—	—	0	—	0.00	0.01	0	—	0	—	0	0.01	1
Semivolatile Organic Compounds																										
100-42-5	Styrene	2.3E-04	—	—	0.00	—	—	—	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
Volatile Organic Compounds																										
630-20-6	1,1,1,2-Tetrachloroethane	5.0E-04	1.7E-07	—	0.00	1.4E-08	—	0.00	—	—	0.00	—	—	—	1.8E-07	0	—	0	0.00	0	1.8E-07	0	—	0	0.00	0
71-55-6	1,1,1-Trichloroethane	2.3E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-34-5	1,1,2,2-Tetrachloroethane	5.0E-04	1.4E-06	1.7E-06	0.01	1.3E-07	—	0.00	—	2.0E-07	0.00	—	—	—	1.5E-06	0	1.9E-06	0	0.01	0	1.5E-06	0	1.9E-06	0	0.01	1
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.0E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
79-00-5	1,1,2-Trichloroethane	5.0E-04	5.0E-07	5.0E-07	0.01	3.8E-08	3.8E-08	0.00	—	3.0E-08	0.00	—	—	—	5.4E-07	0	5.7E-07	0	0.01	0	5.4E-07	0	5.7E-07	0	0.01	1
75-34-3	1,1-Dichloroethane	3.1E-04	3.0E-08	3.0E-08	0.00	2.5E-09	2.5E-09	0.00	1.9E-09	1.6E-09	0.00	—	—	—	3.4E-08	0	3.4E-08	0	0.00	0	3.4E-08	0	3.4E-08	0	0.00	0
75-35-4	1,1-Dichloroethene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
563-58-6	1,1-Dichloropropene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
87-61-6	1,2,3-Trichlorobenzene	5.3E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
96-18-4	1,2,3-Trichloropropane	5.0E-04	5.0E-05	—	0.01	—	—	0.00	—	—	0.00	—	—	—	5.0E-05	9	—	0	0.01	0	5.0E-05	13	—	0	0.01	0
120-82-1	1,2,4-Trichlorobenzene	5.0E-04	3.0E-08	3.0E-08	0.00	—	—	0.00	3.1E-08	2.9E-08	0.01	—	—	—	6.1E-08	0	5.9E-08	0	0.01	0	6.1E-08	0	5.9E-08	0	0.01	1
95-63-6	1,2,4-Trimethylbenzene	5.0E-04	—	—	0.01	—	—	0.00	—	—	0.01	—	—	—	—	0	—	0	0.02	0	—	0	—	0	0.02	1
96-12-8	1,2-Dibromo-3-Chloropropane (M)	2.0E-03	7.0E-05	9.0E-04	0.70	1.8E-04	—	0.20	—	—	0.00	—	—	—	2.5E-04	45	9.0E-04	79	0.90	14	2.5E-04	67	9.0E-04	94	0.90	48
106-93-4	1,2-Dibromoethane	5.0E-04	1.4E-05	3.0E-05	0.00	1.3E-06	1.4E-07	0.00	—	7.0E-07	0.00	2.6E-07	3.1E-08	0.00	1.6E-05	3	3.1E-05	3	0.01	0	1.6E-05	4	3.1E-05	3	0.01	0
95-50-1	1,2-Dichlorobenzene	1.5E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
107-06-2	1,2-Dichloroethane	5.0E-04	6.0E-07	3.0E-07	0.00	6.0E-08	5.0E-08	0.00	3.0E-08	1.5E-08	0.00	—	—	—	6.9E-07	0	3.7E-07	0	0.00	0	6.9E-07	0	3.7E-07	0	0.00	0
78-87-5	1,2-Dichloropropane	5.0E-04	3.0E-07	3.0E-07	0.00	2.5E-08	2.5E-08	0.00	—	2.0E-08	0.00	—	—	—	3.3E-07	0	3.5E-07	0	0.00	0	3.3E-07	0	3.5E-07	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
142-28-9	1,3-Dichloropropane	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
106-46-7	1,4-Dichlorobenzene	5.0E-04	4.0E-08	4.0E-08	0.00	2.5E-08	2.5E-08	0.00	—	—	0.00	—	—	—	6.5E-08	0	6.5E-08	0	0.00	0	6.5E-08	0	6.5E-08	0	0.00	0
594-20-7	2,2-Dichloropropane	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
78-93-3	2-Butanone	3.2E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-49-8	2-Chlorotoluene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
591-78-6	2-Hexanone	2.7E-03	—	—	0.04	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.04	1	—	0	—	0	0.04	2
106-43-4	4-Chlorotoluene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-10-1	4-Methyl-2-pentanone	3.8E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
67-64-1	Acetone	4.7E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
71-43-2	Benzene	1.9E-04	1.6E-07	3.0E-07	0.00	7.0E-09	2.6E-08	0.00	2.1E-08	4.0E-08	0.00	—	—	—	1.9E-07	0	3.7E-07	0	0.00	0	1.9E-07	0	3.7E-07	0	0.00	0
108-86-1	Bromobenzene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	0
74-97-5	Bromochloromethane	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-27-4	Bromodichloromethane	5.0E-04	5.0E-07	1.0E-06	0.00	9.0E-08	—	0.00	—	5.0E-08	0.00	—	—	—	5.9E-07	0	1.1E-06	0	0.00	0	5.9E-07	0	1.1E-06	0	0.00	0
75-25-2	Bromoform	2.4E-04	3.0E-08	3.0E-08	0.00	1.3E-09	—	0.00	—	—	0.00	1.5E-10	1.5E-10	0.00	3.1E-08	0	3.0E-08	0	0.00	0	3.1E-08	0	3.0E-08	0	0.00	0
75-15-0	Carbon disulfide	3.8E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
56-23-5	Carbon tetrachloride	5.0E-04	1.0E-06	1.1E-06	0.06	3.7E-08	1.0E-07	0.00	—	2.0E-07	0.00	—	—	—	1.0E-06	0	1.4E-06	0	0.06	1	1.0E-06	0	1.4E-06	0	0.06	3
108-90-7	Chlorobenzene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0

Table 8-15: IR Site 23 - Residential HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater			Inhalation of Groundwater While Showering			Dermal Contact With Groundwater While Showering			Inhalation of Vapors in Indoor Air Originating from Groundwater			Totals by Analyte						Totals by Analyte - **Excluding Background**					
CAS Number	Chemical		U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total	U.S. EPA Cancer Risk	% of Total	Cal/ EPA Cancer Risk	% of Total	Hazard Index	% of Total
75-00-3	Chloroethane	1.0E-03	5.0E-08	0.0E+00	0.00	—	—	0.00	—	—	0.00	—	—	—	5.0E-08	0	—	0	0.00	0	5.0E-08	0	—	0	0.00	0
67-66-3	Chloroform	5.0E-04	1.8E-07	1.8E-07	0.00	6.0E-08	1.3E-08	0.00	—	—	0.00	—	—	—	2.4E-07	0	1.9E-07	0	0.00	0	2.4E-07	0	1.9E-07	0	0.00	0
74-87-3	Chloromethane	1.0E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	1.1E-03	—	—	0.01	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.01	0	—	0	—	0	0.01	1
10061-01-5	cis-1,3-Dichloropropene	5.0E-04	8.0E-07	6.0E-07	0.00	—	—	0.00	1.9E-08	2.0E-08	0.00	—	—	—	8.2E-07	0	6.2E-07	0	0.00	0	8.2E-07	0	6.2E-07	0	0.00	0
124-48-1	Dibromochloromethane	5.0E-04	6.0E-07	—	0.00	6.0E-08	6.0E-08	0.00	—	—	0.00	—	—	—	6.6E-07	0	6.0E-08	0	0.00	0	6.6E-07	0	6.0E-08	0	0.00	0
74-95-3	Dibromomethane	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-71-8	Dichlorodifluoromethane	1.0E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
100-41-4	Ethylbenzene	5.0E-04	8.0E-08	8.0E-08	0.00	6.0E-09	—	0.00	4.4E-08	4.0E-08	0.00	—	—	—	1.3E-07	0	1.2E-07	0	0.00	0	1.3E-07	0	1.2E-07	0	0.00	0
87-68-3	Hexachlorobutadiene	5.0E-04	6.0E-07	—	0.04	5.0E-08	—	0.00	—	—	0.00	1.0E-07	1.0E-07	0.04	7.5E-07	0	1.0E-07	0	0.07	1	7.5E-07	0	1.0E-07	0	0.07	4
108-20-3	Isopropyl Ether	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-82-8	Isopropylbenzene	3.3E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	2.5E-04	6.0E-09	6.0E-09	0.00	3.6E-10	3.6E-10	0.00	1.4E-10	1.4E-10	0.00	—	—	—	6.5E-09	0	6.5E-09	0	0.00	0	6.5E-09	0	6.5E-09	0	0.00	0
75-09-2	Methylene chloride	1.7E-03	1.7E-07	3.0E-07	0.00	3.8E-09	9.0E-09	0.00	6.6E-09	1.3E-08	0.00	—	—	—	1.8E-07	0	3.2E-07	0	0.00	0	1.8E-07	0	3.2E-07	0	0.00	0
104-51-8	N-Butylbenzene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
103-65-1	N-Propylbenzene	4.2E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
95-47-6	o-Xylene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
99-87-6	p-Isopropyltoluene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
135-98-8	Sec-Butylbenzene	3.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
98-06-6	T-Butylbenzene	3.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
994-05-8	Tert-Amyl Methyl Ether	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	5.7E-03	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
637-92-3	Tert-Butyl Ethyl Ether	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
127-18-4	Tetrachloroethene	5.0E-04	4.0E-06	4.0E-06	0.00	1.3E-08	—	0.00	2.1E-06	2.6E-06	0.00	—	—	—	6.2E-06	1	6.6E-06	1	0.01	0	6.2E-06	2	6.6E-06	1	0.01	0
108-88-3	Toluene	2.2E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
10061-02-6	trans-1,3-Dichloropropene	5.0E-04	8.0E-07	6.0E-07	0.00	—	—	0.00	—	—	0.00	—	—	—	8.0E-07	0	6.0E-07	0	0.00	0	8.0E-07	0	6.0E-07	0	0.00	0
79-01-6	Trichloroethene	5.0E-04	5.0E-08	5.0E-08	0.00	5.0E-09	—	0.00	6.6E-09	7.0E-09	0.00	—	—	—	6.2E-08	0	5.7E-08	0	0.00	0	6.2E-08	0	5.7E-08	0	0.00	0
75-69-4	Trichlorofluoromethane	6.1E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
108-05-4	Vinyl acetate	1.0E-02	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
75-01-4	Vinyl chloride (M)	5.0E-04	4.0E-05	9.0E-06	0.01	3.0E-08	6.0E-07	0.00	—	—	0.00	—	—	—	4.0E-05	7	9.6E-06	1	0.01	0	4.0E-05	11	9.6E-06	1	0.01	1
1330-20-7	Xylenes (total)	5.0E-04	—	—	0.00	—	—	0.00	—	—	0.00	—	—	—	—	0	—	0	0.00	0	—	0	—	0	0.00	0
		Totals by Pathway	4.E-04	1.E-03	6	2.E-04	1.E-06	0.2	3.E-06	5.E-06	0.0	4.E-07	1.E-07	0.0	**6.E-04**		**1.E-03**		**7**							
		% of Totals	66	99	96	33	0	3	1	0	0	0	0	1												
		Totals by Pathway (Excluding Background)	2.E-04	1.E-03	2	2.E-04	1.E-06	0.2	2.E-06	4.E-06	0.0	4.E-07	1.E-07	0.0							**4.E-04**		**1.E-03**		**2**	
		% of Totals (Excluding Background)	50	99	85	49	0	11	1	0	1	0	0	2												

Table 8-16: HHRA Results by Exposure Group, Soil and Groundwater

Exposure Group Number	Exposure Group Definition	Site 9			Site 13			Site 19			Site 22			Site 23		
		U.S. EPA Cancer Risk	Cal/EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Cal/EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Cal/EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Cal/EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Cal/EPA Cancer Risk	Noncancer Hazard Index
HHRA Results by Exposure Group, Soil (0 - 2 feet bgs) and Groundwater																
1	All soil and groundwater exposure pathways															
	Total[a]	1.E-03	5.E-04	78	1.E-03	2.E-03	24	4.E-04	4.E-04	7	3.E-03	5.E-03	141	6.E-04	1.E-03	10
	Total, excluding background constituents	1.E-03	5.E-04	63	1.E-03	2.E-03	22	3.E-04	3.E-04	2	3.E-03	5.E-03	130	4.E-04	1.E-03	3
2	Exposure pathways for soil and vapors from VOCs in groundwater															
	Total[a]	2.E-05	6.E-05	3	6.E-05	1.E-04	4	3.E-05	4.E-05	3	2.E-04	7.E-04	6	3.E-05	5.E-05	3
	Total, excluding background constituents	4.E-06	5.E-05	2	4.E-05	7.E-05	3	2.E-05	3.E-05	2	2.E-04	7.E-04	4	2.E-05	3.E-05	1
3	Exposure pathways for residential use of groundwater															
	Total[a]	1.E-03	4.E-04	76	1.E-03	1.E-03	20	4.E-04	4.E-04	4	3.E-03	4.E-03	136	6.E-04	1.E-03	7
	Total, excluding background constituents	1.E-03	4.E-04	61	1.E-03	1.E-03	20	3.E-04	3.E-04	1	3.E-03	4.E-03	126	4.E-04	1.E-03	2
HHRA Results by Exposure Group, Soil (0 - 8 feet bgs) and Groundwater																
1	All soil and groundwater exposure pathways															
	Total[a]	1.E-03	6.E-04	81	1.E-03	2.E-03	23	4.E-04	4.E-04	7	3.E-03	7.E-03	157	6.E-04	1.E-03	10
	Total, excluding background constituents	1.E-03	6.E-04	67	1.E-03	2.E-03	23	3.E-04	3.E-04	2	3.E-03	7.E-03	146	4.E-04	1.E-03	3
2	Exposure pathways for soil and vapors from VOCs in groundwater															
	Total[a]	6.E-05	2.E-04	6	9.E-05	1.E-04	3	3.E-05	3.E-05	3	3.E-04	2.E-03	22	3.E-05	5.E-05	3
	Total, excluding background constituents	5.E-05	1.E-04	5	7.E-05	1.E-04	3	2.E-05	2.E-05	1	3.E-04	2.E-03	21	2.E-05	4.E-05	1
3	Exposure pathways for residential use of groundwater															
	Total[a]	1.E-03	4.E-04	76	1.E-03	1.E-03	20	4.E-04	4.E-04	4	3.E-03	4.E-03	136	6.E-04	1.E-03	7
	Total, excluding background constituents	1.E-03	4.E-04	61	1.E-03	1.E-03	20	3.E-04	3.E-04	1	3.E-03	4.E-03	126	4.E-04	1.E-03	2

Note:
[a] includes all COPCs

Acronyms/Abbreviations:
Cal/EPA – California Environmental Protection Agency
COPC – chemical of potential concern
HHRA – human health risk assessment
NA – not applicable; without groundwater data, Exposure Group 2 is the only risk group
NC – not calculated; no COPCs in this category
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

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Table 9-1: Commercial Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of COPCs in Groundwater at IR Site 9

CAS NO.	Analyte	Exposure Point Concentration (EPC) (ug/L)	Risk/HQ at EPC COMMERCIAL USE		
			Incremental Lifetime U.S EPA Cancer Risk - Vapor Intrusion	Incremental Lifetime Cal/EPA Cancer Risk - Vapor Intrusion	HI
95636	1,2,4-Trimethylbenzene	27	NA	NA	0.03
108678	1,3,5-Trimethylbenzene	9.4	NA	NA	0.01
71432	Benzene	0.5	1.3E-08	4.9E-08	0.00
75274	Bromodichloromethane	0.43	7.8E-09	7.8E-09	0.00
75252	Bromoform	0.61	1.2E-10	1.2E-10	0.00
124481	Dibromochloromethane	0.41	2.8E-09	2.8E-09	0.00
75718	Dichlorodifluoromethane	16	NA	NA	0.03
98828	Isopropylbenzene	3.3	NA	NA	0.00
127184	Tetrachloroethene	0.88	4.4E-08	4.4E-08	0.00
75014	Vinyl Chloride	6.8	6.3E-07	1.1E-05	0.00
91203	Naphthalene	8	7.3E-08	7.3E-08	0.00
		Cumulative Risk	**8.E-07**	**1.E-05**	**0.08**

Table 9-2: Commercial Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of COPCs in Groundwater at IR Site 13

CAS NO.	Analyte	Exposure Point Concentration (EPC) (ug/L)	Risk/HQ at EPC COMMERCIAL USE		
			Incremental Lifetime U.S EPA Cancer Risk - Vapor Intrusion	Incremental Lifetime Cal/EPA Cancer Risk - Vapor Intrusion	HI
71432	Benzene	94.46	2.5E-06	9.3E-06	0.03
100414	Ethyl benzene	135.7	1.3E-06	1.3E-06	0.00
91203	Naphthalene	33.21	NA	3.0E-07	0.01
		Cumulative Risk	**4.E-06**	**1.E-05**	**0.04**

Table 9-3: Commercial Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of COPCs in Groundwater at IR Site 19

CAS NO.	Analyte	Exposure Point Concentration (EPC) (ug/L)	Risk/HQ at EPC COMMERCIAL USE		
			Incremental Lifetime U.S EPA Cancer Risk - Vapor Intrusion	Incremental Lifetime Cal/EPA Cancer Risk - Vapor Intrusion	HI
127184	Tetrachloroethene	22	1.1E-06	1.1E-06	0.00
79016	Trichloroethene	2.8	3.1E-08	3.1E-08	0.04
		Cumulative Risk	**1.E-06**	**1.E-06**	**0.04**

Table 9-4: Commercial Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of COPCs in Groundwater at IR Site 22

CAS NO.	Analyte	Exposure Point Concentration (EPC) (ug/L)	Risk/HQ at EPC COMMERCIAL USE		
			Incremental Lifetime U.S EPA Cancer Risk - Vapor Intrusion	Incremental Lifetime Cal/EPA Cancer Risk - Vapor Intrusion	HI
95636	1,2,4-Trimethylbenzene	3.174	NA	NA	0.00
107062	1,2-Dichloroethane	12.3	2.6E-07	2.1E-07	0.00
71432	Benzene	1707	4.5E-05	1.7E-04	0.54
75150	Carbon Disulfide	1200	NA	NA	0.11
100414	Ethylbenzene	1160	1.1E-05	1.1E-05	0.01
98828	Isopropylbenzene	47.24	NA	NA	0.00
108883	Toluene	5309	NA	NA	0.01
91203	Naphthalene	130.6	NA	1.2E-06	0.03
		Cumulative Risk	**6.E-05**	**2.E-04**	**0.7**

Table 9-5: Commercial Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of COPCs in Groundwater at IR Site 23

CAS NO.	Analyte	Exposure Point Concentration (EPC) (ug/L)	Risk/HQ at EPC COMMERCIAL USE		
			Incremental Lifetime U.S EPA Cancer Risk - Vapor Intrusion	Incremental Lifetime Cal/EPA Cancer Risk - Vapor Intrusion	HI
106934	1,2-Dibromoethane	0.5	7.8E-08	9.2E-09	0.00
75252	Bromoform	0.239	4.5E-11	4.5E-11	0.00
87683	Hexachlorobutadiene	0.5	3.0E-08	3.0E-08	0.01
		Cumulative Risk	**1.E-07**	**4.E-08**	**0.0**

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ATTACHMENT A
OU-2A Lead Spreadsheet

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LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.017
Lead in Soil/Dust (ug/g)	
Lead in Water (ug/l)	5.6
% Home-grown Produce	6%
Respirable Dust (ug/m^3)	1.5

OUTPUT	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
~~BLOOD Pb, ADULT~~	~~0.6~~	~~1.0~~	~~1.2~~	~~1.5~~	~~1.7~~	~~937~~	~~1368~~
BLOOD Pb, CHILD	0.9	1.6	1.9	2.3	2.7	207	315
BLOOD Pb, PICA CHILD	0.9	1.6	1.9	2.3	2.7	130	198
~~BLOOD Pb, OCCUPATIONA~~	~~0.6~~	~~1.0~~	~~1.2~~	~~1.5~~	~~1.7~~	~~4312~~	~~6301~~

EXPOSURE PARAMETERS	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/day)	0.04	0.16
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.08	0.19
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	0.0	

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PATHWAYS

~~ADULTS~~	~~Residential~~			~~Occupational~~		
	~~Pathway contribution~~			~~Pathway contribution~~		
~~Pathway~~	~~PEF~~	~~ug/dl~~	~~percent~~	~~PEF~~	~~ug/dl~~	~~percent~~
~~Soil Contact~~	~~3.8E-5~~	~~0.00~~	~~0%~~	~~1.4E-5~~	~~0.00~~	~~0%~~
~~Soil Ingestion~~	~~8.8E-4~~	~~0.00~~	~~0%~~	~~6.3E-4~~	~~0.00~~	~~0%~~
~~Inhalation, bkgrnd~~		~~0.03~~	~~5%~~		~~0.02~~	~~4%~~
~~Inhalation~~	~~2.5E-6~~	~~0.00~~	~~0%~~	~~1.8E-6~~	~~0.00~~	~~0%~~
~~Water Ingestion~~		~~0.31~~	~~56%~~		~~0.31~~	~~55%~~
~~Food Ingestion, bkgrnd~~		~~0.22~~	~~39%~~		~~0.23~~	~~41%~~
~~Food Ingestion~~	~~2.1E-3~~	~~0.00~~	~~0%~~			~~0%~~

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.00	0%		0.00	0%
Soil Ingestion	7.0E-3	0.00	0%	1.4E-2	0.00	0%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.02	2%		0.02	2%
Water Ingestion		0.36	40%		0.36	40%
Food Ingestion, bkgrnd		0.51	57%		0.51	57%
Food Ingestion	4.8E-3	0.00	0%		0.00	0%

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ATTACHMENT B
Summary Statistics of Detected and Non-Detected Analytes, Soil and Groundwater

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Table 1: Occurence, Distribution and Exposure Point Concentration Summary
Groundwater - IR Site 9

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Frequency of Detection	Minimum Hit, ug/l	Maximum Hit, ug/l	Calculated EPC Value, ug/l	Calculated EPC or Maximum Value
IR 00009	MET	Antimony	7440-36-0	18	4	14	22.2%	0.506	1.47	0.91	EPC
IR 00009	MET	Arsenic	7440-38-2	14	14	0	100.0%	0.526	35.3	22.37	EPC
IR 00009	MET	Barium	7440-39-3	14	14	0	100.0%	31.3	309	187.4	EPC
IR 00009	MET	Cadmium	7440-43-9	14	1	13	7.1%	0.503	0.503	0.503	Max
IR 00009	MET	Chromium, Hexavalent	18540-29-9	95	1	94	1.1%	20	20	20	Max
IR 00009	MET	Chromium, Total	7440-47-3	14	8	6	57.1%	0.545	3.04	1.331	EPC
IR 00009	MET	Cobalt	7440-48-4	14	11	3	78.6%	0.566	9.86	3.162	EPC
IR 00009	MET	Copper	7440-50-8	14	3	11	21.4%	1.04	1.78	1.288	EPC
IR 00009	MET	Lead	7439-92-1	14	1	13	7.1%	0.513	0.513	0.513	Max
IR 00009	MET	Molybdenum	7439-98-7	14	11	3	78.6%	1.06	14.5	7.025	EPC
IR 00009	MET	Nickel	7440-02-0	14	13	1	92.9%	0.915	39.9	17.47	EPC
IR 00009	MET	Selenium	7782-49-2	14	4	10	28.6%	0.581	2.18	1.258	EPC
IR 00009	MET	Vanadium	7440-62-2	14	11	3	78.6%	1.22	6.11	2.736	EPC
IR 00009	MET	Zinc	7440-66-6	14	10	4	71.4%	5.08	21	10.83	EPC
IR 00009	METD	Aluminum, dissolved	7429-90-5	131	10	121	7.6%	2.9	170	50.34	EPC
IR 00009	METD	Antimony, dissolved	7440-36-0	133	20	113	15.0%	0.079	0.87	0.358	EPC
IR 00009	METD	Arsenic, dissolved	7440-38-2	137	106	31	77.4%	0.77	81.2	15.18	EPC
IR 00009	METD	Barium, dissolved	7440-39-3	131	131	0	100.0%	3.09	350	125.1	EPC
IR 00009	METD	Beryllium, dissolved	7440-41-7	137	1	136	0.7%	0.28	0.28	0.28	Max
IR 00009	METD	Cadmium, dissolved	7440-43-9	137	29	108	21.2%	0.055	125	4.606	EPC
IR 00009	METD	Calciuim, dissolved	7440-70-2	131	131	0	100.0%	2030	518000	95795	EPC
IR 00009	METD	Chromium, dissolved	7440-47-3	137	61	76	44.5%	0.21	151	8.75	EPC
IR 00009	METD	Cobalt, dissolved	7440-48-4	131	76	55	58.0%	0.074	1070	206.1	EPC
IR 00009	METD	Copper, dissolved	7440-50-8	137	61	76	44.5%	0.54	885	117.6	EPC
IR 00009	METD	Iron, dissolved	7439-89-6	131	89	42	67.9%	27	267000	24001	EPC
IR 00009	METD	Lead, dissolved	7439-92-1	137	34	103	24.8%	0.043	158	9.452	EPC
IR 00009	METD	Magnesium, dissolved	7439-95-4	131	131	0	100.0%	1740	644000	101862	EPC
IR 00009	METD	Manganese, dissolved	7439-96-5	131	129	2	98.5%	4.37	11200	2112	EPC
IR 00009	METD	Molybdenum, dissolved	7439-98-7	131	66	65	50.4%	0.49	48.5	14.23	EPC
IR 00009	METD	Nickel, dissolved	7440-02-0	137	107	30	78.1%	0.62	1890	383.3	EPC
IR 00009	METD	Potassium, dissolved	7440-09-7	131	131	0	100.0%	3520	136000	27640	EPC
IR 00009	METD	Selenium, dissolved	7782-49-2	137	14	123	10.2%	0.17	13.6	1.534	EPC
IR 00009	METD	Silver, dissolved	7440-22-4	137	10	127	7.3%	0.26	7.6	6.625	EPC
IR 00009	METD	Sodium, dissolved	7440-23-5	131	131	0	100.0%	11800	3480000	929571	EPC
IR 00009	METD	Thallium, dissolved	7440-28-0	128	9	119	7.0%	0.25	7.79	6.383	EPC
IR 00009	METD	Vanadium, dissolved	7440-62-2	131	84	47	64.1%	0.76	250	34.93	EPC
IR 00009	METD	Zinc, dissolved	7440-66-6	137	97	40	70.8%	1.4	925	154.6	EPC
IR 00009	PAH	2-Methylnaphthalene	91-57-6	95	2	93	2.1%	7.5	16	7.799	EPC
IR 00009	PAH	Naphthalene	91-20-3	195	26	169	13.3%	0.3	250	8.006	EPC
IR 00009	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	19	3	16	15.8%	0.48	4.4	1.302	EPC
IR 00009	SVOC	2,4-Dimethylphenol	105-67-9	105	4	101	3.8%	5.6	26	7.325	EPC
IR 00009	SVOC	2-Methylphenol (O-Cresol)	95-48-7	105	1	104	1.0%	12	12	12	Max
IR 00009	SVOC	4-Methylphenol (P-Cresol)	106-44-5	105	4	101	3.8%	17	500	42.49	EPC
IR 00009	SVOC	Benzoic Acid	65-85-0	95	2	93	2.1%	10	11	11.33	EPC
IR 00009	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	105	6	99	5.7%	11	34	12.75	EPC
IR 00009	SVOC	Phenol	108-95-2	105	2	103	1.9%	60	87	60.86	EPC
IR 00009	SVOC	Styrene	100-42-5	214	2	212	0.9%	0.24	0.33	0.359	EPC
IR 00009	VOC	1,1,1-Trichloroethane	71-55-6	214	3	211	1.4%	0.7	5.9	0.894	EPC
IR 00009	VOC	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	104	4	100	3.8%	0.24	2.6	2.212	EPC
IR 00009	VOC	1,1,2-Trichloroethane	79-00-5	214	1	213	0.5%	2.7	2.7	2.7	Max
IR 00009	VOC	1,1-Dichloroethane	75-34-3	214	121	93	56.5%	0.1	730	58.35	EPC
IR 00009	VOC	1,1-Dichloroethene	75-35-4	214	52	162	24.3%	0.24	34	2.383	EPC
IR 00009	VOC	1,2,3-Trichloropropane	96-18-4	185	30	155	16.2%	0.1	31	1.189	EPC
IR 00009	VOC	1,2,4-Trimethylbenzene	95-63-6	185	27	158	14.6%	0.25	780	26.97	EPC
IR 00009	VOC	1,2-Dichlorobenzene	95-50-1	195	5	190	2.6%	0.2	0.5	0.328	EPC
IR 00009	VOC	1,2-Dichloroethane	107-06-2	214	4	210	1.9%	0.27	0.41	0.401	EPC
IR 00009	VOC	1,2-Dichloropropane	78-87-5	214	10	204	4.7%	0.23	4	0.37	EPC
IR 00009	VOC	1,3,5-Trimethylbenzene	108-67-8	185	23	162	12.4%	0.3	150	9.361	EPC
IR 00009	VOC	1,3-Dichloropropane	142-28-9	81	31	50	38.3%	0.06	0.9	0.3	EPC
IR 00009	VOC	1,4-Dichlorobenzene	106-46-7	214	2	212	0.9%	0.2	0.2	0.2	Max
IR 00009	VOC	2-Butanone	78-93-3	214	8	206	3.7%	5.8	750	19.92	EPC
IR 00009	VOC	2-Chlorotoluene	95-49-8	81	2	79	2.5%	0.1	0.1	0.1	Max
IR 00009	VOC	2-Hexanone	591-78-6	214	1	213	0.5%	6	6	6	Max
IR 00009	VOC	4-Methyl-2-pentanone	108-10-1	214	3	211	1.4%	3.5	5.9	4.587	EPC
IR 00009	VOC	Acetone	67-64-1	214	48	166	22.4%	1.3	220	11.68	EPC
IR 00009	VOC	Benzene	71-43-2	214	63	151	29.4%	0.05	5.4	0.504	EPC
IR 00009	VOC	Bromodichloromethane	75-27-4	214	9	205	4.2%	0.3	2.6	0.431	EPC
IR 00009	VOC	Bromoform	75-25-2	214	12	202	5.6%	0.1	7.7	0.609	EPC
IR 00009	VOC	Carbon disulfide	75-15-0	72	2	70	2.8%	0.2	0.66	0.238	EPC
IR 00009	VOC	Chlorobenzene	108-90-7	214	42	172	19.6%	0.1	35	1.064	EPC
IR 00009	VOC	Chloroethane	75-00-3	214	6	208	2.8%	0.27	0.53	0.402	EPC
IR 00009	VOC	Chloroform	67-66-3	214	58	156	27.1%	0.09	8.8	1.015	EPC
IR 00009	VOC	Chloromethane	74-87-3	214	2	212	0.9%	0.2	0.9	0.9	EPC
IR 00009	VOC	cis-1,2-Dichloroethene	156-59-2	214	123	91	57.5%	0.2	60	5.535	EPC
IR 00009	VOC	Dibromochloromethane	124-48-1	214	8	206	3.7%	0.2	3.9	0.405	EPC
IR 00009	VOC	Dichlorodifluoromethane	75-71-8	185	2	183	1.1%	3.7	16	16	EPC
IR 00009	VOC	Ethylbenzene	100-41-4	214	32	182	15.0%	0.27	120	4.643	EPC
IR 00009	VOC	Isopropyl Ether	108-20-3	176	41	135	23.3%	0.09	56	2.93	EPC
IR 00009	VOC	Isopropylbenzene	98-82-8	185	29	156	15.7%	0.22	93	3.319	EPC
IR 00009	VOC	Methyl Tert-Butyl Ether	1634-04-4	214	59	155	27.6%	0.1	450	13.82	EPC
IR 00009	VOC	Methylene chloride	75-09-2	214	15	199	7.0%	0.1	2.8	0.748	EPC
IR 00009	VOC	Methylene chloride	75-09-2	214	15	199	7.0%	0.1	2.8	0.748	EPC
IR 00009	VOC	N-Butylbenzene	104-51-8	185	8	177	4.3%	1.1	50	2.533	EPC
IR 00009	VOC	N-Propylbenzene	103-65-1	185	28	157	15.1%	0.23	190	5.867	EPC
IR 00009	VOC	o-Xylene	95-47-6	81	10	71	12.3%	0.5	15	1.554	EPC
IR 00009	VOC	p-Isopropyltoluene	99-87-6	81	7	74	8.6%	1.9	57	7.034	EPC
IR 00009	VOC	Sec-Butylbenzene	135-98-8	185	34	151	18.4%	0.21	87	3.128	EPC
IR 00009	VOC	T-Butylbenzene	98-06-6	185	36	149	19.5%	0.09	24	0.845	EPC
IR 00009	VOC	Tert-Amyl Methyl Ether	994-05-8	176	2	174	1.1%	0.8	0.94	0.811	EPC
IR 00009	VOC	Tert-Butyl Alcohol	75-65-0	176	29	147	16.5%	3.6	200	17.4	EPC
IR 00009	VOC	Tetrachloroethene	127-18-4	214	34	180	15.9%	0.21	6.1	0.875	EPC
IR 00009	VOC	Toluene	108-88-3	214	32	182	15.0%	0.2	28	1.031	EPC
IR 00009	VOC	trans-1,2-Dichloroethene	156-60-5	214	33	181	15.4%	0.2	1	0.362	EPC
IR 00009	VOC	Trichloroethene	79-01-6	214	49	165	22.9%	0.1	4.8	0.657	EPC
IR 00009	VOC	Trichlorofluoromethane	75-69-4	185	1	184	0.5%	0.24	0.24	0.24	Max
IR 00009	VOC	Vinyl chloride	75-01-4	214	95	119	44.4%	0.2	280	6.806	EPC
IR 00009	VOC	Xylenes (total)	1330-20-7	133	16	117	12.0%	0.6	380	19.26	EPC
IR 00009	VOC	Xylenes, m & p		81	12	69	14.8%	0.3	30	2.665	EPC

Table 2: IR Site 9 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00009	MET	Beryllium	7440-41-7	14	0	14	1
IR 00009	MET	Mercury	7439-97-6	36	0	36	0.2-0.5
IR 00009	MET	Silver	7440-22-4	14	0	14	1
IR 00009	MET	Thallium	7440-28-0	22	0	22	1-5
IR 00009	METD	Mercury, dissolved	7439-97-6	19	0	19	0.2-0.4
IR 00009	PAH	Acenaphthene	83-32-9	105	0	105	9.4-11
IR 00009	PAH	Acenaphthylene	208-96-8	105	0	105	9.4-11
IR 00009	PAH	Anthracene	120-12-7	105	0	105	9.4-11
IR 00009	PAH	Benzo(a)anthracene	56-55-3	105	0	105	9.4-11
IR 00009	PAH	Benzo(a)pyrene	50-32-8	105	0	105	0.19-11
IR 00009	PAH	Benzo(b)fluoranthene	205-99-2	105	0	105	9.4-11
IR 00009	PAH	Benzo(g,h,i)perylene	191-24-2	105	0	105	9.4-11
IR 00009	PAH	Benzo(k)fluoranthene	207-08-9	105	0	105	9.4-11
IR 00009	PAH	Chrysene	218-01-9	105	0	105	9.4-11
IR 00009	PAH	Dibenz(a,h)Anthracene	53-70-3	105	0	105	9.4-11
IR 00009	PAH	Fluoranthene	206-44-0	105	0	105	9.4-11
IR 00009	PAH	Fluorene	86-73-7	105	0	105	9.4-11
IR 00009	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	105	0	105	9.4-11
IR 00009	PAH	Phenanthrene	85-01-8	105	0	105	9.4-11
IR 00009	PAH	Pyrene	129-00-0	105	0	105	9.4-11
IR 00009	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	2	0	2	0.48-0.49
IR 00009	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	2	0	2	0.48-0.49
IR 00009	PEST	Aldrin	309-00-2	2	0	2	0.095-0.098
IR 00009	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	2	0	2	0.19-0.2
IR 00009	PEST	alpha-Endosulfan	959-98-8	2	0	2	0.095-0.098
IR 00009	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	2	0	2	0.095-0.098
IR 00009	PEST	beta-Endosulfan	33213-65-9	2	0	2	0.19-0.2
IR 00009	PEST	Chlordane	57-74-9	2	0	2	0.95-0.98
IR 00009	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	2	0	2	0.095-0.098
IR 00009	PEST	Dieldrin	60-57-1	2	0	2	0.19-0.2
IR 00009	PEST	Endosulfan sulfate	1031-07-8	2	0	2	0.19-0.2
IR 00009	PEST	Endrin	72-20-8	2	0	2	0.19-0.2
IR 00009	PEST	Endrin aldehyde	7421-93-4	2	0	2	0.19-0.2
IR 00009	PEST	Endrin ketone	53494-70-5	2	0	2	0.19-0.2
IR 00009	PEST	gamma-BHC (Lindane)	58-89-9	2	0	2	0.095-0.098
IR 00009	PEST	Heptachlor	76-44-8	2	0	2	0.095-0.098
IR 00009	PEST	Heptachlor epoxide	1024-57-3	2	0	2	0.095-0.098
IR 00009	PEST	Methoxychlor	72-43-5	2	0	2	0.95-0.98
IR 00009	PEST	p,p'-DDD	72-54-8	2	0	2	0.19-0.2
IR 00009	PEST	p,p'-DDE	72-55-9	2	0	2	0.19-0.2
IR 00009	PEST	p,p'-DDT	50-29-3	2	0	2	0.19-0.2
IR 00009	PEST	Toxaphene	8001-35-2	2	0	2	1.9-2
IR 00009	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	105	0	105	9.4-11
IR 00009	SVOC	2,4,5-Trichlorophenol	95-95-4	105	0	105	9.4-54
IR 00009	SVOC	2,4,6-Trichlorophenol	88-06-2	105	0	105	9.4-11
IR 00009	SVOC	2,4-Dichlorophenol	120-83-2	105	0	105	9.4-11
IR 00009	SVOC	2,4-Dinitrophenol	51-28-5	105	0	105	47-54
IR 00009	SVOC	2,4-Dinitrotoluene	121-14-2	105	0	105	9.4-11
IR 00009	SVOC	2,6-Dinitrotoluene	606-20-2	105	0	105	9.4-11
IR 00009	SVOC	2-Chloronaphthalene	91-58-7	105	0	105	9.4-11
IR 00009	SVOC	2-Chlorophenol	95-57-8	105	0	105	9.4-11
IR 00009	SVOC	2-Nitroaniline	88-74-4	105	0	105	19-54
IR 00009	SVOC	2-Nitrophenol	88-75-5	105	0	105	9.4-20
IR 00009	SVOC	3,3'-Dichlorobenzidine	91-94-1	105	0	105	19-22
IR 00009	SVOC	3-Nitroaniline	99-09-2	105	0	105	19-54
IR 00009	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	105	0	105	47-54
IR 00009	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	105	0	105	9.4-11
IR 00009	SVOC	4-Chloro-3-methylphenol	59-50-7	105	0	105	9.4-11
IR 00009	SVOC	4-Chloroaniline	106-47-8	105	0	105	9.4-11
IR 00009	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	105	0	105	9.4-11
IR 00009	SVOC	4-Nitroaniline	100-01-6	105	0	105	19-54

Table 2: IR Site 9 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00009	SVOC	4-Nitrophenol	100-02-7	105	0	105	19-54
IR 00009	SVOC	Benzyl Butyl Phthalate	85-68-7	105	0	105	9.4-11
IR 00009	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	105	0	105	9.4-11
IR 00009	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	105	0	105	9.4-11
IR 00009	SVOC	Dibenzofuran	132-64-9	105	0	105	9.4-11
IR 00009	SVOC	Diethyl Phthalate	84-66-2	105	0	105	9.4-11
IR 00009	SVOC	Dimethyl Phthalate	131-11-3	105	0	105	9.4-11
IR 00009	SVOC	Di-N-Butyl Phthalate	84-74-2	105	0	105	9.4-11
IR 00009	SVOC	Di-N-Octylphthalate	117-84-0	105	0	105	9.4-11
IR 00009	SVOC	Hexachlorobenzene	118-74-1	105	0	105	0.94-11
IR 00009	SVOC	Hexachlorocyclopentadiene	77-47-4	105	0	105	9.4-50
IR 00009	SVOC	Hexachloroethane	67-72-1	105	0	105	9.4-11
IR 00009	SVOC	Isophorone	78-59-1	95	0	95	9.4-11
IR 00009	SVOC	Nitrobenzene	98-95-3	105	0	105	9.4-11
IR 00009	SVOC	N-Nitrosodimethylamine	62-75-9	95	0	95	9.4-11
IR 00009	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	105	0	105	9.4-11
IR 00009	SVOC	N-Nitrosodiphenylamine	86-30-6	105	0	105	9.4-11
IR 00009	SVOC	Pentachlorophenol	87-86-5	105	0	105	0.94-54
IR 00009	SVOC	Pyridine	110-86-1	10	0	10	38-40
IR 00009	VOC	1,1,1,2-Tetrachloroethane	630-20-6	185	0	185	0.5-1
IR 00009	VOC	1,1,2,2-Tetrachloroethane	79-34-5	214	0	214	0.5-5
IR 00009	VOC	1,1-Dichloropropene	563-58-6	81	0	81	0.5-1
IR 00009	VOC	1,2,3-Trichlorobenzene	87-61-6	81	0	81	0.5-1
IR 00009	VOC	1,2,4-Trichlorobenzene	120-82-1	214	0	214	0.5-5
IR 00009	VOC	1,2-Dibromo-3-Chloropropane	96-12-8	185	0	185	0.5-2
IR 00009	VOC	1,2-Dibromoethane	106-93-4	185	0	185	0.5-1
IR 00009	VOC	1,3-Dichlorobenzene	541-73-1	195	0	195	0.5-10
IR 00009	VOC	2,2-Dichloropropane	594-20-7	81	0	81	0.5-1
IR 00009	VOC	4-Chlorotoluene	106-43-4	185	0	185	0.5-1
IR 00009	VOC	Bromobenzene	108-86-1	185	0	185	0.5-1
IR 00009	VOC	Bromochloromethane	74-97-5	81	0	81	0.5-1
IR 00009	VOC	Bromomethane	74-83-9	214	0	214	0.5-25
IR 00009	VOC	Carbon tetrachloride	56-23-5	214	0	214	0.5-2.5
IR 00009	VOC	cis-1,3-Dichloropropene	10061-01-5	29	0	29	0.5-2.5
IR 00009	VOC	Dibromomethane	74-95-3	81	0	81	0.5-1
IR 00009	VOC	Hexachlorobutadiene	87-68-3	195	0	195	0.5-10
IR 00009	VOC	Tert-Butyl Ethyl Ether	637-92-3	176	0	176	0.5-5
IR 00009	VOC	trans-1,3-Dichloropropene	10061-02-6	29	0	29	0.5-2.5

Table 3: Occurence, Distribution and Exposure Point Concentration Summary
Groundwater - IR Site 13

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Frequency of Detection	Minimum Hit, ug/l	Maximum Hit, ug/l	Calculated EPC Value, ug/l	Calculated EPC or Maximum Value
IR 00013	MET	Aluminum	7429-90-5	4	1	3	25.0%	5.2	5.2	5.2	Max
IR 00013	MET	Antimony	7440-36-0	30	3	27	10.0%	0.17	1.3	0.758	EPC
IR 00013	MET	Arsenic	7440-38-2	12	11	1	91.7%	0.992	95	49.14	EPC
IR 00013	MET	Barium	7440-39-3	12	12	0	100.0%	23	70	53.36	EPC
IR 00013	MET	Cadmium	7440-43-9	12	1	11	8.3%	2.35	2.35	2.35	Max
IR 00013	MET	Calcium	7440-70-2	4	4	0	100.0%	14200	64000	64000	Max
IR 00013	MET	Chromium, Total	7440-47-3	12	6	6	50.0%	0.51	3.47	1.615	EPC
IR 00013	MET	Cobalt	7440-48-4	12	7	5	58.3%	0.22	2.2	1.188	EPC
IR 00013	MET	Copper	7440-50-8	12	9	3	75.0%	0.64	4.3	2.617	EPC
IR 00013	MET	Iron	7439-89-6	4	2	2	50.0%	110	120	120	Max
IR 00013	MET	Lead	7439-92-1	12	1	11	8.3%	1.53	1.53	1.53	Max
IR 00013	MET	Magnesium	7439-95-4	4	4	0	100.0%	14200	29000	29000	Max
IR 00013	MET	Manganese	7439-96-5	4	4	0	100.0%	83.8	1300	1300	Max
IR 00013	MET	Mercury	7439-97-6	108	8	100	7.4%	0.046	0.21	0.0609	EPC
IR 00013	MET	Molybdenum	7439-98-7	12	9	3	75.0%	1.55	18.5	10.86	EPC
IR 00013	MET	Nickel	7440-02-0	12	10	2	83.3%	1.4	6.7	4.449	EPC
IR 00013	MET	Potassium	7440-09-7	4	3	1	75.0%	4300	10000	10000	Max
IR 00013	MET	Selenium	7782-49-2	12	1	11	8.3%	0.36	0.36	0.36	Max
IR 00013	MET	Sodium	7440-23-5	4	4	0	100.0%	28000	113000	113000	Max
IR 00013	MET	Thallium	7440-28-0	46	2	44	4.3%	2.61	2.61	2.61	Max
IR 00013	MET	Vanadium	7440-62-2	12	11	1	91.7%	0.516	35.7	18.61	EPC
IR 00013	MET	Zinc	7440-66-6	12	6	6	50.0%	1.9	16.4	10.04	EPC
IR 00013	METD	Aluminum, dissolved	7429-90-5	123	32	91	26.0%	4.2	260	33.59	EPC
IR 00013	METD	Antimony, dissolved	7440-36-0	117	79	38	67.5%	0.051	2.8	0.699	EPC
IR 00013	METD	Antimony, dissolved	7440-36-0	117	79	38	67.5%	0.051	2.8	0.699	EPC
IR 00013	METD	Arsenic, dissolved	7440-38-2	135	103	32	76.3%	0.21	112	29.78	EPC
IR 00013	METD	Barium, dissolved	7440-39-3	123	123	0	100.0%	32	670	229.5	EPC
IR 00013	METD	Beryllium, dissolved	7440-41-7	135	5	130	3.7%	0.14	0.26	0.255	EPC
IR 00013	METD	Cadmium, dissolved	7440-43-9	135	10	125	7.4%	0.065	2.34	0.48	EPC
IR 00013	METD	Calciuim, dissolved	7440-70-2	123	123	0	100.0%	12000	243000	109635	EPC
IR 00013	METD	Chromium, dissolved	7440-47-3	135	67	68	49.6%	0.09	7.8	1.655	EPC
IR 00013	METD	Cobalt, dissolved	7440-48-4	123	77	46	62.6%	0.044	27	3.131	EPC
IR 00013	METD	Copper, dissolved	7440-50-8	135	96	39	71.1%	0.38	3900	260.4	EPC
IR 00013	METD	Iron, dissolved	7439-89-6	123	90	33	73.2%	7.4	60000	17566	EPC
IR 00013	METD	Lead, dissolved	7439-92-1	135	34	101	25.2%	0.049	6.7	0.466	EPC
IR 00013	METD	Magnesium, dissolved	7439-95-4	123	123	0	100.0%	6300	183000	61193	EPC
IR 00013	METD	Manganese, dissolved	7439-96-5	123	118	5	95.9%	1.4	8050	2896	EPC
IR 00013	METD	Molybdenum, dissolved	7439-98-7	123	47	76	38.2%	0.075	10.6	1.955	EPC
IR 00013	METD	Nickel, dissolved	7440-02-0	135	79	56	58.5%	0.69	24.5	4.932	EPC
IR 00013	METD	Potassium, dissolved	7440-09-7	123	111	12	90.2%	550	32900	10494	EPC
IR 00013	METD	Selenium, dissolved	7782-49-2	135	38	97	28.1%	0.36	3.89	1.435	EPC
IR 00013	METD	Silver, dissolved	7440-22-4	135	7	128	5.2%	0.037	5.09	0.318	EPC
IR 00013	METD	Sodium, dissolved	7440-23-5	123	123	0	100.0%	8800	840000	132432	EPC
IR 00013	METD	Vanadium, dissolved	7440-62-2	123	93	30	75.6%	0.33	11	3.564	EPC
IR 00013	METD	Zinc, dissolved	7440-66-6	135	97	38	71.9%	0.84	76	12.1	EPC
IR 00013	PAH	Naphthalene	91-20-3	173	27	146	15.6%	0.9	210	33.49	EPC
IR 00013	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	6	2	4	33.3%	1	1.1	1.06	EPC
IR 00013	VOC	1,1-Dichloroethane	75-34-3	177	8	169	4.5%	0.1	0.38	0.275	EPC
IR 00013	VOC	1,2,3-Trichlorobenzene	87-61-6	169	2	167	1.2%	0.52	0.52	0.52	Max
IR 00013	VOC	1,2,4-Trimethylbenzene	95-63-6	169	4	165	2.4%	0.3	2.1	2.1	EPC
IR 00013	VOC	1,2-Dichlorobenzene	95-50-1	173	2	171	1.2%	0.32	0.32	0.32	Max
IR 00013	VOC	1,2-Dichloroethane	107-06-2	177	6	171	3.4%	0.51	1.1	0.533	EPC
IR 00013	VOC	1,3-Dichlorobenzene	541-73-1	173	1	172	0.6%	0.2	0.2	0.2	Max
IR 00013	VOC	1,4-Dichlorobenzene	106-46-7	177	1	176	0.6%	0.45	0.45	0.45	Max
IR 00013	VOC	2-Butanone	78-93-3	177	3	174	1.7%	0.5	2.9	2.665	EPC
IR 00013	VOC	4-Methyl-2-pentanone	108-10-1	177	1	176	0.6%	0.4	0.4	0.4	Max
IR 00013	VOC	Acetone	67-64-1	177	34	143	19.2%	0.7	99	7.709	EPC
IR 00013	VOC	Bromomethane	74-83-9	177	4	173	2.3%	0.5	0.6	0.633	EPC
IR 00013	VOC	Carbon disulfide	75-15-0	169	13	156	7.7%	0.1	1.2	0.251	EPC
IR 00013	VOC	Chlorobenzene	108-90-7	177	9	168	5.1%	0.2	0.34	0.276	EPC
IR 00013	VOC	Chloroform	67-66-3	177	3	174	1.7%	0.23	9.7	0.624	EPC
IR 00013	VOC	Chloromethane	74-87-3	177	2	175	1.1%	0.3	0.3	0.3	Max
IR 00013	VOC	cis-1,2-Dichloroethene	156-59-2	177	3	174	1.7%	0.08	2.2	0.221	EPC
IR 00013	VOC	Ethylbenzene	100-41-4	177	2	175	1.1%	1.3	1.3	1.3	Max
IR 00013	VOC	Isopropyl Ether	108-20-3	169	2	167	1.2%	0.8	0.8	0.8	Max
IR 00013	VOC	Isopropylbenzene	98-82-8	169	18	151	10.7%	0.27	3	0.439	EPC
IR 00013	VOC	Methyl Tert-Butyl Ether	1634-04-4	177	9	168	5.1%	0.1	0.5	0.27	EPC
IR 00013	VOC	Methylene chloride	75-09-2	177	5	172	2.8%	0.5	0.97	0.631	EPC
IR 00013	VOC	N-Butylbenzene	104-51-8	169	6	163	3.6%	0.3	2.3	0.379	EPC
IR 00013	VOC	N-Propylbenzene	103-65-1	169	11	158	6.5%	0.1	0.8	0.315	EPC
IR 00013	VOC	o-Xylene	95-47-6	169	5	164	3.0%	0.2	0.49	0.457	EPC
IR 00013	VOC	p-Isopropyltoluene	99-87-6	169	8	161	4.7%	0.2	0.3	0.307	EPC
IR 00013	VOC	p-Isopropyltoluene	99-87-6	169	8	161	4.7%	0.2	0.3	0.307	EPC
IR 00013	VOC	Sec-Butylbenzene	135-98-8	169	21	148	12.4%	0.2	1.4	0.34	EPC
IR 00013	VOC	T-Butylbenzene	98-06-6	169	13	156	7.7%	0.23	0.8	0.376	EPC
IR 00013	VOC	Tert-Butyl Alcohol	75-65-0	166	2	164	1.2%	3.7	3.7	3.7	Max
IR 00013	VOC	Toluene	108-88-3	177	8	169	4.5%	0.3	3.4	0.47	EPC
IR 00013	VOC	trans-1,2-Dichloroethene	156-60-5	177	1	176	0.6%	0.26	0.26	0.26	Max
IR 00013	VOC	Trichloroethene	79-01-6	177	13	164	7.3%	0.2	1.9	0.301	EPC
IR 00013	VOC	Vinyl chloride	75-01-4	177	1	176	0.6%	0.64	0.64	0.64	Max
IR 00013	VOC	Xylenes, m & p	-81	169	2	167	1.2%	1.6	1.6	1.6	Max

Table 4: IR Site 13 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00013	MET	Beryllium	7440-41-7	12	0	12	1-4
IR 00013	MET	Silver	7440-22-4	12	0	12	1-10
IR 00013	METD	Mercury, dissolved	7439-97-6	36	0	36	0.16-0.2
IR 00013	METD	Thallium, dissolved	7440-28-0	99	0	99	0.037-5
IR 00013	PAH	Acenaphthene	83-32-9	4	0	4	9.4-11
IR 00013	PAH	Acenaphthylene	208-96-8	4	0	4	9.4-11
IR 00013	PAH	Anthracene	120-12-7	4	0	4	9.4-11
IR 00013	PAH	Benzo(a)anthracene	56-55-3	4	0	4	9.4-11
IR 00013	PAH	Benzo(a)pyrene	50-32-8	4	0	4	0.19-0.22
IR 00013	PAH	Benzo(b)fluoranthene	205-99-2	4	0	4	9.4-11
IR 00013	PAH	Benzo(g,h,i)perylene	191-24-2	4	0	4	9.4-11
IR 00013	PAH	Benzo(k)fluoranthene	207-08-9	4	0	4	9.4-11
IR 00013	PAH	Chrysene	218-01-9	4	0	4	9.4-11
IR 00013	PAH	Dibenz(a,h)Anthracene	53-70-3	4	0	4	9.4-11
IR 00013	PAH	Fluoranthene	206-44-0	4	0	4	9.4-11
IR 00013	PAH	Fluorene	86-73-7	4	0	4	9.4-11
IR 00013	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	4	0	4	9.4-11
IR 00013	PAH	Phenanthrene	85-01-8	4	0	4	9.4-11
IR 00013	PAH	Pyrene	129-00-0	4	0	4	9.4-11
IR 00013	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	4	0	4	9.4-11
IR 00013	SVOC	2,4,5-Trichlorophenol	95-95-4	4	0	4	9.4-11
IR 00013	SVOC	2,4,6-Trichlorophenol	88-06-2	4	0	4	9.4-11
IR 00013	SVOC	2,4-Dichlorophenol	120-83-2	4	0	4	9.4-11
IR 00013	SVOC	2,4-Dimethylphenol	105-67-9	4	0	4	9.4-11
IR 00013	SVOC	2,4-Dinitrophenol	51-28-5	4	0	4	47-55
IR 00013	SVOC	2,4-Dinitrotoluene	121-14-2	4	0	4	9.4-11
IR 00013	SVOC	2,6-Dinitrotoluene	606-20-2	4	0	4	9.4-11
IR 00013	SVOC	2-Chloronaphthalene	91-58-7	4	0	4	9.4-11
IR 00013	SVOC	2-Chlorophenol	95-57-8	4	0	4	9.4-11
IR 00013	SVOC	2-Methylphenol (O-Cresol)	95-48-7	4	0	4	9.4-11
IR 00013	SVOC	2-Nitroaniline	88-74-4	4	0	4	19-22
IR 00013	SVOC	2-Nitrophenol	88-75-5	4	0	4	19-22
IR 00013	SVOC	3,3'-Dichlorobenzidine	91-94-1	4	0	4	19-22
IR 00013	SVOC	3-Nitroaniline	99-09-2	4	0	4	19-22
IR 00013	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	4	0	4	47-55
IR 00013	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	4	0	4	9.4-11
IR 00013	SVOC	4-Chloro-3-methylphenol	59-50-7	4	0	4	9.4-11
IR 00013	SVOC	4-Chloroaniline	106-47-8	4	0	4	9.4-11
IR 00013	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	4	0	4	9.4-11
IR 00013	SVOC	4-Methylphenol (P-Cresol)	106-44-5	4	0	4	9.4-11
IR 00013	SVOC	4-Nitroaniline	100-01-6	4	0	4	19-22
IR 00013	SVOC	4-Nitrophenol	100-02-7	4	0	4	19-22
IR 00013	SVOC	Benzyl Butyl Phthalate	85-68-7	4	0	4	9.4-11
IR 00013	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	4	0	4	9.4-11
IR 00013	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	4	0	4	9.4-11
IR 00013	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	4	0	4	3.8-4.4
IR 00013	SVOC	Dibenzofuran	132-64-9	4	0	4	9.4-11
IR 00013	SVOC	Diethyl Phthalate	84-66-2	4	0	4	9.4-11
IR 00013	SVOC	Dimethyl Phthalate	131-11-3	4	0	4	9.4-11
IR 00013	SVOC	Di-N-Butyl Phthalate	84-74-2	4	0	4	9.4-11
IR 00013	SVOC	Di-N-Octylphthalate	117-84-0	4	0	4	9.4-11
IR 00013	SVOC	Hexachlorobenzene	118-74-1	4	0	4	0.94-1.1
IR 00013	SVOC	Hexachlorocyclopentadiene	77-47-4	4	0	4	47-55
IR 00013	SVOC	Hexachloroethane	67-72-1	4	0	4	9.4-11
IR 00013	SVOC	Nitrobenzene	98-95-3	4	0	4	9.4-11
IR 00013	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	4	0	4	9.4-11
IR 00013	SVOC	N-Nitrosodiphenylamine	86-30-6	4	0	4	9.4-11
IR 00013	SVOC	Pentachlorophenol	87-86-5	4	0	4	0.94-1.1
IR 00013	SVOC	Phenol	108-95-2	4	0	4	9.4-11
IR 00013	SVOC	Pyridine	110-86-1	4	0	4	38-44
IR 00013	SVOC	Styrene	100-42-5	177	0	177	0.5-5

Table 4: IR Site 13 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00013	VOC	1,1,1,2-Tetrachloroethane	630-20-6	169	0	169	0.5-1.7
IR 00013	VOC	1,1,1-Trichloroethane	71-55-6	177	0	177	0.5-2
IR 00013	VOC	1,1,2,2-Tetrachloroethane	79-34-5	177	0	177	0.5-1.7
IR 00013	VOC	1,1,2-Trichloroethane	79-00-5	177	0	177	0.5-5
IR 00013	VOC	1,1-Dichloroethene	75-35-4	177	0	177	0.5-5
IR 00013	VOC	1,1-Dichloropropene	563-58-6	169	0	169	0.5-1.7
IR 00013	VOC	1,2,3-Trichloropropane	96-18-4	169	0	169	0.5-1.7
IR 00013	VOC	1,2,4-Trichlorobenzene	120-82-1	177	0	177	0.5-1.7
IR 00013	VOC	1,2-Dibromo-3-Chloropropane	96-12-8	169	0	169	0.5-2
IR 00013	VOC	1,2-Dibromoethane	106-93-4	169	0	169	0.5-1.7
IR 00013	VOC	1,2-Dichloropropane	78-87-5	177	0	177	0.5-5
IR 00013	VOC	1,3,5-Trimethylbenzene	108-67-8	169	0	169	0.5-1.7
IR 00013	VOC	1,3-Dichloropropane	142-28-9	169	0	169	0.5-1.7
IR 00013	VOC	2,2-Dichloropropane	594-20-7	169	0	169	0.5-1.7
IR 00013	VOC	2-Chlorotoluene	95-49-8	169	0	169	0.5-1.7
IR 00013	VOC	2-Hexanone	591-78-6	177	0	177	10-50
IR 00013	VOC	4-Chlorotoluene	106-43-4	169	0	169	0.5-1.7
IR 00013	VOC	Benzene	71-43-2	177	0	177	0.5-1.7
IR 00013	VOC	Bromobenzene	108-86-1	169	0	169	0.5-1.7
IR 00013	VOC	Bromochloromethane	74-97-5	169	0	169	0.5-1.7
IR 00013	VOC	Bromodichloromethane	75-27-4	177	0	177	0.5-5
IR 00013	VOC	Bromoform	75-25-2	177	0	177	1-5
IR 00013	VOC	Carbon tetrachloride	56-23-5	177	0	177	0.5-1.7
IR 00013	VOC	Chloroethane	75-00-3	177	0	177	1-5
IR 00013	VOC	cis-1,3-Dichloropropene	10061-01-5	8	0	8	0.5
IR 00013	VOC	Dibromochloromethane	124-48-1	177	0	177	0.5-5
IR 00013	VOC	Dibromomethane	74-95-3	169	0	169	0.5-1.7
IR 00013	VOC	Dichlorodifluoromethane	75-71-8	169	0	169	1-3.3
IR 00013	VOC	Hexachlorobutadiene	87-68-3	173	0	173	0.5-11
IR 00013	VOC	Tert-Amyl Methyl Ether	994-05-8	169	0	169	0.5-5
IR 00013	VOC	Tert-Butyl Ethyl Ether	637-92-3	169	0	169	0.5-5
IR 00013	VOC	Tetrachloroethene	127-18-4	177	0	177	0.5-5
IR 00013	VOC	trans-1,3-Dichloropropene	10061-02-6	8	0	8	0.5
IR 00013	VOC	Trichlorofluoromethane	75-69-4	169	0	169	1-3.3
IR 00013	VOC	Xylenes (total)	1330-20-7	8	0	8	5

Table 5: Occurence, Distribution and Exposure Point Concentration Summary
Groundwater - IR Site 19

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Frequency of Detection	Minimum Hit, ug/l	Maximum Hit, ug/l	Calculated EPC Value, ug/l	Calculated EPC or Maximum Value
IR 00019	MET	Antimony	7440-36-0	8	4	4	50.0%	0.13	0.871	0.854	EPC
IR 00019	MET	Arsenic	7440-38-2	4	4	0	100.0%	1.7	5.58	5.58	Max
IR 00019	MET	Barium	7440-39-3	4	4	0	100.0%	10.9	29.5	29.5	Max
IR 00019	MET	Calcium	7440-70-2	1	1	0	100.0%	37000	37000	37000	Max
IR 00019	MET	Chromium, Total	7440-47-3	4	3	1	75.0%	0.34	0.688	0.688	Max
IR 00019	MET	Cobalt	7440-48-4	4	1	3	25.0%	2.92	2.92	2.92	Max
IR 00019	MET	Copper	7440-50-8	4	2	2	50.0%	0.28	6.34	6.34	Max
IR 00019	MET	Iron	7439-89-6	1	1	0	100.0%	60	60	60	Max
IR 00019	MET	Lead	7439-92-1	4	1	3	25.0%	0.06	0.06	0.06	Max
IR 00019	MET	Magnesium	7439-95-4	1	1	0	100.0%	6000	6000	6000	Max
IR 00019	MET	Manganese	7439-96-5	1	1	0	100.0%	41	41	41	Max
IR 00019	MET	Mercury	7439-97-6	21	2	19	9.5%	0.064	0.064	0.064	Max
IR 00019	MET	Molybdenum	7439-98-7	4	4	0	100.0%	2.3	15.4	15.4	Max
IR 00019	MET	Nickel	7440-02-0	4	4	0	100.0%	1.5	17.8	17.8	Max
IR 00019	MET	Potassium	7440-09-7	1	1	0	100.0%	8200	8200	8200	Max
IR 00019	MET	Selenium	7782-49-2	4	2	2	50.0%	0.62	0.901	0.901	Max
IR 00019	MET	Sodium	7440-23-5	1	1	0	100.0%	38000	38000	38000	Max
IR 00019	MET	Vanadium	7440-62-2	4	4	0	100.0%	0.54	18.8	18.8	Max
IR 00019	MET	Zinc	7440-66-6	4	4	0	100.0%	3.8	13	13	Max
IR 00019	METD	Aluminum, dissolved	7429-90-5	28	22	6	78.6%	9.8	507	281.6	EPC
IR 00019	METD	Antimony, dissolved	7440-36-0	28	17	11	60.7%	0.15	2	0.96	EPC
IR 00019	METD	Arsenic, dissolved	7440-38-2	32	22	10	68.8%	0.55	6.36	3.535	EPC
IR 00019	METD	Barium, dissolved	7440-39-3	28	26	2	92.9%	7.7	34.6	29.46	EPC
IR 00019	METD	Beryllium, dissolved	7440-41-7	32	2	30	6.3%	0.49	0.7	0.777	EPC
IR 00019	METD	Cadmium, dissolved	7440-43-9	32	2	30	6.3%	0.47	0.77	0.879	EPC
IR 00019	METD	Calciuim, dissolved	7440-70-2	28	28	0	100.0%	6300	41000	29805	EPC
IR 00019	METD	Chromium, dissolved	7440-47-3	32	18	14	56.3%	0.33	2.9	1.459	EPC
IR 00019	METD	Cobalt, dissolved	7440-48-4	28	9	19	32.1%	0.046	0.17	0.108	EPC
IR 00019	METD	Copper, dissolved	7440-50-8	32	20	12	62.5%	0.31	5.3	2.583	EPC
IR 00019	METD	Copper, dissolved	7440-50-8	32	20	12	62.5%	0.31	5.3	2.583	EPC
IR 00019	METD	Iron, dissolved	7439-89-6	28	17	11	60.7%	36	170	81.21	EPC
IR 00019	METD	Lead, dissolved	7439-92-1	32	8	24	25.0%	0.12	0.31	0.223	EPC
IR 00019	METD	Magnesium, dissolved	7439-95-4	28	19	9	67.9%	7.6	8000	4524	EPC
IR 00019	METD	Manganese, dissolved	7439-96-5	28	19	9	67.9%	0.23	87	38.09	EPC
IR 00019	METD	Mercury, dissolved	7439-97-6	10	2	8	20.0%	0.096	0.096	0.096	Max
IR 00019	METD	Molybdenum, dissolved	7439-98-7	28	16	12	57.1%	1	8.84	5.004	EPC
IR 00019	METD	Nickel, dissolved	7440-02-0	32	21	11	65.6%	0.93	2.8	2.033	EPC
IR 00019	METD	Potassium, dissolved	7440-09-7	28	28	0	100.0%	3500	18100	11287	EPC
IR 00019	METD	Selenium, dissolved	7782-49-2	32	11	21	34.4%	0.2	1.3	0.931	EPC
IR 00019	METD	Silver, dissolved	7440-22-4	32	2	30	6.3%	0.5	0.85	0.978	EPC
IR 00019	METD	Sodium, dissolved	7440-23-5	28	28	0	100.0%	28000	220000	189290	EPC
IR 00019	METD	Thallium, dissolved	7440-28-0	24	5	19	20.8%	0.18	1.3	0.717	EPC
IR 00019	METD	Vanadium, dissolved	7440-62-2	28	24	4	85.7%	0.53	25.7	38.35	EPC
IR 00019	METD	Zinc, dissolved	7440-66-6	32	18	14	56.3%	0.7	120	46.91	EPC
IR 00019	PAH	Naphthalene	91-20-3	48	22	26	45.8%	0.5	3.1	1.874	EPC
IR 00019	PAH	Naphthalene	91-20-3	48	22	26	45.8%	0.5	3.1	1.874	EPC
IR 00019	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	6	3	3	50.0%	2.6	4.1	3.539	EPC
IR 00019	VOC	1,1,1-Trichloroethane	71-55-6	50	46	4	92.0%	0.2	4.7	1.979	EPC
IR 00019	VOC	1,1-Dichloroethane	75-34-3	49	46	3	93.9%	0.5	9.8	6.192	EPC
IR 00019	VOC	1,1-Dichloroethene	75-35-4	50	24	26	48.0%	0.1	0.5	0.346	EPC
IR 00019	VOC	1,2,4-Trichlorobenzene	120-82-1	50	3	47	6.0%	0.1	0.2	0.235	EPC
IR 00019	VOC	1,2,4-Trimethylbenzene	95-63-6	47	1	46	2.1%	0.1	0.1	0.1	Max
IR 00019	VOC	1,3,5-Trimethylbenzene	108-67-8	47	1	46	2.1%	0.09	0.09	0.09	Max
IR 00019	VOC	1,3-Dichlorobenzene	541-73-1	48	4	44	8.3%	0.07	0.2	0.164	EPC
IR 00019	VOC	4-Chlorotoluene	106-43-4	47	1	46	2.1%	0.09	0.09	0.09	Max
IR 00019	VOC	Acetone	67-64-1	50	6	44	12.0%	1.1	4.4	3.068	EPC
IR 00019	VOC	Benzene	71-43-2	50	20	30	40.0%	0.07	0.3	0.223	EPC
IR 00019	VOC	Carbon disulfide	75-15-0	47	15	32	31.9%	0.08	4.4	0.769	EPC
IR 00019	VOC	Chloroethane	75-00-3	50	1	49	2.0%	0.5	0.5	0.5	Max
IR 00019	VOC	Chloroform	67-66-3	50	2	48	4.0%	0.2	0.2	0.2	Max
IR 00019	VOC	cis-1,2-Dichloroethene	156-59-2	50	42	8	84.0%	0.2	4.2	3.147	EPC
IR 00019	VOC	Ethylbenzene	100-41-4	50	3	47	6.0%	0.06	0.1	0.114	EPC
IR 00019	VOC	Methyl Tert-Butyl Ether	1634-04-4	49	23	26	46.9%	0.09	0.53	0.311	EPC
IR 00019	VOC	N-Butylbenzene	104-51-8	47	1	46	2.1%	0.2	0.2	0.2	Max
IR 00019	VOC	N-Propylbenzene	103-65-1	47	1	46	2.1%	0.1	0.1	0.1	Max
IR 00019	VOC	o-Xylene	95-47-6	47	2	45	4.3%	0.1	0.1	0.1	Max
IR 00019	VOC	Tetrachloroethene	127-18-4	50	43	7	86.0%	0.2	24	21.99	EPC
IR 00019	VOC	Toluene	108-88-3	50	3	47	6.0%	0.08	0.4	0.4	EPC
IR 00019	VOC	trans-1,2-Dichloroethene	156-60-5	50	9	41	18.0%	0.08	0.2	0.187	EPC
IR 00019	VOC	trans-1,2-Dichloroethene	156-60-5	50	9	41	18.0%	0.08	0.2	0.187	EPC
IR 00019	VOC	trans-1,2-Dichloroethene	156-60-5	50	9	41	18.0%	0.08	0.2	0.187	EPC
IR 00019	VOC	Trichloroethene	79-01-6	49	43	6	87.8%	0.2	9.1	2.822	EPC
IR 00019	VOC	Vinyl chloride	75-01-4	50	5	45	10.0%	0.1	0.9	0.473	EPC
IR 00019	VOC	Xylenes, m & p	-81	47	2	45	4.3%	0.4	0.4	0.4	Max

Table 6: IR Site 19 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00019	MET	Aluminum	7429-90-5	1	0	1	8.3
IR 00019	MET	Beryllium	7440-41-7	4	0	4	1
IR 00019	MET	Cadmium	7440-43-9	4	0	4	1
IR 00019	MET	Silver	7440-22-4	4	0	4	1
IR 00019	MET	Thallium	7440-28-0	8	0	8	1-5
IR 00019	PAH	Acenaphthene	83-32-9	1	0	1	11
IR 00019	PAH	Acenaphthylene	208-96-8	1	0	1	11
IR 00019	PAH	Anthracene	120-12-7	1	0	1	11
IR 00019	PAH	Benzo(a)anthracene	56-55-3	1	0	1	11
IR 00019	PAH	Benzo(a)pyrene	50-32-8	1	0	1	0.22
IR 00019	PAH	Benzo(b)fluoranthene	205-99-2	1	0	1	11
IR 00019	PAH	Benzo(g,h,i)perylene	191-24-2	1	0	1	11
IR 00019	PAH	Benzo(k)fluoranthene	207-08-9	1	0	1	11
IR 00019	PAH	Chrysene	218-01-9	1	0	1	11
IR 00019	PAH	Dibenz(a,h)Anthracene	53-70-3	1	0	1	11
IR 00019	PAH	Fluoranthene	206-44-0	1	0	1	11
IR 00019	PAH	Fluorene	86-73-7	1	0	1	11
IR 00019	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	1	0	1	11
IR 00019	PAH	Phenanthrene	85-01-8	1	0	1	11
IR 00019	PAH	Pyrene	129-00-0	1	0	1	11
IR 00019	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	1	0	1	11
IR 00019	SVOC	2,4,5-Trichlorophenol	95-95-4	1	0	1	11
IR 00019	SVOC	2,4,6-Trichlorophenol	88-06-2	1	0	1	11
IR 00019	SVOC	2,4-Dichlorophenol	120-83-2	1	0	1	11
IR 00019	SVOC	2,4-Dimethylphenol	105-67-9	1	0	1	11
IR 00019	SVOC	2,4-Dinitrophenol	51-28-5	1	0	1	55
IR 00019	SVOC	2,4-Dinitrotoluene	121-14-2	1	0	1	11
IR 00019	SVOC	2,6-Dinitrotoluene	606-20-2	1	0	1	11
IR 00019	SVOC	2-Chloronaphthalene	91-58-7	1	0	1	11
IR 00019	SVOC	2-Chlorophenol	95-57-8	1	0	1	11
IR 00019	SVOC	2-Methylphenol (O-Cresol)	95-48-7	1	0	1	11
IR 00019	SVOC	2-Nitroaniline	88-74-4	1	0	1	22
IR 00019	SVOC	2-Nitrophenol	88-75-5	1	0	1	22
IR 00019	SVOC	3,3'-Dichlorobenzidine	91-94-1	1	0	1	22
IR 00019	SVOC	3-Nitroaniline	99-09-2	1	0	1	22
IR 00019	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	1	0	1	55
IR 00019	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	1	0	1	11
IR 00019	SVOC	4-Chloro-3-methylphenol	59-50-7	1	0	1	11
IR 00019	SVOC	4-Chloroaniline	106-47-8	1	0	1	11
IR 00019	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	1	0	1	11
IR 00019	SVOC	4-Methylphenol (P-Cresol)	106-44-5	1	0	1	11
IR 00019	SVOC	4-Nitroaniline	100-01-6	1	0	1	22
IR 00019	SVOC	4-Nitrophenol	100-02-7	1	0	1	22
IR 00019	SVOC	Benzyl Butyl Phthalate	85-68-7	1	0	1	11
IR 00019	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	1	0	1	11
IR 00019	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	1	0	1	11
IR 00019	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	1	0	1	4.4
IR 00019	SVOC	Dibenzofuran	132-64-9	1	0	1	11
IR 00019	SVOC	Diethyl Phthalate	84-66-2	1	0	1	11
IR 00019	SVOC	Dimethyl Phthalate	131-11-3	1	0	1	11
IR 00019	SVOC	Di-N-Butyl Phthalate	84-74-2	1	0	1	11
IR 00019	SVOC	Di-N-Octylphthalate	117-84-0	1	0	1	11
IR 00019	SVOC	Hexachlorobenzene	118-74-1	1	0	1	1.1
IR 00019	SVOC	Hexachlorocyclopentadiene	77-47-4	1	0	1	55
IR 00019	SVOC	Hexachloroethane	67-72-1	1	0	1	11
IR 00019	SVOC	Nitrobenzene	98-95-3	1	0	1	11
IR 00019	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	1	0	1	11
IR 00019	SVOC	N-Nitrosodiphenylamine	86-30-6	1	0	1	11
IR 00019	SVOC	Pentachlorophenol	87-86-5	1	0	1	1.1
IR 00019	SVOC	Phenol	108-95-2	1	0	1	11
IR 00019	SVOC	Pyridine	110-86-1	1	0	1	44

Table 6: IR Site 19 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00019	SVOC	Styrene	100-42-5	50	0	50	0.5-5
IR 00019	VOC	1,1,1,2-Tetrachloroethane	630-20-6	47	0	47	0.5-1
IR 00019	VOC	1,1,2,2-Tetrachloroethane	79-34-5	50	0	50	0.5-1
IR 00019	VOC	1,1,2-Trichloroethane	79-00-5	50	0	50	0.5-5
IR 00019	VOC	1,1-Dichloropropene	563-58-6	47	0	47	0.5-1
IR 00019	VOC	1,2,3-Trichlorobenzene	87-61-6	47	0	47	0.5-1
IR 00019	VOC	1,2,3-Trichloropropane	96-18-4	47	0	47	0.5-1
IR 00019	VOC	1,2-Dibromo-3-Chloropropane	96-12-8	47	0	47	0.5-2
IR 00019	VOC	1,2-Dibromoethane	106-93-4	47	0	47	0.5-1
IR 00019	VOC	1,2-Dichlorobenzene	95-50-1	48	0	48	0.5-11
IR 00019	VOC	1,2-Dichloroethane	107-06-2	50	0	50	0.5
IR 00019	VOC	1,2-Dichloropropane	78-87-5	50	0	50	0.5-5
IR 00019	VOC	1,3-Dichloropropane	142-28-9	47	0	47	0.5
IR 00019	VOC	1,4-Dichlorobenzene	106-46-7	50	0	50	0.5-1
IR 00019	VOC	2,2-Dichloropropane	594-20-7	47	0	47	0.5-1
IR 00019	VOC	2-Butanone	78-93-3	50	0	50	10-100
IR 00019	VOC	2-Chlorotoluene	95-49-8	47	0	47	0.5-1
IR 00019	VOC	2-Hexanone	591-78-6	50	0	50	10-50
IR 00019	VOC	4-Methyl-2-pentanone	108-10-1	50	0	50	10-50
IR 00019	VOC	Bromobenzene	108-86-1	47	0	47	0.5-1
IR 00019	VOC	Bromochloromethane	74-97-5	47	0	47	0.5-1
IR 00019	VOC	Bromodichloromethane	75-27-4	50	0	50	0.5-5
IR 00019	VOC	Bromoform	75-25-2	50	0	50	1-5
IR 00019	VOC	Bromomethane	74-83-9	50	0	50	1-5
IR 00019	VOC	Carbon tetrachloride	56-23-5	50	0	50	0.5
IR 00019	VOC	Chlorobenzene	108-90-7	50	0	50	0.5-5
IR 00019	VOC	Chloromethane	74-87-3	50	0	50	1-5
IR 00019	VOC	cis-1,3-Dichloropropene	10061-01-5	3	0	3	0.5
IR 00019	VOC	Dibromochloromethane	124-48-1	50	0	50	0.5-5
IR 00019	VOC	Dibromomethane	74-95-3	47	0	47	0.5-1
IR 00019	VOC	Dichlorodifluoromethane	75-71-8	47	0	47	1
IR 00019	VOC	Hexachlorobutadiene	87-68-3	48	0	48	0.5-11
IR 00019	VOC	Isopropyl Ether	108-20-3	47	0	47	0.5-5
IR 00019	VOC	Isopropylbenzene	98-82-8	47	0	47	0.5-1
IR 00019	VOC	Methylene chloride	75-09-2	50	0	50	0.2-10
IR 00019	VOC	p-Isopropyltoluene	99-87-6	47	0	47	0.5-1
IR 00019	VOC	Sec-Butylbenzene	135-98-8	47	0	47	0.5-1
IR 00019	VOC	T-Butylbenzene	98-06-6	47	0	47	0.5-1
IR 00019	VOC	Tert-Amyl Methyl Ether	994-05-8	47	0	47	0.5-5
IR 00019	VOC	Tert-Butyl Alcohol	75-65-0	47	0	47	10-50
IR 00019	VOC	Tert-Butyl Ethyl Ether	637-92-3	47	0	47	0.5-5
IR 00019	VOC	trans-1,3-Dichloropropene	10061-02-6	3	0	3	0.5
IR 00019	VOC	Trichlorofluoromethane	75-69-4	47	0	47	1
IR 00019	VOC	Xylenes (total)	1330-20-7	3	0	3	5

Table 7: Occurence, Distribution and Exposure Point Concentration Summary
Groundwater - IR Site 22

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Frequency of Detection	Minimum Hit, ug/l	Maximum Hit, ug/l	Calculated EPC Value, ug/l	Calculated EPC or Maximum Value
IR 00022	MET	Aluminum	7429-90-5	2	1	1	50.0%	7.9	7.9	7.9	Max
IR 00022	MET	Antimony	7440-36-0	9	1	8	11.1%	0.843	0.843	0.843	Max
IR 00022	MET	Arsenic	7440-38-2	3	1	2	33.3%	4.27	4.27	4.27	Max
IR 00022	MET	Barium	7440-39-3	3	3	0	100.0%	74.8	190	190	Max
IR 00022	MET	Calcium	7440-70-2	2	2	0	100.0%	62200	93000	93000	Max
IR 00022	MET	Cobalt	7440-48-4	3	1	2	33.3%	1.78	1.78	1.78	Max
IR 00022	MET	Copper	7440-50-8	3	2	1	66.7%	0.767	12	12	Max
IR 00022	MET	Iron	7439-89-6	2	1	1	50.0%	40	40	40	Max
IR 00022	MET	Lead	7439-92-1	11	2	9	18.2%	5.6	5.6	5.6	Max
IR 00022	MET	Magnesium	7439-95-4	2	2	0	100.0%	14000	62900	62900	Max
IR 00022	MET	Manganese	7439-96-5	2	2	0	100.0%	160	472	472	Max
IR 00022	MET	Mercury	7439-97-6	34	6	28	17.6%	0.052	0.15	0.142	EPC
IR 00022	MET	Molybdenum	7439-98-7	3	2	1	66.7%	3.73	5.3	5.3	Max
IR 00022	MET	Nickel	7440-02-0	3	2	1	66.7%	4.33	20	20	Max
IR 00022	MET	Potassium	7440-09-7	2	1	1	50.0%	17000	17000	17000	Max
IR 00022	MET	Selenium	7782-49-2	3	1	2	33.3%	4	4	4	Max
IR 00022	MET	Sodium	7440-23-5	2	2	0	100.0%	36000	158000	158000	Max
IR 00022	MET	Vanadium	7440-62-2	3	2	1	66.7%	1.71	4.7	4.7	Max
IR 00022	MET	Zinc	7440-66-6	3	2	1	66.7%	7	35.4	35.4	Max
IR 00022	METD	Aluminum, dis	7429-90-5	41	22	19	53.7%	2.8	210	43.02	EPC
IR 00022	METD	Antimony, dis	7440-36-0	39	27	12	69.2%	0.079	4.8	2.343	EPC
IR 00022	METD	Arsenic, disso	7440-38-2	45	37	8	82.2%	0.96	41	23.06	EPC
IR 00022	METD	Arsenic, disso	7440-38-2	45	37	8	82.2%	0.96	41	23.06	EPC
IR 00022	METD	Barium, disso	7440-39-3	41	41	0	100.0%	64	520	334.5	EPC
IR 00022	METD	Beryllium, dis	7440-41-7	45	1	44	2.2%	0.49	0.49	0.49	Max
IR 00022	METD	Cadmium, dis	7440-43-9	45	11	34	24.4%	0.094	2.2	0.9	EPC
IR 00022	METD	Calciuim, diss	7440-70-2	41	41	0	100.0%	40000	108000	76533	EPC
IR 00022	METD	Chromium, di	7440-47-3	45	19	26	42.2%	0.13	2.1	1.11	EPC
IR 00022	METD	Cobalt, dissol	7440-48-4	41	29	12	70.7%	0.19	6.3	4.971	EPC
IR 00022	METD	Copper, disso	7440-50-8	45	33	12	73.3%	0.46	38	13.57	EPC
IR 00022	METD	Iron, dissolve	7439-89-6	41	23	18	56.1%	46	29000	9507	EPC
IR 00022	METD	Lead, dissolve	7439-92-1	45	16	29	35.6%	0.11	1.2	0.407	EPC
IR 00022	METD	Magnesium, d	7439-95-4	41	41	0	100.0%	4900	99900	93108	EPC
IR 00022	METD	Manganese, d	7439-96-5	41	41	0	100.0%	2.1	11000	10952	EPC
IR 00022	METD	Manganese, d	7439-96-5	41	41	0	100.0%	2.1	11000	10952	EPC
IR 00022	METD	Mercury, diss	7439-97-6	12	1	11	8.3%	0.035	0.035	0.035	Max
IR 00022	METD	Molybdenum,	7439-98-7	41	24	17	58.5%	0.42	6.7	3.97	EPC
IR 00022	METD	Nickel, dissolv	7440-02-0	45	30	15	66.7%	0.91	32	13.44	EPC
IR 00022	METD	Potassium, di	7440-09-7	41	39	2	95.1%	780	45600	21721	EPC
IR 00022	METD	Selenium, dis	7782-49-2	45	16	29	35.6%	0.22	2.2	1.01	EPC
IR 00022	METD	Silver, dissolv	7440-22-4	45	3	42	6.7%	0.091	3.3	1.711	EPC
IR 00022	METD	Sodium, disso	7440-23-5	41	41	0	100.0%	11000	240000	231553	EPC
IR 00022	METD	Thallium, diss	7440-28-0	33	3	30	9.1%	0.3	9.8	7.29	EPC
IR 00022	METD	Vanadium, dis	7440-62-2	41	33	8	80.5%	0.71	24	8.214	EPC
IR 00022	METD	Zinc, dissolve	7440-66-6	45	31	14	68.9%	1.5	28	11.94	EPC
IR 00022	PAH	Naphthalene	91-20-3	61	23	38	37.7%	9.4	460	130.6	EPC
IR 00022	SVOC	Styrene	100-42-5	67	1	66	1.5%	0.1	0.1	0.1	Max
IR 00022	VOC	1,1,1-Trichlor	71-55-6	67	2	65	3.0%	27	27	27	Max
IR 00022	VOC	1,1-Dichloroet	75-34-3	67	2	65	3.0%	2.4	2.4	2.4	Max
IR 00022	VOC	1,1-Dichloroet	75-35-4	67	2	65	3.0%	3.9	3.9	3.9	Max
IR 00022	VOC	1,2,4-Trimeth	95-63-6	60	13	47	21.7%	0.4	31	3.174	EPC
IR 00022	VOC	1,2-Dichlorob	95-50-1	67	4	63	6.0%	0.8	2.4	0.941	EPC
IR 00022	VOC	1,2-Dichloroet	107-06-2	67	6	61	9.0%	0.3	38	12.3	EPC
IR 00022	VOC	1,3,5-Trimeth	108-67-8	60	12	48	20.0%	0.53	14	1.718	EPC
IR 00022	VOC	2-Butanone	78-93-3	67	1	66	1.5%	0.5	0.5	0.5	Max
IR 00022	VOC	Acetone	67-64-1	67	7	60	10.4%	1	16	4.351	EPC
IR 00022	VOC	Benzene	71-43-2	79	41	38	51.9%	0.3	19000	1707	EPC
IR 00022	VOC	Bromomethan	74-83-9	67	2	65	3.0%	0.6	0.6	0.6	Max
IR 00022	VOC	Carbon disulfi	75-15-0	66	2	64	3.0%	1200	1200	1200	Max
IR 00022	VOC	Chloroform	67-66-3	67	3	64	4.5%	0.58	19	7.273	EPC
IR 00022	VOC	Chloromethan	74-87-3	67	2	65	3.0%	0.2	0.2	0.2	Max
IR 00022	VOC	cis-1,2-Dichlo	156-59-2	61	1	60	1.6%	0.09	0.09	0.09	Max
IR 00022	VOC	Ethylbenzene	100-41-4	79	37	42	46.8%	0.6	3830	1160	EPC
IR 00022	VOC	Isopropyl Ethe	108-20-3	60	5	55	8.3%	0.2	0.3	0.323	EPC
IR 00022	VOC	Isopropyl Ethe	108-20-3	60	5	55	8.3%	0.2	0.3	0.323	EPC
IR 00022	VOC	Isopropylbenz	98-82-8	60	23	37	38.3%	7.5	140	47.24	EPC
IR 00022	VOC	Methyl Tert-B	1634-04-4	69	10	59	14.5%	0.2	2	0.533	EPC
IR 00022	VOC	Methylene chl	75-09-2	67	1	66	1.5%	0.1	0.1	0.1	Max
IR 00022	VOC	N-Butylbenze	104-51-8	60	18	42	30.0%	1.5	51	8.907	EPC
IR 00022	VOC	N-Propylbenz	103-65-1	60	23	37	38.3%	11	280	156.1	EPC
IR 00022	VOC	N-Propylbenz	103-65-1	60	23	37	38.3%	11	280	156.1	EPC
IR 00022	VOC	o-Xylene	95-47-6	60	15	45	25.0%	0.2	3.2	0.604	EPC
IR 00022	VOC	p-Isopropyltol	99-87-6	60	5	55	8.3%	0.2	0.4	0.409	EPC
IR 00022	VOC	Sec-Butylben	135-98-8	60	23	37	38.3%	2.1	30	8.489	EPC
IR 00022	VOC	Tert-Butyl Alc	75-65-0	60	19	41	31.7%	43	210	80.88	EPC
IR 00022	VOC	Tetrachloroeth	127-18-4	67	2	65	3.0%	2.6	2.6	2.6	Max
IR 00022	VOC	Toluene	108-88-3	79	28	51	35.4%	0.6	16000	5309	EPC
IR 00022	VOC	Trichloroether	79-01-6	67	4	63	6.0%	0.3	1.9	1.9	Max
IR 00022	VOC	Xylenes (total	1330-20-7	19	16	3	84.2%	20	17000	24027	EPC
IR 00022	VOC	Xylenes, m &	-81	60	18	42	30.0%	0.2	11	1.672	EPC

Table 8: IR Site 22 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00022	MET	Beryllium	7440-41-7	3	0	3	1-4
IR 00022	MET	Cadmium	7440-43-9	3	0	3	1-5
IR 00022	MET	Chromium, Total	7440-47-3	3	0	3	1-10
IR 00022	MET	Silver	7440-22-4	3	0	3	1-10
IR 00022	MET	Thallium	7440-28-0	15	0	15	1-5
IR 00022	PAH	Acenaphthene	83-32-9	1	0	1	9.6
IR 00022	PAH	Acenaphthylene	208-96-8	1	0	1	9.6
IR 00022	PAH	Anthracene	120-12-7	1	0	1	9.6
IR 00022	PAH	Benzo(a)anthracene	56-55-3	1	0	1	9.6
IR 00022	PAH	Benzo(a)pyrene	50-32-8	1	0	1	0.19
IR 00022	PAH	Benzo(b)fluoranthene	205-99-2	1	0	1	9.6
IR 00022	PAH	Benzo(g,h,i)perylene	191-24-2	1	0	1	9.6
IR 00022	PAH	Benzo(k)fluoranthene	207-08-9	1	0	1	9.6
IR 00022	PAH	Chrysene	218-01-9	1	0	1	9.6
IR 00022	PAH	Dibenz(a,h)Anthracene	53-70-3	1	0	1	9.6
IR 00022	PAH	Fluoranthene	206-44-0	1	0	1	9.6
IR 00022	PAH	Fluorene	86-73-7	1	0	1	9.6
IR 00022	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	1	0	1	9.6
IR 00022	PAH	Phenanthrene	85-01-8	1	0	1	9.6
IR 00022	PAH	Pyrene	129-00-0	1	0	1	9.6
IR 00022	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	1	0	1	0.48
IR 00022	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	1	0	1	0.48
IR 00022	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	1	0	1	0.48
IR 00022	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	1	0	1	0.48
IR 00022	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	1	0	1	0.48
IR 00022	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	1	0	1	0.48
IR 00022	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	1	0	1	0.48
IR 00022	PEST	Aldrin	309-00-2	1	0	1	0.095
IR 00022	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	1	0	1	0.19
IR 00022	PEST	alpha-Endosulfan	959-98-8	1	0	1	0.095
IR 00022	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	1	0	1	0.095
IR 00022	PEST	beta-Endosulfan	33213-65-9	1	0	1	0.19
IR 00022	PEST	Chlordane	57-74-9	1	0	1	0.95
IR 00022	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	1	0	1	0.095
IR 00022	PEST	Dieldrin	60-57-1	1	0	1	0.19
IR 00022	PEST	Endosulfan sulfate	1031-07-8	1	0	1	0.19
IR 00022	PEST	Endrin	72-20-8	1	0	1	0.19
IR 00022	PEST	Endrin aldehyde	7421-93-4	1	0	1	0.19
IR 00022	PEST	Endrin ketone	53494-70-5	1	0	1	0.19
IR 00022	PEST	gamma-BHC (Lindane)	58-89-9	1	0	1	0.095
IR 00022	PEST	Heptachlor	76-44-8	1	0	1	0.095
IR 00022	PEST	Heptachlor epoxide	1024-57-3	1	0	1	0.095
IR 00022	PEST	Methoxychlor	72-43-5	1	0	1	0.95
IR 00022	PEST	p,p'-DDD	72-54-8	1	0	1	0.19
IR 00022	PEST	p,p'-DDE	72-55-9	1	0	1	0.19
IR 00022	PEST	p,p'-DDT	50-29-3	1	0	1	0.19
IR 00022	PEST	Toxaphene	8001-35-2	1	0	1	1.9
IR 00022	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	1	0	1	0.95
IR 00022	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	1	0	1	9.6
IR 00022	SVOC	2,4,5-Trichlorophenol	95-95-4	1	0	1	9.6
IR 00022	SVOC	2,4,6-Trichlorophenol	88-06-2	1	0	1	9.6
IR 00022	SVOC	2,4-Dichlorophenol	120-83-2	1	0	1	9.6
IR 00022	SVOC	2,4-Dimethylphenol	105-67-9	1	0	1	9.6
IR 00022	SVOC	2,4-Dinitrophenol	51-28-5	1	0	1	48
IR 00022	SVOC	2,4-Dinitrotoluene	121-14-2	1	0	1	9.6
IR 00022	SVOC	2,6-Dinitrotoluene	606-20-2	1	0	1	9.6
IR 00022	SVOC	2-Chloronaphthalene	91-58-7	1	0	1	9.6
IR 00022	SVOC	2-Chlorophenol	95-57-8	1	0	1	9.6
IR 00022	SVOC	2-Methylphenol (O-Cresol)	95-48-7	1	0	1	9.6
IR 00022	SVOC	2-Nitroaniline	88-74-4	1	0	1	19
IR 00022	SVOC	2-Nitrophenol	88-75-5	1	0	1	19
IR 00022	SVOC	3,3'-Dichlorobenzidine	91-94-1	1	0	1	19
IR 00022	SVOC	3-Nitroaniline	99-09-2	1	0	1	19
IR 00022	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	1	0	1	48

Table 8: IR Site 22 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00022	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	1	0	1	9.6
IR 00022	SVOC	4-Chloro-3-methylphenol	59-50-7	1	0	1	9.6
IR 00022	SVOC	4-Chloroaniline	106-47-8	1	0	1	9.6
IR 00022	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	1	0	1	9.6
IR 00022	SVOC	4-Methylphenol (P-Cresol)	106-44-5	1	0	1	9.6
IR 00022	SVOC	4-Nitroaniline	100-01-6	1	0	1	19
IR 00022	SVOC	4-Nitrophenol	100-02-7	1	0	1	19
IR 00022	SVOC	Benzyl Butyl Phthalate	85-68-7	1	0	1	9.6
IR 00022	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	1	0	1	9.6
IR 00022	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	1	0	1	9.6
IR 00022	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	1	0	1	3.8
IR 00022	SVOC	Dibenzofuran	132-64-9	1	0	1	9.6
IR 00022	SVOC	Diethyl Phthalate	84-66-2	1	0	1	9.6
IR 00022	SVOC	Dimethyl Phthalate	131-11-3	1	0	1	9.6
IR 00022	SVOC	Di-N-Butyl Phthalate	84-74-2	1	0	1	9.6
IR 00022	SVOC	Di-N-Octylphthalate	117-84-0	1	0	1	9.6
IR 00022	SVOC	Hexachlorobenzene	118-74-1	1	0	1	0.96
IR 00022	SVOC	Hexachlorocyclopentadiene	77-47-4	1	0	1	48
IR 00022	SVOC	Hexachloroethane	67-72-1	1	0	1	9.6
IR 00022	SVOC	Nitrobenzene	98-95-3	1	0	1	9.6
IR 00022	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	1	0	1	9.6
IR 00022	SVOC	N-Nitrosodiphenylamine	86-30-6	1	0	1	9.6
IR 00022	SVOC	Pentachlorophenol	87-86-5	1	0	1	0.96
IR 00022	SVOC	Phenol	108-95-2	1	0	1	9.6
IR 00022	SVOC	Pyridine	110-86-1	1	0	1	38
IR 00022	VOC	1,1,1,2-Tetrachloroethane	630-20-6	60	0	60	0.5-8.3
IR 00022	VOC	1,1,2,2-Tetrachloroethane	79-34-5	67	0	67	0.5-250
IR 00022	VOC	1,1,2-Trichloroethane	79-00-5	67	0	67	0.5-500
IR 00022	VOC	1,1-Dichloropropene	563-58-6	60	0	60	0.5-8.3
IR 00022	VOC	1,2,3-Trichlorobenzene	87-61-6	60	0	60	0.5-8.3
IR 00022	VOC	1,2,3-Trichloropropane	96-18-4	60	0	60	0.5-8.3
IR 00022	VOC	1,2,4-Trichlorobenzene	120-82-1	61	0	61	0.5-8.3
IR 00022	VOC	1,2-Dibromo-3-Chloropropane	96-12-8	60	0	60	0.5-8.3
IR 00022	VOC	1,2-Dibromoethane	106-93-4	60	0	60	0.5-8.3
IR 00022	VOC	1,2-Dichloroethene (total)	540-59-0	6	0	6	2-500
IR 00022	VOC	1,2-Dichloropropane	78-87-5	67	0	67	0.5-500
IR 00022	VOC	1,3-Dichlorobenzene	541-73-1	67	0	67	0.5-500
IR 00022	VOC	1,3-Dichloropropane	142-28-9	60	0	60	0.5-8.3
IR 00022	VOC	1,4-Dichlorobenzene	106-46-7	67	0	67	0.5-500
IR 00022	VOC	2,2-Dichloropropane	594-20-7	60	0	60	0.5-8.3
IR 00022	VOC	2-Chlorotoluene	95-49-8	60	0	60	0.5-8.3
IR 00022	VOC	2-Hexanone	591-78-6	67	0	67	2-500
IR 00022	VOC	4-Chlorotoluene	106-43-4	60	0	60	0.5-8.3
IR 00022	VOC	4-Methyl-2-pentanone	108-10-1	67	0	67	2-500
IR 00022	VOC	Bromobenzene	108-86-1	60	0	60	0.5-8.3
IR 00022	VOC	Bromochloromethane	74-97-5	60	0	60	0.5-8.3
IR 00022	VOC	Bromodichloromethane	75-27-4	67	0	67	0.5-500
IR 00022	VOC	Bromoform	75-25-2	67	0	67	1-500
IR 00022	VOC	Carbon tetrachloride	56-23-5	67	0	67	0.5-130
IR 00022	VOC	Chlorobenzene	108-90-7	67	0	67	0.5-500
IR 00022	VOC	Chloroethane	75-00-3	67	0	67	1-500
IR 00022	VOC	cis-1,3-Dichloropropene	10061-01-5	7	0	7	0.5-130
IR 00022	VOC	Dibromochloromethane	124-48-1	67	0	67	0.5-500
IR 00022	VOC	Dibromomethane	74-95-3	60	0	60	0.5-8.3
IR 00022	VOC	Dichlorodifluoromethane	75-71-8	60	0	60	1-17
IR 00022	VOC	Hexachlorobutadiene	87-68-3	61	0	61	0.5-9.6
IR 00022	VOC	T-Butylbenzene	98-06-6	60	0	60	0.5-8.3
IR 00022	VOC	Tert-Amyl Methyl Ether	994-05-8	60	0	60	0.5-8.3
IR 00022	VOC	Tert-Butyl Ethyl Ether	637-92-3	60	0	60	0.5-8.3
IR 00022	VOC	trans-1,2-Dichloroethene	156-60-5	61	0	61	0.5-8.3
IR 00022	VOC	trans-1,3-Dichloropropene	10061-02-6	7	0	7	0.5-130
IR 00022	VOC	Trichlorofluoromethane	75-69-4	60	0	60	1-17
IR 00022	VOC	Vinyl chloride	75-01-4	67	0	67	0.5-130

Table 9: Occurence, Distribution and Exposure Point Concentration Summary
Groundwater - IR Site 23

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Frequency of Detection	Minimum Hit, ug/l	Maximum Hit, ug/l	Calculated EPC Value, ug/l	Calculated EPC or Maximum Value
IR 00023	MET	Aluminum	7429-90-5	5	1	4	20.0%	7.5	7.5	7.5	Max
IR 00023	MET	Antimony	7440-36-0	13	1	12	7.7%	0.13	0.13	0.13	Max
IR 00023	MET	Arsenic	7440-38-2	5	4	1	80.0%	2.5	9.74	9.292	EPC
IR 00023	MET	Barium	7440-39-3	5	5	0	100.0%	14.9	61	62.96	EPC
IR 00023	MET	Cadmium	7440-43-9	5	1	4	20.0%	0.07	0.07	0.07	Max
IR 00023	MET	Calcium	7440-70-2	5	5	0	100.0%	13200	44800	39139	EPC
IR 00023	MET	Chromium, Hexavalent	18540-29-9	2	1	1	50.0%	20	20	20	Max
IR 00023	MET	Chromium, Total	7440-47-3	5	1	4	20.0%	3.3	3.3	3.3	Max
IR 00023	MET	Cobalt	7440-48-4	5	2	3	40.0%	0.035	0.041	0.0444	EPC
IR 00023	MET	Copper	7440-50-8	5	4	1	80.0%	0.83	6.2	7.939	EPC
IR 00023	MET	Iron	7439-89-6	5	3	2	60.0%	60	3380	7951	EPC
IR 00023	MET	Lead	7439-92-1	5	1	4	20.0%	0.12	0.12	0.12	Max
IR 00023	MET	Magnesium	7439-95-4	5	5	0	100.0%	1230	48300	34016	EPC
IR 00023	MET	Manganese	7439-96-5	5	4	1	80.0%	0.23	499	338.7	EPC
IR 00023	MET	Mercury	7439-97-6	45	6	39	13.3%	0.048	1.7	0.284	EPC
IR 00023	MET	Molybdenum	7439-98-7	5	2	3	40.0%	0.82	7.84	20.03	EPC
IR 00023	MET	Nickel	7440-02-0	5	3	2	60.0%	0.48	16.1	16.78	EPC
IR 00023	MET	Potassium	7440-09-7	5	4	1	80.0%	12000	26900	21985	EPC
IR 00023	MET	Selenium	7782-49-2	5	1	4	20.0%	0.59	0.59	0.59	Max
IR 00023	MET	Sodium	7440-23-5	5	4	1	80.0%	65000	646000	491038	EPC
IR 00023	MET	Vanadium	7440-62-2	5	5	0	100.0%	2.96	13.7	11.83	EPC
IR 00023	MET	Zinc	7440-66-6	5	3	2	60.0%	2.4	12	11.87	EPC
IR 00023	METD	Aluminum, dissolved	7429-90-5	56	11	45	19.6%	2.9	63	28.32	EPC
IR 00023	METD	Antimony, dissolved	7440-36-0	52	26	26	50.0%	0.067	1.3	0.402	EPC
IR 00023	METD	Arsenic, dissolved	7440-38-2	60	53	7	88.3%	2.4	18	9.426	EPC
IR 00023	METD	Barium, dissolved	7440-39-3	56	56	0	100.0%	15.7	190	85.15	EPC
IR 00023	METD	Beryllium, dissolved	7440-41-7	60	1	59	1.7%	0.33	0.33	0.33	Max
IR 00023	METD	Cadmium, dissolved	7440-43-9	60	8	52	13.3%	0.066	0.46	0.383	EPC
IR 00023	METD	Calciuim, dissolved	7440-70-2	56	56	0	100.0%	13200	90000	53916	EPC
IR 00023	METD	Chromium, dissolved	7440-47-3	60	38	22	63.3%	0.39	8.3	4.606	EPC
IR 00023	METD	Cobalt, dissolved	7440-48-4	56	30	26	53.6%	0.033	3.2	1.394	EPC
IR 00023	METD	Copper, dissolved	7440-50-8	60	39	21	65.0%	0.31	300	62.41	EPC
IR 00023	METD	Iron, dissolved	7439-89-6	56	36	20	64.3%	45	3670	766	EPC
IR 00023	METD	Lead, dissolved	7439-92-1	60	19	41	31.7%	0.029	0.5	0.245	EPC
IR 00023	METD	Magnesium, dissolved	7439-95-4	56	56	0	100.0%	1280	100000	40149	EPC
IR 00023	METD	Manganese, dissolved	7439-96-5	56	41	15	73.2%	0.34	1100	379.8	EPC
IR 00023	METD	Molybdenum, dissolved	7439-98-7	56	26	30	46.4%	0.77	11	4.629	EPC
IR 00023	METD	Molybdenum, dissolved	7439-98-7	56	26	30	46.4%	0.77	11	4.629	EPC
IR 00023	METD	Nickel, dissolved	7440-02-0	60	29	31	48.3%	0.42	28.5	5.656	EPC
IR 00023	METD	Potassium, dissolved	7440-09-7	56	54	2	96.4%	5280	55000	27171	EPC
IR 00023	METD	Selenium, dissolved	7782-49-2	60	24	36	40.0%	0.49	6.9	1.883	EPC
IR 00023	METD	Silver, dissolved	7440-22-4	60	4	56	6.7%	0.019	0.3	0.285	EPC
IR 00023	METD	Sodium, dissolved	7440-23-5	56	54	2	96.4%	20000	1700000	753453	EPC
IR 00023	METD	Thallium, dissolved	7440-28-0	44	4	40	9.1%	0.095	0.49	0.49	EPC
IR 00023	METD	Vanadium, dissolved	7440-62-2	56	50	6	89.3%	0.93	30	9.475	EPC
IR 00023	METD	Zinc, dissolved	7440-66-6	60	38	22	63.3%	1.5	40	9.523	EPC
IR 00023	PAH	Naphthalene	91-20-3	105	9	96	8.6%	1.1	6.6	1.506	EPC
IR 00023	SVOC	Styrene	100-42-5	106	3	103	2.8%	0.1	0.5	0.23	EPC
IR 00023	VOC	1,1,1,2-Tetrachloroethane	630-20-6	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,1,1-Trichloroethane	71-55-6	106	3	103	2.8%	0.21	0.5	0.231	EPC
IR 00023	VOC	1,1,2,2-Tetrachloroethane	79-34-5	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	3	1	2	33.3%	5	5	5	Max
IR 00023	VOC	1,1,2-Trichloroethane	79-00-5	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,1-Dichloroethane	75-34-3	106	7	99	6.6%	0.1	0.5	0.307	EPC
IR 00023	VOC	1,1-Dichloroethene	75-35-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,1-Dichloropropene	563-58-6	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2,3-Trichlorobenzene	87-61-6	104	3	101	2.9%	0.5	1.1	0.532	EPC
IR 00023	VOC	1,2,3-Trichloropropane	96-18-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2,4-Trichlorobenzene	120-82-1	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2,4-Trimethylbenzene	95-63-6	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2-Dibromo-3-Chloropropane	96-12-8	106	1	105	0.9%	2	2	2	Max
IR 00023	VOC	1,2-Dibromoethane	106-93-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2-Dichlorobenzene	95-50-1	106	4	102	3.8%	0.1	0.7	0.154	EPC
IR 00023	VOC	1,2-Dichloroethane	107-06-2	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,2-Dichloropropane	78-87-5	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,3,5-Trimethylbenzene	108-67-8	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,3-Dichlorobenzene	541-73-1	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	1,3-Dichloropropane	142-28-9	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	1,4-Dichlorobenzene	106-46-7	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	2,2-Dichloropropane	594-20-7	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	2-Butanone	78-93-3	106	6	100	5.7%	1.2	610	32.43	EPC
IR 00023	VOC	2-Chlorotoluene	95-49-8	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	2-Hexanone	591-78-6	106	3	103	2.8%	0.5	10	2.7	EPC
IR 00023	VOC	4-Chlorotoluene	106-43-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	4-Methyl-2-pentanone	108-10-1	106	4	102	3.8%	0.9	10	3.783	EPC
IR 00023	VOC	Acetone	67-64-1	105	31	74	29.5%	0.4	36	4.703	EPC
IR 00023	VOC	Benzene	71-43-2	106	6	100	5.7%	0.1	0.5	0.192	EPC
IR 00023	VOC	Bromobenzene	108-86-1	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Bromochloromethane	74-97-5	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	Bromodichloromethane	75-27-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Bromoform	75-25-2	106	5	101	4.7%	0.1	1	0.239	EPC
IR 00023	VOC	Carbon disulfide	75-15-0	103	10	93	9.7%	0.1	0.75	0.384	EPC
IR 00023	VOC	Carbon tetrachloride	56-23-5	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Chlorobenzene	108-90-7	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Chloroethane	75-00-3	106	1	105	0.9%	1	1	1	Max
IR 00023	VOC	Chloroform	67-66-3	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Chloromethane	74-87-3	106	1	105	0.9%	1	1	1	Max
IR 00023	VOC	cis-1,2-Dichloroethene	156-59-2	106	8	98	7.5%	0.7	6.9	1.143	EPC
IR 00023	VOC	cis-1,3-Dichloropropene	10061-01-5	1	1	0	100.0%	0.5	0.5	0.5	Max
IR 00023	VOC	Dibromochloromethane	124-48-1	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Dibromomethane	74-95-3	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	Dichlorodifluoromethane	75-71-8	106	1	105	0.9%	1	1	1	Max
IR 00023	VOC	Ethylbenzene	100-41-4	106	2	104	1.9%	0.1	0.5	0.5	Max
IR 00023	VOC	Hexachlorobutadiene	87-68-3	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Isopropyl Ether	108-20-3	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Isopropylbenzene	98-82-8	105	2	103	1.9%	0.32	0.5	0.333	EPC
IR 00023	VOC	Methyl Tert-Butyl Ether	1634-04-4	106	3	103	2.8%	0.23	0.5	0.25	EPC
IR 00023	VOC	Methylene chloride	75-09-2	106	2	104	1.9%	0.7	10	1.718	EPC
IR 00023	VOC	N-Butylbenzene	104-51-8	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	N-Propylbenzene	103-65-1	105	2	103	1.9%	0.41	0.5	0.417	EPC
IR 00023	VOC	o-Xylene	95-47-6	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	p-Isopropyltoluene	99-87-6	104	1	103	1.0%	0.5	0.5	0.5	Max
IR 00023	VOC	Sec-Butylbenzene	135-98-8	105	6	99	5.7%	0.2	1.2	0.301	EPC
IR 00023	VOC	T-Butylbenzene	98-06-6	106	3	103	2.8%	0.28	0.5	0.296	EPC
IR 00023	VOC	Tert-Amyl Methyl Ether	994-05-8	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Tert-Butyl Alcohol	75-65-0	106	11	95	10.4%	1.5	28	5.72	EPC
IR 00023	VOC	Tert-Butyl Ethyl Ether	637-92-3	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Tetrachloroethene	127-18-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Toluene	108-88-3	106	6	100	5.7%	0.2	0.5	0.22	EPC
IR 00023	VOC	trans-1,2-Dichloroethene	156-60-5	106	3	103	2.8%	0.1	0.5	0.5	EPC
IR 00023	VOC	trans-1,3-Dichloropropene	10061-02-6	1	1	0	100.0%	0.5	0.5	0.5	Max
IR 00023	VOC	Trichloroethene	79-01-6	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Trichlorofluoromethane	75-69-4	106	2	104	1.9%	0.59	1	0.611	EPC
IR 00023	VOC	Vinyl acetate	108-05-4	1	1	0	100.0%	10	10	10	Max
IR 00023	VOC	Vinyl chloride	75-01-4	106	1	105	0.9%	0.5	0.5	0.5	Max
IR 00023	VOC	Xylenes (total)	1330-20-7	3	1	2	33.3%	0.5	0.5	0.5	Max

Table 10: IR Site 23 Groundwater Non-Detect Constituents with Reporting Limits

Site	Analytical Group	Analyte	CAS	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, ug/l
IR 00023	MET	Beryllium	7440-41-7	5	0	5	2-4
IR 00023	MET	Silver	7440-22-4	5	0	5	5-10
IR 00023	MET	Thallium	7440-28-0	18	0	18	0.044-25
IR 00023	METD	Mercury, dissolved	7439-97-6	14	0	14	0.2
IR 00023	PAH	2-Methylnaphthalene	91-57-6	2	0	2	9.6-10
IR 00023	PAH	Acenaphthene	83-32-9	2	0	2	9.6-10
IR 00023	PAH	Acenaphthylene	208-96-8	2	0	2	9.6-10
IR 00023	PAH	Anthracene	120-12-7	2	0	2	9.6-10
IR 00023	PAH	Benzo(a)anthracene	56-55-3	2	0	2	9.6-10
IR 00023	PAH	Benzo(a)pyrene	50-32-8	2	0	2	9.6-10
IR 00023	PAH	Benzo(b)fluoranthene	205-99-2	2	0	2	9.6-10
IR 00023	PAH	Benzo(g,h,i)perylene	191-24-2	2	0	2	9.6-10
IR 00023	PAH	Benzo(k)fluoranthene	207-08-9	2	0	2	9.6-10
IR 00023	PAH	Chrysene	218-01-9	2	0	2	9.6-10
IR 00023	PAH	Dibenz(a,h)Anthracene	53-70-3	2	0	2	9.6-10
IR 00023	PAH	Fluoranthene	206-44-0	2	0	2	9.6-10
IR 00023	PAH	Fluorene	86-73-7	2	0	2	9.6-10
IR 00023	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	2	0	2	9.6-10
IR 00023	PAH	Phenanthrene	85-01-8	2	0	2	9.6-10
IR 00023	PAH	Pyrene	129-00-0	2	0	2	9.6-10
IR 00023	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	2	0	2	9.6-10
IR 00023	SVOC	2,4,5-Trichlorophenol	95-95-4	2	0	2	48-51
IR 00023	SVOC	2,4,6-Trichlorophenol	88-06-2	2	0	2	9.6-10
IR 00023	SVOC	2,4-Dichlorophenol	120-83-2	2	0	2	9.6-10
IR 00023	SVOC	2,4-Dimethylphenol	105-67-9	2	0	2	9.6-10
IR 00023	SVOC	2,4-Dinitrophenol	51-28-5	2	0	2	48-51
IR 00023	SVOC	2,4-Dinitrotoluene	121-14-2	2	0	2	9.6-10
IR 00023	SVOC	2,6-Dinitrotoluene	606-20-2	2	0	2	9.6-10
IR 00023	SVOC	2-Chloronaphthalene	91-58-7	2	0	2	9.6-10
IR 00023	SVOC	2-Chlorophenol	95-57-8	2	0	2	9.6-10
IR 00023	SVOC	2-Methylphenol (O-Cresol)	95-48-7	2	0	2	9.6-10
IR 00023	SVOC	2-Nitroaniline	88-74-4	2	0	2	48-51
IR 00023	SVOC	2-Nitrophenol	88-75-5	2	0	2	9.6-10
IR 00023	SVOC	3,3'-Dichlorobenzidine	91-94-1	2	0	2	19-20
IR 00023	SVOC	3-Nitroaniline	99-09-2	2	0	2	48-51
IR 00023	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	2	0	2	48-51
IR 00023	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	2	0	2	9.6-10
IR 00023	SVOC	4-Chloro-3-methylphenol	59-50-7	2	0	2	9.6-10
IR 00023	SVOC	4-Chloroaniline	106-47-8	2	0	2	9.6-10
IR 00023	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	2	0	2	9.6-10
IR 00023	SVOC	4-Methylphenol (P-Cresol)	106-44-5	2	0	2	9.6-10
IR 00023	SVOC	4-Nitroaniline	100-01-6	2	0	2	48-51
IR 00023	SVOC	4-Nitrophenol	100-02-7	2	0	2	48-51
IR 00023	SVOC	Benzoic Acid	65-85-0	2	0	2	48-51
IR 00023	SVOC	Benzyl Butyl Phthalate	85-68-7	2	0	2	9.6-10
IR 00023	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	2	0	2	9.6-10
IR 00023	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	2	0	2	9.6-10
IR 00023	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	2	0	2	19-20
IR 00023	SVOC	Dibenzofuran	132-64-9	2	0	2	9.6-10
IR 00023	SVOC	Diethyl Phthalate	84-66-2	2	0	2	9.6-10
IR 00023	SVOC	Dimethyl Phthalate	131-11-3	2	0	2	9.6-10
IR 00023	SVOC	Di-N-Butyl Phthalate	84-74-2	2	0	2	9.6-10
IR 00023	SVOC	Di-N-Octylphthalate	117-84-0	2	0	2	9.6-10
IR 00023	SVOC	Hexachlorobenzene	118-74-1	2	0	2	9.6-10
IR 00023	SVOC	Hexachlorocyclopentadiene	77-47-4	2	0	2	9.6-10
IR 00023	SVOC	Hexachloroethane	67-72-1	2	0	2	9.6-10
IR 00023	SVOC	Isophorone	78-59-1	2	0	2	9.6-10
IR 00023	SVOC	Nitrobenzene	98-95-3	2	0	2	9.6-10
IR 00023	SVOC	N-Nitrosodimethylamine	62-75-9	2	0	2	9.6-10
IR 00023	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	2	0	2	9.6-10
IR 00023	SVOC	N-Nitrosodiphenylamine	86-30-6	2	0	2	9.6-10
IR 00023	SVOC	Pentachlorophenol	87-86-5	2	0	2	48-51
IR 00023	SVOC	Phenol	108-95-2	2	0	2	9.6-10
IR 00023	VOC	Bromomethane	74-83-9	106	0	106	0.5-2.5
IR 00023	VOC	Xylenes, m & p	-81	103	0	103	0.5-1.3

Table 11: Summary of Detected Soil Analytes at IR Site 9 (0 - 2 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00009	0-2	MET	Aluminum	7429-90-5	13	13		100.0%	2890	11900	6,138.00	EPC
2A	IR 00009	0-2	MET	Arsenic	7440-38-2	14	6	8	42.9%	0.85	5.9	2.65	EPC
2A	IR 00009	0-2	MET	Barium	7440-39-3	15	15		100.0%	16.3	198	107.60	EPC
2A	IR 00009	0-2	MET	Beryllium	7440-41-7	13	10	3	76.9%	0.09	0.92	0.64	EPC
2A	IR 00009	0-2	MET	Cadmium	7440-43-9	15	8	7	53.3%	0.11	0.49	0.31	EPC
2A	IR 00009	0-2	MET	Calcium	7440-70-2	13	13		100.0%	1680	12700	7,645.00	EPC
2A	IR 00009	0-2	MET	Chromium, Total	7440-47-3	14	14		100.0%	22.7	110	71.59	EPC
2A	IR 00009	0-2	MET	Cobalt	7440-48-4	15	8	7	53.3%	3.22	11.3	6.32	EPC
2A	IR 00009	0-2	MET	Copper	7440-50-8	15	14	1	93.3%	5.2	89.4	43.73	EPC
2A	IR 00009	0-2	MET	Iron	7439-89-6	13	13		100.0%	5480	19300	13,399.00	EPC
2A	IR 00009	0-2	MET	Lead	7439-92-1	14	10	4	71.4%	1.3	26.3	10.49	EPC
2A	IR 00009	0-2	MET	Magnesium	7439-95-4	12	12		100.0%	1700	5860	4,066.00	EPC
2A	IR 00009	0-2	MET	Manganese	7439-96-5	13	13		100.0%	68	1050	491.90	EPC
2A	IR 00009	0-2	MET	Mercury	7439-97-6	9	1	8	11.1%	0.0447	0.0447	0.04	Max
2A	IR 00009	0-2	MET	Molybdenum	7439-98-7	14	2	12	14.3%	0.714	0.778	0.78	EPC
2A	IR 00009	0-2	MET	Nickel	7440-02-0	14	14		100.0%	17.8	64.4	44.27	EPC
2A	IR 00009	0-2	MET	Potassium	7440-09-7	12	12		100.0%	390	2400	1,749.00	EPC
2A	IR 00009	0-2	MET	Silver	7440-22-4	13	1	12	7.7%	0.308	0.308	0.31	Max
2A	IR 00009	0-2	MET	Sodium	7440-23-5	12	11	1	91.7%	82.7	343	253.40	EPC
2A	IR 00009	0-2	MET	Titanium	7440-32-6	6	6		100.0%	223	1020	950.40	EPC
2A	IR 00009	0-2	MET	Vanadium	7440-62-2	14	14		100.0%	13	35.4	23.80	EPC
2A	IR 00009	0-2	MET	Zinc	7440-66-6	15	15		100.0%	17.9	80.6	49.99	EPC
2A	IR 00009	0-2	PAH	2-Methylnaphthalene	91-57-6	26	15	11	57.7%	0.0002	1.5	0.67	EPC
2A	IR 00009	0-2	PAH	Acenaphthene	83-32-9	28	3	25	10.7%	0.0008	0.14	0.08	EPC
2A	IR 00009	0-2	PAH	Anthracene	120-12-7	28	12	16	42.9%	0.0002	0.043	0.01	EPC
2A	IR 00009	0-2	PAH	Fluorene	86-73-7	28	10	18	35.7%	0.0003	0.38	0.12	EPC
2A	IR 00009	0-2	PAH	Naphthalene	91-20-3	28	11	17	39.3%	0.0003	0.38	0.17	EPC
2A	IR 00009	0-2	PAH	Pyrene	129-00-0	28	21	7	75.0%	0.0001	12	4.75	EPC
2A	IR 00009	0-2	PAH	Benzo(a)Pyrene Equivalent		28	19	9	67.9%	0.000272	0.0721	0.02	EPC
2A	IR 00009	0-2	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	8	1	7	12.5%	0.18	0.18	0.18	Max
2A	IR 00009	0-2	SVOC	N-Nitrosodiphenylamine	86-30-6	8	2	6	25.0%	0.042	0.054	0.06	EPC
2A	IR 00009	0-2	VOC	1,2-Dichloroethene (total)	540-59-0	7	2	5	28.6%	0.001	0.13	0.26	EPC
2A	IR 00009	0-2	VOC	Acetone	67-64-1	9	1	8	11.1%	0.02	0.02	0.02	Max
2A	IR 00009	0-2	VOC	Ethylbenzene	100-41-4	9	1	8	11.1%	0.2	0.2	0.20	Max
2A	IR 00009	0-2	VOC	Toluene	108-88-3	9	1	8	11.1%	0.049	0.049	0.05	Max
2A	IR 00009	0-2	VOC	Xylenes (total)	1330-20-7	9	2	7	22.2%	0.002	3.1	4.91	EPC

Table 12: Summary of Detected Soil Analytes at IR Site 9 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00009	0-8	MET	Aluminum	7429-90-5	42	42		100.0%	2890	13900	5,886.00	EPC
2A	IR 00009	0-8	MET	Antimony	7440-36-0	51	2	49	3.9%	0.47	1.2	0.57	EPC
2A	IR 00009	0-8	MET	Arsenic	7440-38-2	50	22	28	44.0%	0.85	5.9	1.94	EPC
2A	IR 00009	0-8	MET	Barium	7440-39-3	51	51		100.0%	16.3	266	90.01	EPC
2A	IR 00009	0-8	MET	Beryllium	7440-41-7	49	31	18	63.3%	0.09	1.5	0.49	EPC
2A	IR 00009	0-8	MET	Cadmium	7440-43-9	51	16	35	31.4%	0.11	1.96	0.28	EPC
2A	IR 00009	0-8	MET	Calcium	7440-70-2	42	42		100.0%	1340	17600	7,843.00	EPC
2A	IR 00009	0-8	MET	Chromium, Total	7440-47-3	50	50		100.0%	21	178	53.33	EPC
2A	IR 00009	0-8	MET	Cobalt	7440-48-4	51	28	23	54.9%	3.22	23	5.67	EPC
2A	IR 00009	0-8	MET	Copper	7440-50-8	51	47	4	92.2%	4.1	89.4	19.23	EPC
2A	IR 00009	0-8	MET	Iron	7439-89-6	42	42		100.0%	5350	21500	10,093.00	EPC
2A	IR 00009	0-8	MET	Lead	7439-92-1	49	30	19	61.2%	1.3	79.4	9.28	EPC
2A	IR 00009	0-8	MET	Magnesium	7439-95-4	41	40	1	97.6%	1570	5860	2,768.00	EPC
2A	IR 00009	0-8	MET	Manganese	7439-96-5	42	42		100.0%	62.5	1050	214.00	EPC
2A	IR 00009	0-8	MET	Mercury	7439-97-6	30	2	28	6.7%	0.0447	0.398	0.16	EPC
2A	IR 00009	0-8	MET	Molybdenum	7439-98-7	49	3	46	6.1%	0.714	1.32	0.81	EPC
2A	IR 00009	0-8	MET	Nickel	7440-02-0	50	50		100.0%	16.5	276	51.90	EPC
2A	IR 00009	0-8	MET	Potassium	7440-09-7	41	39	2	95.1%	310	2400	1,054.00	EPC
2A	IR 00009	0-8	MET	Silver	7440-22-4	48	2	46	4.2%	0.308	1.39	1.39	EPC
2A	IR 00009	0-8	MET	Sodium	7440-23-5	41	34	7	82.9%	68	939	252.20	EPC
2A	IR 00009	0-8	MET	Thallium	7440-28-0	50	1	49	2.0%	0.118	0.118	0.12	Max
2A	IR 00009	0-8	MET	Titanium	7440-32-6	21	21		100.0%	223	1020	506.30	EPC
2A	IR 00009	0-8	MET	Vanadium	7440-62-2	50	50		100.0%	12.7	42.3	22.25	EPC
2A	IR 00009	0-8	MET	Zinc	7440-66-6	51	51		100.0%	12	218	46.05	EPC
2A	IR 00009	0-8	PAH	2-Methylnaphthalene	91-57-6	51	25	26	49.0%	0.0002	2.8	0.75	EPC
2A	IR 00009	0-8	PAH	Acenaphthene	83-32-9	61	8	53	13.1%	0.0004	0.14	0.01	EPC
2A	IR 00009	0-8	PAH	Anthracene	120-12-7	61	17	44	27.9%	0.0002	0.043	0.01	EPC
2A	IR 00009	0-8	PAH	Fluorene	86-73-7	61	17	44	27.9%	0.0002	0.38	0.07	EPC
2A	IR 00009	0-8	PAH	Naphthalene	91-20-3	61	20	41	32.8%	0.0003	4.3	0.58	EPC
2A	IR 00009	0-8	PAH	Pyrene	129-00-0	61	43	18	70.5%	0.0001	12	1.71	EPC
2A	IR 00009	0-8	PAH	Benzo(a)Pyrene Equivalent		61	43	18	70.5%	0.000003	0.0721	0.02	EPC
2A	IR 00009	0-8	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	5	1	4	20.0%	0.12	0.12	0.12	Max
2A	IR 00009	0-8	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	5	1	4	20.0%	0.1	0.1	0.10	Max
2A	IR 00009	0-8	PEST	Chlordane	57-74-9	5	1	4	20.0%	0.16	0.16	0.16	Max
2A	IR 00009	0-8	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	5	1	4	20.0%	0.019	0.019	0.02	Max
2A	IR 00009	0-8	PEST	Dieldrin	60-57-1	5	1	4	20.0%	0.0054	0.0054	0.01	Max
2A	IR 00009	0-8	PEST	Endosulfan sulfate	1031-07-8	5	1	4	20.0%	0.0037	0.0037	0.00	Max
2A	IR 00009	0-8	PEST	Endrin	72-20-8	5	1	4	20.0%	0.0018	0.0018	0.00	Max
2A	IR 00009	0-8	PEST	Endrin aldehyde	7421-93-4	5	1	4	20.0%	0.0021	0.0021	0.00	Max
2A	IR 00009	0-8	PEST	gamma-BHC (Lindane)	58-89-9	5	1	4	20.0%	0.015	0.015	0.02	Max
2A	IR 00009	0-8	PEST	Heptachlor epoxide	1024-57-3	5	1	4	20.0%	0.0049	0.0049	0.00	Max
2A	IR 00009	0-8	PEST	Methoxychlor	72-43-5	5	1	4	20.0%	0.0053	0.0053	0.01	Max
2A	IR 00009	0-8	PEST	p,p'-DDE	72-55-9	5	1	4	20.0%	0.0034	0.0034	0.00	Max
2A	IR 00009	0-8	PEST	p,p'-DDT	50-29-3	5	1	4	20.0%	0.012	0.012	0.01	Max
2A	IR 00009	0-8	SVOC	4-Chloro-3-methylphenol	59-50-7	30	1	29	3.3%	0.043	0.043	0.04	Max
2A	IR 00009	0-8	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	30	2	28	6.7%	0.18	0.37	0.22	EPC
2A	IR 00009	0-8	SVOC	N-Nitrosodiphenylamine	86-30-6	30	10	20	33.3%	0.038	0.12	0.07	EPC
2A	IR 00009	0-8	SVOC	Pentachlorophenol	87-86-5	30	1	29	3.3%	0.43	0.43	0.43	Max
2A	IR 00009	0-8	SVOC	Phenol	108-95-2	30	1	29	3.3%	0.042	0.042	0.04	Max
2A	IR 00009	0-8	VOC	1,2-Dichloroethene (total)	540-59-0	36	4	32	11.1%	0.001	0.13	0.01	EPC
2A	IR 00009	0-8	VOC	2-Butanone	78-93-3	45	1	44	2.2%	0.009	0.009	0.01	Max
2A	IR 00009	0-8	VOC	Acetone	67-64-1	45	2	43	4.4%	0.0085	0.02	0.01	EPC
2A	IR 00009	0-8	VOC	Ethylbenzene	100-41-4	45	3	42	6.7%	0.002	0.2	0.02	EPC
2A	IR 00009	0-8	VOC	Tetrachloroethene	127-18-4	45	1	44	2.2%	0.001	0.001	0.00	Max
2A	IR 00009	0-8	VOC	Toluene	108-88-3	45	18	27	40.0%	0.003	0.73	0.06	EPC
2A	IR 00009	0-8	VOC	Xylenes (total)	1330-20-7	45	9	36	20.0%	0.002	3.1	0.32	EPC

Table 13: Summary of Non-Detected Soil Analytes at IR Site 9 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, mg/kg
2A	IR 00009	0-8	MET	Selenium	7782-49-2	50		50	0.522-12
2A	IR 00009	0-8	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	5		5	0.052-0.059
2A	IR 00009	0-8	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	5		5	0.052-0.059
2A	IR 00009	0-8	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	5		5	0.052-0.059
2A	IR 00009	0-8	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	5		5	0.052-0.059
2A	IR 00009	0-8	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	5		5	0.052-0.059
2A	IR 00009	0-8	PEST	Aldrin	309-00-2	5		5	0.0021-0.0023
2A	IR 00009	0-8	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	5		5	0.0021-0.0023
2A	IR 00009	0-8	PEST	alpha-Endosulfan	959-98-8	5		5	0.0021-0.0023
2A	IR 00009	0-8	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	5		5	0.0021-0.0023
2A	IR 00009	0-8	PEST	beta-Endosulfan	33213-65-9	5		5	0.0042-0.0047
2A	IR 00009	0-8	PEST	Endrin ketone	53494-70-5	5		5	0.0042-0.0047
2A	IR 00009	0-8	PEST	Heptachlor	76-44-8	5		5	0.0021-0.0023
2A	IR 00009	0-8	PEST	p,p'-DDD	72-54-8	5		5	0.0042-0.0047
2A	IR 00009	0-8	PEST	Toxaphene	8001-35-2	5		5	0.052-0.059
2A	IR 00009	0-8	SVOC	1,2-Diphenylhydrazine	122-66-7	21		21	0.34-0.96
2A	IR 00009	0-8	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	3		3	0.052-0.11
2A	IR 00009	0-8	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	9		9	0.34-0.76
2A	IR 00009	0-8	SVOC	2,4,5-Trichlorophenol	95-95-4	30		30	0.34-4.6
2A	IR 00009	0-8	SVOC	2,4,6-Trichlorophenol	88-06-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2,4-Dichlorophenol	120-83-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2,4-Dimethylphenol	105-67-9	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2,4-Dinitrophenol	51-28-5	30		30	0.7-4.6
2A	IR 00009	0-8	SVOC	2,4-Dinitrotoluene	121-14-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2,6-Dinitrotoluene	606-20-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2-Chloronaphthalene	91-58-7	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2-Chlorophenol	95-57-8	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2-Methylphenol (O-Cresol)	95-48-7	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	2-Nitroaniline	88-74-4	30		30	0.34-4.6
2A	IR 00009	0-8	SVOC	2-Nitrophenol	88-75-5	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	3,3'-Dichlorobenzidine	91-94-1	28		28	0.34-1.9
2A	IR 00009	0-8	SVOC	3-Nitroaniline	99-09-2	30		30	0.34-4.6
2A	IR 00009	0-8	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	30		30	0.7-4.6
2A	IR 00009	0-8	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	4-Chloroaniline	106-47-8	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	4-Methylphenol (P-Cresol)	106-44-5	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	4-Nitroaniline	100-01-6	30		30	0.34-4.6
2A	IR 00009	0-8	SVOC	4-Nitrophenol	100-02-7	30		30	0.7-4.6
2A	IR 00009	0-8	SVOC	Aniline (Phenylamine, Aminobenzene)	62-53-3	8		8	0.35-0.72
2A	IR 00009	0-8	SVOC	Benzoic Acid	65-85-0	19		19	1.6-4.6
2A	IR 00009	0-8	SVOC	Benzyl Alcohol	100-51-6	21		21	0.34-0.96
2A	IR 00009	0-8	SVOC	Benzyl Butyl Phthalate	85-68-7	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	30		30	0.021-0.96
2A	IR 00009	0-8	SVOC	Dibenzofuran	132-64-9	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Diethyl Phthalate	84-66-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Dimethyl Phthalate	131-11-3	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Di-N-Butyl Phthalate	84-74-2	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Di-N-Octylphthalate	117-84-0	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Hexachlorobenzene	118-74-1	30		30	0.021-0.96
2A	IR 00009	0-8	SVOC	Hexachlorocyclopentadiene	77-47-4	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Hexachloroethane	67-72-1	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	Isophorone	78-59-1	21		21	0.34-0.96
2A	IR 00009	0-8	SVOC	Nitrobenzene	98-95-3	30		30	0.34-0.96
2A	IR 00009	0-8	SVOC	N-Nitrosodimethylamine	62-75-9	8		8	0.35-0.72
2A	IR 00009	0-8	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	30		30	0.021-0.96
2A	IR 00009	0-8	SVOC	Pyridine	110-86-1	9		9	0.87-1.9
2A	IR 00009	0-8	SVOC	Styrene	100-42-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,1,1-Trichloroethane	71-55-6	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,1,2,2-Tetrachloroethane	79-34-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,1,2-Trichloroethane	79-00-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,1-Dichloroethane	75-34-3	44		44	0.005-0.12
2A	IR 00009	0-8	VOC	1,1-Dichloroethene	75-35-4	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,2,4-Trichlorobenzene	120-82-1	30		30	0.34-0.96
2A	IR 00009	0-8	VOC	1,2-Dichlorobenzene	95-50-1	30		30	0.005-0.96
2A	IR 00009	0-8	VOC	1,2-Dichloroethane	107-06-2	44		44	0.005-0.12
2A	IR 00009	0-8	VOC	1,2-Dichloropropane	78-87-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	1,3-Dichlorobenzene	541-73-1	30		30	0.005-0.96
2A	IR 00009	0-8	VOC	1,4-Dichlorobenzene	106-46-7	30		30	0.005-0.96
2A	IR 00009	0-8	VOC	2-Chloroethyl Vinyl Ether	110-75-8	15		15	0.01-0.055
2A	IR 00009	0-8	VOC	2-Hexanone	591-78-6	45		45	0.01-0.12
2A	IR 00009	0-8	VOC	4-Methyl-2-pentanone	108-10-1	45		45	0.01-0.12
2A	IR 00009	0-8	VOC	Benzene	71-43-2	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Bromodichloromethane	75-27-4	44		44	0.005-0.12
2A	IR 00009	0-8	VOC	Bromoform	75-25-2	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Bromomethane	74-83-9	44		44	0.01-0.12
2A	IR 00009	0-8	VOC	Carbon disulfide	75-15-0	36		36	0.005-0.12
2A	IR 00009	0-8	VOC	Carbon tetrachloride	56-23-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Chlorobenzene	108-90-7	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Chloroethane	75-00-3	45		45	0.0055-0.12
2A	IR 00009	0-8	VOC	Chloroform	67-66-3	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Chloromethane	74-87-3	45		45	0.01-0.12
2A	IR 00009	0-8	VOC	cis-1,2-Dichloroethene	156-59-2	9		9	0.0055-0.0069
2A	IR 00009	0-8	VOC	cis-1,3-Dichloropropene	10061-01-5	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Dibromochloromethane	124-48-1	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Hexachlorobutadiene	87-68-3	30		30	0.34-0.96
2A	IR 00009	0-8	VOC	Methyl Tert-Butyl Ether	1634-04-4	9		9	0.0055-0.0069
2A	IR 00009	0-8	VOC	Methylene chloride	75-09-2	45		45	0.006-0.12
2A	IR 00009	0-8	VOC	trans-1,2-Dichloroethene	156-60-5	9		9	0.0055-0.0069
2A	IR 00009	0-8	VOC	trans-1,3-Dichloropropene	10061-02-6	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Trichloroethene	79-01-6	45		45	0.005-0.12
2A	IR 00009	0-8	VOC	Trichlorofluoromethane	75-69-4	15		15	0.005-0.027
2A	IR 00009	0-8	VOC	Vinyl acetate	108-05-4	15		15	0.01-0.055
2A	IR 00009	0-8	VOC	Vinyl chloride	75-01-4	45		45	0.0055-0.12

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Table 14: Summary of Detected Soil Analytes at IR Site 13 (0 - 2 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00013	0-2	MET	Aluminum	7429-90-5	31	31		100.0%	47.9	18200	10,184.00	EPC
2A	IR 00013	0-2	MET	Antimony	7440-36-0	61	13	48	21.3%	0.134	8.2	1.31	EPC
2A	IR 00013	0-2	MET	Arsenic	7440-38-2	62	51	11	82.3%	1.3	20	6.27	EPC
2A	IR 00013	0-2	MET	Barium	7440-39-3	62	60	2	96.8%	11.6	376	94.38	EPC
2A	IR 00013	0-2	MET	Beryllium	7440-41-7	59	37	22	62.7%	0.106	1.9	0.29	EPC
2A	IR 00013	0-2	MET	Cadmium	7440-43-9	58	41	17	70.7%	0.05	18	1.96	EPC
2A	IR 00013	0-2	MET	Calcium	7440-70-2	31	31		100.0%	1310	22300	7,964.00	EPC
2A	IR 00013	0-2	MET	Chromium, Total	7440-47-3	62	62		100.0%	10.7	337	54.36	EPC
2A	IR 00013	0-2	MET	Cobalt	7440-48-4	62	54	8	87.1%	0.667	28.9	7.32	EPC
2A	IR 00013	0-2	MET	Copper	7440-50-8	61	58	3	95.1%	4.08	160	31.51	EPC
2A	IR 00013	0-2	MET	Iron	7439-89-6	31	31		100.0%	2790	74800	21,581.00	EPC
2A	IR 00013	0-2	MET	Lead	7439-92-1	64	56	8	87.5%	1.3	431	86.99	EPC
2A	IR 00013	0-2	MET	Magnesium	7439-95-4	31	31		100.0%	157	12000	4,439.00	EPC
2A	IR 00013	0-2	MET	Manganese	7439-96-5	31	31		100.0%	22.6	548	273.40	EPC
2A	IR 00013	0-2	MET	Mercury	7439-97-6	46	12	34	26.1%	0.01	0.606	0.10	EPC
2A	IR 00013	0-2	MET	Molybdenum	7439-98-7	60	8	52	13.3%	0.11	5.9	0.51	EPC
2A	IR 00013	0-2	MET	Nickel	7440-02-0	62	60	2	96.8%	4.69	278	49.37	EPC
2A	IR 00013	0-2	MET	Potassium	7440-09-7	31	23	8	74.2%	432	2700	937.10	EPC
2A	IR 00013	0-2	MET	Selenium	7782-49-2	61	13	48	21.3%	0.119	12	2.00	EPC
2A	IR 00013	0-2	MET	Selenium	7782-49-2	61	13	48	21.3%	0.119	12	2.00	EPC
2A	IR 00013	0-2	MET	Silver	7440-22-4	60	4	56	6.7%	0.118	1.6	0.24	EPC
2A	IR 00013	0-2	MET	Sodium	7440-23-5	31	22	9	71.0%	70	590	324.30	EPC
2A	IR 00013	0-2	MET	Thallium	7440-28-0	62	7	55	11.3%	0.108	2.7	0.41	EPC
2A	IR 00013	0-2	MET	Titanium	7440-32-6	16	16		100.0%	209	567	424.40	EPC
2A	IR 00013	0-2	MET	Vanadium	7440-62-2	62	62		100.0%	9.31	89	30.53	EPC
2A	IR 00013	0-2	MET	Zinc	7440-66-6	62	62		100.0%	7	7120	674.30	EPC
2A	IR 00013	0-2	PAH	2-Methylnaphthalene	91-57-6	164	78	86	47.6%	0.0003	9	0.47	EPC
2A	IR 00013	0-2	PAH	Acenaphthene	83-32-9	180	27	153	15.0%	0.0003	0.1	0.01	EPC
2A	IR 00013	0-2	PAH	Acenaphthylene	208-96-8	180	41	139	22.8%	0.0002	0.37	0.02	EPC
2A	IR 00013	0-2	PAH	Anthracene	120-12-7	180	62	118	34.4%	0.0003	0.45	0.03	EPC
2A	IR 00013	0-2	PAH	Benzo(a)anthracene	56-55-3	180	97	83	53.9%	0.0002	1.2	0.13	EPC
2A	IR 00013	0-2	PAH	Benzo(a)anthracene	56-55-3	180	97	83	53.9%	0.0002	1.2	0.13	EPC
2A	IR 00013	0-2	PAH	Benzo(a)pyrene	50-32-8	180	92	88	51.1%	0.0002	2.4	0.14	EPC
2A	IR 00013	0-2	PAH	Benzo(b)fluoranthene	205-99-2	180	92	88	51.1%	0.0002	1.6	0.13	EPC
2A	IR 00013	0-2	PAH	Benzo(g,h,i)perylene	191-24-2	180	112	68	62.2%	0.0004	1.5	0.09	EPC
2A	IR 00013	0-2	PAH	Benzo(k)fluoranthene	207-08-9	180	70	110	38.9%	0.0004	1.4	0.07	EPC
2A	IR 00013	0-2	PAH	Chrysene	218-01-9	180	98	82	54.4%	0.0002	3.4	0.24	EPC
2A	IR 00013	0-2	PAH	Dibenz(a,h)Anthracene	53-70-3	180	63	117	35.0%	0.0007	0.42	0.02	EPC
2A	IR 00013	0-2	PAH	Fluoranthene	206-44-0	180	89	91	49.4%	0.0002	1.9	0.15	EPC
2A	IR 00013	0-2	PAH	Fluoranthene	206-44-0	180	89	91	49.4%	0.0002	1.9	0.15	EPC
2A	IR 00013	0-2	PAH	Fluorene	86-73-7	180	49	131	27.2%	0.0002	3.1	0.10	EPC
2A	IR 00013	0-2	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	180	72	108	40.0%	0.0003	1.6	0.07	EPC
2A	IR 00013	0-2	PAH	Naphthalene	91-20-3	180	66	114	36.7%	0.0003	2.7	0.10	EPC
2A	IR 00013	0-2	PAH	Phenanthrene	85-01-8	180	88	92	48.9%	0.0002	9.1	0.50	EPC
2A	IR 00013	0-2	PAH	Pyrene	129-00-0	180	91	89	50.6%	0.0002	2.7	0.22	EPC
2A	IR 00013	0-2	PAH	Pyrene	129-00-0	180	91	89	50.6%	0.0002	2.7	0.22	EPC
2A	IR 00013	0-2	PEST	Heptachlor epoxide	1024-57-3	15	1	14	6.7%	0.0054	0.0054	0.01	Max
2A	IR 00013	0-2	PEST	p,p'-DDE	72-55-9	16	1	15	6.3%	0.031	0.031	0.03	Max
2A	IR 00013	0-2	PEST	p,p'-DDT	50-29-3	16	2	14	12.5%	0.0021	0.16	0.15	EPC
2A	IR 00013	0-2	SVOC	Di-N-Butyl Phthalate	84-74-2	37	1	36	2.7%	0.031	0.031	0.03	Max
2A	IR 00013	0-2	SVOC	N-Nitrosodiphenylamine	86-30-6	36	6	30	16.7%	0.043	1.2	0.18	EPC
2A	IR 00013	0-2	SVOC	Pentachlorophenol	87-86-5	37	1	36	2.7%	0.64	0.64	0.64	Max
2A	IR 00013	0-2	VOC	2-Butanone	78-93-3	24	3	21	12.5%	0.0059	0.0098	0.01	EPC
2A	IR 00013	0-2	VOC	Acetone	67-64-1	24	14	10	58.3%	0.0063	0.18	0.04	EPC
2A	IR 00013	0-2	VOC	Benzene	71-43-2	24	3	21	12.5%	0.002	0.026	0.01	EPC
2A	IR 00013	0-2	VOC	Carbon disulfide	75-15-0	8	1	7	12.5%	0.002	0.002	0.00	Max
2A	IR 00013	0-2	VOC	Carbon disulfide	75-15-0	8	1	7	12.5%	0.002	0.002	0.00	Max
2A	IR 00013	0-2	VOC	Ethylbenzene	100-41-4	24	3	21	12.5%	0.006	0.097	0.02	EPC
2A	IR 00013	0-2	VOC	Ethylbenzene	100-41-4	24	3	21	12.5%	0.006	0.097	0.02	EPC
2A	IR 00013	0-2	VOC	Methylene chloride	75-09-2	24	2	22	8.3%	0.0026	0.0027	0.00	EPC
2A	IR 00013	0-2	VOC	Toluene	108-88-3	24	3	21	12.5%	0.002	0.009	0.00	EPC
2A	IR 00013	0-2	VOC	Toluene	108-88-3	24	3	21	12.5%	0.002	0.009	0.00	EPC
2A	IR 00013	0-2	VOC	Xylenes (total)	1330-20-7	24	3	21	12.5%	0.02	0.24	0.05	EPC

Table 15: Summary of Detected Soil Analytes at IR Site 13 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00013	0-8	MET	Aluminum	7429-90-5	112	112		100.0%	45.8	18200	7,169.00	EPC
2A	IR 00013	0-8	MET	Antimony	7440-36-0	191	45	146	23.6%	0.134	8.2	0.99	EPC
2A	IR 00013	0-8	MET	Arsenic	7440-38-2	192	151	41	78.6%	0.715	20.3	3.92	EPC
2A	IR 00013	0-8	MET	Barium	7440-39-3	192	187	5	97.4%	11.6	376	66.45	EPC
2A	IR 00013	0-8	MET	Beryllium	7440-41-7	189	99	90	52.4%	0.08	2	0.32	EPC
2A	IR 00013	0-8	MET	Cadmium	7440-43-9	186	101	85	54.3%	0.02	18	0.53	EPC
2A	IR 00013	0-8	MET	Calcium	7440-70-2	112	112		100.0%	363	22300	3,787.00	EPC
2A	IR 00013	0-8	MET	Chromium, Total	7440-47-3	192	192		100.0%	3.4	337	34.53	EPC
2A	IR 00013	0-8	MET	Cobalt	7440-48-4	192	165	27	85.9%	0.506	28.9	5.45	EPC
2A	IR 00013	0-8	MET	Copper	7440-50-8	191	176	15	92.1%	1.2	317	18.83	EPC
2A	IR 00013	0-8	MET	Iron	7439-89-6	112	112		100.0%	1110	74800	12,552.00	EPC
2A	IR 00013	0-8	MET	Lead	7439-92-1	215	180	35	83.7%	1	815	90.77	EPC
2A	IR 00013	0-8	MET	Magnesium	7439-95-4	112	112		100.0%	153	12000	2,916.00	EPC
2A	IR 00013	0-8	MET	Manganese	7439-96-5	112	112		100.0%	7.5	702	168.50	EPC
2A	IR 00013	0-8	MET	Mercury	7439-97-6	140	40	100	28.6%	0.01	0.606	0.08	EPC
2A	IR 00013	0-8	MET	Molybdenum	7439-98-7	189	16	173	8.5%	0.11	5.9	0.28	EPC
2A	IR 00013	0-8	MET	Nickel	7440-02-0	191	189	2	99.0%	1.2	278	31.45	EPC
2A	IR 00013	0-8	MET	Potassium	7440-09-7	112	100	12	89.3%	270	3220	936.50	EPC
2A	IR 00013	0-8	MET	Selenium	7782-49-2	190	48	142	25.3%	0.112	12	0.57	EPC
2A	IR 00013	0-8	MET	Selenium	7782-49-2	190	48	142	25.3%	0.112	12	0.57	EPC
2A	IR 00013	0-8	MET	Silver	7440-22-4	189	12	177	6.3%	0.118	1.6	0.19	EPC
2A	IR 00013	0-8	MET	Sodium	7440-23-5	112	83	29	74.1%	69.6	2690	398.10	EPC
2A	IR 00013	0-8	MET	Sodium	7440-23-5	112	83	29	74.1%	69.6	2690	398.10	EPC
2A	IR 00013	0-8	MET	Thallium	7440-28-0	192	14	178	7.3%	0.108	2.7	0.20	EPC
2A	IR 00013	0-8	MET	Titanium	7440-32-6	50	50		100.0%	139	632	404.90	EPC
2A	IR 00013	0-8	MET	Vanadium	7440-62-2	192	192		100.0%	2	1780	50.47	EPC
2A	IR 00013	0-8	MET	Zinc	7440-66-6	192	192		100.0%	5.6	7120	151.90	EPC
2A	IR 00013	0-8	PAH	2-Methylnaphthalene	91-57-6	328	161	167	49.1%	0.0002	39	1.34	EPC
2A	IR 00013	0-8	PAH	Acenaphthene	83-32-9	382	68	314	17.8%	0.0003	0.99	0.03	EPC
2A	IR 00013	0-8	PAH	Acenaphthylene	208-96-8	382	90	292	23.6%	0.0002	0.87	0.02	EPC
2A	IR 00013	0-8	PAH	Anthracene	120-12-7	382	126	256	33.0%	0.0003	12	0.25	EPC
2A	IR 00013	0-8	PAH	Benzo(a)anthracene	56-55-3	382	202	180	52.9%	0.0001	4.3	0.22	EPC
2A	IR 00013	0-8	PAH	Benzo(a)pyrene	50-32-8	382	198	184	51.8%	0.0002	5.2	0.17	EPC
2A	IR 00013	0-8	PAH	Benzo(b)fluoranthene	205-99-2	382	188	194	49.2%	0.0002	3.2	0.11	EPC
2A	IR 00013	0-8	PAH	Benzo(g,h,i)perylene	191-24-2	382	202	180	52.9%	0.00032	2.9	0.11	EPC
2A	IR 00013	0-8	PAH	Benzo(k)fluoranthene	207-08-9	382	148	234	38.7%	0.0002	3.5	0.08	EPC
2A	IR 00013	0-8	PAH	Chrysene	218-01-9	382	205	177	53.7%	0.0002	7.1	0.34	EPC
2A	IR 00013	0-8	PAH	Dibenz(a,h)Anthracene	53-70-3	382	136	246	35.6%	0.0003	1.3	0.04	EPC
2A	IR 00013	0-8	PAH	Fluoranthene	206-44-0	382	189	193	49.5%	0.0002	7.4	0.21	EPC
2A	IR 00013	0-8	PAH	Fluorene	86-73-7	382	108	274	28.3%	0.0002	9.1	0.25	EPC
2A	IR 00013	0-8	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	382	153	229	40.1%	0.0002	3.3	0.08	EPC
2A	IR 00013	0-8	PAH	Naphthalene	91-20-3	382	144	238	37.7%	0.0002	14	0.49	EPC
2A	IR 00013	0-8	PAH	Phenanthrene	85-01-8	382	196	186	51.3%	0.0002	9.6	0.42	EPC
2A	IR 00013	0-8	PAH	Pyrene	129-00-0	382	196	186	51.3%	0.0002	7.1	0.29	EPC
2A	IR 00013	0-8	PEST	Heptachlor epoxide	1024-57-3	51	1	50	2.0%	0.0054	0.0054	0.01	Max
2A	IR 00013	0-8	PEST	p,p'-DDE	72-55-9	54	3	51	5.6%	0.0037	0.031	0.01	EPC
2A	IR 00013	0-8	PEST	p,p'-DDT	50-29-3	54	4	50	7.4%	0.0021	0.16	0.01	EPC
2A	IR 00013	0-8	SVOC	2,4-Dimethylphenol	105-67-9	136	3	133	2.2%	1.2	12	12.00	EPC
2A	IR 00013	0-8	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	136	2	134	1.5%	0.17	0.3	0.30	EPC
2A	IR 00013	0-8	SVOC	Carbazole	86-74-8	32	4	28	12.5%	0.27	5.9	5.90	EPC
2A	IR 00013	0-8	SVOC	Dibenzofuran	132-64-9	136	3	133	2.2%	0.22	6.9	0.54	EPC
2A	IR 00013	0-8	SVOC	Di-N-Butyl Phthalate	84-74-2	136	1	135	0.7%	0.031	0.031	0.03	Max
2A	IR 00013	0-8	SVOC	N-Nitrosodiphenylamine	86-30-6	135	20	115	14.8%	0.042	1.2	0.10	EPC
2A	IR 00013	0-8	SVOC	Pentachlorophenol	87-86-5	136	3	133	2.2%	0.27	1	0.61	EPC
2A	IR 00013	0-8	VOC	2-Butanone	78-93-3	123	17	106	13.8%	0.0052	0.025	0.01	EPC
2A	IR 00013	0-8	VOC	4-Methyl-2-pentanone	108-10-1	123	3	120	2.4%	0.0062	0.041	0.04	EPC
2A	IR 00013	0-8	VOC	4-Methyl-2-pentanone	108-10-1	123	3	120	2.4%	0.0062	0.041	0.04	EPC
2A	IR 00013	0-8	VOC	Acetone	67-64-1	122	42	80	34.4%	0.0063	0.47	0.04	EPC
2A	IR 00013	0-8	VOC	Acetone	67-64-1	122	42	80	34.4%	0.0063	0.47	0.04	EPC
2A	IR 00013	0-8	VOC	Benzene	71-43-2	137	24	113	17.5%	0.0004	1.9	0.14	EPC
2A	IR 00013	0-8	VOC	Carbon disulfide	75-15-0	83	3	80	3.6%	0.001	0.002	0.00	EPC
2A	IR 00013	0-8	VOC	Carbon disulfide	75-15-0	83	3	80	3.6%	0.001	0.002	0.00	EPC
2A	IR 00013	0-8	VOC	Chlorobenzene	108-90-7	123	1	122	0.8%	0.002	0.002	0.00	Max
2A	IR 00013	0-8	VOC	Ethylbenzene	100-41-4	137	27	110	19.7%	0.0007	6.4	0.49	EPC
2A	IR 00013	0-8	VOC	Methylene chloride	75-09-2	123	7	116	5.7%	0.0026	0.0056	0.00	EPC
2A	IR 00013	0-8	VOC	o-Xylene	95-47-6	7	2	5	28.6%	0.054	0.14	0.10	EPC
2A	IR 00013	0-8	VOC	p-Xylene	106-42-3	7	2	5	28.6%	0.11	0.39		
2A	IR 00013	0-8	VOC	Toluene	108-88-3	137	55	82	40.1%	0.001	3.3	0.32	EPC
2A	IR 00013	0-8	VOC	Toluene	108-88-3	137	55	82	40.1%	0.001	3.3	0.32	EPC
2A	IR 00013	0-8	VOC	Xylenes (total)	1330-20-7	130	30	100	23.1%	0.0011	38	2.46	EPC

Table 16: Summary of Non-Detected Soil Analytes at IR Site 13 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, mg/kg
2A	IR 00013	0-8	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	54		54	0.018-1.3
2A	IR 00013	0-8	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	54		54	0.018-1.3
2A	IR 00013	0-8	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	54		54	0.018-1.3
2A	IR 00013	0-8	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	54		54	0.018-1.3
2A	IR 00013	0-8	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	54		54	0.017-1.3
2A	IR 00013	0-8	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	54		54	0.017-2.6
2A	IR 00013	0-8	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	54		54	0.017-2.6
2A	IR 00013	0-8	PEST	Aldrin	309-00-2	54		54	0.001-0.082
2A	IR 00013	0-8	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	54		54	0.001-0.082
2A	IR 00013	0-8	PEST	alpha-Chlordane	5103-71-9	23		23	0.0019-0.82
2A	IR 00013	0-8	PEST	alpha-Endosulfan	959-98-8	54		54	0.0019-0.1
2A	IR 00013	0-8	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	54		54	0.001-0.082
2A	IR 00013	0-8	PEST	beta-Chlordane	5103-74-2	23		23	0.0019-0.82
2A	IR 00013	0-8	PEST	beta-Endosulfan	33213-65-9	54		54	0.0021-0.16
2A	IR 00013	0-8	PEST	Chlordane	57-74-9	31		31	0.01-0.53
2A	IR 00013	0-8	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	54		54	0.001-0.082
2A	IR 00013	0-8	PEST	Dieldrin	60-57-1	54		54	0.0014-0.16
2A	IR 00013	0-8	PEST	Endosulfan sulfate	1031-07-8	54		54	0.0021-0.16
2A	IR 00013	0-8	PEST	Endrin	72-20-8	53		53	0.0021-0.16
2A	IR 00013	0-8	PEST	Endrin aldehyde	7421-93-4	34		34	0.0021-0.1
2A	IR 00013	0-8	PEST	Endrin ketone	53494-70-5	23		23	0.0037-0.16
2A	IR 00013	0-8	PEST	gamma-BHC (Lindane)	58-89-9	54		54	0.001-0.082
2A	IR 00013	0-8	PEST	Heptachlor	76-44-8	53		53	0.0003-0.082
2A	IR 00013	0-8	PEST	Methoxychlor	72-43-5	54		54	0.0052-0.82
2A	IR 00013	0-8	PEST	p,p'-DDD	72-54-8	54		54	0.0021-0.16
2A	IR 00013	0-8	PEST	Toxaphene	8001-35-2	54		54	0.052-2.6
2A	IR 00013	0-8	SVOC	1,2-Diphenylhydrazine	122-66-7	45		45	0.34-6.9
2A	IR 00013	0-8	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	13		13	0.051-0.11
2A	IR 00013	0-8	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	81		81	0.037-62
2A	IR 00013	0-8	SVOC	2,4,5-Trichlorophenol	95-95-4	136		136	0.089-170
2A	IR 00013	0-8	SVOC	2,4,6-Trichlorophenol	88-06-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2,4-Dichlorophenol	120-83-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2,4-Dinitrophenol	51-28-5	125		125	0.089-170
2A	IR 00013	0-8	SVOC	2,4-Dinitrotoluene	121-14-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2,6-Dinitrotoluene	606-20-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2-Chloronaphthalene	91-58-7	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2-Chlorophenol	95-57-8	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2-Methylphenol (O-Cresol)	95-48-7	136		136	0.037-62
2A	IR 00013	0-8	SVOC	2-Nitroaniline	88-74-4	136		136	0.089-170
2A	IR 00013	0-8	SVOC	2-Nitrophenol	88-75-5	136		136	0.037-62
2A	IR 00013	0-8	SVOC	3,3'-Dichlorobenzidine	91-94-1	136		136	0.037-68
2A	IR 00013	0-8	SVOC	3-Nitroaniline	99-09-2	136		136	0.089-170
2A	IR 00013	0-8	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	132		132	0.089-170
2A	IR 00013	0-8	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	136		136	0.037-62
2A	IR 00013	0-8	SVOC	4-Chloro-3-methylphenol	59-50-7	136		136	0.037-62
2A	IR 00013	0-8	SVOC	4-Chloroaniline	106-47-8	136		136	0.037-62
2A	IR 00013	0-8	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	136		136	0.037-62
2A	IR 00013	0-8	SVOC	4-Methylphenol (P-Cresol)	106-44-5	136		136	0.037-62
2A	IR 00013	0-8	SVOC	4-Nitroaniline	100-01-6	136		136	0.089-170
2A	IR 00013	0-8	SVOC	4-Nitrophenol	100-02-7	136		136	0.089-170
2A	IR 00013	0-8	SVOC	Aniline (Phenylamine, Aminobenzene)	62-53-3	24		24	0.34-6.9
2A	IR 00013	0-8	SVOC	Benzoic Acid	65-85-0	55		55	1.6-170
2A	IR 00013	0-8	SVOC	Benzyl Alcohol	100-51-6	55		55	0.34-34
2A	IR 00013	0-8	SVOC	Benzyl Butyl Phthalate	85-68-7	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	136		136	0.02-62
2A	IR 00013	0-8	SVOC	Diethyl Phthalate	84-66-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Dimethyl Phthalate	131-11-3	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Di-N-Octylphthalate	117-84-0	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Hexachlorobenzene	118-74-1	136		136	0.02-62
2A	IR 00013	0-8	SVOC	Hexachlorocyclopentadiene	77-47-4	134		134	0.037-62
2A	IR 00013	0-8	SVOC	Hexachloroethane	67-72-1	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Isophorone	78-59-1	88		88	0.037-62
2A	IR 00013	0-8	SVOC	Nitrobenzene	98-95-3	135		135	0.037-62
2A	IR 00013	0-8	SVOC	N-Nitrosodimethylamine	62-75-9	24		24	0.34-6.9
2A	IR 00013	0-8	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	135		135	0.02-62
2A	IR 00013	0-8	SVOC	Phenol	108-95-2	136		136	0.037-62
2A	IR 00013	0-8	SVOC	Pyridine	110-86-1	48		48	0.84-11
2A	IR 00013	0-8	SVOC	Styrene	100-42-5	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,1,1-Trichloroethane	71-55-6	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,1,2,2-Tetrachloroethane	79-34-5	123		123	0.0046-1.3
2A	IR 00013	0-8	VOC	1,1,2-Trichloroethane	79-00-5	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,1-Dichloroethane	75-34-3	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,1-Dichloroethene	75-35-4	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,2,4-Trichlorobenzene	120-82-1	136		136	0.037-62
2A	IR 00013	0-8	VOC	1,2-Dibromoethane	106-93-4	4		4	0.006-0.014
2A	IR 00013	0-8	VOC	1,2-Dichlorobenzene	95-50-1	136		136	0.005-62
2A	IR 00013	0-8	VOC	1,2-Dichloroethane	107-06-2	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,2-Dichloroethene (total)	540-59-0	76		76	0.005-0.72
2A	IR 00013	0-8	VOC	1,2-Dichloropropane	78-87-5	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	1,3-Dichlorobenzene	541-73-1	136		136	0.005-62
2A	IR 00013	0-8	VOC	1,4-Dichlorobenzene	106-46-7	136		136	0.005-62
2A	IR 00013	0-8	VOC	2-Chloroethyl Vinyl Ether	110-75-8	27		27	0.01-1.3
2A	IR 00013	0-8	VOC	2-Hexanone	591-78-6	123		123	0.0094-3.7
2A	IR 00013	0-8	VOC	Bromodichloromethane	75-27-4	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Bromoform	75-25-2	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Bromomethane	74-83-9	123		123	0.0091-1.4
2A	IR 00013	0-8	VOC	Carbon tetrachloride	56-23-5	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Chloroethane	75-00-3	123		123	0.0046-1.4
2A	IR 00013	0-8	VOC	Chloroform	67-66-3	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Chloromethane	74-87-3	123		123	0.0091-1.4
2A	IR 00013	0-8	VOC	cis-1,2-Dichloroethene	156-59-2	47		47	0.0046-0.37
2A	IR 00013	0-8	VOC	cis-1,3-Dichloropropene	10061-01-5	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Dibromochloromethane	124-48-1	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Hexachlorobutadiene	87-68-3	136		136	0.037-62
2A	IR 00013	0-8	VOC	Methyl Tert-Butyl Ether	1634-04-4	47		47	0.0046-0.37
2A	IR 00013	0-8	VOC	Tetrachloroethene	127-18-4	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	trans-1,2-Dichloroethene	156-60-5	47		47	0.0046-0.37
2A	IR 00013	0-8	VOC	trans-1,3-Dichloropropene	10061-02-6	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Trichloroethene	79-01-6	123		123	0.0046-0.72
2A	IR 00013	0-8	VOC	Trichlorofluoromethane	75-69-4	27		27	0.005-0.63
2A	IR 00013	0-8	VOC	Vinyl acetate	108-05-4	35		35	0.01-1.4
2A	IR 00013	0-8	VOC	Vinyl chloride	75-01-4	123		123	0.0046-1.4

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Table 17: Summary of Detected Soil Analytes at IR Site 19 (0 - 2 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00019	0-2	MET	Aluminum	7429-90-5	12	12		100.0%	3120	9940	5,813.00	EPC
2A	IR 00019	0-2	MET	Arsenic	7440-38-2	20	10	10	50.0%	1.18	9.5	3.16	EPC
2A	IR 00019	0-2	MET	Barium	7440-39-3	20	18	2	90.0%	18.2	140	57.47	EPC
2A	IR 00019	0-2	MET	Beryllium	7440-41-7	19	6	13	31.6%	0.105	0.4	0.21	EPC
2A	IR 00019	0-2	MET	Cadmium	7440-43-9	20	9	11	45.0%	0.115	7.4	1.37	EPC
2A	IR 00019	0-2	MET	Calcium	7440-70-2	12	12		100.0%	2000	7480	5,856.00	EPC
2A	IR 00019	0-2	MET	Chromium, Total	7440-47-3	20	20		100.0%	20.9	32.8	27.21	EPC
2A	IR 00019	0-2	MET	Cobalt	7440-48-4	20	12	8	60.0%	3.31	9.7	4.60	EPC
2A	IR 00019	0-2	MET	Copper	7440-50-8	20	19	1	95.0%	4.67	138	74.90	EPC
2A	IR 00019	0-2	MET	Iron	7439-89-6	12	12		100.0%	5440	30500	17,601.00	EPC
2A	IR 00019	0-2	MET	Lead	7439-92-1	20	9	11	45.0%	1.41	28.4	6.28	EPC
2A	IR 00019	0-2	MET	Magnesium	7439-95-4	12	12		100.0%	1800	4870	3,701.00	EPC
2A	IR 00019	0-2	MET	Manganese	7439-96-5	12	12		100.0%	72	830	423.20	EPC
2A	IR 00019	0-2	MET	Mercury	7439-97-6	8	1	7	12.5%	0.0424	0.0424	0.04	Max
2A	IR 00019	0-2	MET	Nickel	7440-02-0	20	20		100.0%	20	30	24.94	EPC
2A	IR 00019	0-2	MET	Potassium	7440-09-7	12	11	1	91.7%	540	1020	735.00	EPC
2A	IR 00019	0-2	MET	Silver	7440-22-4	20	1	19	5.0%	0.7	0.7	0.70	Max
2A	IR 00019	0-2	MET	Sodium	7440-23-5	12	5	7	41.7%	153	359	296.70	EPC
2A	IR 00019	0-2	MET	Thallium	7440-28-0	20	1	19	5.0%	3.3	3.3	3.30	Max
2A	IR 00019	0-2	MET	Titanium	7440-32-6	12	12		100.0%	260	535	432.90	EPC
2A	IR 00019	0-2	MET	Vanadium	7440-62-2	20	20		100.0%	14	41.5	23.94	EPC
2A	IR 00019	0-2	MET	Zinc	7440-66-6	20	20		100.0%	14	192	70.20	EPC
2A	IR 00019	0-2	PAH	2-Methylnaphthalene	91-57-6	26	14	12	53.8%	0.0003	0.0061	0.00	EPC
2A	IR 00019	0-2	PAH	Acenaphthene	83-32-9	34	6	28	17.6%	0.0003	0.0018	0.00	EPC
2A	IR 00019	0-2	PAH	Acenaphthylene	208-96-8	34	14	20	41.2%	0.0002	0.019	0.00	EPC
2A	IR 00019	0-2	PAH	Anthracene	120-12-7	34	15	19	44.1%	0.0003	0.047	0.01	EPC
2A	IR 00019	0-2	PAH	Benzo(a)anthracene	56-55-3	34	19	15	55.9%	0.0002	0.32	0.05	EPC
2A	IR 00019	0-2	PAH	Benzo(a)pyrene	50-32-8	34	18	16	52.9%	0.0002	0.52	0.18	EPC
2A	IR 00019	0-2	PAH	Benzo(b)fluoranthene	205-99-2	34	19	15	55.9%	0.0003	0.28	0.13	EPC
2A	IR 00019	0-2	PAH	Benzo(g,h,i)perylene	191-24-2	34	22	12	64.7%	0.0002	0.4	0.06	EPC
2A	IR 00019	0-2	PAH	Benzo(k)fluoranthene	207-08-9	34	16	18	47.1%	0.0002	0.33	0.10	EPC
2A	IR 00019	0-2	PAH	Chrysene	218-01-9	34	23	11	67.6%	0.0002	0.42	0.05	EPC
2A	IR 00019	0-2	PAH	Dibenz(a,h)Anthracene	53-70-3	34	13	21	38.2%	0.0003	0.04	0.01	EPC
2A	IR 00019	0-2	PAH	Fluoranthene	206-44-0	34	23	11	67.6%	0.0004	0.64	0.24	EPC
2A	IR 00019	0-2	PAH	Fluorene	86-73-7	34	12	22	35.3%	0.0002	0.0064	0.00	EPC
2A	IR 00019	0-2	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	34	20	14	58.8%	0.0003	0.47	0.06	EPC
2A	IR 00019	0-2	PAH	Naphthalene	91-20-3	34	20	14	58.8%	0.0003	0.025	0.00	EPC
2A	IR 00019	0-2	PAH	Phenanthrene	85-01-8	34	20	14	58.8%	0.0004	0.17	0.08	EPC
2A	IR 00019	0-2	PAH	Pyrene	129-00-0	34	24	10	70.6%	0.0002	0.71	0.26	EPC
2A	IR 00019	0-2	SVOC	2-Chlorophenol	95-57-8	23	1	22	4.3%	1.5	1.5	1.50	Max
2A	IR 00019	0-2	SVOC	4-Chloro-3-methylphenol	59-50-7	23	1	22	4.3%	1.5	1.5	1.50	Max
2A	IR 00019	0-2	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	23	1	22	4.3%	0.89	0.89	0.89	Max
2A	IR 00019	0-2	SVOC	Diethyl Phthalate	84-66-2	23	2	21	8.7%	6.2	7.7	6.43	EPC
2A	IR 00019	0-2	SVOC	Di-N-Butyl Phthalate	84-74-2	23	1	22	4.3%	7.3	7.3	7.30	Max
2A	IR 00019	0-2	SVOC	N-Nitrosodiphenylamine	86-30-6	23	3	20	13.0%	0.078	0.082	0.08	EPC
2A	IR 00019	0-2	SVOC	Pentachlorophenol	87-86-5	23	3	20	13.0%	0.41	1.6	0.85	EPC
2A	IR 00019	0-2	VOC	1,1,1-Trichloroethane	71-55-6	11	2	9	18.2%	0.018	0.022	0.02	EPC
2A	IR 00019	0-2	VOC	1,3-Dichlorobenzene	541-73-1	23	1	22	4.3%	0.59	0.59	0.59	Max
2A	IR 00019	0-2	VOC	Acetone	67-64-1	11	3	8	27.3%	0.0067	0.028	0.02	EPC
2A	IR 00019	0-2	VOC	Methylene chloride	75-09-2	11	2	9	18.2%	0.0037	0.0047	0.00	EPC
2A	IR 00019	0-2	VOC	Toluene	108-88-3	10	2	8	20.0%	0.058	1	1.41	EPC
2A	IR 00019	0-2	VOC	Xylenes (total)	1330-20-7	11	1	10	9.1%	0.19	0.19	0.19	Max

Table 18: Summary of Detected Soil Analytes at IR Site 19 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00019	0-8	MET	Aluminum	7429-90-5	33	33		100.0%	2840	10900	5,776.00	EPC
2A	IR 00019	0-8	MET	Arsenic	7440-38-2	51	25	26	49.0%	1.18	9.5	2.85	EPC
2A	IR 00019	0-8	MET	Barium	7440-39-3	51	48	3	94.1%	15.3	570	102.30	EPC
2A	IR 00019	0-8	MET	Beryllium	7440-41-7	50	15	35	30.0%	0.105	0.4	0.20	EPC
2A	IR 00019	0-8	MET	Cadmium	7440-43-9	51	19	32	37.3%	0.115	7.4	0.70	EPC
2A	IR 00019	0-8	MET	Calcium	7440-70-2	33	33		100.0%	1400	84900	17,099.00	EPC
2A	IR 00019	0-8	MET	Chromium, Total	7440-47-3	51	50	1	98.0%	5.8	67	33.29	EPC
2A	IR 00019	0-8	MET	Cobalt	7440-48-4	51	32	19	62.7%	3.2	9.7	4.78	EPC
2A	IR 00019	0-8	MET	Copper	7440-50-8	51	47	4	92.2%	4.67	138	39.85	EPC
2A	IR 00019	0-8	MET	Iron	7439-89-6	33	33		100.0%	4670	32300	15,147.00	EPC
2A	IR 00019	0-8	MET	Lead	7439-92-1	51	28	23	54.9%	1.41	303	38.99	EPC
2A	IR 00019	0-8	MET	Magnesium	7439-95-4	33	32	1	97.0%	1200	13000	4,236.00	EPC
2A	IR 00019	0-8	MET	Manganese	7439-96-5	33	33		100.0%	72	897	325.50	EPC
2A	IR 00019	0-8	MET	Mercury	7439-97-6	20	4	16	20.0%	0.0424	0.152	0.10	EPC
2A	IR 00019	0-8	MET	Molybdenum	7439-98-7	51	1	50	2.0%	1.6	1.6	1.60	Max
2A	IR 00019	0-8	MET	Nickel	7440-02-0	51	50	1	98.0%	5.5	64	30.17	EPC
2A	IR 00019	0-8	MET	Potassium	7440-09-7	33	31	2	93.9%	231	1400	757.90	EPC
2A	IR 00019	0-8	MET	Silver	7440-22-4	51	2	49	3.9%	0.43	0.7	0.46	EPC
2A	IR 00019	0-8	MET	Sodium	7440-23-5	33	12	21	36.4%	153	727	309.10	EPC
2A	IR 00019	0-8	MET	Thallium	7440-28-0	51	1	50	2.0%	3.3	3.3	3.30	Max
2A	IR 00019	0-8	MET	Titanium	7440-32-6	31	31		100.0%	220	819	449.80	EPC
2A	IR 00019	0-8	MET	Vanadium	7440-62-2	51	51		100.0%	12	41.5	22.82	EPC
2A	IR 00019	0-8	MET	Zinc	7440-66-6	51	51		100.0%	11.1	292	64.85	EPC
2A	IR 00019	0-8	PAH	2-Methylnaphthalene	91-57-6	52	28	24	53.8%	0.0003	0.0077	0.00	EPC
2A	IR 00019	0-8	PAH	Acenaphthene	83-32-9	78	13	65	16.7%	0.0003	0.002	0.00	EPC
2A	IR 00019	0-8	PAH	Acenaphthylene	208-96-8	78	32	46	41.0%	0.0002	0.019	0.00	EPC
2A	IR 00019	0-8	PAH	Anthracene	120-12-7	78	34	44	43.6%	0.0003	0.047	0.00	EPC
2A	IR 00019	0-8	PAH	Benzo(a)anthracene	56-55-3	78	45	33	57.7%	0.0002	0.36	0.08	EPC
2A	IR 00019	0-8	PAH	Benzo(a)pyrene	50-32-8	78	45	33	57.7%	0.0002	0.82	0.11	EPC
2A	IR 00019	0-8	PAH	Benzo(b)fluoranthene	205-99-2	78	44	34	56.4%	0.0003	0.72	0.10	EPC
2A	IR 00019	0-8	PAH	Benzo(g,h,i)perylene	191-24-2	78	47	31	60.3%	0.0002	0.67	0.10	EPC
2A	IR 00019	0-8	PAH	Benzo(k)fluoranthene	207-08-9	78	37	41	47.4%	0.0002	0.33	0.06	EPC
2A	IR 00019	0-8	PAH	Chrysene	218-01-9	78	49	29	62.8%	0.0002	0.47	0.09	EPC
2A	IR 00019	0-8	PAH	Dibenz(a,h)Anthracene	53-70-3	78	28	50	35.9%	0.0003	0.08	0.01	EPC
2A	IR 00019	0-8	PAH	Fluoranthene	206-44-0	78	48	30	61.5%	0.0004	0.69	0.12	EPC
2A	IR 00019	0-8	PAH	Fluorene	86-73-7	78	22	56	28.2%	0.0002	0.0064	0.00	EPC
2A	IR 00019	0-8	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	78	45	33	57.7%	0.0003	0.49		
2A	IR 00019	0-8	PAH	Naphthalene	91-20-3	78	42	36	53.8%	0.0003	0.025	0.00	EPC
2A	IR 00019	0-8	PAH	Phenanthrene	85-01-8	78	43	35	55.1%	0.0003	0.29	0.06	EPC
2A	IR 00019	0-8	PAH	Pyrene	129-00-0	78	51	27	65.4%	0.0002	1.2	0.17	EPC
2A	IR 00019	0-8	SVOC	2-Chlorophenol	95-57-8	68	1	67	1.5%	1.5	1.5	1.50	Max
2A	IR 00019	0-8	SVOC	4-Chloro-3-methylphenol	59-50-7	68	1	67	1.5%	1.5	1.5	1.50	Max
2A	IR 00019	0-8	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	68	4	64	5.9%	0.11	0.89	0.20	EPC
2A	IR 00019	0-8	SVOC	Diethyl Phthalate	84-66-2	68	2	66	2.9%	6.2	7.7	6.28	EPC
2A	IR 00019	0-8	SVOC	Di-N-Butyl Phthalate	84-74-2	68	2	66	2.9%	5.2	7.3	5.31	EPC
2A	IR 00019	0-8	SVOC	N-Nitrosodiphenylamine	86-30-6	68	9	59	13.2%	0.048	0.9	0.11	EPC
2A	IR 00019	0-8	SVOC	Pentachlorophenol	87-86-5	68	4	64	5.9%	0.41	1.6	0.65	EPC
2A	IR 00019	0-8	VOC	1,1,1-Trichloroethane	71-55-6	57	6	51	10.5%	0.001	0.022	0.00	EPC
2A	IR 00019	0-8	VOC	1,3-Dichlorobenzene	541-73-1	79	1	78	1.3%	0.59	0.59	0.59	Max
2A	IR 00019	0-8	VOC	2-Butanone	78-93-3	57	2	55	3.5%	0.0095	0.023	0.01	EPC
2A	IR 00019	0-8	VOC	Acetone	67-64-1	56	13	43	23.2%	0.004	0.1	0.02	EPC
2A	IR 00019	0-8	VOC	Chloroethane	75-00-3	54	1	53	1.9%	0.003	0.003	0.00	Max
2A	IR 00019	0-8	VOC	Methylene chloride	75-09-2	56	7	49	12.5%	0.003	0.03	0.01	EPC
2A	IR 00019	0-8	VOC	Tetrachloroethene	127-18-4	56	3	53	5.4%	0.002	0.004	0.00	EPC
2A	IR 00019	0-8	VOC	Toluene	108-88-3	56	27	29	48.2%	0.002	1	0.07	EPC
2A	IR 00019	0-8	VOC	Trichloroethene	79-01-6	56	1	55	1.8%	0.004	0.004	0.00	Max
2A	IR 00019	0-8	VOC	Xylenes (total)	1330-20-7	57	3	54	5.3%	0.003	0.19	0.01	EPC

Table 19: Summary of Non-Detected Soil Analytes at IR Site 19 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, mg/kg
2A	IR 00019	0-8	MET	Antimony	7440-36-0	51		51	0.113-7.4
2A	IR 00019	0-8	MET	Selenium	7782-49-2	51		51	0.47-13
2A	IR 00019	0-8	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	33		33	0.026-0.658
2A	IR 00019	0-8	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	33		33	0.026-1.646
2A	IR 00019	0-8	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	33		33	0.026-1.646
2A	IR 00019	0-8	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	33		33	0.026-0.658
2A	IR 00019	0-8	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	33		33	0.017-0.52
2A	IR 00019	0-8	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	33		33	0.017-1
2A	IR 00019	0-8	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	33		33	0.017-1
2A	IR 00019	0-8	PEST	Aldrin	309-00-2	33		33	0.001-0.056
2A	IR 00019	0-8	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	33		33	0.001-0.044
2A	IR 00019	0-8	PEST	alpha-Chlordane	5103-71-9	14		14	0.0018-0.44
2A	IR 00019	0-8	PEST	alpha-Endosulfan	959-98-8	33		33	0.0018-0.082
2A	IR 00019	0-8	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	33		33	0.001-0.082
2A	IR 00019	0-8	PEST	beta-Chlordane	5103-74-2	14		14	0.0018-0.44
2A	IR 00019	0-8	PEST	beta-Endosulfan	33213-65-9	33		33	0.0021-0.088
2A	IR 00019	0-8	PEST	Chlordane	57-74-9	19		19	0.01-0.21
2A	IR 00019	0-8	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	33		33	0.001-0.082
2A	IR 00019	0-8	PEST	Dieldrin	60-57-1	33		33	0.0014-0.088
2A	IR 00019	0-8	PEST	Endosulfan sulfate	1031-07-8	33		33	0.0021-0.165
2A	IR 00019	0-8	PEST	Endrin	72-20-8	33		33	0.0021-0.088
2A	IR 00019	0-8	PEST	Endrin aldehyde	7421-93-4	21		21	0.0021-0.042
2A	IR 00019	0-8	PEST	Endrin ketone	53494-70-5	14		14	0.0035-0.165
2A	IR 00019	0-8	PEST	gamma-BHC (Lindane)	58-89-9	33		33	0.001-0.056
2A	IR 00019	0-8	PEST	Heptachlor	76-44-8	33		33	0.001-0.044
2A	IR 00019	0-8	PEST	Heptachlor epoxide	1024-57-3	33		33	0.001-0.082
2A	IR 00019	0-8	PEST	Methoxychlor	72-43-5	33		33	0.0052-0.44
2A	IR 00019	0-8	PEST	p,p'-DDD	72-54-8	33		33	0.0021-0.152
2A	IR 00019	0-8	PEST	p,p'-DDE	72-55-9	33		33	0.0021-0.088
2A	IR 00019	0-8	PEST	p,p'-DDT	50-29-3	33		33	0.0021-0.165
2A	IR 00019	0-8	PEST	Toxaphene	8001-35-2	33		33	0.052-1.379
2A	IR 00019	0-8	SVOC	1,2-Diphenylhydrazine	122-66-7	17		17	0.34-6.8
2A	IR 00019	0-8	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	24		24	0.052-0.1
2A	IR 00019	0-8	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	38		38	0.035-11
2A	IR 00019	0-8	SVOC	2,4,5-Trichlorophenol	95-95-4	68		68	0.085-33
2A	IR 00019	0-8	SVOC	2,4,6-Trichlorophenol	88-06-2	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2,4-Dichlorophenol	120-83-2	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2,4-Dimethylphenol	105-67-9	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2,4-Dinitrophenol	51-28-5	68		68	0.085-33
2A	IR 00019	0-8	SVOC	2,4-Dinitrotoluene	121-14-2	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2,6-Dinitrotoluene	606-20-2	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2-Chloronaphthalene	91-58-7	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2-Methylphenol (O-Cresol)	95-48-7	68		68	0.035-11
2A	IR 00019	0-8	SVOC	2-Nitroaniline	88-74-4	68		68	0.085-33
2A	IR 00019	0-8	SVOC	2-Nitrophenol	88-75-5	68		68	0.035-11
2A	IR 00019	0-8	SVOC	3,3'-Dichlorobenzidine	91-94-1	68		68	0.035-14
2A	IR 00019	0-8	SVOC	3-Nitroaniline	99-09-2	68		68	0.085-33
2A	IR 00019	0-8	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	68		68	0.085-33
2A	IR 00019	0-8	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	68		68	0.035-11
2A	IR 00019	0-8	SVOC	4-Chloroaniline	106-47-8	68		68	0.035-11
2A	IR 00019	0-8	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	68		68	0.035-11
2A	IR 00019	0-8	SVOC	4-Methylphenol (P-Cresol)	106-44-5	68		68	0.035-11
2A	IR 00019	0-8	SVOC	4-Nitroaniline	100-01-6	68		68	0.085-33
2A	IR 00019	0-8	SVOC	4-Nitrophenol	100-02-7	68		68	0.085-33
2A	IR 00019	0-8	SVOC	Aniline (Phenylamine, Aminobenzene)	62-53-3	8		8	0.4-6.8
2A	IR 00019	0-8	SVOC	Benzoic Acid	65-85-0	30		30	1.6-33
2A	IR 00019	0-8	SVOC	Benzyl Alcohol	100-51-6	30		30	0.34-6.8
2A	IR 00019	0-8	SVOC	Benzyl Butyl Phthalate	85-68-7	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	69		69	0.021-11
2A	IR 00019	0-8	SVOC	Carbazole	86-74-8	12		12	0.035-11
2A	IR 00019	0-8	SVOC	Dibenzofuran	132-64-9	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Dimethyl Phthalate	131-11-3	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Di-N-Octylphthalate	117-84-0	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Hexachlorobenzene	118-74-1	68		68	0.021-11
2A	IR 00019	0-8	SVOC	Hexachlorocyclopentadiene	77-47-4	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Hexachloroethane	67-72-1	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Isophorone	78-59-1	42		42	0.035-11
2A	IR 00019	0-8	SVOC	Nitrobenzene	98-95-3	68		68	0.035-11
2A	IR 00019	0-8	SVOC	N-Nitrosodimethylamine	62-75-9	8		8	0.4-6.8
2A	IR 00019	0-8	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	68		68	0.021-11
2A	IR 00019	0-8	SVOC	Phenol	108-95-2	68		68	0.035-11
2A	IR 00019	0-8	SVOC	Pyridine	110-86-1	26		26	0.86-8.6
2A	IR 00019	0-8	SVOC	Styrene	100-42-5	55		55	0.005-0.68
2A	IR 00019	0-8	VOC	1,1,2,2-Tetrachloroethane	79-34-5	55		55	0.005-1.4
2A	IR 00019	0-8	VOC	1,1,2-Trichloroethane	79-00-5	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	1,1-Dichloroethane	75-34-3	56		56	0.005-0.68
2A	IR 00019	0-8	VOC	1,1-Dichloroethene	75-35-4	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	1,2,4-Trichlorobenzene	120-82-1	68		68	0.035-11
2A	IR 00019	0-8	VOC	1,2-Dichlorobenzene	95-50-1	77		77	0.005-11
2A	IR 00019	0-8	VOC	1,2-Dichloroethane	107-06-2	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	1,2-Dichloroethene (total)	540-59-0	37		37	0.005-0.68
2A	IR 00019	0-8	VOC	1,2-Dichloropropane	78-87-5	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	1,4-Dichlorobenzene	106-46-7	77		77	0.005-11
2A	IR 00019	0-8	VOC	2-Chloroethyl Vinyl Ether	110-75-8	15		15	0.01-1.4
2A	IR 00019	0-8	VOC	2-Hexanone	591-78-6	55		55	0.01-1.4
2A	IR 00019	0-8	VOC	4-Methyl-2-pentanone	108-10-1	55		55	0.0052-1.4
2A	IR 00019	0-8	VOC	Benzene	71-43-2	55		55	0.005-0.68
2A	IR 00019	0-8	VOC	Bromodichloromethane	75-27-4	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Bromoform	75-25-2	55		55	0.005-0.68
2A	IR 00019	0-8	VOC	Bromomethane	74-83-9	55		55	0.01-1.4
2A	IR 00019	0-8	VOC	Carbon disulfide	75-15-0	39		39	0.005-0.68
2A	IR 00019	0-8	VOC	Carbon tetrachloride	56-23-5	55		55	0.005-0.68
2A	IR 00019	0-8	VOC	Chlorobenzene	108-90-7	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Chloroform	67-66-3	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Chloromethane	74-87-3	55		55	0.01-1.4
2A	IR 00019	0-8	VOC	cis-1,2-Dichloroethene	156-59-2	17		17	0.0053-0.0089
2A	IR 00019	0-8	VOC	cis-1,3-Dichloropropene	10061-01-5	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Dibromochloromethane	124-48-1	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Ethylbenzene	100-41-4	56		56	0.005-0.68
2A	IR 00019	0-8	VOC	Hexachlorobutadiene	87-68-3	68		68	0.035-11
2A	IR 00019	0-8	VOC	Methyl Tert-Butyl Ether	1634-04-4	18		18	0.0053-0.0089
2A	IR 00019	0-8	VOC	trans-1,2-Dichloroethene	156-60-5	17		17	0.0053-0.0089
2A	IR 00019	0-8	VOC	trans-1,3-Dichloropropene	10061-02-6	54		54	0.005-0.68
2A	IR 00019	0-8	VOC	Trichlorofluoromethane	75-69-4	15		15	0.005-0.68
2A	IR 00019	0-8	VOC	Vinyl acetate	108-05-4	25		25	0.01-1.4
2A	IR 00019	0-8	VOC	Vinyl chloride	75-01-4	54		54	0.0053-1.4

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Table 20: Summary of Detected Soil Analytes at IR Site 22 (0 - 2 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00022	0-2	MET	Aluminum	7429-90-5	14	14		100.0%	3700	26800	11,173.00	EPC
2A	IR 00022	0-2	MET	Arsenic	7440-38-2	22	15	7	68.2%	1.22	18	4.65	EPC
2A	IR 00022	0-2	MET	Barium	7440-39-3	23	23		100.0%	39.4	305	127.00	EPC
2A	IR 00022	0-2	MET	Beryllium	7440-41-7	21	13	8	61.9%	0.109	1.8	0.52	EPC
2A	IR 00022	0-2	MET	Cadmium	7440-43-9	23	16	7	69.6%	0.141	4.3	0.80	EPC
2A	IR 00022	0-2	MET	Calcium	7440-70-2	14	14		100.0%	2120	15500	8,355.00	EPC
2A	IR 00022	0-2	MET	Chromium, Total	7440-47-3	22	22		100.0%	11.4	50.8	35.18	EPC
2A	IR 00022	0-2	MET	Cobalt	7440-48-4	23	19	4	82.6%	3.41	18.7	8.98	EPC
2A	IR 00022	0-2	MET	Copper	7440-50-8	23	23		100.0%	5.49	86.2	42.30	EPC
2A	IR 00022	0-2	MET	Iron	7439-89-6	14	14		100.0%	760	21400	13,822.00	EPC
2A	IR 00022	0-2	MET	Lead	7439-92-1	23	22	1	95.7%	2.7	9890	4,726.00	EPC
2A	IR 00022	0-2	MET	Magnesium	7439-95-4	14	14		100.0%	1800	6800	3,605.00	EPC
2A	IR 00022	0-2	MET	Manganese	7439-96-5	14	14		100.0%	93.4	352	231.50	EPC
2A	IR 00022	0-2	MET	Mercury	7439-97-6	14	4	10	28.6%	0.0441	0.0562	0.06	EPC
2A	IR 00022	0-2	MET	Molybdenum	7439-98-7	23	1	22	4.3%	1.28	1.28	1.28	Max
2A	IR 00022	0-2	MET	Nickel	7440-02-0	23	23		100.0%	11.6	51.7	30.12	EPC
2A	IR 00022	0-2	MET	Potassium	7440-09-7	14	13	1	92.9%	577	2000	1,216.00	EPC
2A	IR 00022	0-2	MET	Selenium	7782-49-2	23	2	21	8.7%	0.515	0.74	0.57	EPC
2A	IR 00022	0-2	MET	Silver	7440-22-4	23	4	19	17.4%	0.129	1.2	0.37	EPC
2A	IR 00022	0-2	MET	Sodium	7440-23-5	14	10	4	71.4%	74.6	1810	543.70	EPC
2A	IR 00022	0-2	MET	Thallium	7440-28-0	23	1	22	4.3%	0.901	0.901	0.90	Max
2A	IR 00022	0-2	MET	Titanium	7440-32-6	9	9		100.0%	300	500	441.90	EPC
2A	IR 00022	0-2	MET	Vanadium	7440-62-2	23	23		100.0%	15.6	62.3	34.13	EPC
2A	IR 00022	0-2	MET	Zinc	7440-66-6	23	23		100.0%	20.6	151	65.42	EPC
2A	IR 00022	0-2	PAH	2-Methylnaphthalene	91-57-6	44	34	10	77.3%	0.0003	3.8	1.44	EPC
2A	IR 00022	0-2	PAH	Acenaphthene	83-32-9	35	17	18	48.6%	0.0003	0.035	0.01	EPC
2A	IR 00022	0-2	PAH	Acenaphthylene	208-96-8	44	20	24	45.5%	0.0004	0.02	0.01	EPC
2A	IR 00022	0-2	PAH	Anthracene	120-12-7	35	24	11	68.6%	0.0004	0.027	0.01	EPC
2A	IR 00022	0-2	PAH	Anthracene	120-12-7	35	24	11	68.6%	0.0004	0.027	0.01	EPC
2A	IR 00022	0-2	PAH	Benzo(a)anthracene	56-55-3	39	36	3	92.3%	0.0003	0.11	0.04	EPC
2A	IR 00022	0-2	PAH	Benzo(a)pyrene	50-32-8	38	37	1	97.4%	0.0002	0.19	0.07	EPC
2A	IR 00022	0-2	PAH	Benzo(b)fluoranthene	205-99-2	40	39	1	97.5%	0.0003	0.17	0.05	EPC
2A	IR 00022	0-2	PAH	Benzo(g,h,i)perylene	191-24-2	40	36	4	90.0%	0.0002	0.2	0.06	EPC
2A	IR 00022	0-2	PAH	Benzo(k)fluoranthene	207-08-9	38	35	3	92.1%	0.0002	0.085	0.02	EPC
2A	IR 00022	0-2	PAH	Chrysene	218-01-9	40	40		100.0%	0.0003	0.14	0.05	EPC
2A	IR 00022	0-2	PAH	Dibenz(a,h)Anthracene	53-70-3	44	26	18	59.1%	0.0004	0.038	0.01	EPC
2A	IR 00022	0-2	PAH	Fluoranthene	206-44-0	40	37	3	92.5%	0.0005	0.35	0.12	EPC
2A	IR 00022	0-2	PAH	Fluorene	86-73-7	36	18	18	50.0%	0.0003	0.053	0.01	EPC
2A	IR 00022	0-2	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	38	34	4	89.5%	0.0002	0.13	0.05	EPC
2A	IR 00022	0-2	PAH	Naphthalene	91-20-3	44	35	9	79.5%	0.0003	2.5	0.98	EPC
2A	IR 00022	0-2	PAH	Phenanthrene	85-01-8	37	34	3	91.9%	0.0009	0.17	0.08	EPC
2A	IR 00022	0-2	PAH	Pyrene	129-00-0	41	38	3	92.7%	0.0019	0.33	0.10	EPC
2A	IR 00022	0-2	PEST	alpha-Chlordane	5103-71-9	5	1	4	20.0%	0.027	0.027	0.03	Max
2A	IR 00022	0-2	PEST	beta-Chlordane	5103-74-2	5	1	4	20.0%	0.022	0.022	0.02	Max
2A	IR 00022	0-2	PEST	p,p'-DDD	72-54-8	8	1	7	12.5%	0.009	0.009	0.01	Max
2A	IR 00022	0-2	PEST	p,p'-DDE	72-55-9	8	3	5	37.5%	0.0061	0.023	0.02	EPC
2A	IR 00022	0-2	PEST	p,p'-DDT	50-29-3	8	2	6	25.0%	0.01	0.053	0.05	EPC
2A	IR 00022	0-2	SVOC	Carbazole	86-74-8	5	1	4	20.0%	0.018	0.018	0.02	Max
2A	IR 00022	0-2	VOC	Ethylbenzene	100-41-4	3	1	2	33.3%	0.12	0.12	0.12	Max
2A	IR 00022	0-2	VOC	Xylenes (total)	1330-20-7	3	1	2	33.3%	0.84	0.84	0.84	Max

Table 21: Summary of Detected Soil Analytes at IR Site 22 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00022	0-8	MET	Aluminum	7429-90-5	48	48		100.0%	3120	26800	9,265.00	EPC
2A	IR 00022	0-8	MET	Arsenic	7440-38-2	64	34	30	53.1%	1.22	24	3.42	EPC
2A	IR 00022	0-8	MET	Barium	7440-39-3	65	65		100.0%	0.3	305	82.30	EPC
2A	IR 00022	0-8	MET	Beryllium	7440-41-7	63	30	33	47.6%	0.109	1.8	0.48	EPC
2A	IR 00022	0-8	MET	Cadmium	7440-43-9	65	32	33	49.2%	0.1	4.3	0.42	EPC
2A	IR 00022	0-8	MET	Calcium	7440-70-2	47	47		100.0%	574	15500	4,664.00	EPC
2A	IR 00022	0-8	MET	Chromium, Total	7440-47-3	64	64		100.0%	11.4	67	36.75	EPC
2A	IR 00022	0-8	MET	Cobalt	7440-48-4	65	47	18	72.3%	3.19	18.7	5.97	EPC
2A	IR 00022	0-8	MET	Copper	7440-50-8	65	65		100.0%	4.23	86.2	23.07	EPC
2A	IR 00022	0-8	MET	Iron	7439-89-6	48	48		100.0%	760	29600	13,162.00	EPC
2A	IR 00022	0-8	MET	Lead	7439-92-1	65	48	17	73.8%	1.99	9890	830.40	EPC
2A	IR 00022	0-8	MET	Magnesium	7439-95-4	48	48		100.0%	1510	7100	3,250.00	EPC
2A	IR 00022	0-8	MET	Manganese	7439-96-5	48	48		100.0%	72.4	440	183.70	EPC
2A	IR 00022	0-8	MET	Mercury	7439-97-6	33	5	28	15.2%	0.0441	0.46	0.09	EPC
2A	IR 00022	0-8	MET	Molybdenum	7439-98-7	64	1	63	1.6%	1.28	1.28	1.28	Max
2A	IR 00022	0-8	MET	Nickel	7440-02-0	64	62	2	96.9%	11.6	89	33.18	EPC
2A	IR 00022	0-8	MET	Potassium	7440-09-7	48	46	2	95.8%	497	2300	1,148.00	EPC
2A	IR 00022	0-8	MET	Selenium	7782-49-2	64	6	58	9.4%	0.515	1	0.59	EPC
2A	IR 00022	0-8	MET	Silver	7440-22-4	64	4	60	6.3%	0.129	1.2	0.25	EPC
2A	IR 00022	0-8	MET	Sodium	7440-23-5	48	34	14	70.8%	74.6	1810	353.50	EPC
2A	IR 00022	0-8	MET	Thallium	7440-28-0	64	1	63	1.6%	0.901	0.901	0.90	Max
2A	IR 00022	0-8	MET	Titanium	7440-32-6	31	31		100.0%	258	704	454.70	EPC
2A	IR 00022	0-8	MET	Vanadium	7440-62-2	65	65		100.0%	13.9	62.3	27.57	EPC
2A	IR 00022	0-8	MET	Zinc	7440-66-6	65	65		100.0%	13.7	151	53.31	EPC
2A	IR 00022	0-8	PAH	2-Methylnaphthalene	91-57-6	88	67	21	76.1%	0.0003	36	4.22	EPC
2A	IR 00022	0-8	PAH	Acenaphthene	83-32-9	76	31	45	40.8%	0.0003	0.13	0.01	EPC
2A	IR 00022	0-8	PAH	Acenaphthylene	208-96-8	90	38	52	42.2%	0.0004	0.062	0.01	EPC
2A	IR 00022	0-8	PAH	Anthracene	120-12-7	76	45	31	59.2%	0.0003	0.11	0.03	EPC
2A	IR 00022	0-8	PAH	Benzo(a)anthracene	56-55-3	82	69	13	84.1%	0.0003	0.32	0.06	EPC
2A	IR 00022	0-8	PAH	Benzo(a)anthracene	56-55-3	82	69	13	84.1%	0.0003	0.32	0.06	EPC
2A	IR 00022	0-8	PAH	Benzo(a)pyrene	50-32-8	82	73	9	89.0%	0.0002	0.56	0.11	EPC
2A	IR 00022	0-8	PAH	Benzo(b)fluoranthene	205-99-2	84	74	10	88.1%	0.0003	0.55	0.09	EPC
2A	IR 00022	0-8	PAH	Benzo(g,h,i)perylene	191-24-2	83	71	12	85.5%	0.0002	0.48	0.09	EPC
2A	IR 00022	0-8	PAH	Benzo(k)fluoranthene	207-08-9	81	69	12	85.2%	0.0002	0.26	0.05	EPC
2A	IR 00022	0-8	PAH	Chrysene	218-01-9	83	74	9	89.2%	0.0002	0.37	0.07	EPC
2A	IR 00022	0-8	PAH	Dibenz(a,h)Anthracene	53-70-3	90	47	43	52.2%	0.0004	0.056	0.01	EPC
2A	IR 00022	0-8	PAH	Fluoranthene	206-44-0	84	74	10	88.1%	0.0004	1.3	0.18	EPC
2A	IR 00022	0-8	PAH	Fluorene	86-73-7	76	33	43	43.4%	0.0003	0.091	0.02	EPC
2A	IR 00022	0-8	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	79	65	14	82.3%	0.0002	0.35	0.07	EPC
2A	IR 00022	0-8	PAH	Naphthalene	91-20-3	90	69	21	76.7%	0.0003	34	4.01	EPC
2A	IR 00022	0-8	PAH	Phenanthrene	85-01-8	80	67	13	83.8%	0.0005	0.54	0.11	EPC
2A	IR 00022	0-8	PAH	Pyrene	129-00-0	85	72	13	84.7%	0.0006	1.5	0.22	EPC
2A	IR 00022	0-8	PEST	alpha-Chlordane	5103-71-9	16	2	14	12.5%	0.0009	0.027	0.14	EPC
2A	IR 00022	0-8	PEST	beta-Chlordane	5103-74-2	16	2	14	12.5%	0.0014	0.022	0.08	EPC
2A	IR 00022	0-8	PEST	Methoxychlor	72-43-5	33	2	31	6.1%	0.011	0.02	0.01	EPC
2A	IR 00022	0-8	PEST	p,p'-DDD	72-54-8	32	1	31	3.1%	0.009	0.009	0.01	Max
2A	IR 00022	0-8	PEST	p,p'-DDE	72-55-9	32	3	29	9.4%	0.0061	0.023	0.01	EPC
2A	IR 00022	0-8	PEST	p,p'-DDT	50-29-3	32	3	29	9.4%	0.0027	0.053	0.01	EPC
2A	IR 00022	0-8	SVOC	2-Chlorophenol	95-57-8	50	1	49	2.0%	3.1	3.1	3.10	Max
2A	IR 00022	0-8	SVOC	4-Chloro-3-methylphenol	59-50-7	50	1	49	2.0%	5.7	5.7	5.70	Max
2A	IR 00022	0-8	SVOC	Carbazole	86-74-8	17	2	15	11.8%	0.018	0.024	0.03	EPC
2A	IR 00022	0-8	SVOC	Phenol	108-95-2	50	1	49	2.0%	0.3	0.3	0.30	Max
2A	IR 00022	0-8	VOC	1,2,4-Trichlorobenzene	120-82-1	50	1	49	2.0%	2	2	2.00	Max
2A	IR 00022	0-8	VOC	4-Methyl-2-pentanone	108-10-1	29	1	28	3.4%	72	72	72.00	Max
2A	IR 00022	0-8	VOC	Acetone	67-64-1	30	1	29	3.3%	0.0054	0.0054	0.01	Max
2A	IR 00022	0-8	VOC	Benzene	71-43-2	31	3	28	9.7%	0.006	3.3	0.37	EPC
2A	IR 00022	0-8	VOC	Ethylbenzene	100-41-4	31	10	21	32.3%	0.012	570	210.80	EPC
2A	IR 00022	0-8	VOC	Methylene chloride	75-09-2	31	1	30	3.2%	0.0027	0.0027	0.00	Max
2A	IR 00022	0-8	VOC	Toluene	108-88-3	35	21	14	60.0%	0.002	840	268.00	EPC
2A	IR 00022	0-8	VOC	Xylenes (total)	1330-20-7	31	11	20	35.5%	0.017	2600	237.80	EPC

Table 22: Summary of Non-Detected Soil Analytes at IR Site 22 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, mg/kg
2A	IR 00022	0-8	MET	Antimony	7440-36-0	64		64	0.119-10
2A	IR 00022	0-8	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	33		33	0.026-0.99
2A	IR 00022	0-8	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	33		33	0.026-0.99
2A	IR 00022	0-8	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	33		33	0.026-0.99
2A	IR 00022	0-8	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	33		33	0.026-0.99
2A	IR 00022	0-8	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	33		33	0.026-0.99
2A	IR 00022	0-8	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	33		33	0.052-2
2A	IR 00022	0-8	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	33		33	0.052-2
2A	IR 00022	0-8	PEST	Aldrin	309-00-2	32		32	0.0011-0.099
2A	IR 00022	0-8	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	alpha-Endosulfan	959-98-8	33		33	0.0021-0.099
2A	IR 00022	0-8	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	beta-Endosulfan	33213-65-9	32		32	0.0021-0.2
2A	IR 00022	0-8	PEST	Chlordane	57-74-9	16		16	0.011-0.052
2A	IR 00022	0-8	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	Dieldrin	60-57-1	33		33	0.0021-0.2
2A	IR 00022	0-8	PEST	Endosulfan sulfate	1031-07-8	33		33	0.0021-0.2
2A	IR 00022	0-8	PEST	Endrin	72-20-8	33		33	0.0021-0.2
2A	IR 00022	0-8	PEST	Endrin aldehyde	7421-93-4	17		17	0.0021-0.01
2A	IR 00022	0-8	PEST	Endrin ketone	53494-70-5	17		17	0.0042-0.2
2A	IR 00022	0-8	PEST	gamma-BHC (Lindane)	58-89-9	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	Heptachlor	76-44-8	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	Heptachlor epoxide	1024-57-3	33		33	0.0011-0.099
2A	IR 00022	0-8	PEST	Toxaphene	8001-35-2	33		33	0.052-2
2A	IR 00022	0-8	SVOC	1,2-Diphenylhydrazine	122-66-7	16		16	0.33-0.72
2A	IR 00022	0-8	SVOC	1,4-Dioxane (P-Dioxane)	123-91-1	2		2	0.052
2A	IR 00022	0-8	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	19		19	0.34-24
2A	IR 00022	0-8	SVOC	2,4,5-Trichlorophenol	95-95-4	50		50	0.34-67
2A	IR 00022	0-8	SVOC	2,4,6-Trichlorophenol	88-06-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2,4-Dichlorophenol	120-83-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2,4-Dimethylphenol	105-67-9	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2,4-Dinitrophenol	51-28-5	50		50	0.7-67
2A	IR 00022	0-8	SVOC	2,4-Dinitrotoluene	121-14-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2,6-Dinitrotoluene	606-20-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2-Chloronaphthalene	91-58-7	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2-Methylphenol (O-Cresol)	95-48-7	50		50	0.33-24
2A	IR 00022	0-8	SVOC	2-Nitroaniline	88-74-4	50		50	0.34-67
2A	IR 00022	0-8	SVOC	2-Nitrophenol	88-75-5	50		50	0.33-24
2A	IR 00022	0-8	SVOC	3,3'-Dichlorobenzidine	91-94-1	50		50	0.34-28
2A	IR 00022	0-8	SVOC	3-Nitroaniline	99-09-2	50		50	0.34-67
2A	IR 00022	0-8	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	50		50	0.7-67
2A	IR 00022	0-8	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	50		50	0.33-24
2A	IR 00022	0-8	SVOC	4-Chloroaniline	106-47-8	50		50	0.33-24
2A	IR 00022	0-8	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	50		50	0.33-24
2A	IR 00022	0-8	SVOC	4-Methylphenol (P-Cresol)	106-44-5	50		50	0.33-24
2A	IR 00022	0-8	SVOC	4-Nitroaniline	100-01-6	50		50	0.34-67
2A	IR 00022	0-8	SVOC	4-Nitrophenol	100-02-7	50		50	0.7-67
2A	IR 00022	0-8	SVOC	Benzoic Acid	65-85-0	31		31	1.6-67
2A	IR 00022	0-8	SVOC	Benzyl Alcohol	100-51-6	31		31	0.33-14
2A	IR 00022	0-8	SVOC	Benzyl Butyl Phthalate	85-68-7	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	50		50	0.021-24
2A	IR 00022	0-8	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Dibenzofuran	132-64-9	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Diethyl Phthalate	84-66-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Dimethyl Phthalate	131-11-3	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Di-N-Butyl Phthalate	84-74-2	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Di-N-Octylphthalate	117-84-0	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Hexachlorobenzene	118-74-1	50		50	0.021-24
2A	IR 00022	0-8	SVOC	Hexachlorocyclopentadiene	77-47-4	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Hexachloroethane	67-72-1	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Isophorone	78-59-1	48		48	0.33-24
2A	IR 00022	0-8	SVOC	Nitrobenzene	98-95-3	50		50	0.33-24
2A	IR 00022	0-8	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	50		50	0.021-24
2A	IR 00022	0-8	SVOC	N-Nitrosodiphenylamine	86-30-6	50		50	0.33-24
2A	IR 00022	0-8	SVOC	Pentachlorophenol	87-86-5	50		50	0.7-67
2A	IR 00022	0-8	SVOC	Pyridine	110-86-1	2		2	0.86
2A	IR 00022	0-8	SVOC	Styrene	100-42-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,1,1-Trichloroethane	71-55-6	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,1,2,2-Tetrachloroethane	79-34-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,1,2-Trichloroethane	79-00-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,1-Dichloroethane	75-34-3	36		36	0.005-140
2A	IR 00022	0-8	VOC	1,1-Dichloroethene	75-35-4	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,2-Dibromoethane	106-93-4	15		15	0.005-72
2A	IR 00022	0-8	VOC	1,2-Dichlorobenzene	95-50-1	51		51	0.005-24
2A	IR 00022	0-8	VOC	1,2-Dichloroethane	107-06-2	35		35	0.005-140
2A	IR 00022	0-8	VOC	1,2-Dichloroethene (total)	540-59-0	29		29	0.005-140
2A	IR 00022	0-8	VOC	1,2-Dichloropropane	78-87-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	1,3-Dichlorobenzene	541-73-1	51		51	0.005-24
2A	IR 00022	0-8	VOC	1,4-Dichlorobenzene	106-46-7	51		51	0.005-24
2A	IR 00022	0-8	VOC	2-Butanone	78-93-3	31		31	0.01-140
2A	IR 00022	0-8	VOC	2-Chloroethyl Vinyl Ether	110-75-8	5		5	0.01-0.013
2A	IR 00022	0-8	VOC	2-Hexanone	591-78-6	31		31	0.01-140
2A	IR 00022	0-8	VOC	Bromodichloromethane	75-27-4	31		31	0.005-140
2A	IR 00022	0-8	VOC	Bromoform	75-25-2	31		31	0.005-140
2A	IR 00022	0-8	VOC	Bromomethane	74-83-9	31		31	0.01-140
2A	IR 00022	0-8	VOC	Carbon disulfide	75-15-0	29		29	0.005-140
2A	IR 00022	0-8	VOC	Carbon tetrachloride	56-23-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	Chlorobenzene	108-90-7	31		31	0.005-140
2A	IR 00022	0-8	VOC	Chloroethane	75-00-3	31		31	0.0052-140
2A	IR 00022	0-8	VOC	Chloroform	67-66-3	31		31	0.005-140
2A	IR 00022	0-8	VOC	Chloromethane	74-87-3	31		31	0.01-140
2A	IR 00022	0-8	VOC	cis-1,2-Dichloroethene	156-59-2	2		2	0.0052-0.0057
2A	IR 00022	0-8	VOC	cis-1,3-Dichloropropene	10061-01-5	31		31	0.005-140
2A	IR 00022	0-8	VOC	Dibromochloromethane	124-48-1	31		31	0.005-140
2A	IR 00022	0-8	VOC	Hexachlorobutadiene	87-68-3	50		50	0.33-24
2A	IR 00022	0-8	VOC	Methyl Tert-Butyl Ether	1634-04-4	2		2	0.0052-0.0057
2A	IR 00022	0-8	VOC	Tetrachloroethene	127-18-4	31		31	0.005-140
2A	IR 00022	0-8	VOC	trans-1,2-Dichloroethene	156-60-5	2		2	0.0052-0.0057
2A	IR 00022	0-8	VOC	trans-1,3-Dichloropropene	10061-02-6	31		31	0.005-140
2A	IR 00022	0-8	VOC	Trichloroethene	79-01-6	31		31	0.005-140
2A	IR 00022	0-8	VOC	Trichlorofluoromethane	75-69-4	5		5	0.005-0.007
2A	IR 00022	0-8	VOC	Vinyl acetate	108-05-4	15		15	0.01-14
2A	IR 00022	0-8	VOC	Vinyl chloride	75-01-4	31		31	0.0052-140

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Table 23: Summary of Detected Soil Analytes at IR Site 23 (0 - 2 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00023	0-2	MET	Aluminum	7429-90-5	14	14		100.0%	3080	21900	11,986.00	EPC
2A	IR 00023	0-2	MET	Antimony	7440-36-0	14	3	11	21.4%	2.4	4.8	3.60	EPC
2A	IR 00023	0-2	MET	Antimony	7440-36-0	14	3	11	21.4%	2.4	4.8	3.60	EPC
2A	IR 00023	0-2	MET	Arsenic	7440-38-2	12	2	10	16.7%	3.7	4.2	3.91	EPC
2A	IR 00023	0-2	MET	Barium	7440-39-3	11	11		100.0%	20.6	200	135.00	EPC
2A	IR 00023	0-2	MET	Beryllium	7440-41-7	12	1	11	8.3%	0.17	0.17	0.17	Max
2A	IR 00023	0-2	MET	Cadmium	7440-43-9	14	8	6	57.1%	0.18	10	5.51	EPC
2A	IR 00023	0-2	MET	Calcium	7440-70-2	14	14		100.0%	1720	14800	11,070.00	EPC
2A	IR 00023	0-2	MET	Chromium, Total	7440-47-3	15	15		100.0%	7.3	76.9	49.90	EPC
2A	IR 00023	0-2	MET	Cobalt	7440-48-4	13	8	5	61.5%	2.8	13.3	6.13	EPC
2A	IR 00023	0-2	MET	Copper	7440-50-8	14	11	3	78.6%	5.3	113	71.89	EPC
2A	IR 00023	0-2	MET	Iron	7439-89-6	14	14		100.0%	5600	25900	15,267.00	EPC
2A	IR 00023	0-2	MET	Lead	7439-92-1	14	6	8	42.9%	3	85.8	23.42	EPC
2A	IR 00023	0-2	MET	Magnesium	7439-95-4	12	12		100.0%	26.6	9730	7,022.00	EPC
2A	IR 00023	0-2	MET	Manganese	7439-96-5	14	14		100.0%	74.1	414	245.20	EPC
2A	IR 00023	0-2	MET	Nickel	7440-02-0	14	14		100.0%	4.7	25.9	26.82	EPC
2A	IR 00023	0-2	MET	Potassium	7440-09-7	14	11	3	78.6%	390	2400	1,133.00	EPC
2A	IR 00023	0-2	MET	Silver	7440-22-4	13	1	12	7.7%	0.38	0.38	0.38	Max
2A	IR 00023	0-2	MET	Sodium	7440-23-5	13	7	6	53.8%	130	1830	599.60	EPC
2A	IR 00023	0-2	MET	Titanium	7440-32-6	11	11		100.0%	256	879	527.20	EPC
2A	IR 00023	0-2	MET	Vanadium	7440-62-2	14	14		100.0%	13.8	82	43.10	EPC
2A	IR 00023	0-2	MET	Zinc	7440-66-6	14	13	1	92.9%	17	79	46.06	EPC
2A	IR 00023	0-2	PAH	2-Methylnaphthalene	91-57-6	120	46	74	38.3%	0.0002	0.031	0.00	EPC
2A	IR 00023	0-2	PAH	Acenaphthene	83-32-9	120	8	112	6.7%	0.0003	0.072	0.00	EPC
2A	IR 00023	0-2	PAH	Acenaphthylene	208-96-8	120	28	92	23.3%	0.0002	0.037	0.00	EPC
2A	IR 00023	0-2	PAH	Anthracene	120-12-7	120	35	85	29.2%	0.0002	0.43	0.02	EPC
2A	IR 00023	0-2	PAH	Benzo(a)anthracene	56-55-3	120	69	51	57.5%	0.0002	2.1	0.15	EPC
2A	IR 00023	0-2	PAH	Benzo(a)pyrene	50-32-8	120	70	50	58.3%	0.0003	2	0.15	EPC
2A	IR 00023	0-2	PAH	Benzo(b)fluoranthene	205-99-2	120	71	49	59.2%	0.0004	2	0.15	EPC
2A	IR 00023	0-2	PAH	Benzo(g,h,i)perylene	191-24-2	120	79	41	65.8%	0.0003	1.3	0.11	EPC
2A	IR 00023	0-2	PAH	Benzo(k)fluoranthene	207-08-9	120	54	66	45.0%	0.0003	1.6	0.09	EPC
2A	IR 00023	0-2	PAH	Chrysene	218-01-9	120	76	44	63.3%	0.0003	2.3	0.17	EPC
2A	IR 00023	0-2	PAH	Dibenz(a,h)Anthracene	53-70-3	119	59	60	49.6%	0.0002	0.39	0.03	EPC
2A	IR 00023	0-2	PAH	Fluoranthene	206-44-0	120	64	56	53.3%	0.0003	3.4	0.25	EPC
2A	IR 00023	0-2	PAH	Fluorene	86-73-7	120	25	95	20.8%	0.0002	0.059	0.00	EPC
2A	IR 00023	0-2	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	120	64	56	53.3%	0.0002	1.4	0.11	EPC
2A	IR 00023	0-2	PAH	Naphthalene	91-20-3	120	48	72	40.0%	0.0002	0.037	0.00	EPC
2A	IR 00023	0-2	PAH	Phenanthrene	85-01-8	118	64	54	54.2%	0.0003	1.5	0.11	EPC
2A	IR 00023	0-2	PAH	Pyrene	129-00-0	120	74	46	61.7%	0.0003	2.7	0.21	EPC
2A	IR 00023	0-2	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	10	1	9	10.0%	0.038	0.038	0.04	Max
2A	IR 00023	0-2	PEST	p,p'-DDT	50-29-3	10	1	9	10.0%	0.0054	0.0054	0.01	Max
2A	IR 00023	0-2	SVOC	2,4-Dimethylphenol	105-67-9	20	1	19	5.0%	0.052	0.052	0.05	Max
2A	IR 00023	0-2	SVOC	2-Methylphenol (O-Cresol)	95-48-7	20	1	19	5.0%	0.021	0.021	0.02	Max
2A	IR 00023	0-2	SVOC	4-Methylphenol (P-Cresol)	106-44-5	20	1	19	5.0%	0.048	0.048	0.05	Max
2A	IR 00023	0-2	SVOC	N-Nitrosodiphenylamine	86-30-6	20	3	17	15.0%	0.046	0.22	0.21	EPC

Table 24: Summary of Detected Soil Analytes at IR Site 23 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Detects	Number of Non-Detects	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Calculated EPC Value (mg/kg)	Calculated EPC or Maximum Value
2A	IR 00023	0-8	MET	Aluminum	7429-90-5	41	41		100.0%	2880	21900	6,941.00	EPC
2A	IR 00023	0-8	MET	Antimony	7440-36-0	41	9	32	22.0%	0.89	4.8	2.33	EPC
2A	IR 00023	0-8	MET	Antimony	7440-36-0	41	9	32	22.0%	0.89	4.8	2.33	EPC
2A	IR 00023	0-8	MET	Arsenic	7440-38-2	39	9	30	23.1%	0.84	4.3	2.10	EPC
2A	IR 00023	0-8	MET	Barium	7440-39-3	35	33	2	94.3%	18.8	300	90.72	EPC
2A	IR 00023	0-8	MET	Beryllium	7440-41-7	38	4	34	10.5%	0.13	0.22	0.17	EPC
2A	IR 00023	0-8	MET	Cadmium	7440-43-9	41	18	23	43.9%	0.18	10	1.06	EPC
2A	IR 00023	0-8	MET	Calcium	7440-70-2	41	40	1	97.6%	1720	28800	10,275.00	EPC
2A	IR 00023	0-8	MET	Chromium, Total	7440-47-3	41	41		100.0%	7.3	76.9	37.26	EPC
2A	IR 00023	0-8	MET	Cobalt	7440-48-4	40	24	16	60.0%	2.8	13.3	4.76	EPC
2A	IR 00023	0-8	MET	Copper	7440-50-8	41	38	3	92.7%	4.5	113	36.45	EPC
2A	IR 00023	0-8	MET	Iron	7439-89-6	41	41		100.0%	4690	25900	10,737.00	EPC
2A	IR 00023	0-8	MET	Lead	7439-92-1	41	15	26	36.6%	1.3	120	17.36	EPC
2A	IR 00023	0-8	MET	Magnesium	7439-95-4	38	38		100.0%	26.6	9730	3,258.00	EPC
2A	IR 00023	0-8	MET	Manganese	7439-96-5	41	41		100.0%	69.8	414	155.00	EPC
2A	IR 00023	0-8	MET	Nickel	7440-02-0	41	41		100.0%	4.7	38	25.38	EPC
2A	IR 00023	0-8	MET	Potassium	7440-09-7	41	34	7	82.9%	390	2400	962.40	EPC
2A	IR 00023	0-8	MET	Silver	7440-22-4	39	1	38	2.6%	0.38	0.38	0.38	Max
2A	IR 00023	0-8	MET	Sodium	7440-23-5	40	25	15	62.5%	130	1830	432.50	EPC
2A	IR 00023	0-8	MET	Thallium	7440-28-0	41	2	39	4.9%	2.9	3.3	2.96	EPC
2A	IR 00023	0-8	MET	Titanium	7440-32-6	33	33		100.0%	234	879	491.90	EPC
2A	IR 00023	0-8	MET	Vanadium	7440-62-2	41	41		100.0%	12	82	26.56	EPC
2A	IR 00023	0-8	MET	Zinc	7440-66-6	41	40	1	97.6%	17	79	41.92	EPC
2A	IR 00023	0-8	PAH	2-Methylnaphthalene	91-57-6	240	70	170	29.2%	0.0002	11	0.26	EPC
2A	IR 00023	0-8	PAH	Acenaphthene	83-32-9	240	23	217	9.6%	0.0002	0.093	0.01	EPC
2A	IR 00023	0-8	PAH	Acenaphthylene	208-96-8	240	48	192	20.0%	0.0002	0.066	0.00	EPC
2A	IR 00023	0-8	PAH	Anthracene	120-12-7	240	61	179	25.4%	0.0002	0.43	0.02	EPC
2A	IR 00023	0-8	PAH	Benzo(a)anthracene	56-55-3	240	135	105	56.3%	0.0002	2.1	0.10	EPC
2A	IR 00023	0-8	PAH	Benzo(a)pyrene	50-32-8	240	130	110	54.2%	0.0002	2	0.11	EPC
2A	IR 00023	0-8	PAH	Benzo(b)fluoranthene	205-99-2	240	130	110	54.2%	0.0004	2	0.11	EPC
2A	IR 00023	0-8	PAH	Benzo(g,h,i)perylene	191-24-2	240	148	92	61.7%	0.0002	1.3	0.08	EPC
2A	IR 00023	0-8	PAH	Benzo(k)fluoranthene	207-08-9	240	105	135	43.8%	0.0002	1.6	0.06	EPC
2A	IR 00023	0-8	PAH	Chrysene	218-01-9	240	141	99	58.8%	0.0002	2.3	0.12	EPC
2A	IR 00023	0-8	PAH	Dibenz(a,h)Anthracene	53-70-3	238	100	138	42.0%	0.0002	0.39	0.02	EPC
2A	IR 00023	0-8	PAH	Fluoranthene	206-44-0	240	132	108	55.0%	0.0002	3.4	0.17	EPC
2A	IR 00023	0-8	PAH	Fluorene	86-73-7	240	38	202	15.8%	0.0002	0.29	0.01	EPC
2A	IR 00023	0-8	PAH	Indeno(1,2,3-CD)pyrene	193-39-5	240	121	119	50.4%	0.0002	1.4	0.08	EPC
2A	IR 00023	0-8	PAH	Naphthalene	91-20-3	240	87	153	36.3%	0.0002	12	0.27	EPC
2A	IR 00023	0-8	PAH	Phenanthrene	85-01-8	237	124	113	52.3%	0.0002	1.5	0.08	EPC
2A	IR 00023	0-8	PAH	Pyrene	129-00-0	240	142	98	59.2%	0.0002	2.7	0.15	EPC
2A	IR 00023	0-8	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	21	1	20	4.8%	0.038	0.038	0.04	Max
2A	IR 00023	0-8	PEST	p,p'-DDT	50-29-3	21	2	19	9.5%	0.0028	0.0054	0.00	EPC
2A	IR 00023	0-8	PEST	Toxaphene	8001-35-2	21	1	20	4.8%	1.4	1.4	1.40	Max
2A	IR 00023	0-8	SVOC	2,4-Dimethylphenol	105-67-9	57	1	56	1.8%	0.052	0.052	0.05	Max
2A	IR 00023	0-8	SVOC	2-Methylphenol (O-Cresol)	95-48-7	57	1	56	1.8%	0.021	0.021	0.02	Max
2A	IR 00023	0-8	SVOC	4-Methylphenol (P-Cresol)	106-44-5	57	1	56	1.8%	0.048	0.048	0.05	Max
2A	IR 00023	0-8	SVOC	N-Nitrosodiphenylamine	86-30-6	57	6	51	10.5%	0.046	0.22	0.13	EPC
2A	IR 00023	0-8	VOC	Toluene	108-88-3	43	21	22	48.8%	0.004	1.1	0.09	EPC

Table 25: Summary of Non-Detected Soil Analytes at IR Site 23 (0 - 8 feet bgs), OU2A

OU	Site	Interval	Analytical Group	Analyte	CAS Number	Number of Samples	Number of Hits	Number of Non-Detects	Non-Detect Range, mg/kg
2A	IR 00023	0-8	MET	Mercury	7439-97-6	5		5	0.16-0.19
2A	IR 00023	0-8	MET	Molybdenum	7439-98-7	40		40	0.31-6.6
2A	IR 00023	0-8	MET	Selenium	7782-49-2	41		41	0.55-13
2A	IR 00023	0-8	PCB	PCB-1016 (Aroclor 1016)	12674-11-2	21		21	0.027-0.47
2A	IR 00023	0-8	PCB	PCB-1221 (Aroclor 1221)	11104-28-2	21		21	0.027-0.85
2A	IR 00023	0-8	PCB	PCB-1232 (Aroclor 1232)	11141-16-5	21		21	0.027-0.85
2A	IR 00023	0-8	PCB	PCB-1242 (Aroclor 1242)	53469-21-9	21		21	0.027-0.47
2A	IR 00023	0-8	PCB	PCB-1248 (Aroclor 1248)	12672-29-6	21		21	0.017-0.47
2A	IR 00023	0-8	PCB	PCB-1254 (Aroclor 1254)	11097-69-1	21		21	0.017-0.94
2A	IR 00023	0-8	PEST	Aldrin	309-00-2	21		21	0.0011-0.047
2A	IR 00023	0-8	PEST	alpha-BHC (Alpha hexachlorocyclohexane)	319-84-6	21		21	0.0011-0.047
2A	IR 00023	0-8	PEST	alpha-Chlordane	5103-71-9	14		14	0.0018-0.47
2A	IR 00023	0-8	PEST	alpha-Endosulfan	959-98-8	21		21	0.0018-0.047
2A	IR 00023	0-8	PEST	beta-BHC (Beta hexachlorocyclohexane)	319-85-7	21		21	0.0011-0.047
2A	IR 00023	0-8	PEST	beta-Chlordane	5103-74-2	14		14	0.0018-0.47
2A	IR 00023	0-8	PEST	beta-Endosulfan	33213-65-9	22		22	0.0021-0.094
2A	IR 00023	0-8	PEST	Chlordane	57-74-9	7		7	0.011-0.056
2A	IR 00023	0-8	PEST	delta-BHC (Delta hexachlorocyclohexane)	319-86-8	21		21	0.0011-0.047
2A	IR 00023	0-8	PEST	Dieldrin	60-57-1	21		21	0.0014-0.094
2A	IR 00023	0-8	PEST	Endosulfan sulfate	1031-07-8	21		21	0.0021-0.094
2A	IR 00023	0-8	PEST	Endrin	72-20-8	20		20	0.0021-0.094
2A	IR 00023	0-8	PEST	Endrin aldehyde	7421-93-4	11		11	0.0021-0.011
2A	IR 00023	0-8	PEST	Endrin ketone	53494-70-5	14		14	0.0034-0.094
2A	IR 00023	0-8	PEST	gamma-BHC (Lindane)	58-89-9	21		21	0.0011-0.047
2A	IR 00023	0-8	PEST	Heptachlor	76-44-8	19		19	0.0011-0.047
2A	IR 00023	0-8	PEST	Heptachlor epoxide	1024-57-3	20		20	0.001-0.047
2A	IR 00023	0-8	PEST	Methoxychlor	72-43-5	21		21	0.0053-0.47
2A	IR 00023	0-8	PEST	p,p'-DDD	72-54-8	21		21	0.0021-0.094
2A	IR 00023	0-8	PEST	p,p'-DDE	72-55-9	21		21	0.0021-0.094
2A	IR 00023	0-8	SVOC	1,2-Diphenylhydrazine	122-66-7	24		24	0.34-0.69
2A	IR 00023	0-8	SVOC	2,2'-Oxybis(1-Chloro)Propane	108-60-1	20		20	0.34-6
2A	IR 00023	0-8	SVOC	2,4,5-Trichlorophenol	95-95-4	57		57	0.83-34
2A	IR 00023	0-8	SVOC	2,4,6-Trichlorophenol	88-06-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2,4-Dichlorophenol	120-83-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2,4-Dinitrophenol	51-28-5	57		57	0.83-34
2A	IR 00023	0-8	SVOC	2,4-Dinitrotoluene	121-14-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2,6-Dinitrotoluene	606-20-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2-Chloronaphthalene	91-58-7	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2-Chlorophenol	95-57-8	57		57	0.34-7
2A	IR 00023	0-8	SVOC	2-Nitroaniline	88-74-4	57		57	0.83-34
2A	IR 00023	0-8	SVOC	2-Nitrophenol	88-75-5	57		57	0.34-7
2A	IR 00023	0-8	SVOC	3,3'-Dichlorobenzidine	91-94-1	57		57	0.34-14
2A	IR 00023	0-8	SVOC	3-Nitroaniline	99-09-2	57		57	0.83-34
2A	IR 00023	0-8	SVOC	4,6-Dinitro-2-methylphenol	534-52-1	56		56	0.83-34
2A	IR 00023	0-8	SVOC	4-Bromophenyl Phenyl Ether	101-55-3	57		57	0.34-7
2A	IR 00023	0-8	SVOC	4-Chloro-3-methylphenol	59-50-7	57		57	0.34-7
2A	IR 00023	0-8	SVOC	4-Chloroaniline	106-47-8	57		57	0.34-7
2A	IR 00023	0-8	SVOC	4-Chlorophenyl Phenyl Ether	7005-72-3	57		57	0.34-7
2A	IR 00023	0-8	SVOC	4-Nitroaniline	100-01-6	57		57	0.83-34
2A	IR 00023	0-8	SVOC	4-Nitrophenol	100-02-7	57		57	0.83-34
2A	IR 00023	0-8	SVOC	Aniline (Phenylamine, Aminobenzene)	62-53-3	5		5	0.35-0.68
2A	IR 00023	0-8	SVOC	Benzoic Acid	65-85-0	36		36	1.6-34
2A	IR 00023	0-8	SVOC	Benzyl Alcohol	100-51-6	37		37	0.34-7
2A	IR 00023	0-8	SVOC	Benzyl Butyl Phthalate	85-68-7	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Bis(2-Chloroethoxy) Methane	111-91-1	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Bis(2-Chloroethyl) Ether	111-44-4	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Bis(2-Ethylhexyl) Phthalate	117-81-7	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Carbazole	86-74-8	20		20	0.34-6
2A	IR 00023	0-8	SVOC	Dibenzofuran	132-64-9	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Diethyl Phthalate	84-66-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Dimethyl Phthalate	131-11-3	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Di-N-Butyl Phthalate	84-74-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Di-N-Octylphthalate	117-84-0	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Hexachlorobenzene	118-74-1	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Hexachlorocyclopentadiene	77-47-4	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Hexachloroethane	67-72-1	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Isophorone	78-59-1	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Nitrobenzene	98-95-3	57		57	0.34-7
2A	IR 00023	0-8	SVOC	N-Nitrosodimethylamine	62-75-9	5		5	0.35-0.68
2A	IR 00023	0-8	SVOC	N-Nitrosodi-N-Propylamine	621-64-7	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Pentachlorophenol	87-86-5	57		57	0.83-34
2A	IR 00023	0-8	SVOC	Phenol	108-95-2	57		57	0.34-7
2A	IR 00023	0-8	SVOC	Styrene	100-42-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,1,1-Trichloroethane	71-55-6	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,1,2,2-Tetrachloroethane	79-34-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,1,2-Trichloroethane	79-00-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,1-Dichloroethane	75-34-3	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,1-Dichloroethene	75-35-4	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,2,4-Trichlorobenzene	120-82-1	57		57	0.34-7
2A	IR 00023	0-8	VOC	1,2-Dichlorobenzene	95-50-1	57		57	0.005-7
2A	IR 00023	0-8	VOC	1,2-Dichloroethane	107-06-2	43		43	0.005-0.059
2A	IR 00023	0-8	VOC	1,2-Dichloroethene (total)	540-59-0	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,2-Dichloropropane	78-87-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	1,3-Dichlorobenzene	541-73-1	57		57	0.005-7
2A	IR 00023	0-8	VOC	1,4-Dichlorobenzene	106-46-7	57		57	0.005-7
2A	IR 00023	0-8	VOC	2-Butanone	78-93-3	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	2-Chloroethyl Vinyl Ether	110-75-8	14		14	0.01-0.012
2A	IR 00023	0-8	VOC	2-Hexanone	591-78-6	43		43	0.01-0.059
2A	IR 00023	0-8	VOC	4-Methyl-2-pentanone	108-10-1	43		43	0.006-0.059
2A	IR 00023	0-8	VOC	Acetone	67-64-1	42		42	0.01-0.063
2A	IR 00023	0-8	VOC	Benzene	71-43-2	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Bromodichloromethane	75-27-4	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Bromoform	75-25-2	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Bromomethane	74-83-9	43		43	0.01-0.059
2A	IR 00023	0-8	VOC	Carbon disulfide	75-15-0	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Carbon tetrachloride	56-23-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Chlorobenzene	108-90-7	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Chloroethane	75-00-3	43		43	0.01-0.059
2A	IR 00023	0-8	VOC	Chloroform	67-66-3	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Chloromethane	74-87-3	43		43	0.01-0.059
2A	IR 00023	0-8	VOC	cis-1,3-Dichloropropene	10061-01-5	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Dibromochloromethane	124-48-1	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Ethylbenzene	100-41-4	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Hexachlorobutadiene	87-68-3	57		57	0.34-7
2A	IR 00023	0-8	VOC	Methylene chloride	75-09-2	43		43	0.005-0.04
2A	IR 00023	0-8	VOC	Tetrachloroethene	127-18-4	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	trans-1,3-Dichloropropene	10061-02-6	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Trichloroethene	79-01-6	43		43	0.005-0.029
2A	IR 00023	0-8	VOC	Trichlorofluoromethane	75-69-4	14		14	0.005-0.006
2A	IR 00023	0-8	VOC	Vinyl acetate	108-05-4	23		23	0.01-0.059
2A	IR 00023	0-8	VOC	Vinyl chloride	75-01-4	43		43	0.01-0.059
2A	IR 00023	0-8	VOC	Xylenes (total)	1330-20-7	43		43	0.005-0.029

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
27	IR Site 13 soil	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.2, Pages 3-7 through 3-9, Figures 3-4 and 3-5, Table 3-4. Oneida Total Integrated Enterprises LLC 2011.

3.2.2 IR Site 13

3.2.2.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most chemicals reported at IR Site 13 are consistent with historical activities known to occur at the site, which included the former oil refinery and the aircraft storage, overhaul, and defueling area. Physical features of IR Site 13, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results from these investigations were evaluated. Of the potential sources, the following physical features and site activities were considered likely sources at IR Site 13:

Former oil refinery activities

Solid Waste Management Unit (SWMU) Area of Concern (AOC) 009 consisting of ASTs 324 through 328

Building 397 and associated OWSs 397A, 397B, 397D, and 397D

Fill material containing PAHs

3.2.2.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 13:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

TRW Investigation Using Laser-Induced Fluorescence (Richard Brady & Associates 2008)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b), TRW Investigation report (Richard Brady & Associates 2008), and the Data Gap Study report (Tetra Tech EC 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels in soil from 0 feet to 8 feet bgs are summarized in Table 3-4.

These results indicated the following:

None of the reported SVOCs, pesticides, and PCBs in IR Site 13 soil exceeded the screening levels.

Concentrations of the metals arsenic, chromium, cobalt, iron, lead, and vanadium in IR Site 13 soil exceeded screening levels at limited number of locations.

Four out of 192 soil samples (4 to 4.5 feet bgs) reported arsenic at concentrations exceeding the statistically derived background value of 16.55 mg/kg (which is

based on the 95th quantile of the blue background dataset documented in Appendix A of the OU-2A RI – Sul Tech 2005[b]). These reported concentrations were within the concentration ranges reported in the background dataset. The reasonable maximum exposure point concentration (EPC) based on the 192 soil samples analyzed for arsenic was estimated to be 3.9 mg/kg, which is less than the background value of 16.55 mg/kg. Elevated concentrations of arsenic in soil are unrelated to storm sewers, buildings, or other site features, which suggests that these elevated concentrations of arsenic occur randomly across the site with no apparent site related source and may be naturally occurring.

One out of 192 soil samples reported chromium, cobalt, iron (112 soil samples), and vanadium at concentrations exceeding their screening level at only one location. The reasonable maximum EPC of these soil samples analyzed for chromium (35 mg/kg), cobalt (5.5 mg/kg), iron (12,552 mg/kg), and vanadium (51 mg/kg) was estimated to be less than their respective screening levels

Seven out of 215 soil samples reported lead at concentrations greater than its screening level of 207 mg/kg from the northern and eastern portions of IR Site 13 (see Figure 3-4). These exceedances are mainly located at depths greater than 4 feet and have overlying soils with lead concentrations less than the screening level of 207 mg/kg. The reasonable maximum EPC of the 215 soil samples analyzed for lead was estimated to be 91 mg/kg, which is less than its screening level of 207 mg/kg.

- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a maximum reported value of 7.6 mg/kg in IR Site 13 soil. The PAH results also include samples collected within areas associated with the TRW. These results indicate relatively low PAH concentrations are present within the TRW with the majority of the waste characterized as highly degraded, solid long chain alkanes with a very low volatile fraction. The reasonable maximum EPC based on the 382 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.27 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The exceedances of PAHs, expressed as B(a)P equivalent concentrations, mainly occur at depths greater than or up to 4 feet bgs which may be associated with the use of fill material to construct the island. These exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg (see Figure 3-5).

- The SCAPS LIF TRW investigation reported TPH in the diesel range (17,000 mg/kg), TPH in the motor oil range (24,000 mg/kg), and PAHs in soil in the area east of the TRW boundary. In addition, benzene and ethylbenzene were reported at maximum concentrations in soil of 14 mg/kg and 13 mg/kg, respectively at a depth of 8 feet to 9.5 feet bgs at location AP13-48, east of the inferred TRW boundary. VOCs were not reported above their respective screening levels within the TRW area. To the east of TRW, VOCs in soil are likely attributed to petroleum groundwater plume in the eastern portion of IR Site 13 designated as Plume 2 (Richard Brady and Associates 2008). Based on the SCAPS LIF investigation (Richard Brady & Associates 2008), VOCs and TPH reported in groundwater at IR Site 13 to the east of the TRW boundary appear to be unrelated to TRW (refinery waste that has been in-place for over 100 years), and contain compounds normally associated with fuel releases. The petroleum soil and groundwater plume are being addressed under the Petroleum Program. However, VOCs (including benzene) in groundwater are being addressed as part of this FS.

  The soil samples collected within the TRW-impacted mass during SCAPS TRW investigation reported TPH in the diesel range (6,000 mg/kg). None of the reported soil samples within the TRW area contained PAHs expressed as benzo(a)pyrene equivalents above the screening level of 0.62 mg/kg. Metals were not reported above their respective screening levels. Soil samples

were analyzed for pH as a part of SCAPS TRW investigation based on historic refinery operations and the occurrence of low pH in soil samples previously collected at OU-2A. Near neutral pH values were reported between 6.75 and 8.97 in 15 of the 16 soil samples collected during this investigation. Sample AP13-169-S-02 had a pH of 4.09 and is in an area east of IR Site 13 that is inferred to not contain TRW. Thus it appears the low pH conditions reported in previous investigations are localized and may have been removed during previous trenching operations at the site. Based on the results of SCAPS TRW investigation and previous investigations at the site, it was concluded that the TRW contains very low volatile or semi-volatile fraction as expected from a refinery waste that has been in-place for over 100 years. The TRW appears to be mainly comprised of solid long chain alkanes. In addition, it should be noted that based on boring logs prepared during basewide soil PAH investigation conducted in 2003 as part of the RI (SulTech 2005b), TRW occurs mainly at a depth greater than 5 feet bgs and is mainly below the water table. As reported in the Final Semiannual Groundwater Monitoring Report (ITSI 2009b), depth to water at IR Site 13 generally ranges from 4.03 to 6.51 feet bgs, with water table as high as 0.25 feet bgs as observed at MWOR-3 in March 2005. Although TRW mainly occurs at depth and below the water table, surface manifestations of this asphalt-like refining residue have been observed at several locations within IR Site 13.

3.2.3 IR Site 19

3.2.3.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI Report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 19 are consistent with historical activities that occurred at the site, which included hazardous material storage at Building 616 and Yard D-13. Physical features of IR Site 19, along with specific details on the hazardous waste storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil, and the analytical results were evaluated. The following physical features and site activities were considered likely sources at IR Site 19:

- Yard D-13 (hazardous waste storage yard),
- Building 616 (hazardous materials storage area), and
- Fill material containing PAHs.

3.2.3.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 19:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P

Table 3-3: Summary of Chemicals in IR Site 9 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
None							

Notes:
mg/kg = milligrams per kilogram

Table 3-4: Summary of Chemicals in IR Site 13 Exceeding the Screening Levels (0-8 feet bgs)

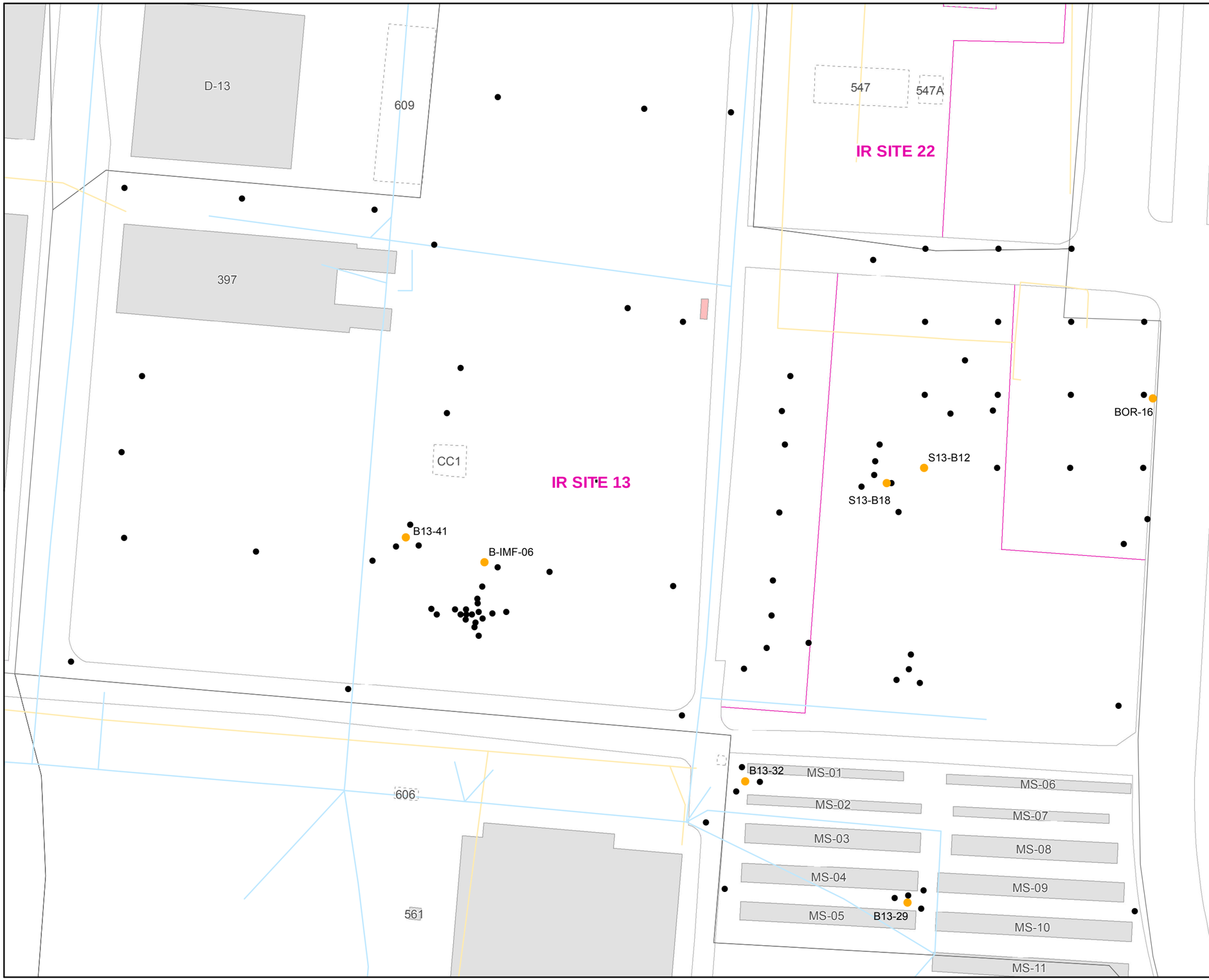
Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Volatile Organic Compounds (VOCs) (mg/kg)							
Benzene	1.1	24/137	1	AP13-148	04-Dec-07	5.5-7	1.9
Ethylbenzene	5.7	27/137	1	AP13-148	04-Dec-07	5.5-7	6.4
Metals (mg/kg)							
Arsenic	16.55	151/192	4	S13-B18	13-Sep-07	4-4.5	20.3
Chromium	280	192/192	1	B13-30	09-Dec-94	1-2	337
Cobalt	23	165/192	1	S13-B30	04-Oct-07	0.5-1	28.9
Iron	55,000	112/112	1	B13-32	12-Aug-94	0.5-1.5	74,800
Lead	207	180/215	7	S13-B12	11-Sep-07	4.7-5.2	815
Vanadium	550	192/192	1	MWOR-4	19-Jul-90	7-7.5	1,780
PAHs (mg/kg)							
B(a)P equivalents	0.62	237/382	13	C3S0133B051	30-Jul-03	4-8	7.6

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-5: Summary of Chemicals in IR Site 19 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	53/78	2	S19-B07	03-Oct-07	4.5-5	1.1
Metals (mg/kg)							
Lead	207	28/51	1	BD13-13	11-July-90	2-2.5	303

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram



Legend

- Lead Locations Exceeding the Screening Level of 207 mg/kg
- Lead Locations Less Than 207 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Paved

IR Site 13, OU2A, Lead Concentrations Greater than Screening Levels

Location	Sample Date	Sample Depth Range (feet bgs)	Lead (mg/kg)
B13-41	05-Apr-94	0.5-1	4.7
	05-Apr-94	4.5-5	1.1
	05-Apr-94	7-7.5	**413**
B-IMF-06	19-Jul-91	4-4.5	**602**/41.3 (duplicate)
B13-29	09-Dec-94	1-1.5	**378**
	09-Dec-94	1.5-2	148
	09-Dec-94	2.5-3.5	39.8
	09-Dec-94	5-5.5	4.3
S13-B12	11-Sep-07	0.7-.12	6.8
	11-Sep-07	4.7-5.2	**815**
S13-B18	13-Sep-07	1-1.5	6.1
	13-Sep-07	4-4.5	**758**
B13-32	12-Aug-94	0.5-1.5	**431**
	12-Aug-94	2.0-3.0	79.6
	12-Aug-94	4.0-5.0	3.3
BOR-16	23-Jul-90	0.5-1	**260**
	23-Jul-90	2.5-3	5.7
	23-Jul-90	7-7.5	6

Concentrations in **bold font** indicate values greater than the screening level.

*Max Depth to Groundwater - 6.45 feet bgs

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION

N

100 50 0 100 Feet

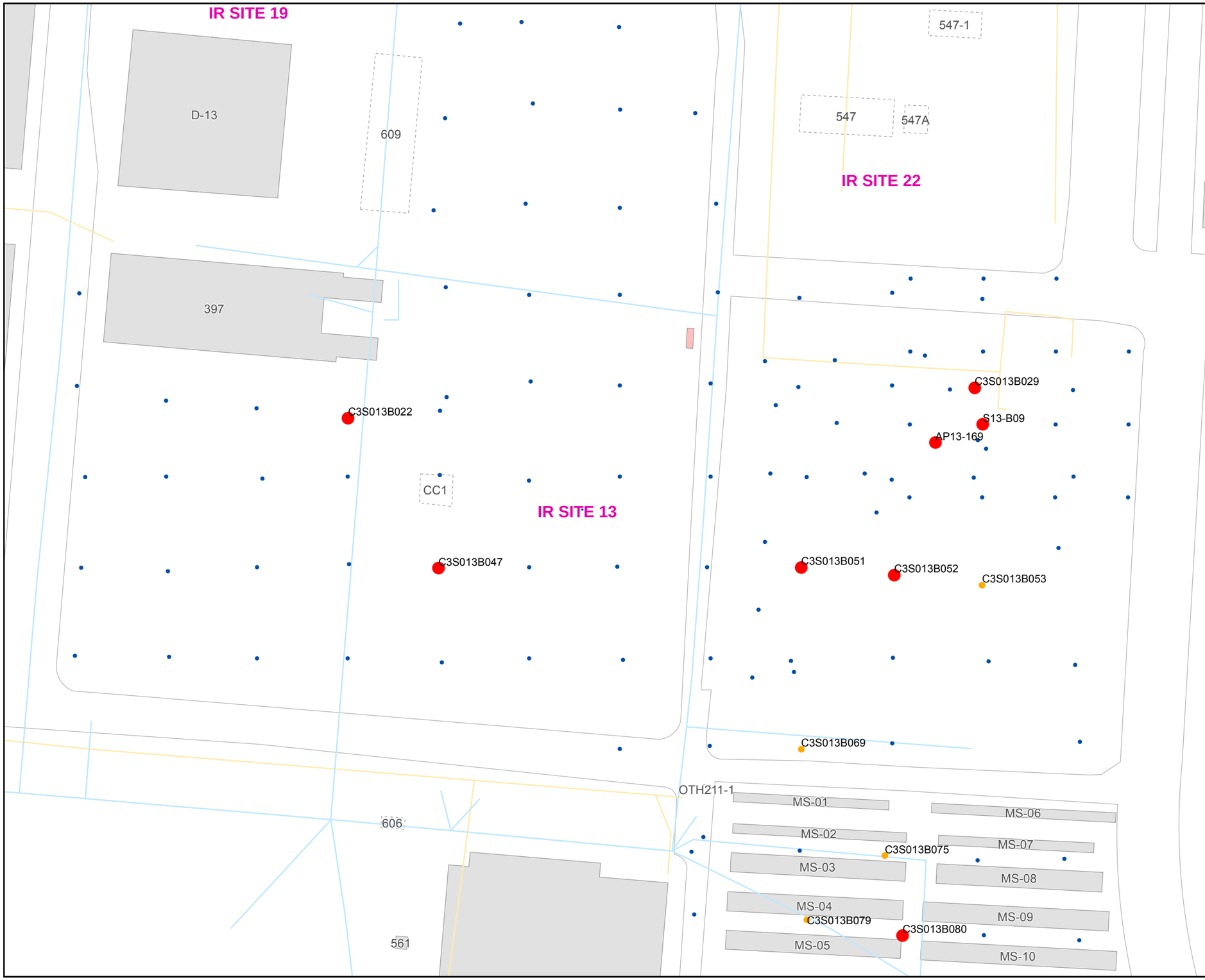
OU-2A FS — Final

Nature and Extent of Lead in Soil at IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-4

OTIE Oneida Total Integrated Enterprises

AECOM



Legend

- Total Benzo(a) Pyrene Equivalents > 1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer
- Estimated Extent of Tarry Refinery Waste (R.B. & Assoc. 2008)

Building Status

- Former
- Removed
- Present
- Undetermined
- Road

IR Site 13, OU2A, Benzo(a)Pyrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) Pyrene Equivalents (mg/kg)
AP13-169	04-Dec-07	5.5-7	2.5
C3S013B022	29-Jul-03	0.5-2	3.5
C3S013B029	29-Jul-03	0-0.5	1.2
C3S013B029	29-Jul-03	0.5-2	0.67
C3S013B047	28-Jul-03	0-0.5	1.1
C3S013B051	30-Jul-03	4-8	7.6
C3S013B052	30-Jul-03	4-8	1.8
C3S013B053	30-Jul-03	0.5-2	0.91
C3S013B069	30-Jul-03	2-4	1.0
C3S013B075	30-Jul-03	0-0.5	0.85
C3S013B079	30-Jul-03	4-8	0.97
C3S013B080	30-Jul-03	2-4	2.5
S13-B09	11-Sep-07	4-4.5	1.9

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
PAH - POLYCYCLIC AROMATIC HYDROCARBON

N

100 50 0 100 Feet

OU-2A FS — Final

Nature and Extent of PAHs in Soil at IR Site 13

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-5

OTIE Oneida Total Integrated Enterprises

AECOM

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
28	groundwater at IR Site 13	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.2.2, Pages 3-13 through 3-19, Figures 3-9 through 3-14; Tables 3-10 and 3-11. Oneida Total Integrated Enterprises LLC 2011.

VC

Methyl tert-butyl ether

In addition, arsenic was reported at concentrations exceeding its MCL in monitoring well S9-TT-MW02 located east of Building 410. Although, there is some uncertainty with respect to the extents of VOCs in IR Site 9 groundwater, the current definitions of extents are adequate for conducting the FS.

3.3.2 IR Site 13

3.3.2.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of potential sources of impacted soil and groundwater at IR Site 13 based on past investigations. This analysis was refined by subsequent studies conducted at IR Site 13 including TRW investigation conducted in 2007 and 2008 (Richard Brady & Associates 2008). Benzene has been reported at concentrations exceeding its MCL under the mini-storage units in the southeastern portion of IR Site 13 (see Section 3.3.2.2). This area is located east of the currently defined extent of TRW (Richard Brady & Associates 2008) (see Figure 3-13). Based on the SCAPS LIF investigation (Richard Brady & Associates 2008), the VOCs and TPH reported in groundwater at IR Site 13 to the east of the TRW boundary defined by SCAPS LIF investigation appear to be unrelated to TRW, and contain compounds normally associated with fuel releases. The TRW has been shown to contain very low volatile or semi-volatile fraction as expected from refinery waste that has been in-place for over 100 years (Richard Brady & Associates 2008). The VOCs reported in IR Site 13 groundwater appear to be associated with damaged storm sewer line identified in the RI (SulTech 2005b).

3.3.2.2 Nature and Extent of Impact

The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 13 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and U&A 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech EC 2002)

Petroleum Program Investigations and Removal Action (Tetra Tech 2001, DON 1993, Tetra Tech and R&M 2000)

Basewide Groundwater Sampling (ITSI 2009a and ITSI 2009b)

Data Gap Study in 2008 (Tetra Tech EC 2009)

Supplemental DGI (Tetra Tech EC 2010)

These investigations included collection of groundwater samples from monitoring wells and hydropunch locations and analyses for VOCs, SVOCs, dissolved and total metals, general chemistry, TPH and/or PAHs. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). A summary of reported constituents in groundwater during investigations conducted from 2002 to Fall 2008 at IR Site 13 is presented in Table 3-10. It should be noted that portions of IR Site 13, including areas in the vicinity of Building 397, are being investigated and remediated under the Petroleum Program.

The distribution of VOCs in groundwater at IR Site 13 is provided by the data collected during the following investigations:

Groundwater sampling conducted as part of Follow-on Investigation in 1994 (PRC and JMM 1995) and as part of Petroleum Program in 2000 (Tetra Tech 2001). These investigations included:

Collection of grab samples for shallow groundwater (less than 15 feet bgs) using direct push and Hydropunch and analyses for TPH-d, TPH-gasoline range (TPH-g), TPH-motor oil range (TPH-mo), jet fuel, benzene, toluene, ethylbenzene, xylenes, MTBE, and lead.

Data Gap Study conducted at OU-2A and OU-2B in 2008 (Tetra Tech EC 2009) . The following data gaps pertaining to IR Site 13 groundwater were addressed by the Data Gap Study:

Hydropunch sampling to investigate a benzene plume in the southeastern portion of the site reported in the RI (SulTech 2005b).

Groundwater sampling near the locations of former ASTs 324 through 328 (also known as AOC 009) in the southeastern portion of IR Site 13 (Figure 3-9).

Groundwater sampling at OU-2A conducted as part of Basewide groundwater monitoring events conducted in Spring and Fall 2008 (ITSI 2009a and ITSI 2009b).

Investigation of TRW conducted in 2007 and 2008 (Richard Brady & Associates 2008).

Supplemental DGI (Tetra Tech 2010) at OU-2A and OU-2B (August 2009 to February 2010) to address the uncertainties following Data Gap Study.

Figures 3-9 and 3-11 present the sampling locations for the Data Gap Study and Basewide groundwater sampling events at IR Site 13. Figure 3-14 presents the sampling locations at IR Site 13 for investigations conducted as part of Petroleum Program in 1994 (PRC and JMM 1995) and 2000 (Tetra Tech 2001), , the Data Gap Study (Tetra Tech 2009), and the Supplemental DGI (Tetra Tech 2010).

Benzene and TPH Plume

The total TPH (TTPH) (sum of TPH-g, TPH-d, and TPH-mo) plume in groundwater in the southeastern portion of IR Site 13 based on sampling conducted in 1994 and 2000 was referred to in the RI as Plume 2 (SulTech 2005b). The extent of Plume 2 as presented in the RI is shown on Figure 3-14. Subsequent to the RI, groundwater samples have been collected within the boundaries of Plume 2 as part of Basewide Groundwater Monitoring Program (ITSI 2009a and ITSI 2009b) and Data Gap Study (Tetra Tech EC 2009). The TTPH concentrations exceeding its PRC of 1,400 µg/L (DON 2009) are shown on Figure 3-14. The TTPH plume will be handled as part of Petroleum Program; this FS will address VOCs including benzene commingled with the TTPH plume as summarized below.

Groundwater samples collected from 11 sampling locations (B13-29, CA13-11, CA13-12, CA13-13, CA13-14, CA13-15, CA13-16, CA13-17, CA13-22, CA13-23, and CA13-25) during 1994 and 2000 investigations in the southeastern portion of IR Site 13 exhibited benzene concentrations ranging from 1.4 to 1,400 µg/L (see Figure 3-14 and Table 3-11). The lateral extent of this benzene plume was further defined as part of Data Gap Study and the Supplemental DGI. During the Data Gap Study, three hydropunch samples (S13-HP01, S13-HP02, and S13-HP03) were collected near the edge of the benzene plume reported in the RI and one shallow (5 feet to 15 feet bgs) groundwater monitoring well (S13-TTMW01) was installed near the location where the highest concentrations of benzene had been previously reported (Figure 3-9). The hydropunch samples were analyzed for VOCs, SVOCs, total petroleum hydrocarbons – extractable (TPH-e), total petroleum hydrocarbons – purgeable (TPH-p),

metals, and natural attenuation parameters. The sample collected from monitoring well S13-TTMW01 was analyzed for VOCs (including benzene), metals, and 1,4-dioxane. Benzene was not reported at concentrations exceeding its MCL in any hydropunch or groundwater monitoring well sample during the Data Gap Study.

During the Supplemental DGI, groundwater monitoring well (S13-TTMW01) was sampled and five hydropunch samples (S13-HP06 through S13-HP10) were collected to further define the extent of benzene plume reported in the RI (see Figure 3-14). Benzene was reported at concentrations exceeding its MCL in two hydropunch samples S13-HP9 and S13-HP10. Benzene was not reported at concentrations exceeding its MCL in groundwater samples collected from monitoring well S13-TTMW01. In addition, benzene was not reported at concentrations exceeding its MCL in groundwater samples collected from monitoring wells MW13-07, MW13-08, MW13-09, and MWOR-4 during Spring and/or Fall 2008 sampling rounds of Basewide groundwater sampling (Figure 3-14).

It should be noted that benzene was reported at a concentration of 14,000 µg/kg in a soil sample collected at 8 to 9.5 feet bgs (below water table) from sampling location AP13-148 as part of TRW investigation (see Figure 3-14) (Richard Brady & Associates 2008). However, as stated earlier, benzene was reported at concentrations below its MCL during groundwater sampling conducted at a nearby monitoring well MW13-07 in Spring and Fall 2008 sampling rounds. Benzene was also reported below its MCL in three Hydropunch samples (S13-HP06, S13-HP07, and S13-HP08) collected near AP13-148 during Supplemental DGI. This indicates benzene (if present) in groundwater in the vicinity of AP13-48 is localized and limited in extent.

Ethylbenzene and xylene (total) were reported at concentrations exceeding their respective MCLs in hydropunch samples collected from S13-HP09 and S13-HP10 (see Figure 3-14 and Table 3-11). The maximum reported concentrations of ethylbenzene and xylene were 2,000 µg/L and 7,300 µg/L, respectively. Toluene was reported at a concentration of 890 µg/L in hydropunch sample collected from S13-HP9. However, ethylbenzene, xylene, and toluene were reported at concentrations below their MCLs at 17 nearby sampling locations (CA13-11 through CA13-25, B13-28, and B13-29) during 1994 and 2000 investigations in the southeastern portion of IR Site 13. This indicates that ethylbenzene, xylene, and toluene are also localized in the vicinity of S13-HP9 and S13-HP10.

Nature and Extent of Other Constituents

Table 3-11 presents a summary of the constituents reported in IR Site 13 groundwater above their respective screening levels during the Data Gap Study (Tetra Tech EC 2009), Spring/Fall 2008 Basewide groundwater sampling events (ITSI 2009a and ITSI 2009b), and Supplemental DGI (Tetra Tech 2010). The screening levels for VOCs and metals are Federal or State MCLs, whichever is less.

VC was reported at 0.64 µg/L in a sample from S13-HP02 at 4 feet to 9 feet bgs (Figure 3-9). However, VC concentrations were below its MCL of 0.5 µg/L in the sample collected from newly-installed well S13-TT-MW01, screened from 5 feet to 15 feet bgs, and located approximately 30 feet north of S13-HP02. The VC reported in the hydropunch sample was marginally above the MCL of 0.50 µg/L and did not appear to be indicative of a VOC source in FWBZ groundwater. VOCs were not identified as a chemical of concern during the RI for the southern portion of IR Site 13 or for the western portion of IR Site 23 (SulTech 2005b). Therefore, well S13-TT-MW01 was sampled for VOCs in September 2009 as part of Supplemental DGI for further assessment of VC at this location. VC was not reported at concentration exceeding 0.5 µg/L in a sample collected from well S13-TT-MW01 during this monitoring round.

Arsenic was reported above its MCL in samples collected from S13-HP02, S13-HP03 and S13-B34 during the Data Gap Study (Figure 3-9). Arsenic was reported at concentrations exceeding its MCL in

monitoring well M13-07 relatively consistently during Basewide sampling events from Summer 2002 to Spring 2007. However, arsenic was reported at 2.4 µg/L (estimated) (less than its MCL of 10 µg/L) during the Spring 2008 monitoring event in a sample collected from M13-07.

3.3.3 IR Site 19

3.3.3.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of the sources of the impacted soil and groundwater at IR Site 19 based on past investigations. Based on the RI (Sul Tech 2005b), the likely sources of impacted groundwater at IR Site 19 include:

Yard D-13 – Hazardous waste storage yard; concrete area with built-in berms around individual containment areas; stored wastes such as corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel; documented releases during operation included spills of nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel; no spills were reported to enter the secondary containment overflow system, and

Building 616 – Constructed for use as office and storage space; served as a hazardous materials storage area until Yard D-13 was built; potentially stored wastes such as corrosives, organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel releases of petroleum fuel from storage and defueling activities near Building 410.

3.3.3.2 Nature and Extent of Impact

The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 19 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and U&A 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech 2002)

Phase 2B Environmental Baseline Survey (IT 2001)

Petroleum Program Investigations and Removal Actions (Tetra Tech and R&M 2000)

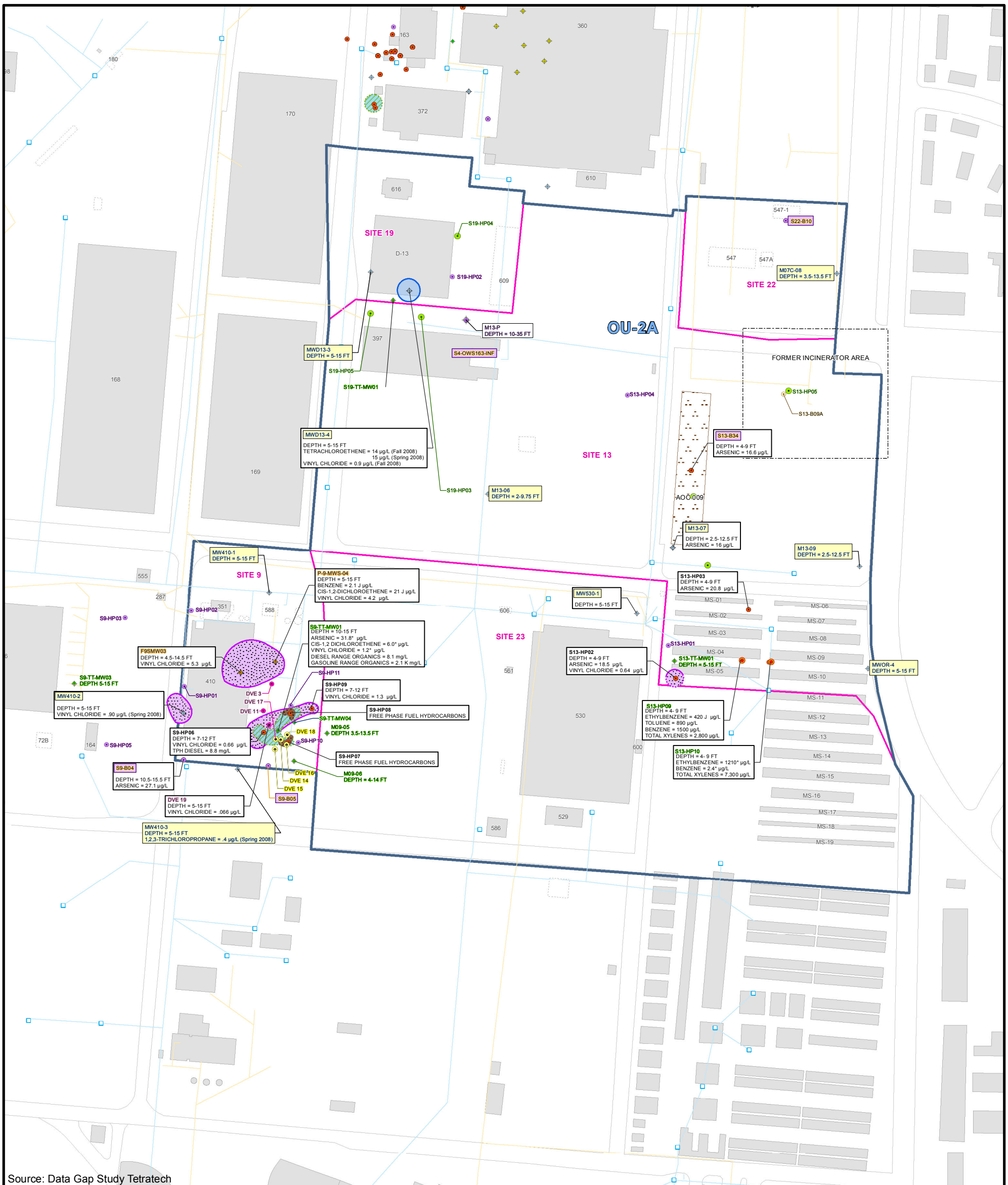
Basewide Groundwater Sampling (ITSI 2009a and ITSI 2009b)

Data Gap Study in 2008 (Tetra Tech EC 2009)

Supplemental DGI (Tetra Tech 2010)

These investigations included collection of groundwater samples from monitoring wells and hydropunch locations and analyses for VOCs, SVOCs, dissolved and total metals, pesticides/PCBs, general chemistry, TPH and/or PAHs. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). A summary of reported constituents in groundwater during investigations conducted from 2002 to Fall 2008 at IR Site 19 is presented in Table 3-12.

The most current assessment (at the time of issuance of the Draft Final FS) of the nature and extent of CERCLA constituents in groundwater at IR Site 19 is provided by the data collected during the following investigations:



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

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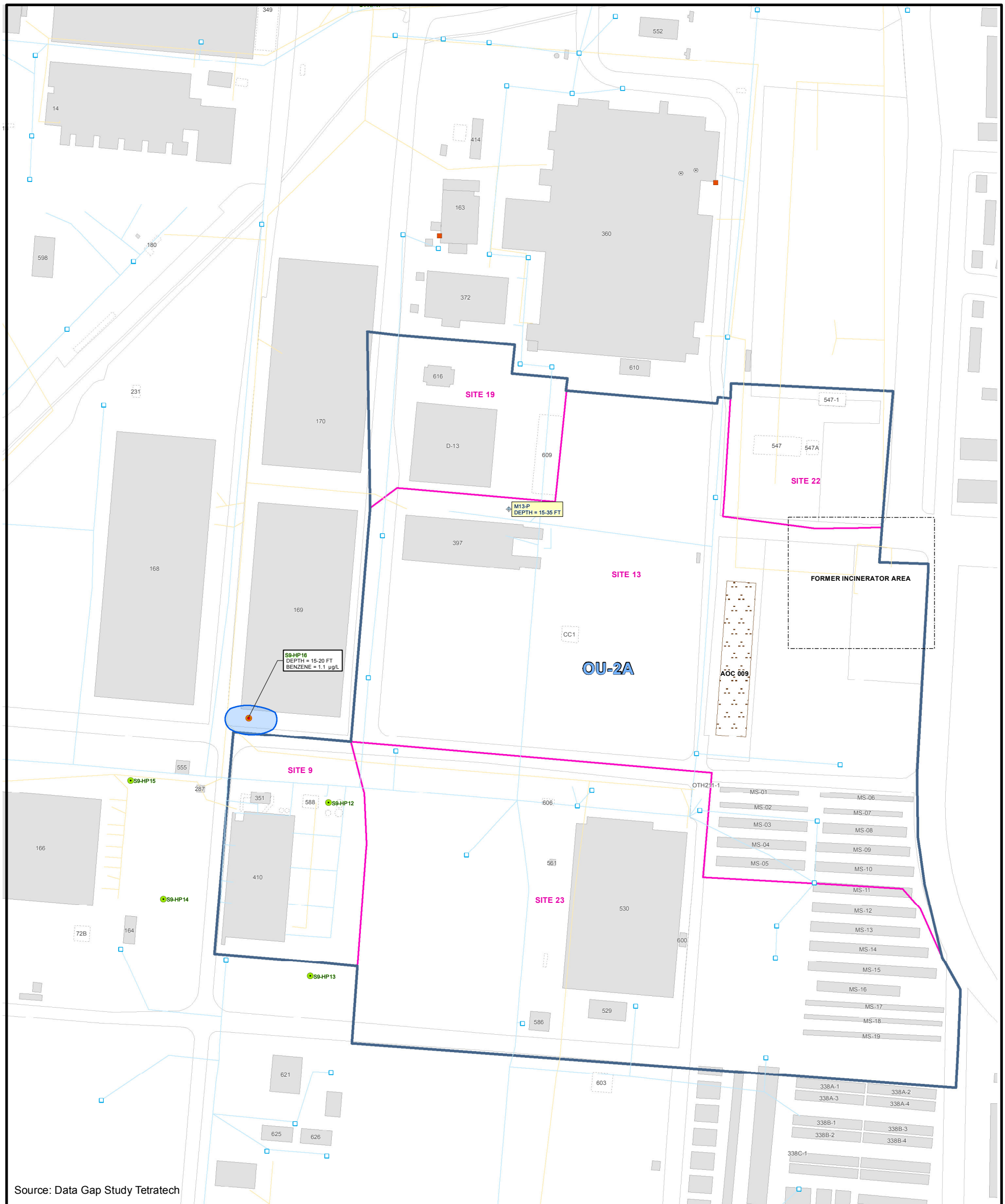

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (15 - 20 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-10

OTIE Oneida Total Integrated Enterprises

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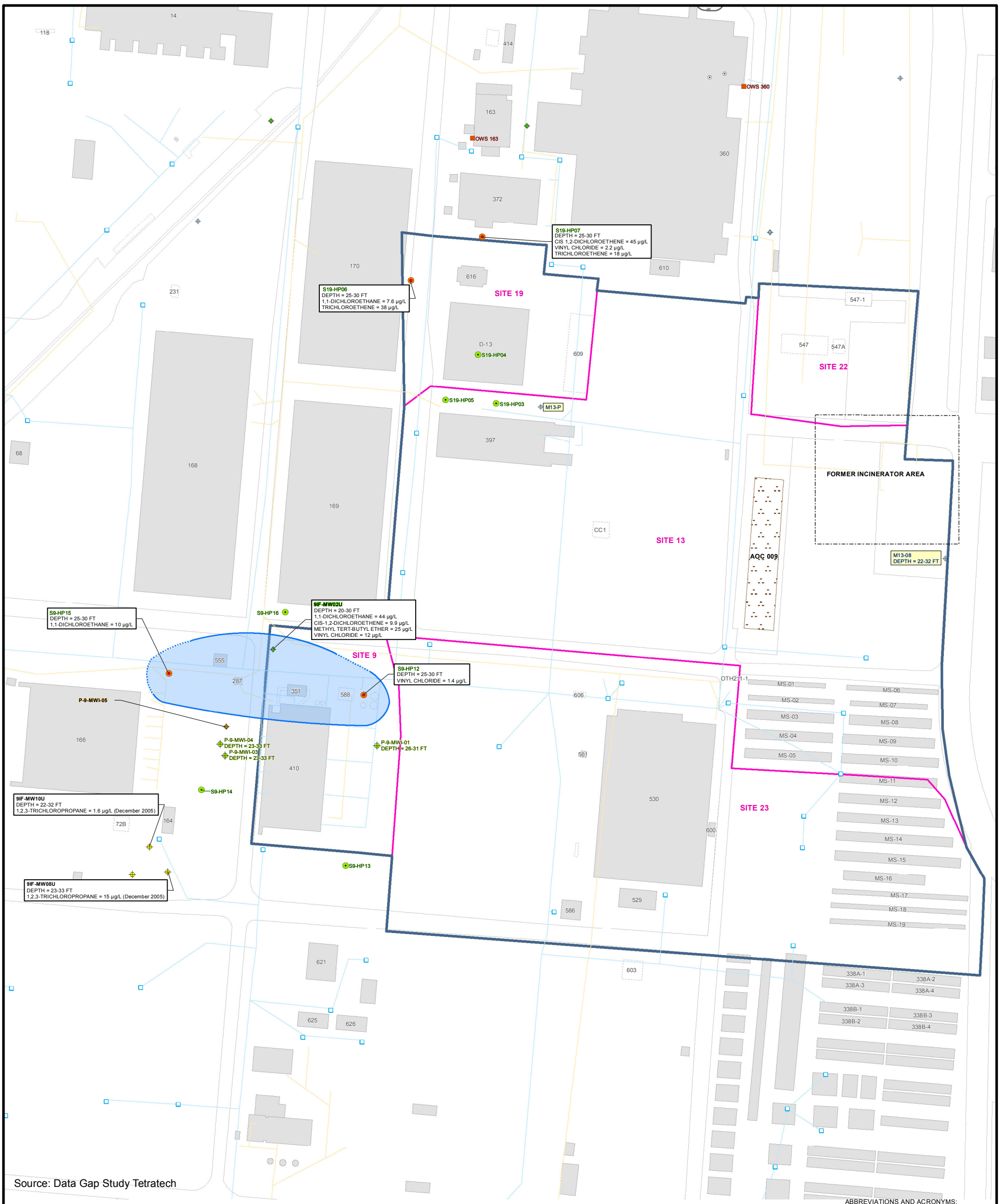

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-08 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
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FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS

Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (20 - 30 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-11

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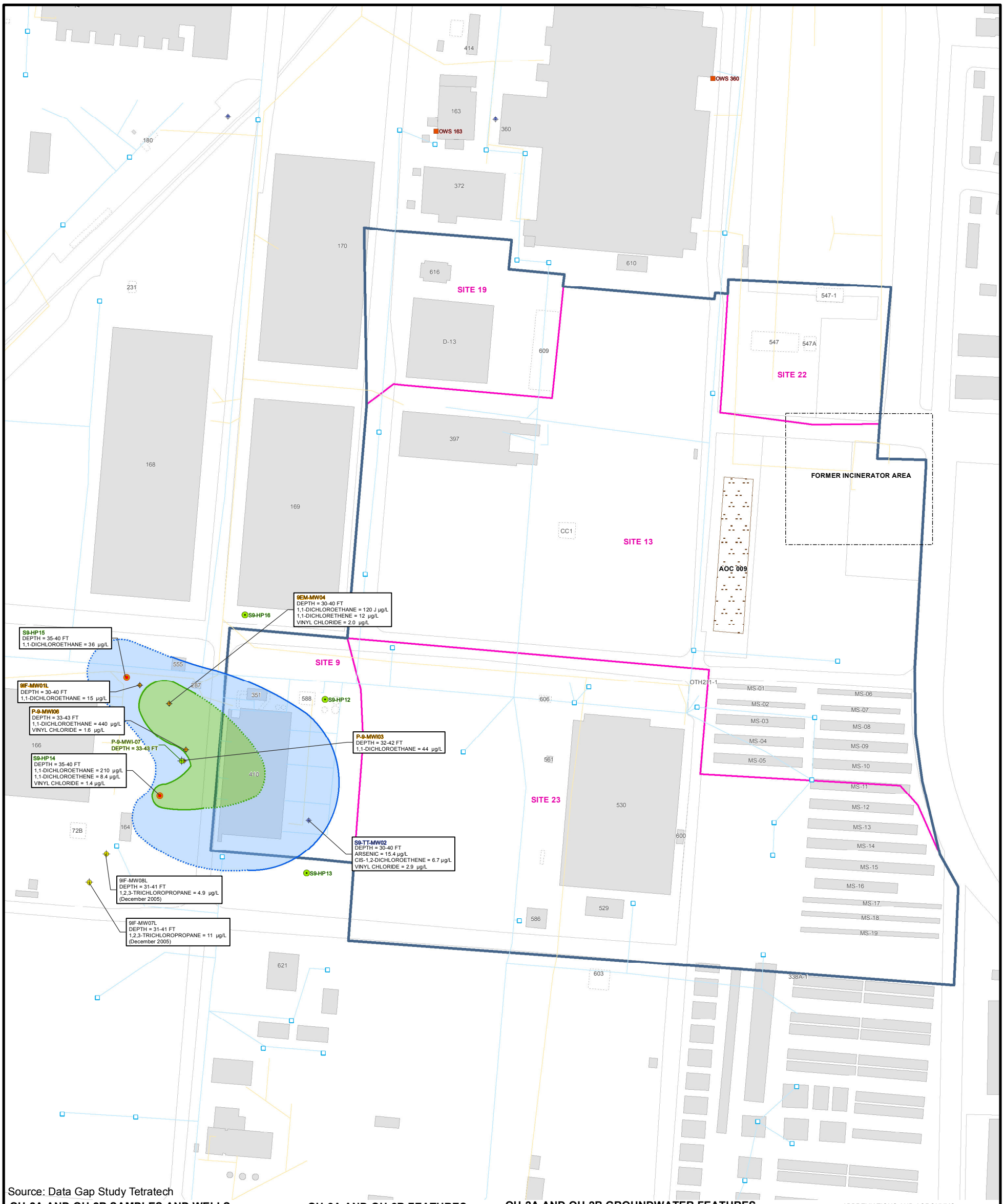

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (30 - 40 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-12

OTIE Oneida Total Integrated Enterprises

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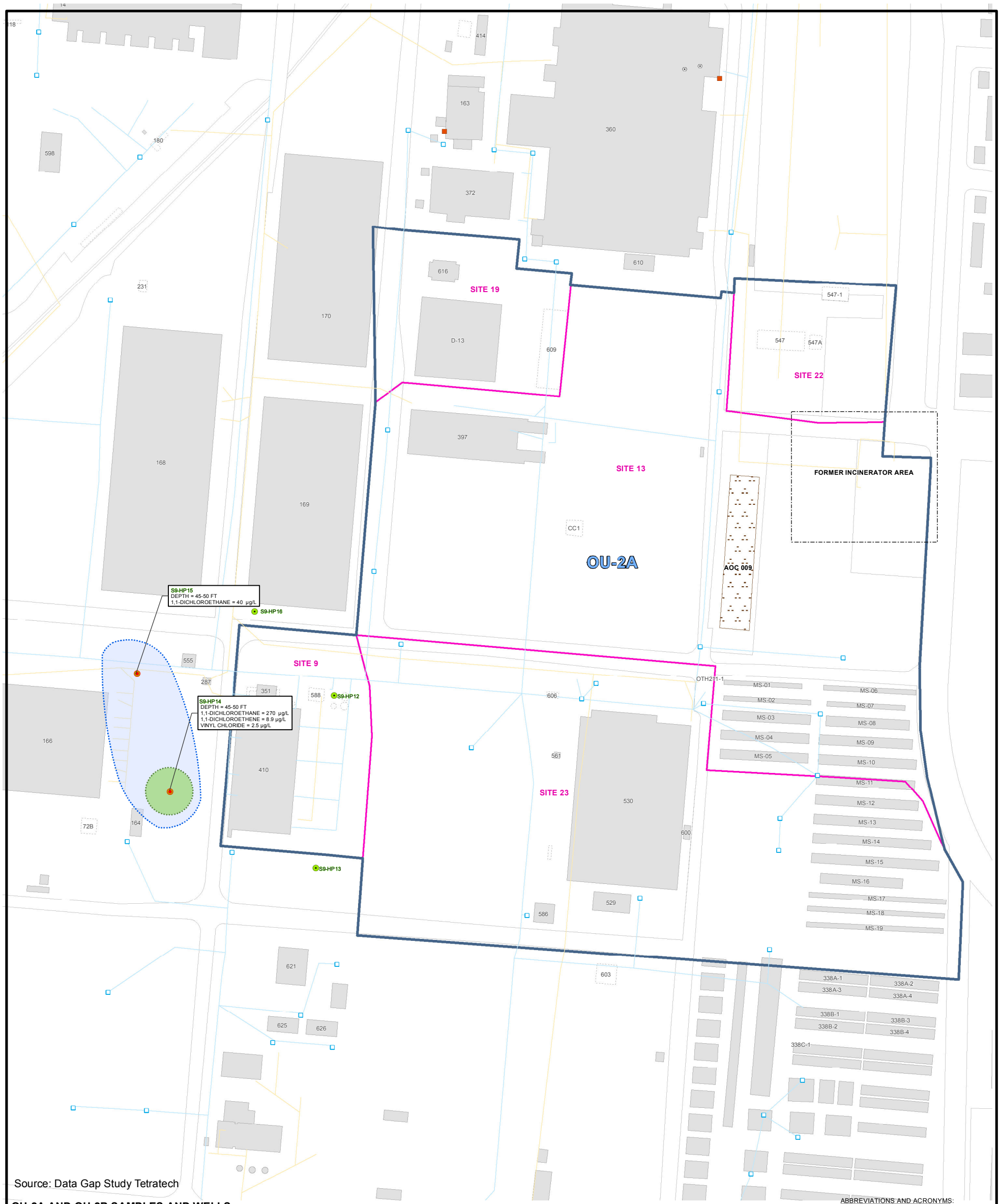

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (40 - 50 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-13

OTIE Oneida Total Integrated Enterprises

AECOM

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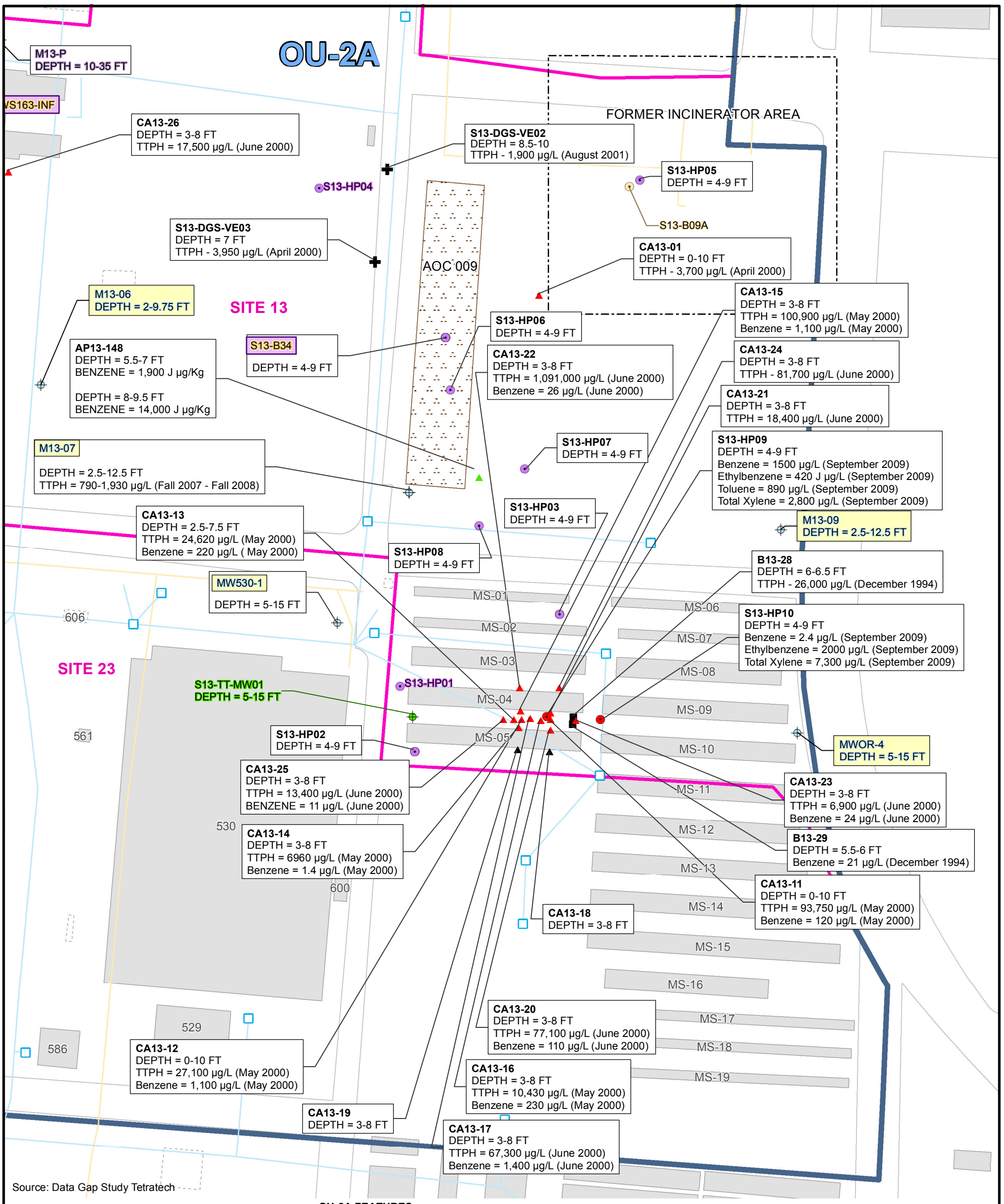


Source: Data Gap Study Tetratech

OU-2A SAMPLES AND WELLS

- S9-HP09 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2010)
- S3-HP04 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2010)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE LESS THAN MCL AND TTPH LESS THAN 1400 µG/L (SULTECH 2005B)
- VACCUM EXTRACTION - APRIL 2000 THROUGH AUGUST 2001
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE GREATER THAN MCL AND/OR TTPH GREATER THAN 1400 µG/L (SULTECH 2005B)
- BORINGS - DECEMBER 1994
- SOIL SAMPLE LOCATIONS - TRW INVESTIGATION (RBA 2008)

OU-2A FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF BENZENE ABOVE MCL (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF TTPH (SUM OF TPH-g, TPH-d, and TPH-mo) PLUME GREATER THAN 1,400 µg/L AS PRESENTED IN THE RI (DASHED WHERE INFERRED) (SULTECH 2005b)

N

0 100 200 Feet

1 inch = 100 feet

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
TPH-d - TPH AS DIESEL
TPH-g - TPH AS GASOLINE
TPH-mo - TPH AS MOTOR OIL
TRW - TARRY REFINERY WASTE
TTPH - Sum OF TPH-g, TPH-d, and TPH-mo
VOC - VOLATILE ORGANIC COMPOUND

OU-2A FS — Final

Benzene and TPH Results
IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-14

OTIE Oneida Total Integrated Enterprises — AECOM

Table 3-10: Summary of Detected Groundwater Analytes at Site 13 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Volatile Organic Compounds												
1,1-Dichloroethane	75-34-3	177	8	4.5%	0.1	0.38	S13-HP02	10/23/2007	5	--	--	--
1,2,3-Trichlorobenzene	87-61-6	169	2	1.2%	0.52	0.52	M13-07	12/9/2003	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	169	4	2.4%	0.3	2.1	M13-09	6/19/2002	--	--	--	--
1,2-Dichlorobenzene	95-50-1	173	2	1.2%	0.32	0.32	D13-01	12/4/2003	600	--	--	--
1,2-Dichloroethane[b]	107-06-2	177	6	3.4%	0.51	1.1	M13-P	11/12/2004	0.5	6	--	--
1,3-Dichlorobenzene	541-73-1	173	1	0.6%	0.2	0.2	M13-06	5/1/2006	--	--	--	--
1,4-Dichlorobenzene	106-46-7	177	1	0.6%	0.45	0.45	S13-HP02	10/23/2007	5	--	--	--
2-Butanone	78-93-3	177	3	1.7%	0.5	2.9	MW-001	11/12/2004	--	--	--	--
4-Methyl-2-pentanone	108-10-1	177	1	0.6%	0.4	0.4	M07C-06	11/12/2004	--	--	--	--
Acetone	67-64-1	177	34	19.2%	0.7	99	M13-07	12/17/2002	--	--	--	--
Bromomethane	74-83-9	177	4	2.3%	0.5	0.6	MWOR-4	12/17/2002	--	--	--	--
Carbon disulfide	75-15-0	169	13	7.7%	0.1	1.2	M13-07	6/18/2002	--	--	--	--
Chlorobenzene	108-90-7	177	9	5.1%	0.2	0.34	M13-09	7/1/2003	70	--	--	--
Chloroform	67-66-3	177	3	1.7%	0.23	9.7	S13-B34	11/28/2007	80	--	--	--
Chloromethane	74-87-3	177	2	1.1%	0.3	0.3	D13-01	12/17/2002	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	177	3	1.7%	0.08	2.2	S13-HP02	10/23/2007	6	--	--	--
Ethylbenzene	100-41-4	177	2	1.1%	1.3	1.3	M13-09	6/19/2002	300	--	--	--
Isopropyl Ether	108-20-3	169	2	1.2%	0.8	0.8	M13-07	6/18/2002	--	--	--	--
Isopropylbenzene	98-82-8	169	18	10.7%	0.27	3	M13-07	6/18/2002	--	--	--	--
Methyl Tert-Butyl Ether	1634-04-4	177	9	5.1%	0.1	0.5	M13-08	3/26/2008	13	--	--	--
Methylene chloride	75-09-2	177	5	2.8%	0.5	0.97	S13-B34	11/28/2007	5	--	--	--
N-Butylbenzene	104-51-8	169	6	3.6%	0.3	2.3	M13-07	9/8/2005	--	--	--	--
N-Propylbenzene	103-65-1	169	11	6.5%	0.1	0.8	M13-09	6/19/2002	--	--	--	--
o-Xylene	95-47-6	169	5	3.0%	0.2	0.49	M13-07	12/9/2003	1750	--	--	--
p-Isopropyltoluene	99-87-6	169	8	4.7%	0.2	0.3	M13-07	12/17/2002	--	--	--	--
p-Isopropyltoluene	99-87-6	169	8	4.7%	0.2	0.3	M13-09	6/19/2002	--	--	--	--
Sec-Butylbenzene	135-98-8	169	21	12.4%	0.2	1.4	M13-07	6/18/2002	--	--	--	--
T-Butylbenzene	98-06-6	169	13	7.7%	0.23	0.8	M13-07	12/17/2002	--	--	--	--
Tert-Butyl Alcohol	75-65-0	166	2	1.2%	3.7	3.7	MW-001	12/17/2002	--	--	--	--
Toluene	108-88-3	177	8	4.5%	0.3	3.4	M13-07	3/26/2008	150	--	--	--
trans-1,2-Dichloroethene	156-60-5	177	1	0.6%	0.26	0.26	S13-HP02	10/23/2007	10	--	--	--
Trichloroethene	79-01-6	177	13	7.3%	0.2	1.9	S13-HP02	10/23/2007	5	--	--	--
Vinyl chloride	75-01-4	177	1	0.6%	0.64	0.64	S13-HP02	10/23/2007	0.5	1	--	--
Xylenes, m & p	-81	169	2	0.6%	1.6	1.6	M13-09	6/19/2002	1750	--	--	--
Metals												
Aluminum	7429-90-5	4	1	25.0%	5.2	5.2	M07C-09	12/17/2002	1000	--	1070	--
Antimony	7440-36-0	30	3	10.0%	0.17	1.3	M13-06	7/7/2004	6	--	37.5	--
Arsenic	7440-38-2	12	11	91.7%	0.992	95	M07C-09	12/17/2002	10	5	20.72	2
Barium	7440-39-3	12	12	100.0%	23	70	M07C-09	6/19/2002	1000	--	569.5	--
Cadmium	7440-43-9	12	1	8.3%	2.35	2.35	M13-08	12/9/2003	5	--	--	--
Calcium	7440-70-2	4	4	100.0%	14200	64000	M13-06	7/7/2004		--	--	--
Chromium, Total	7440-47-3	12	6	50.0%	0.51	3.47	S13-HP03	10/23/2007	50	--	12.45	--
Cobalt	7440-48-4	12	7	58.3%	0.22	2.2	M07C-09	12/17/2002		--	--	--
Copper	7440-50-8	12	9	75.0%	0.64	4.3	M07C-09	6/19/2002	1300	--	24.03	--
Iron	7439-89-6	4	2	50.0%	110	120	M13-06	7/7/2004	300	--	6585.5	--
Lead	7439-92-1	12	1	8.3%	1.53	1.53	S13-HP03	10/23/2007	15	--	11.45	--
Magnesium	7439-95-4	4	4	100.0%	14200	29000	M07C-09	6/19/2002		--	--	--
Manganese	7439-96-5	4	4	100.0%	83.8	1300	M07C-09	6/19/2002	50	4	1741	--
Mercury	7439-97-6	108	8	7.4%	0.046	0.21	M13-09	12/9/2003	2	--	--	--

Table 3-10: Summary of Detected Groundwater Analytes at Site 13 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Molybdenum	7439-98-7	12	9	75.0%	1.55	18.5	S13-B34	11/28/2007		--	--	--
Nickel	7440-02-0	12	10	83.3%	1.4	6.7	M07C-09	6/19/2002	100	--	--	--
Potassium	7440-09-7	4	3	75.0%	4300	10000	M07C-09	6/19/2002		--	--	--
Selenium	7782-49-2	12	1	8.3%	0.36	0.36	M07C-09	6/19/2002	50	--	8.58	--
Sodium	7440-23-5	4	4	100.0%	28000	113000	M13-08	12/9/2003		--	--	--
Thallium	7440-28-0	46	2	4.3%	2.61	2.61	D13-01	12/4/2003	2	2	16.15	--
Vanadium	7440-62-2	12	11	91.7%	0.516	35.7	S13-HP03	10/23/2007		--	26.27	1
Zinc	7440-66-6	12	6	50.0%	1.9	16.4	S13-TT-MW01	5/7/2008	5000	--	36.39	--
Dissolved Metals												
Aluminum, dissolved	7429-90-5	123	32	26.0%	4.2	260	D13-01	7/8/2002	1000	--	1070	--
Antimony, dissolved	7440-36-0	117	79	67.5%	0.051	2.8	M07C-09 MWOR-4	7/7/2004 7/7/2004	6	--	37.5	--
Arsenic, dissolved	7440-38-2	135	103	76.3%	0.21	112	M07C-06	6/30/2003	10	31	20.72	21
Barium, dissolved	7440-39-3	123	123	100.0%	32	670	M07C-06	6/30/2003	1000	--	569.5	2
Beryllium, dissolved	7440-41-7	135	5	3.7%	0.14	0.26	D13-01	4/27/2006	4	--	2.5	--
Cadmium, dissolved	7440-43-9	135	10	7.4%	0.065	2.34	M13-09	12/9/2003	5	--	--	--
Calciuim, dissolved	7440-70-2	123	123	100.0%	12000	243000	M07C-06	6/30/2003		--	--	--
Chromium, dissolved	7440-47-3	135	67	49.6%	0.09	7.8	M13-07	9/8/2005	50	--	12.45	--
Cobalt, dissolved	7440-48-4	123	77	62.6%	0.044	27	MW-001	12/17/2002		--	--	--
Copper, dissolved	7440-50-8	135	96	71.1%	0.38	3900	D13-01	3/27/2008	1300	1	24.03	1
Iron, dissolved	7439-89-6	123	90	73.2%	7.4	60000	MW-001	12/17/2002	300	61	6585.5	40
Lead, dissolved	7439-92-1	135	34	25.2%	0.049	6.7	MW-001	12/17/2002	15	--	11.45	--
Magnesium, dissolved	7439-95-4	123	123	100.0%	6300	183000	D13-01	12/4/2003		--	--	--
Manganese, dissolved	7439-96-5	123	118	95.9%	1.4	8050	M07C-06	6/30/2003	50	106	1741	41
Molybdenum, dissolved	7439-98-7	123	47	38.2%	0.075	10.6	MW-001	7/2/2003		--	--	--
Nickel, dissolved	7440-02-0	135	79	58.5%	0.69	24.5	MW-001	7/2/2003	100	--	--	--
Potassium, dissolved	7440-09-7	123	111	90.2%	550	32900	MWOR-4	7/2/2003		--	--	--
Selenium, dissolved	7782-49-2	135	38	28.1%	0.36	3.89	M13-09	7/1/2003	50	--	8.58	--
Silver, dissolved	7440-22-4	135	7	5.2%	0.037	5.09	M13-08	12/9/2003	100	--	--	--
Sodium, dissolved	7440-23-5	123	123	100.0%	8800	840000	D13-01	7/7/2004		--	--	--
Vanadium, dissolved	7440-62-2	123	93	75.6%	0.33	11	M07C-09	6/19/2002		--	26.27	--
Zinc, dissolved	7440-66-6	135	97	71.9%	0.84	76	D13-01	7/7/2004	5000	--	36.39	3
Polycylclic Aromatic Hydrocarbons												
Naphthalene	91-20-3	173	27	15.6%	0.9	210	M13-07	6/18/2002		--	--	--
Semi-volatile Organic Compounds												
1,4-Dioxane (P-Dioxane)	123-91-1	6	2	33.3%	1	1.1	S13-TT-MW01	5/7/2008		--	--	--

Notes

[a] The lesser of Federal primary MCL and State (primary or secondary) MCL.

[b] Highlighted cells indicate analytes exceeding MCLs.

Table 3-11: Summary of the Analytes Exceeding Federal/State MCLs at IR Site 13 – 1994 and 2000 Groundwater Monitoring, Data Gap Study, Spring/Fall 2008 Basewide Groundwater Monitoring and Supplemental DGI

Analytes Exceeding MCL/Screening Level	Federal/State MCL (µg/L)	Other Project-Specific Screening Level (µg/L)	Minimum Concentration Exceeding MCL/Screening Level (µg/L)	Maximum Concentration Exceeding MCL/Screening Levels (µg/L)	Depth Range for Detection Above MCL/Screening Level (feet bgs)
Data Gap Study and Spring/Fall 2008 Basewide Groundwater Monitoring					
Vinyl Chloride	0.5[a]	--	0.64[b]	0.64[b]	4 – 9
Arsenic	10	--	16.6	20.8	4 – 9
Supplemental DGI (2009 – 2010)					
Benzene	1[a]	--	2.4 J	1,500	4 – 4.9
Toluene	150[a]	--	890	890	4 – 4.9
Ethylbenzene	300[a]	--	420 J	2,000 J	4 – 4.9
Xylene, total	1,750[a]	--	2,800	7,300 J	4 – 4.9
1994 and 2000 Groundwater Monitoring [c]					
Benzene	1[a]	--	1.4	1,400	3 – 8
Total TPH	--	1,400[b]	1,900	1,091,000	3 – 10

Notes:

Project screening levels for groundwater are Federal or State MCLs, whichever is less. There are no CERCLA screening criteria for petroleum hydrocarbons. Preliminary remediation criteria (PRC) for petroleum-contaminated sites are provided for informational purposes (DON 2009). There are no specific PRCs for TPH reported as diesel, motor oil, JP-5, or gasoline for groundwater; thus, the PRC for total TPH was used for TPH in groundwater.

[a] California MCL

[b] VC was reported at 0.64 µg/L in a sample from S13-HP02 at 4 to 9 ft bgs (Figure 3-9). However, VC concentrations were below its MCL of 0.5 µg/L in the sample collected from newly installed well S13-TT-MW01, screened from 5 to 15 ft bgs, and located approximately 30 feet north of S13-HP02. Well S13-TT-MW01 is included in the Summer 2009 sampling event for further assessment of VC at this location.

[c] As reported in the RI (SulTech 2005b)

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
29	treatability studies and removal actions have been conducted at IR Site 13	Section 2.3.2	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Sections 6.2.5 through 6.2.6, Pages 6-20 through 6-23, Figures 6-2, 6-3, 6-5, 6-6, 6-7 and 6-11; Table 6-11. SulTech 2005.

As stated in Section 6.1.3, TPH contamination at AOC 397 is not commingled with CERCLA chemicals and is being addressed under the TPH screening strategy described in Appendix F. At AOC 009, petroleum-related chemicals are commingled with CERCLA chemicals associated with refinery waste; therefore, the chemicals in soil and groundwater at AOC 009 are further discussed in Section 6.4, Nature and Extent of Chemicals in Soil and Groundwater.

6.2.5 Removal Actions

Several removal actions have been conducted at Site 13. These removal actions included removal of tarry refinery waste (TRW) in 1940, removal of lead in 1993, removal of free product at Building 397 in 1993, removal of a fuel line in 1998, and removal of TPH in 2002. Each removal action is summarized below.

TRW Removal, 1940. The area once occupied by the oil refinery had been filled and surfaced by the Navy. The resulting gas pressure buildup from underground hydrocarbons and refinery wastes induced a surface rupture sometime in the 1940s. An area approximately 30 feet by 30 feet was excavated down to the old material, and a concrete slab was emplaced in the bottom of the excavation. The excavation was then backfilled and resurfaced. No information was provided on the location of the excavation area or the concrete slab. These procedures apparently mitigated the problem of gas pressure buildup (E&E 1983).

Lead Removal, 1993. As part of a plan to construct a two-building IMF at Site 13, the Navy conducted a geotechnical investigation in 1989. Free hydrocarbon product and hydrocarbon stains or odors were identified in selected borings. The boring with the highest concentrations of TPH-g, oil and grease, and lead and the lowest pH was located in the central portion of a former oil refinery, adjacent to the previous lubricating building and close to former bleaching tanks and activators (see Figure 6-2). It is believed that these units were the source of the high TPH and high lead and low pH found in the boring. The Navy was directed by DTSC to initiate soil removal activities in the vicinity of the boring. Following three phases of additional characterization sampling near the boring, a removal action was eventually conducted in 1993. The first portion of the removal action activities was conducted from September to October 1993. Confirmation samples indicated that residual total lead concentrations exceeded the interim cleanup goal of 100 mg/kg. Additional excavation was performed from October 1994 to December 1994 to complete the removal action. The final excavation area measured about 25 by 30 feet and had a maximum depth of 7 feet bgs. Approximately 120 cubic yards of contaminated soil was excavated and shipped to a Class I landfill. Lead concentrations in all but one confirmation sample were below the interim cleanup goal of 100 mg/kg. Lead was detected at a concentration (121 mg/kg) exceeding the interim cleanup goal in one confirmation sample (PRC and MW 1995a). The location of the excavation is shown on Figure 6-5.

Free Product Removal at Building 397, 1993. After the 3,500- to 17,000-gallon spill of JP-5 in 1991, DTSC entered into an agreement with NAS Alameda for a soil cleanup action limited to contamination caused by the JP-5 spill. The project scope initially included removal of soil contaminated by only JP-5 and only down to groundwater. In February 1993, IT began an excavation of test holes to groundwater. Samples were collected and analyzed for JP-5 and

BTEX. The excavation extended out from those areas that tested above the cleanup goal of 1,000 ppm total; the excavation was extended 2 feet below the groundwater table. The maximum extent of the excavation was reached on March 8, 1993, with a total of 1,310 tons of soil removed (Navy 1993). The location of the excavation is shown on Figure 6-5.

Contaminated water and floating fuel product were pumped into temporary tanks before testing and disposal. Numerous underground structures and abandoned pipes were encountered and contained water and product. The piping was cut off, plugged, and removed as encountered. Damaged storm and industrial sewers and manholes abandoned in place earlier could not be removed because of their proximity to the building; therefore, they were filled with concrete slurry.

The occurrence of floating free product required installation of a recovery system, based on the Navy's agreement with DTSC. The recovery system consisted of a thick gravel drainage bed in the groundwater and six vertical pipes to allow for pumping. The product recovery system consisted of an air-powered floating pump in the well, a packaged air compressor, a control panel, and a double-walled tank. No information is available on the amount of free product removed.

Fuel Line Removal, 1998. One fuel line ran from Building 372 to Building 397. The line carried JP-5 to the jet engine testing facility located in Building 397. The section of fuel line on Site 13 was removed in October 1998 (Tetra Tech and R&M 2000). Three confirmation samples (030-S19-001 through 030-S19-003) were collected and analyzed for TTPH. Two soil samples (030-S19-002) and (030-S19-003) collected along the north side of Building 397 exhibited elevated concentrations of TPH. Figure 6-3 shows the location of the former fuel line and sampling locations.

DVE for Residual Free Product Recovery, 2001 to 2003. A DVE pilot test was conducted in 2001 by IT to demonstrate the capability of DVE technology to recover free product from the groundwater surface and to capture hydrocarbon vapors from soil. The pilot test indicated that DVE was successfully removing hydrocarbon contaminants from soil. In 2002, a full-scale DVE system was installed on the east end of Building 397. The system began operation in 2002, and activities were suspended on September 17, 2003, after removing 1,148 pounds of TPH. The system operation was suspended because recovery of floating petroleum had reached an asymptotic rate (see Figure 6-11).

6.2.6 Treatability Studies

Several treatability studies have been conducted at Site 13 to determine the viability of different technologies for cleanup and assessment of contaminants at the site. These treatability studies include the Site Characterization and Analysis Penetrometer System (SCAPS) laser-induced fluorescence testing to delineate TPH contamination, intrinsic bioremediation to treat hydrocarbons, emulsion recycling to treat TPH- and metals-impacted soil, and terrain conductivity mapping to delineate the location of the TRW. Each treatability study is summarized below.

SCAPS, 1997. The Navy evaluated the effectiveness of SCAPS laser-induced fluorescence testing in delineating petroleum hydrocarbons at several locations at Alameda Point. The process uses ultraviolet light generated by the laser to induce PAHs present in petroleum products to fluoresce. A CPT rig drives a rod containing a fiberoptic cable into the ground to detect relative subsurface petroleum concentrations based on the response to the ultraviolet light. SCAPS testing was conducted at 11 locations approximately 70 feet south of Building 397 at Site 13. The testing suggested the presence of petroleum products near the water level in five of the test locations near the east end of Building 397. No confirmation samples were collected at Site 13, but confirmation sampling at other locations did not show a strong correlation between SCAPS results and the presence of petroleum products. The technology was not used after the initial study in 1997.

Intrinsic Bioremediation, 1998. The intrinsic bioremediation study was conducted in 1998 by the University of California at Berkeley (UCB), Lawrence Livermore National Laboratory, and Lawrence Berkeley National Laboratory (Berkley Environmental Restoration Center [BERC] 1998). The study objectives were to identify intrinsic bioremediation of hydrocarbons at Site 13 and to estimate the rate of bioremediation. Samples were collected in the field southeast of Building 397 and field and laboratory analyses were performed to accomplish the following objectives: (1) characterize the microbial populations present at each site (microcosms, microbial enrichment, and direct epifluorescent microscopy); (2) characterize the geochemical conditions at each site and identify the occurrence of metabolic substrates and products (field physical/chemical assays, soil gas, and isotopic assays); (3) evaluate the mechanisms responsible for degradation (soil gas and isotopic assays).

Analytical data indicated that although biodegradation of the hydrocarbons is occurring, the mode of degradation is dominated by a coupled process of methanogenesis and methane oxidation rather than by direct aerobic activity on the parent hydrocarbons. The contaminant degradation activity varies significantly over time and is much more pronounced following periods of high rainfall. Modeling results and field observations suggest that oxygen transport is hindered in the unsaturated soils above the hydrocarbons at Site 13, resulting in slow bioremediation rates. Results of this study indicated that to significantly accelerate the in situ bioremediation rate at the site, the permeability within the unsaturated subsurface above the zone of contamination must be increased to facilitate soil gas exchange. In addition, these results suggested that capping Site 13 with an impermeable surface without appropriate gas venting could result in the buildup of potentially hazardous methane gas.

Emulsion Recycling, 1999. During February 2000 a treatability study was conducted to demonstrate the capability of emulsion recycling to immobilize organic and inorganic chemical contaminants in soil at Site 13 to acceptable soluble concentrations, while producing an engineered construction product such as road base material (Tetra Tech and others 2000). TPH and lead in soils at Site 13 were the subject of the study.

Criteria used to evaluate whether the emulsion recycling process was a success included comparing the soluble threshold limit concentration (STLC) as measured by the waste extraction test (WET) to the regulatory limit of 5 mg/L for lead in soil to meet the State of California

regulations. A toxicity characteristic leaching procedure (TCLP) concentration of less than 0.75 mg/L for lead was used to meet federal regulations. In addition, the action level for extractable TPH in soil was selected as 500 mg/kg, excluding asphaltene range hydrocarbons.

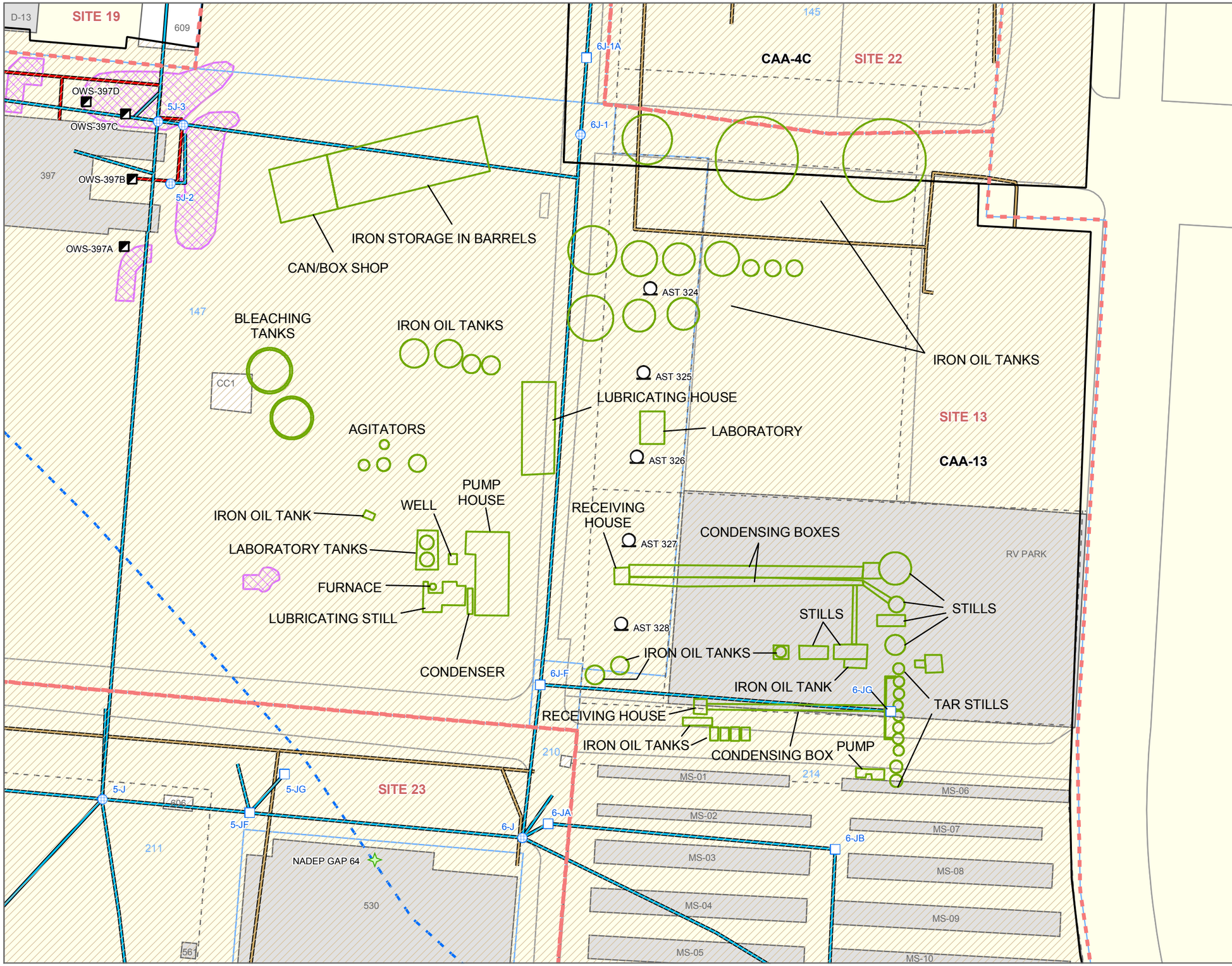
During the treatability study, soil samples were collected from two locations at Site 13. One sample was collected near boring B13-30, and the other soil sample was collected near soil boring B13-41 (see Figure 6-3). One sample was characterized as silty sand with relatively high concentrations of lead and low concentrations of TPH. The second soil sample was characterized as poorly graded sand with low concentrations of lead and relatively high concentrations of TPH. Each sample was treated with three dosages of asphalt emulsion and three dosages of lime to determine the optimum mix design to yield the maximum strength when subject to a Marshall stability test (Tetra Tech and others 2000). The maximum strength samples were then subjected to the TCLP and WET extractions followed by analyses for lead and TPH, as described previously. Based on STLC criteria, the sample exhibiting the highest concentration of lead was not adequately immobilized. The optimum mix design for that soil was altered by substituting magnesium oxide for the lime. The substitution of magnesium oxide for lime resulted in acceptable WET concentrations that met the 5-mg/L STLC requirement for lead.

Results of the physical testing of the emulsion-treated product showed that both soils exceeded specifications for an aggregate base (Tetra Tech and others 2000). A construction cost estimate showed that this technology could be used at Site 13 for treatment of contaminated soils for less than the cost of transporting the soil to an appropriate off-site landfill. The study recommended the results of this treatability study be evaluated in the FS.

Terrain Conductivity Mapping, 2003. In June and August 2003, a pilot test was conducted to evaluate the effectiveness of this technology for mapping the TRW. This nonintrusive technology transmits an alternating electromagnetic current flow into the ground, which produces a secondary magnetic field. The instrument receiver senses the secondary magnetic field strength that is a function of terrain conductivity. The equipment measured the relative conductivity of the soil to determine whether the TRW affected the soil conductivity in two pilot test areas. After the sensor readings were plotted on a map and compared with boring logs that identified the refinery waste, it was evident that conductivity was not correlated with the presence of the refinery waste; therefore, the technology was considered not practical for mapping the refinery waste. Confirmation sampling was conducted to determine the chemical characteristics of the material. The samples were collected in seven areas (see Figures 6-5, 6-6, and 6-7) and tested for TPH-P, TPH-E, BTEX, PAHs, lead, and pH. The results, as shown in Table 6-11, indicated that the pH of the wastes are as low as 1.1 and that the waste contains elevated concentrations of TPH-g, TPH-d, TPH-mo, BTEX, PAHs, and lead.

6.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 6.2, the Navy completed an initial data evaluation for Site 13. This evaluation included (1) a site-specific CSM, (2) a data quality



ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

FORMER OIL-WATER SEPARATOR (OWS)

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

EXCAVATION

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

40 0 40 80 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-2
SITE 13
FORMER OIL REFINERY FEATURES

Operable Unit 2A
Remedial Investigation Report

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SAMPLE LOCATION
- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Soil Gas
- Surface Location
- Vacuum Extraction

SAMPLE INVESTIGATION
- HLA 1989
- Phase 1 & 2A, 1991
- IMF Removal Action, 1993
- Follow-On Investigation 1994
- Data Gap Sampling 2001
- Total Petroleum Hydrocarbon Program
- EBS Phase 2A
- PAH Investigation 2003

- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- TRENCH
- FENCE
- HISTORIC SHORELINE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

60 0 60 120 Feet

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FIGURE 6-3
SITE 13 CERCLA, TPH AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

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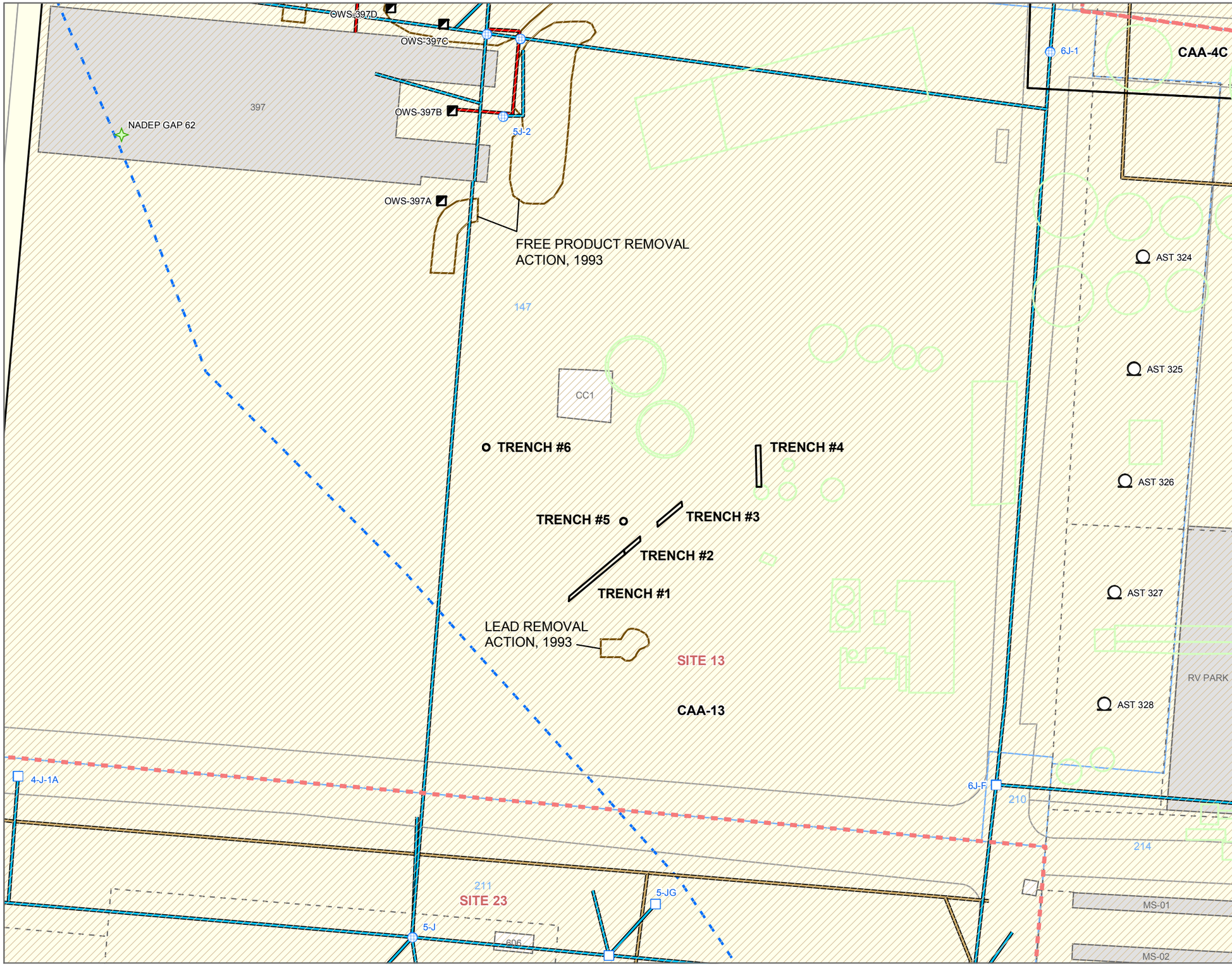

ABOVEGROUND STORAGE TANK (AST), REMOVED

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

FORMER-OIL WATER SEPARATOR (OWS)

TRENCH, TERRAIN CONDUCTIVITY MAPPING, 2003

FENCE

HISTORIC SHORELINE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

EXCAVATION

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

FORMER OIL REFINERY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

30 0 30 60 Feet

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FIGURE 6-5
SITE 13 PAST REMOVAL ACTIONS AND TERRAIN CONDUCTIVITY MAPPING

Operable Unit 2A
Remedial Investigation Report

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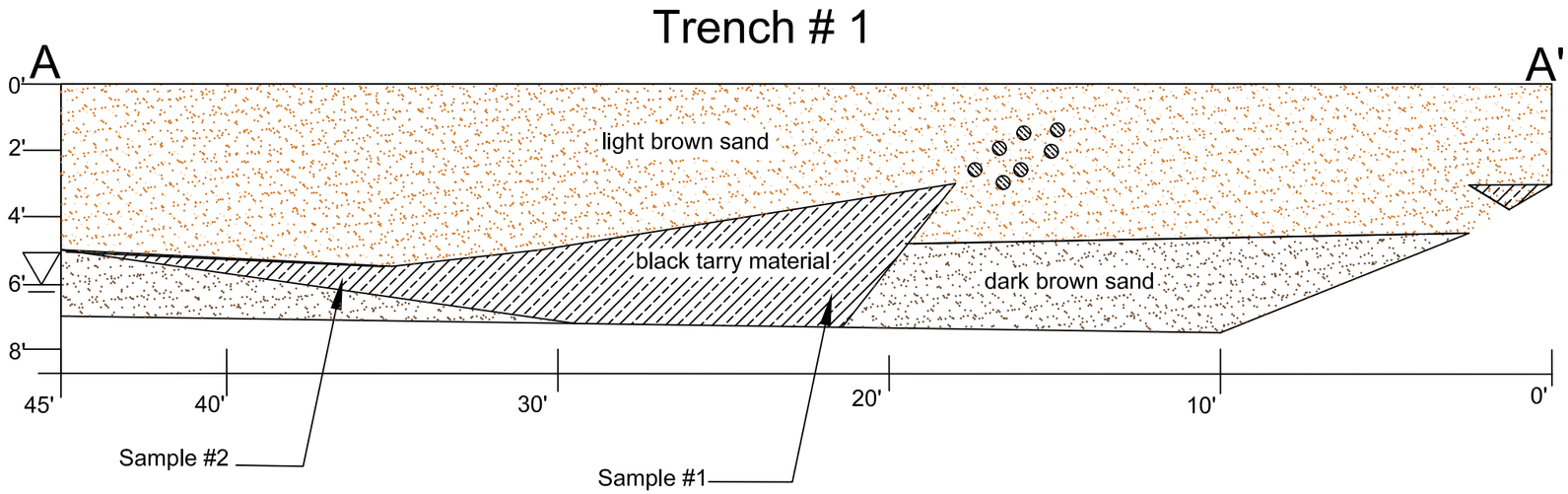

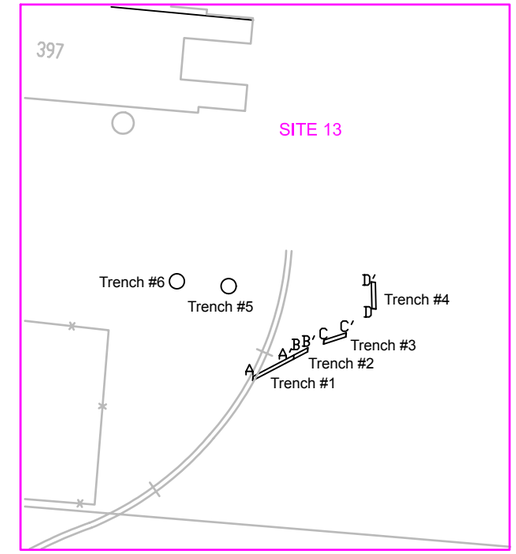

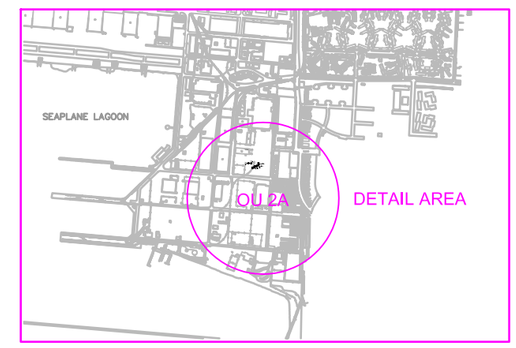

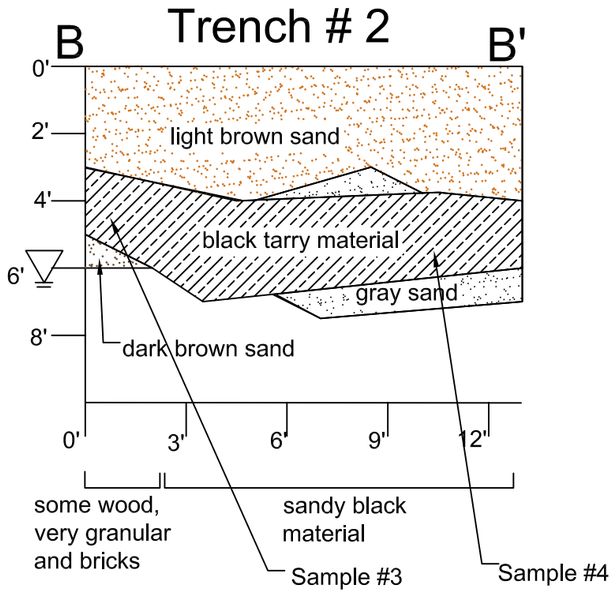

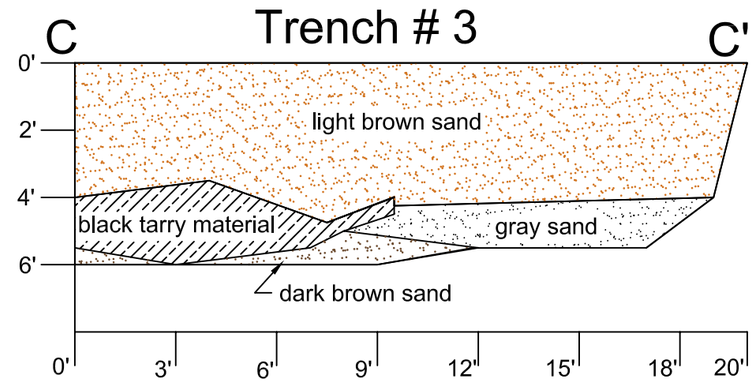

N

5' 0' 5' 10'

▽ = Water level encountered in Test Pits

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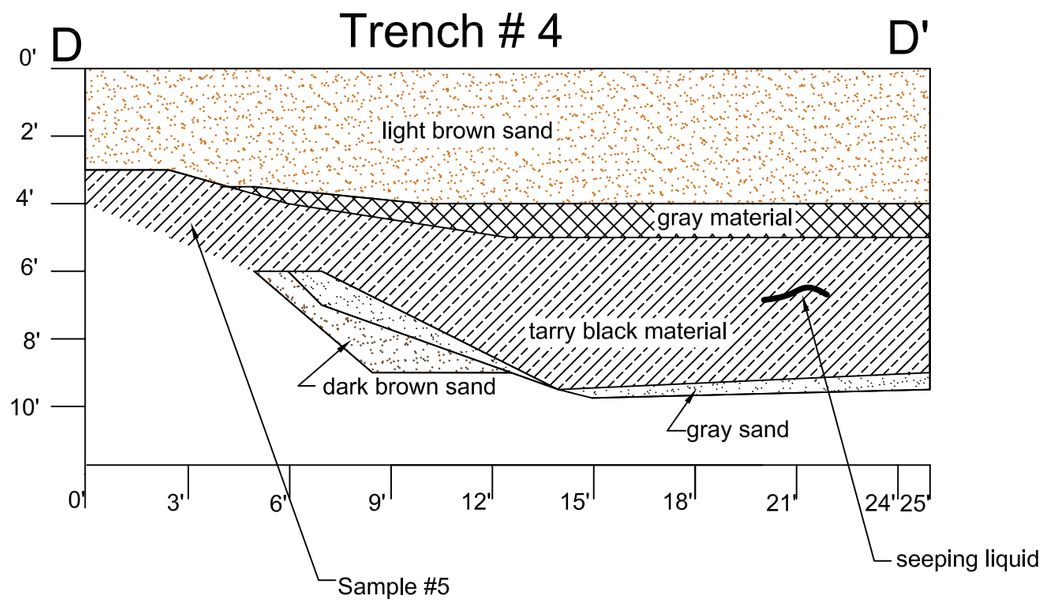
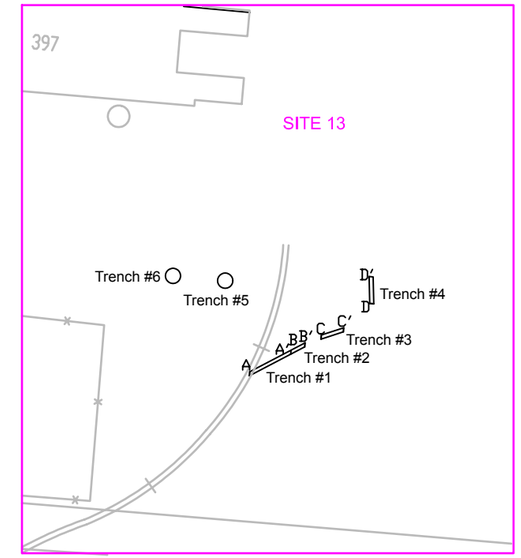
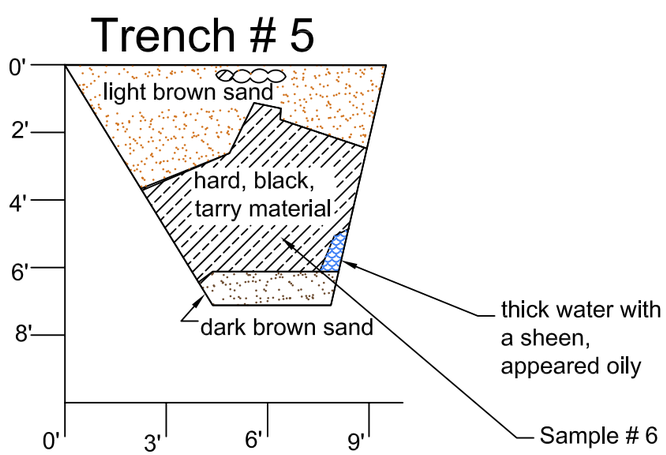
FIGURE 6-6
GEOLOGICAL CROSS SECTION and CONDUCTIVITY SAMPLE LOCATIONS, TRENCHES 1 - 3
Operable Unit 2A, Site 13
Operable Unit 2A
Remedial Investigation Report

S:/AECRU/ALAMEDA/Operable Unit 2A (DO 028)\OU-2A RI\WORKING FILES\PAH\Trench PAH\tarry waste

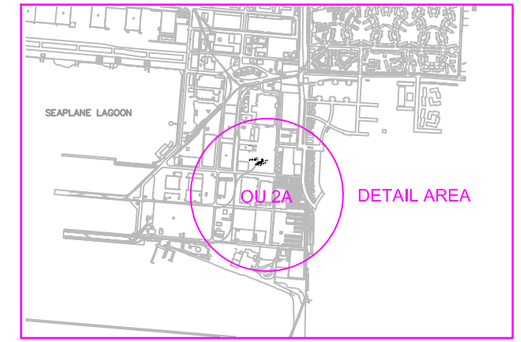






Trench # 6

Surface Sample # 7



▽ = Water level encountered in Test Pits

N

5' 0' 5' 10'

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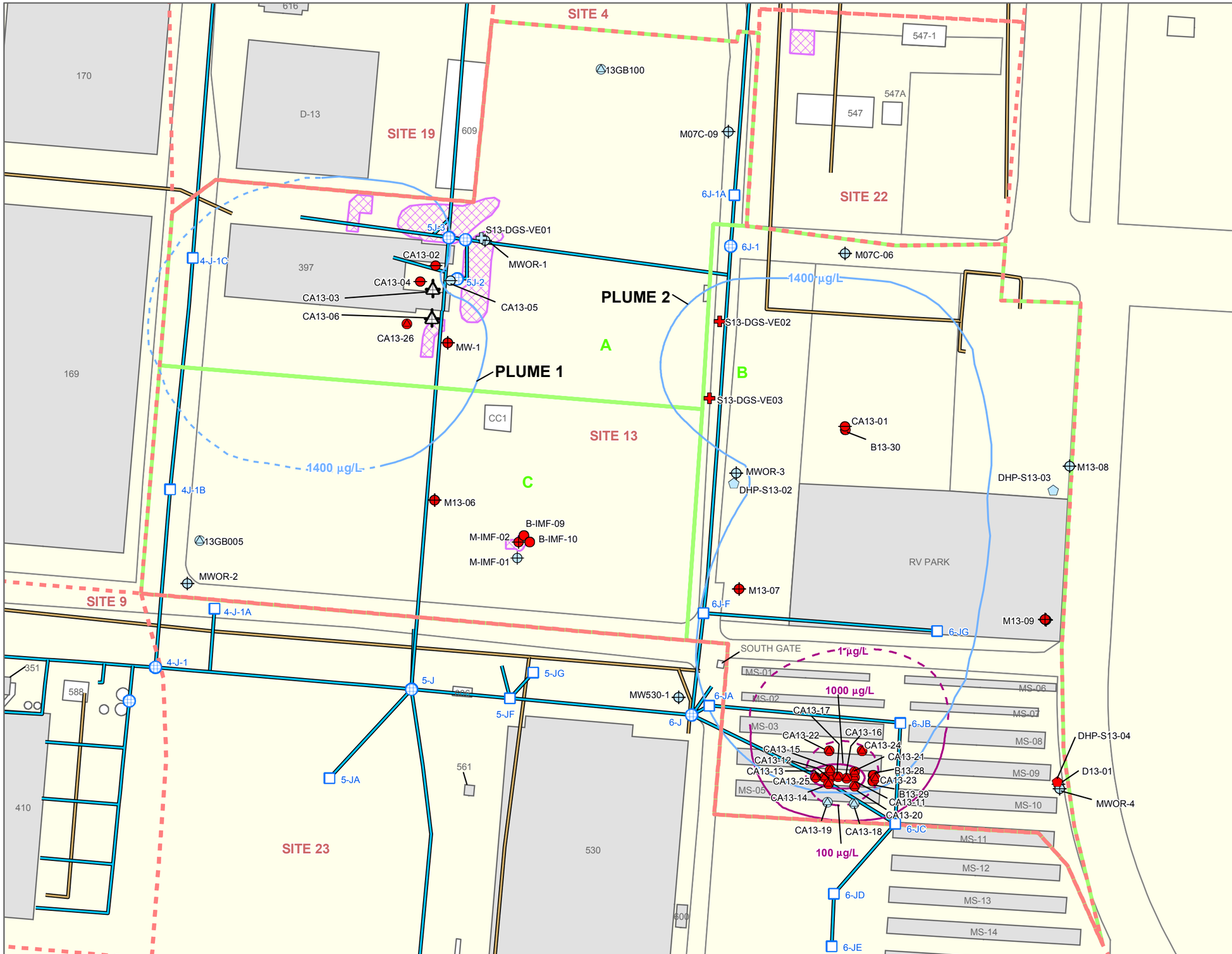
ALAMEDA POINT
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-7
GEOLOGICAL CROSS SECTION and SAMPLE LOCATIONS, TRENCHES 4 - 6
Operable Unit 2A, Site 13
Operable Unit 2A
Remedial Investigation Report

S:/AECRU/ALAMEDA/Operable Unit 2A (DO 028)\OU-2A RI\WORKING FILES\PAH\Trench PAH\tarry waste



Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-11
SITE 13
LOCATION OF TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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TABLE 6-11: SITE 13 ANALYTICAL DATA FOR FREE PRODUCT TARRY REFINERY WASTE

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Petroleum Hydrocarbon Constituents (mg/kg)							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
TPH-gasoline	980	3,000	470	4,500[g]	2,800[e]	910[c]	580
TPH-diesel	17,000[b]	61,000[e]	26,000[e]	16,000	9,700[e]	5,000[f]	140,000[d]
TPH-motor oil	12,000[b]	52,000[e]	21,000[e]	6,600	2,200[e]	440[f]	110,000[d]
Benzene	5	31	0.8	ND	ND	ND	1.3
Toluene	27	130	4.5	ND	ND	ND	4.3
Ethylbenzene	81	36	1.4	60	13	4.7	3.1
Xylenes (total)	48	220	18.7	163	15.3	2.9	14.5

Polynuclear Aromatic Hydrocarbon Concentrations in TRW (mg/kg)							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
Naphthalene	28	83	21	9	ND	ND	100
Ancenaphthalene	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	2.7 J	7.3	8.3	1.2	0.99 J	ND	12 J
Fluorene	28	59	27	3.7	1.7	0.57	140
Phenanthrene	98	210	220	10	5.1	0.59	510
Anthracene	4.9	7.5	34	2	0.68 J	0.16	23
Fluoranthene	3	12	35	1.2	ND	0.12	19
Pyrene	11	23	120	3.6	1 J	0.36	64
Benzo(a)anthracene	8.8	14	110	3.5	0.89 J	0.30	37
Chrysene	23	44	200	4.9	1.2 J	0.51	120
Benzo(b)fluoranthene	11	ND	38	1.8	ND	0.021	49
Benzo(k)fluoranthene	1.2 J	ND	12	0.21 J	ND	0.025 J	6.5 J
Benzo(a)pyrene	3.1	5.6	37	0.48 J	ND	0.072	15
Indeno(1,2,3-cd)pyrene	ND	ND	42 J	ND	ND	ND	3.9 J
Dibenz(a,h)anthracene	1.6	ND	2.1 J	ND	ND	ND	7.9 J
Benzo(g,h,I)perylene	ND	ND	7.2	ND	ND	ND	7.9 J

pH and Lead Concentrations in TRW							
Location	028-S13-001[f]	028-S13-002[f]	028-S13-003[c]	028-S13-004[e]	028-S13-005[c]	028-S13-006[a]	028-S13-007[f]
Analyte							
Lead, mg/kg	630	2,000	900	3.5	1.9	9.2	220
pH	1.7	1.4	1.5	5.7	6.7	6.4	1.1

Notes:

[a] Dilution factor of 5
[b] Dilution factor of 10
[c] Dilution factor of 20
[d] Dilution factor of 40
[e] Dilution factor of 50
[f] Dilution factor of 100
[g] Dilution factor of 200
mg/kg Milligram per kilogram
ND Analyte was not detected
J Estimated value
TPH Total petroleum hydrocarbons
TRW Tarry refinery waste

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
30	RI Report for IR Site 19	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2 through 7.4, Pages 7-4 through 7-27, Figures 7-1, 7-3 through 7-9; Tables 7-1 through 7-12 and 7-14 and 7-15. SulTech 2005.

7.2 SITE 19 ENVIRONMENTAL INVESTIGATIONS

This section describes the environmental investigations conducted at Site 19, which include investigations conducted before the IRP, under CERCLA, under the EBS and TPH Programs, and during removal actions.

Tables 7-1 and 7-2 summarize the soil and groundwater samples collected by the environmental investigations conducted at Site 19 and the types of analyses conducted. Sampling locations are shown on Figure 7-3 and are categorized by the investigation. Results for each investigation are presented in Tables 7-3 through 7-10. The tables are organized by analytical group and detail the number and percent of detections; the minimum, average, and maximum detected concentration; the minimum and maximum detection limit; the number of detections exceeding either the residential (for soil) or tap water (for groundwater) PRGs (EPA 2002a); the number of detection limits for nondetected samples exceeding the PRG; and the PRG.

The following subsections summarize investigations conducted at Site 19 prior to the IRP (Section 7.2.1), under the CERCLA (Section 7.2.2), EBS (Section 7.2.3), and TPH programs (Section 7.2.4), and as a part of removal actions and treatability studies (Sections 7.2.5 and 7.2.6, respectively).

7.2.1 Investigations Conducted Before the IRP

In 1982, the Navy initiated the NACIP to identify, assess, and control contamination of the environment resulting from base activities. The IAS completed in 1983 (E&E 1983) identified several areas for additional investigation. In addition, information from several active portions of NAS Alameda was documented in the IAS report. These findings provide much of the operational and historical information presented in this document and set the stage for much of the Navy's subsequent investigations at Alameda Point. The IAS report discusses activities conducted at NAS Alameda and identifies the former oil refinery as a potential concern. The Navy began investigation activities at Site 19 to evaluate whether the property had been part of the former oil refinery identified by DTSC in 1988 (DTSC 1988).

7.2.2 CERCLA Investigations

The following subsections summarize investigations conducted at Site 19 under CERCLA. These investigations include the Phase 1 and 2A investigation performed in 1991, the follow-on investigations conducted in 1994 and 1998, the storm sewer investigation in 2000, the supplemental RI data gap sampling performed in 2001, the basewide groundwater monitoring conducted in 2002 and 2003, and the basewide PAH study in 2003.

Boring logs for all investigations are presented in Appendix B.

7.2.2.1 Phase 1 and 2A Investigation, 1991

The Navy contracted with Canonie to determine if contamination from surface spills or leaks within Yard D-13 or waste from the former refinery had impacted soil and groundwater at Site 19 (Canonie 1989).

Soil

The 1991 investigation included drilling 16 soil borings (BD13-1 through BD13-16) and installing four monitoring wells at four of the boring locations (MWD13-1 through MWD13-4 at BD13-1 through BD13-4) (see Figure 7-3). To evaluate if contaminants were present in the areas investigated, 174 soil samples were collected and analyzed for VOCs, SVOCs, pesticide and PCBs, metals, TRPH, TOC, cations/anions and pH, cyanide, and general chemistry characteristics. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 19 1991 Phase 1 and 2A Investigation Soil Summary

Analytical Group	Detected Compounds Exceeding 2002 Residential PRG	Location of Highest Concentration
VOCs	None	Not Applicable
SVOCs	Benzo(a)pyrene and benzo(b)fluoranthene	BD13-9 BD13-16
Pesticides and PCBs	None	Not Applicable
Metals	Arsenic	BD13-8
	Iron	BD13-7
	Lead	BD13-16

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs, PCBs, petroleum hydrocarbons, or pesticides were detected in soil at concentrations exceeding their respective residential PRGs (EPA 2002a).

No SVOCs were detected in soil at concentrations exceeding their respective residential PRGs (EPA 2002a). PAHs were detected at concentrations exceeding 2002 residential PRGs in the SVOC analytical run in borings BD13-9 (8.5 to 9.0 feet bgs) and BD13-16 (13.5 to 14.0 feet bgs). It was noted in the investigation report that several borings had PAH compounds detected in the saturated zone (beneath approximately 6 feet bgs) (PRC and JMM 1992).

Arsenic (in samples from BD13-8, BD13-11, BD13-13, BD13-15, BD13-16, MWD13-1, MWD13-2, and MWD13-3), iron (in samples from BD13-7 and MWD13-2), and lead (in samples from BD13-13 and BD13-16) concentrations exceeded 2002 residential PRGs (EPA 2002a).

Groundwater

Four of the 16 soil borings were completed as monitoring wells: two in the southern portion of the yard near Yard D-13, one in the northern portion of Site 19, and one west of Building 616. Four groundwater samples were collected, one from each monitoring well, and analyzed for VOCs, SVOCs, pesticides and PCBs, metals, TRPH, TOC, cyanide, and cations/anions. The table below summarizes the chemicals detected at concentrations exceeding tap water PRGs (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 19 1991 Phase 1 and 2A Investigation Groundwater Summary

Analytical Group	Detected Compounds Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	1,1-DCA	MWD13-1
SVOC	None	Not Applicable
Metals	Arsenic	MWD13-1
	Barium, iron, manganese, nickel, and vanadium	MWD13-4

VOCs, pesticides, and metals were all detected in groundwater samples collected from Site 19. Various metals that exceeded the 95 percent/95 percent statistical tolerance level for background were also detected in groundwater (PRC and JMM 1992). Arsenic, barium, iron, manganese, nickel, and vanadium were detected at concentrations exceeding 2002 tap water PRGs (EPA 2002a).

Analytical detection limits of numerous VOCs, SVOCs, and metals in soil and groundwater, exceeded 2002 tap water PRGs (EPA 2002a). Furthermore, QA/QC information was not available for data validation at the time of the investigation report was prepared. Groundwater and soil data were used only for qualitative purposes in the investigation report (PRC and JMM 1992), but the Navy and agencies deemed the data acceptable for inclusion in the risk assessments.

Recommendations for future work included collecting additional soil samples to evaluate the extent of SVOCs and VOCs in the northwest corner of Site 19 and to characterize petroleum hydrocarbons detected in surface soils. Recommendations also were made for the collection of additional groundwater samples to evaluate tidal influence on the shallow and deeper water-bearing zones; to verify that groundwater has not been impacted by VOCs, SVOCs, and petroleum hydrocarbons; to better characterize metals in groundwater; and to evaluate whether groundwater beneath Site 19 was considered a potential drinking water source.

The investigation report concluded that based on the samples collected, sufficient metals data were collected in soil for the RI/FS and that VOCs, SVOCs, and petroleum compounds detected at Site 19 would be addressed during the risk assessments (PRC and JMM 1992).

7.2.2.2 Follow-On Investigation, 1994

Based on the recommendations of the 1991 investigation and discussions with the regulatory agencies, a follow-on investigation was conducted to provide additional lithologic, chemical, and hydrogeologic information to help assess the nature and extent of soil and groundwater contamination for the RI/FS (PRC and JMM 1994). Analytical results from previous investigations indicated the presence of VOCs, SVOCs, pesticides, metals, and petroleum hydrocarbons above the background concentrations at several locations at Site 19. Activities conducted under the follow-on investigation consisted of soil sampling, nonpoint sampling (sediment in storm drain catch basins), CPT and direct-push groundwater sampling, well installation, and four quarters of groundwater monitoring (PRC and MW 1996). Sampling locations are presented on Figure 7-3.

Soil

Twelve soil samples were collected from four borings (B19-17, B19-18, B19-19, and M19-05). One boring was completed as a monitoring well. Soil sampling and monitoring well installation was performed to confirm previously reported VOC concentrations in near-surface soils and to evaluate the lateral extent of VOC concentrations detected in monitoring well MWD13-2. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 19 1994 Follow-On Investigation Soil Summary

Analytical Group	Detected Compounds Exceeding 2002 Residential PRG	Location of Highest Concentration
VOC	None	Not Applicable
SVOCs	Benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene	B19-17
	Benzo(a)pyrene,	B19-18
Metals (Cyanide only)	None	Not Applicable

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs or cyanide were detected in soil at concentrations exceeding their respective residential PRGs (EPA 2002a). SVOCs were detected in soil samples collected during this investigation. PAHs were detected at concentrations exceeding the 2002 residential PRG in samples from borings B19-17 (1 to 2 feet bgs) and B19-18 (4.5 to 5.5 feet bgs).

Groundwater

Direct-push groundwater sampling was performed at five locations to evaluate the lithologic and hydrogeologic characteristics below a depth of 15 feet and to identify the SWBZ. Hydropunch groundwater sampling was conducted adjacent to the CPT locations. Four of the sampling locations (DHP-S19-01 through DHP-S19-04) were at the edges of Site 19, and one location (DHP-S19-05) was southwest of MWD13-2; these locations were sampled in shallow groundwater for analysis of VOCs, TRPH, and oil and grease to assess the extent of contamination. Three locations (SHP-S19-01 through SHP-S19-03) were sampled in shallow groundwater for analysis of petroleum hydrocarbons to assess the extent of contamination north and east of Yard D13. Figure 7-3 shows the sample locations.

One shallow monitoring well, M19-05, was installed in the central part of the site to evaluate the presence of petroleum hydrocarbons in groundwater and to further characterize groundwater flow directions and gradients in the FWBZ. Based on detected concentrations from Hydropunch samples, one deep monitoring well (D19-01) was installed immediately west of Building 616. These two wells, along with the four existing wells, were sampled on a quarterly basis as part of this investigation (PRC and MW 1996). The table below summarizes the chemicals detected at concentrations exceeding tap water PRGs (EPA 2002a) and the sampling location with highest detected concentration for each chemical.

Site 19 1994 Follow-On Investigation Groundwater Summary

Analytical Group	Detected Compounds Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	1,1-DCA and TCE	DHP-S19-02
	1,2-DCA	DHP-S19-04
	Benzene and PCE	MWD13-4
SVOCs	Bis(2-ethylhexyl)phthalate	MWD13-3
Metals	Arsenic	MWD13-1
	Manganese	D19-01
	Thallium	MWD13-3

VOCs, SVOCs, and metals were detected in groundwater samples collected during the 1994 follow-on investigation at concentrations exceeding 2002 residential PRGs (EPA 2002a). Arsenic, manganese, and thallium were detected at concentrations exceeding the 2002 tap water PRGs (EPA 2002a).

Analytical detection limits of numerous VOC, SVOC, and metals in soil and groundwater exceeded the 2002 tap water PRGs (EPA 2002a).

Nonpoint source samples

Two sediment samples were collected from a storm drain catch basin (4-J-1C) south of Site 19 to evaluate whether nonpoint sources were discharging into the drainage system. Figure 7-3 shows the sampling locations, and Table 7-1 for a lists the analyses conducted.

Based on the data collected, it was determined that chemicals detected during this investigation were similar in nature to those found during previous investigations. The extent of chemicals appeared to be adequately characterized; however, the report recommended additional sampling to evaluate if a human health or environmental risk was defined during the risk assessment (PRC and MW 1995).

7.2.2.3 Follow-On Investigation, 1998

The 1998 follow-on investigation consisted of basewide quarterly groundwater monitoring to assess and monitor the extent of plumes on various sites at Alameda Point (U&A 1998). One well (MWD13-3) within Site 19 was originally included in the monitoring program to assess the migration of a petroleum hydrocarbon plume at adjacent Site 13, which borders Site 19 along its western and southern borders. Two more wells (D19-01 and MWD13-2) were sampled during the third and fourth quarters. Groundwater samples collected from these wells were analyzed for VOCs; metals; TPH-g, TPH-d, and TPH-mo; and general groundwater chemistry (Tetra Tech and U&A 1998). Data from the latter two analyses were used in the basewide analysis of ambient water quality (Tetra Tech 1998) and in the evaluation of beneficial uses of groundwater (Tetra Tech 2000a). Samples from the first quarter of groundwater monitoring were also analyzed for TOC to help evaluate the biodegradation potential for petroleum hydrocarbons. Sampling locations are presented on Figure 7-3. The table below summarizes the chemicals detected at concentrations greater exceeding tap water PRGs (EPA 2002a) and the sampling locations with the highest detected concentration for each chemical.

Site 19 1998 Follow-On Investigation Groundwater Summary

Analytical Group	Detected Compounds Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	1,1-DCA	MWD13-3
Metals	Arsenic	MWD13-3
	Manganese	D19-01

1,1-DCA was detected in samples from two wells, MWD13-2 and MWD13-3. Groundwater samples from monitoring well MWD13-3 exhibited 1,1-DCA at concentrations above the reporting limit and above the tap water PRG (EPA 2002a) during all four quarters. 1,1-DCA was detected above the reporting limit (but below the PRG) in one sample from MWD13-2. Various unfiltered and filtered metals were detected above reporting limits in groundwater samples collected, but arsenic and manganese were detected at concentrations above tap water PRGs (EPA 2002a). TPH compounds were detected in three wells, D19-01, MWD13-2, and MWD13-3.

7.2.2.4 Storm Sewer Investigation, 2000

The basewide storm sewer investigation evaluated the physical conditions of storm sewers and the places where storm sewers are submerged below groundwater; identified locations where contaminated groundwater intercept submerged, damaged sections of storm sewers; and identified significant data gaps for further evaluation.

The storm sewer line (sewer line 4J) that runs north to south across the western portion of Site 19 was determined to be in sound condition between Site 4 to the north and Site 13 to the south. It is unknown whether or not it is submerged. The storm sewer line (sewer line 5J) that runs north to south across the eastern portion of Site 19 was determined to be overall in sound condition between Site 4 to the north and Site 13 to the south, although infiltration was observed during the storm sewer survey at a section of line near the southern border of Site 19 (Tetra Tech 2000b). No further study was recommended for these lines at Site 19 (Tetra Tech 2000b).

7.2.2.5 Supplemental Data Gaps Investigation, 2001

The supplemental data gaps investigation at OU-2A addressed two primary data gap categories: (1) monitor the status of groundwater contaminant plumes and (2) evaluate preferential flow paths associated with the storm sewer system (Tetra Tech 2002a). This investigation included sampling of groundwater monitoring wells but did not include sampling of bedding material at the storm sewers.

Groundwater samples were collected from the six monitoring wells at Site 19 to establish current site conditions, identify point-of-compliance wells for long-term monitoring, and approximate exposure areas for the risk assessment (Tetra Tech 2002a). Water level elevations also were collected to provide local conditions of groundwater flow. Groundwater samples from the wells at Site 19 were analyzed for PAHs using a separate analytical method capable of attaining lower detection limits during this investigation. The table below summarizes the chemicals detected at concentrations exceeding tap water PRGs (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 19 2001 Supplemental Data Gaps Sampling Investigation

Analytical Group	Detected Compounds Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	1,1-DCA, PCE, and TCE	MWD13-4
	1,2-DCP	M19-05
SVOCs	None	Not Applicable
PAHs	None	Not Applicable

VOCs, TPH, and PAHs were detected in the groundwater samples collected during the data gaps investigation. VOCs were detected in samples from five wells (MWD13-1 through MWD13-4

and M19-05). PAHs were detected in five wells, and naphthalene was present at the highest concentration. TPH was detected in three wells.

VOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs (EPA 2002a) in samples from monitoring wells MWD13-4 and M19-05. VOCs were detected at concentrations exceeding MCLs in a sample from monitoring well MWD13-4.

No SVOCs or PAHs were detected in groundwater at concentrations exceeding their respective residential PRGs (EPA 2002a) or MCLs.

The data gaps sampling investigation defined the horizontal and vertical extent of chlorinated hydrocarbons in groundwater west of Building 410. Sampling was conducted in accordance with the FSP and accompanying QAPP and project-specific DQOs (Tetra Tech 2001a). Analytical detection limits were established based on MCLs and not 2002 residential PRGs.

7.2.2.6 Basewide Groundwater Monitoring, 2002 and 2003

The specific objectives of the basewide groundwater monitoring investigation were to (1) evaluate contaminant plumes in groundwater and (2) determine the main chemicals of concern (Shaw 2003a). The monitoring scheme for OU-2A included 23 of the 46 wells located within the five sites of OU-2A (Sites 9, 13, 19, 22, and 23). Two wells at Site 19 (MWD13-3 and D19-01) were sampled during the first and third quarterly events, between June 19 and July 12, 2002, and in December 2002, respectively. One well (MWD13-4) was sampled for four quarters (June, September, and December 2002 and April 2003). Samples were analyzed for chlorinated VOCs, benzene, dissolved metals, TPH-E, and TPH-P (IT 2002).

Sampling locations are presented on Figure 7-3. The table below summarizes chemicals detected at concentrations exceeding the tap water PRG and sampling locations with the highest detected result for each chemical.

Site 19 2002/2003 Basewide Groundwater Monitoring Investigation

Analytical Group	Detected Compounds Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	1,1-DCA, PCE, and TCE	MWD13-4
Metals	Arsenic and manganese	D19-01

VOCs, TPH, and metals were detected in groundwater samples collected during this investigation. TPH-P was detected in two wells, MWD13-3 and D19-01, and TPH-E was detected in samples from one well, MWD13-3. VOCs were detected in samples from two wells, MWD13-3 and MWD13-4. Low concentrations of 18 different VOCs were detected.

VOCs were detected at concentrations exceeding their respective PRGs and MCLs in samples from monitoring well MWD13-4. Arsenic and manganese were detected at concentrations exceeding their respective tap water PRGs in samples from monitoring well D19-01.

7.2.2.7 Basewide PAH Study, 2003

The primary objectives of the PAH study was to collect sufficient PAH data to calculate EPCs for risk assessments at CERCLA sites (Bechtel 2003). The historical PAH data collected at each CERCLA site were used to estimate the mean and standard deviation of BaP concentrations to determine the appropriate number of PAH samples to collect at each site. At Site 19, 13 soil borings were advanced across the site using direct-push sampling methods. Samples were collected from each of the following four depth intervals: 0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs. Sampling locations are shown on Figure 7-3. Boring logs are presented in Appendix B. Table 7-10 provides a statistical summary.

PAHs were detected at concentrations exceeding the Alameda Point action level of 0.62 mg/kg in 1 of the 52 samples collected at Site 19 (see Figure 7-3). PAHs (quantified as BaP) were detected at a concentration of 0.675 mg/kg at location B009l.

7.2.3 EBS

The EBS was performed to identify the environmental condition of all base property and facilities to help transfer the land to the community as quickly as possible. The EBS was conducted in two phases.

Phase 1. The first phase of the investigation comprised an examination of aerial photographs and historical records as well as the performance of site inspections and interviews with current and former employees involved in operations. The Phase 1 EBS found that many parcels had insufficient information to classify them as transferable; therefore, recommendations for additional investigations for soil and groundwater were prepared and presented in the zone analysis plans and parcel evaluation plans (ERM-West 1995a, 1995b).

Phase 2A. As recommended by the IAS (E&E 1983), the Phase 2A and 2B investigations did not focus on areas already under evaluation. Other Navy land uses or areas that may impact transfer were the subject of the Phase 2A and 2B EBS investigations. Site 19 lies in Zone 22 and comprises Parcel 142 and a section of Subparcel 134A that lies within the site and runs along the western border (Figure 7-1). Soil sampling was conducted in Subparcel 134A from January to April 1995 during the Phase 2A investigation. No sampling was conducted on Parcel 142 (IT 2001).

Subsurface soil sampling conducted in the portion of Subparcel 134A that lies within Site 19 was performed to address the possible release of compounds associated with fuel oil, solvents, and lubricating oil used in Building 372 located north of Site 19 in Site 4. One surface soil sample was collected in Target Area 2 (Zone 22) south of Building 372 at location 134-Z22-025 to

address possible releases within Zone 22. This sample was analyzed for SVOCs, PCBs, metals, TPH-E, and TPH-P (IT 2001). Three locations were sampled (one sample from each location) in the sewer lines: storm sewer 134-SS-003, sanitary sewer 134-SN-003, and industrial waste line 134-IW-005 in Target Area 1 (Building 372), south and downgradient of Building 372 (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-E.

One additional industrial waste line sample was collected at location 210-IW-004 but was labeled incorrectly as belonging to Parcel 210 (see Figure 7-3). This sample was analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P. Results for this sample were reported in the EBS under Parcel 147 Phase 2A investigation (IT 2001). TPH-mo, PCB, and one SVOC were detected at low concentrations in the Zone 22 sample collected within Site 19. PAH and oil and grease were detected at low concentrations in the samples collected from the industrial waste and storm sewer lines. See Appendix E for further information.

Phase 2B. Soil and groundwater sampling was conducted at Subparcel 134A in October 1995 during the Phase 2B EBS investigation. Parcel sampling was conducted during Phase 2B to further address the possible release of compounds associated with Building 372. Two soil samples and one water sample were collected at point 134-006-041 located west of the southwestern corner of Yard D-13 in Target Area 6 (Parcel 134) (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P (IT 2001). Two pesticides and TPH-g were detected at low concentrations in the soil sample collected at a depth of 6 feet bgs. Low-concentration PAHs and VOCs were detected in the grab groundwater sample.

7.2.4 TPH Program

As defined under the Alameda TPH program, the northwestern corner of Site 19 is also part of CAA 4B (see Figure 7-1). CAA 4B was created to address TPH and lead contamination in soil and groundwater in the vicinity of Building 372 and two associated USTs (371-1 and 372-2), all of which are located in Site 4 in OU-2B, to the north of Site 19. Issues associated with CAA 4B will be addressed in the upcoming OU-2B RI report.

In 1995, several monitoring wells were installed to the north of Site 19 to monitor TPH-related chemicals in soil and groundwater at the location of former USTs 372-1 and 372-2. One of these wells (372-MW2) is located within the boundaries of Site 19. Soil samples were collected during the construction of this monitoring well, and groundwater has been sampled several times under the TPH program. Low-level TPH-d, TPH-g, and TPH-jet fuel have been detected in this well several times. One VOC has been detected once, at a low concentration.

7.2.5 Removal Actions

In 1998, a basewide removal action was conducted to address active and inactive fuel lines across Alameda Point (Tetra Tech and R&M 2000). Although no removal was conducted at Site 19, the inactive fuel line running north-south across the western portion of the site (Figure 7-1) was sampled at two locations (030-S19-005 and 030-S19-007) and subsequently

filled with grout as part of the in-place closure. TPH-g was detected at a concentration of 0.05 mg/kg in one sample.

7.2.6 Treatability Studies

No treatability studies were conducted at Site 19 during the RI.

7.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 7.2, the Navy completed an initial data evaluation for Site 19. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

7.3.1 Site 19 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 19 and identification of remaining data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 19 is described in the following text and presented on Figure 7-5.

Through environmental investigations and literature searches for Site 19, physical features and activities at Site 19 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination:

- Yard D-13 (RCRA site HW-07) – Hazardous waste storage yard; concrete area with built-in berms around individual containment areas; stored wastes such as corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel; documented releases during operation included spills of nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel; no spills were reported to enter the secondary containment overflow system.
- Building 616 – Constructed for use as office and storage space; served as a hazardous materials storage area until Yard D-13 was built; potentially stored wastes such as corrosives, organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel.

- USTs 616-1 and 616-2 (AOC 616) – 5,000 and 10,000-gallon capacity tanks associated with Building 616; installed for spill containment and emergency overflow for fire control; were never used and have an exempt status under RCRA.
- Placement of dredged fill material used to build the island – Potential source of PAHs.

USTs 616-1 and 616-2 and Building 609 are not considered likely sources of contamination. Building 609 was used to store engine parts. USTs 616-1 and 616-2 were closed in place, and no samples were collected from below the tanks. VOCs in soil were evaluated in five samples collected from sampling location BD13-5 located within 25 feet of the USTs. Groundwater was evaluated in monitoring well 372-MW2 located 25 feet downgradient from the USTs. No evidence of CERCLA contamination was observed at these locations.

Of these potential sources, (1) Yard D-13, (2) Building 616, and (3) fill material containing PAHs were identified as likely sources of contaminants in soil and groundwater at Site 19. The exposure pathways and primary and secondary release mechanisms may include the following:

- Direct release of organic compounds, paints, metals, asbestos, PCBs, and petroleum products associated with Yard D-13 to surface soil.
- Direct release of organic compounds, paints, metals, asbestos, PCBs, and petroleum products associated with Building 616 to surface soil.
- Placement of fill material containing PAHs.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration uptake.
- Secondary release from groundwater to air through volatilization.
- Secondary release from groundwater into domestic use through a well.

As shown in the CSM for Site 19 (see Figure 7-5), residential, commercial/industrial, and construction worker receptors were identified as potential human receptors. Exposure scenarios that include ingestion of homegrown produce and ingestion, dermal contact, and inhalation of soil and groundwater are evaluated in the HHRA (see Appendix H). Exposure of potential ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ERA.

Exposure of potential ecological receptors to groundwater from migration to surface water was considered an incomplete pathway. Groundwater contamination has not migrated to San Francisco Bay, and the storm sewer system at Site 19 is not considered a preferential pathway for contaminant migration to San Francisco Bay. In addition, samples collected from the storm

drain bedding did not contain VOCs at concentrations exceeding detection limits, indicating that the bedding is not serving as a migration pathway.

The storm sewer line (sewer line 4J) that runs north to south across the western portion of Site 19 (see Figure 7-1) was determined to be in sound condition between Site 4 to the north and Site 13 to the south. It is unknown whether or not it is submerged. The storm sewer line (sewer line 5J) that runs north to south across the eastern portion of Site 19 was determined to be in sound condition between Site 4 to the north and Site 13 to the south, although infiltration was observed during the storm sewer survey at a section of line near the southern border of Site 19 (Tetra Tech 2000b). Because data show that the groundwater contamination plumes do not intersect sewer lines 4J and 5J, it is unlikely that the sewer lines will create a preferential migration pathway to San Francisco Bay. Data collected from storm drain manhole 5J-3B indicates that very low concentrations of VOCs are present in storm water. Although data suggest that the groundwater contaminant plumes do not intersect sewer lines 4J and 5J; available data are limited to complete this evaluation.

7.3.2 Site 19 Data Quality Assessment

As discussed in Section 7.2, several environmental investigations were conducted at Site 19 as a part of CERCLA and EBS programs to identify and assess the extent of contamination in soil and groundwater and to determine risk. Data were collected over a period of approximately 13 years from 1990 through 2003 using a biased and phased sampling approach. Sampling focused on the following:

- Industrial, sanitary, and storm sewers
- Refinery waste, surface spills, and leaks within Yard D-13 to determine if soil or groundwater had been impacted
- Confirm the presence of VOCs in near surface soil
- Determine lateral extent of VOCs in groundwater
- Determine extent of TPH and oil and grease in shallow groundwater
- Evaluate fill material and native sediments to assess the presence of PAHs

These data, through an iterative process, were used to construct and refine the site-specific CSM presented in Section 7.3.1 and to identify and fill data gaps until the quantity and quality of the data at Site 19 were judged to be sufficient to complete the RI report, as determined by applying the DQOs presented in Section 3.4.

Detection limits for some of the data used to evaluate Site 19 are elevated over residential PRGs (EPA 2002a); these elevated detection limits are the consequence of one or more of the following circumstances: (1) the evolution of lower detection limits as technology improves, (2) the revision of PRGs over time (which are not always technologically feasible), (3) and matrix interference. The first two of these circumstances generally do not result in significantly

elevated detection limits. However, matrix interferences sometimes cause significant elevations in the detection limits for a chemical contaminant, which leads to uncertainty as to whether that undetected compound could be present in significant concentrations at a site. Although some detection limits (SQL) were elevated above 2002 residential PRGs, detection limits for nondetected chemicals were typically sufficiently low to permit identification of potential health risks. However, detection limits were elevated in both soil and groundwater for some nondetected SVOCs; as a result, further sampling and analysis of soil and groundwater for SVOCs may be needed to confirm these chemicals are not present in soil or groundwater at Site 19.

Although soil and groundwater data gaps were identified, it was determined that the types and numbers of samples collected at the Site 19 (see Figures 7-4A through 7-4L and 7-6 through 7-9) and the analytical suite (see Tables 7-11 and 7-12) were adequate to characterize Site 19 and to conduct risk assessments because data collection at Site 19 focused mainly on potential sources and was conducted in phases. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of the data collected and the need for additional data to identify releases and complete the RI report. It is unlikely that a source at Site 19 has not been adequately characterized or that the RI would recommend NFA if the site poses a potential significant risk to human health or the environment.

Both definitive and screening-level data were generated. Screening data were considered appropriate for use only in evaluations of nature and extent and fate and transport of chemicals. Section 3.4.2 provides further detail on the assessment of data quality and the use of definitive and screening-level data.

Data generated during the environmental investigations that were considered to be of sufficient quality for use in the RI report are presented in Appendix E and in the subsections below. Tables 7-14 through 7-15 summarize results of the CERCLA and EBS investigations for soil and groundwater. Soil gas results are presented in Appendix E. The summaries are organized according to analytical group and include the following: (1) the number and percent of detections of chemicals; (2) the average, minimum, and maximum detected concentrations; (3) minimum and maximum detection limits for nondetected samples; and (4) whether the maximum detected concentrations or detection limits exceed Region 9 residential PRGs or Cal-modified PRGs (EPA 2002a). Cal-modified PRGs are used for some chemicals if the California EPA PRG is more protective than the federal EPA value. PRGs and MCLs are provided in the tables for comparison only.

7.3.2.1 Soil

Soil samples collected at Site 19 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals as well as physical parameters (hardness, acidity, pH, anions, specific conductance, total dissolved solids, dissolved gases, sulfides, and biological and chemical oxygen demand) (see Table 7-1). Of the samples collected and analyzed, 97 samples for VOCs, 78 samples for SVOCs, 52 samples from the additional PAH sampling conducted in 2003, 71 samples for pesticides and PCBs, 60 samples for total metals, and 12 samples for cyanide were considered

acceptable for use in this RI report. PAH data for soil samples collected during previous investigations were not evaluated because of the high detection limits associated with the data. Laboratory detection limits for some chemicals exceeded residential PRGs (EPA 2002a) and are noted in Table 7-11. Detection limits for a few of the nondetected pesticides and PCBs were also elevated above residential PRGs (EPA 2002a); however, most of the nondetected samples had detection limits below PRGs. Therefore, detection limits for pesticides and PCBs were sufficiently low to permit identification of a potential health risk. Most of the detection limits for some of the nondetected SVOCs (2-nitroaniline, bis[2-chloroethyl]ether, hexachlorobenzene, and n-nitroso-di-n-propylamine) had detection limits exceeding PRGs. Detection limits for non-detected arsenic and thallium in soil were also elevated above residential PRGs. However, Site 19 was not identified as a source of arsenic or thallium (see Section 7.3.1), and concentrations detected in site soil are similar to concentrations detected in ambient soil.

A subset of these data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Only data collected with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS program are more of a screening nature, and inclusion of these data could add more uncertainty to the risk assessments. Soil samples collected from petroleum-saturated soil were not included in the risk assessments. Petroleum-saturated soil encountered in the center and southeast portions of Site 19 is associated with oil refinery waste, and petroleum-saturated soil encountered around Building 397 is associated with the release of jet fuel. Risk from TPH was assessed separately (see Appendix F).

Data for soil from each site were aggregated in depth intervals of 0 to 2, 0 to 4, and 0 to 8 feet bgs. The depth intervals evaluate potential exposures associated with site use. The 0-to-2-feet and 0-to-8-feet-bgs depth intervals evaluate potential human health exposures, and the 0-to-4-feet-bgs depth interval evaluates potential ecological exposures. The total number of samples for each analytical group included in the data set for each of these depth intervals is presented in the table below.

Number of Suitable Soil Data for Site 19 Risk Assessments

Analytical Group	(0 to 2 feet bgs)	(0 to 4 feet bgs)	(0 to 8 feet bgs)
VOCs	5	20	38
SVOCs	18	29	42
PAHs	26	39	52
Pesticides and PCBs	14	24	33
Metals	14	24	33

The minimal data for VOCs in soil from 0 to 2 feet bgs are not perceived as a data gap because Site 19 is predominantly paved and VOCs in surface soil would likely volatilize and no longer be present in the soil at the site. Data for 2 to 8 feet bgs are sufficient to capture the nature and extent and risk from VOCs at Site 19.

7.3.2.2 Groundwater

Groundwater samples collected at Site 19 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals (see Table 7-12). Of the samples collected and analyzed, 62 samples for VOCs, 39 samples for SVOCs, 6 samples for PAHs, 11 samples for pesticides and PCBs, and 43 samples for metals were considered acceptable for use in this RI report. Laboratory detection limits for some chemicals in groundwater exceeded residential PRGs (EPA 2002a) and are noted in Table 7-12. Detection limits for some nondetected or detected (at a low frequency) VOCs, SVOCs, and pesticides and PCBs had detection limits exceeding tap water PRGs; however, they were not significantly elevated and are due to the revision of PRGs over time and detection limits that are not always technologically feasible. Arsenic and thallium were detected in groundwater at a low frequency, and detection limits for nondetected samples were also elevated (see Table 7-12). However, Site 19 was not identified as a source of arsenic or thallium (see Section 7.3.1), and concentrations detected in site groundwater are similar to concentrations detected in ambient groundwater.

A subset of these groundwater data was selected for use in the risk assessments (see table below). Data were considered appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Data for groundwater were aggregated by contaminant plume rather than site. Data for groundwater later replaced with more current data were not included because they do not reflect current conditions at Site 19. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS were not used to evaluate risk because they were collected with DQOs that differ from the CERCLA investigations. At least four quarters of groundwater data from monitoring wells were used. However, if data were lacking for an analytical group, older data were included for all analytical groups. Groundwater data included samples collected from April 1994 to April 2003. Field and screening-level data typically were not used; however, data obtained using direct-push methods were used because of a lack of data from monitoring wells in the concentrated plume areas.

Number of Suitable Groundwater Data for Site 19

Analytical Group	Suitable for RI	Used in Risk Assessments
VOCs	62	28
SVOCs	39	16
Pesticides/PCBs	11	0
Metals	43	19

Although 11 samples were analyzed for pesticides and 10 for PCBs, these data were not included in the risk assessments because all results were nondetected except for 4,4'-DDT, which was detected at a low concentration in one sample. The limited PCB and pesticide data were not perceived as a data gap because pesticide and PCB use was not an activity identified at Site 19.

7.3.2.3 Soil Gas

Soil gas data were not collected at Site 19.

7.3.3 Site 19 Background Comparison

A background comparison was conducted for Site 19 by comparing a background data set with analytical results for metals in samples representative of Site 19. This comparison was used to determine which metals in soil and groundwater are statistically similar to background and could be considered to be either naturally occurring (background) or potentially resulting from historical site activities. The complete approach is presented in Appendix A and summarized previously in Section 3.4.3.

Metals that exceeded background in soil at Site 19 included copper, iron, lead, and zinc.

Metals that exceeded background in groundwater at Site 19 included aluminum, barium, chromium, copper, iron, manganese, selenium, and vanadium.

7.4 NATURE AND EXTENT OF CHEMICALS IN SOIL AND GROUNDWATER

This section summarizes the nature and extent of contamination in soil and groundwater at Site 19. The nature and extent evaluation summarizes (1) TPH detected at the site, (2) types and concentrations of CERCLA chemicals that most likely were used at the site, and (3) CERCLA chemicals that demonstrate significant risk to human health or the environment (also known as "risk drivers"). Only chemicals that pose risk to human health or the environment (see Appendices H and I) or relate to past site activity are discussed in the sections below. Section 7.4.2, Chemicals Used at Site 19, assisted the Navy in determining whether contamination "hot spots" were present at Site 19. The nature and extent of risk drivers, excluding those that may occur naturally at the site, are evaluated in Section 7.4.3. Risk drivers are those chemicals that pose a cancer risk above 1E-06 or an HI above 1 to human receptors or pose significant risk to ecological receptors. The evaluation of risk drivers includes (1) site-specific figures to assess the spatial distribution and concentration patterns of risk drivers and (2) a review of the figures, data, and site hydrology to identify the boundaries of the contamination, the volume of the affected media, and, if possible, the suspected source of the risk drivers at the site.

7.4.1 TPH

Even though TPH is not a CERCLA contaminant, soil and groundwater were sampled at various locations across Site 19 for TTPH, which includes all TPH-fractions (TPH-d, TPH-g, jet fuel, or TPH-mo) and TPH-associated constituents (BTEX, lead, and MTBE).

An evaluation of TPH in soil and groundwater at Site 19 was conducted based on the TPH strategy for Alameda Point (see Appendix F) to assess contamination and possible risk at the site.

On the basis of this evaluation, NFA is recommended at Site 19 under the TPH program for TPH-fractions and TPH-associated constituents. The following potential sources of TPH contamination were identified:

- A fuel pipeline that extends along the western and southern site boundaries, which has been abandoned in place
- Storage of engine parts at Building 609
- Hazardous waste storage area at Yard D-13; spills have been documented, including oil and fuel in 1990
- USTs 616-1 and 616-2, which were overflow protection for the secondary containment at Yard D-13 and closed in place in 1987
- CAA-4B associated with AST 372, which overlaps the northern portion of Site 19

The maximum concentration of TPH-mo (4,680 mg/kg) was detected in a sample collected at a depth of 1 to 2 feet bgs from sampling location B19-17, which is in the northwest corner of Site 19. Two additional samples collected at greater depths from B19-17 had no detectable concentrations of TPH-mo, indicating no significant TPH contamination at depth or at the site. Soil sampling locations are depicted on Figure 7-6.

The maximum concentration of lead (385 mg/kg) was detected in a sample collected at a depth of 10.5 to 11 feet bgs from sampling location BD13-16, which is on the southern side of Yard D-13. Lead was not detected above laboratory detection limits in two of the samples collected at the same location at depths of 1.5 and 5.5 feet bgs, indicating lead was limited to subsurface soil at that location.

Benzene was detected at a concentration of 2 µg/L in a sample from location MWD13-4 (see Figure 7-7). However, during subsequent sampling events at this location from June 2001 to April 2003, benzene was not detected at these concentrations.

7.4.2 Chemicals Used at Site 19

This section focuses on chemicals detected in soil and groundwater that were used historically at Site 19. Site 19 activities included historical and hazardous material storage at Building 616 and Yard D-13. Chemicals believed to be stored include corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel. Several releases were documented in Yard D-13, including nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel (IT 2001). Most of the chemicals detected across Site 19 are consistent with the historical activities known to occur at the site. Statistical summaries of all results for soil and groundwater are presented in Tables 7-11 and 7-12.

Soil

The table below lists the chemicals that most likely were used at Site 19 (or their breakdown components), the residential PRG (EPA 2002a), the range of concentrations detected in soil at the site, and the sampling locations where the maximum concentration of each chemical was detected. It also lists chemicals not detected in soil but detected in groundwater at Site 19. Figure 7-3 shows the sampling locations.

Soil Analytical Results for Chemicals Stored at Site 19

Chemical	Residential PRG (mg/kg)	Range of Concentrations (mg/kg)	Sampling Location of Maximum Concentration
1,1-DCA	2.8*	0.001	BD13-15 [10.5-11.0]
1,2-DCA	0.28	Not detected	Not available
1,2-DCP	0.34	Not detected	Not available
Benzene	0.6	Not detected	Not available
PCE	1.5	0.002J to 0.004J	BD13-10 [2.0-2.5]
TCE	0.053	0.004J	BD13-10 [2.0-2.5]

Note: Residential PRG is provided for reference only. Risks are quantified in the HHRA section of this document.

* Denotes California-modified PRG

1,1-DCA was detected in one soil sample collected at location BD13-15 at a concentration of 0.001 mg/kg, which is below the reporting limit of 0.006 mg/kg. 1,1-DCA was not detected in any of the four other soil samples collected at that location above the reporting limit or 0.006 mg/kg. BD13-15 is located in the southern portion of Yard D-13, near the area designated for halogenated solvent storage (see Figure 7-2). 1-1-DCA was not detected in any other soil samples collected at Site 19.

PCE was detected in two soils samples collected at location BD13-10, which is in an open area near the northeast corner of Yard D-13. Soil samples collected at depths from 2 to 2.5 and 4.5 to 5 feet bgs exhibited PCE concentrations of 0.004 and 0.002 mg/kg, respectively. Three soil samples collected at greater depths did not contain concentrations of PCE above the reporting limit of 0.006 mg/kg.

TCE was detected at a concentration of 0.004 mg/kg in one soil sample collected from a depth of 2 to 2.5 feet bgs at location BD13-10. No other soil samples exhibited concentrations of TCE above the laboratory reporting limit of 0.006 mg/kg.

Groundwater

The table below lists the chemicals believed to be used at Site 19, the tap water PRGs (EPA 2002a), the range of concentrations detected in groundwater, and the sampling location of the maximum concentration detected. Figures 7-3 shows the sampling locations for groundwater at Site 19.

Groundwater Analytical Results for Chemicals Stored at Site 19			
Chemical	**Tap Water PRG (µg/L)**	**Range of Concentrations (µg/L)**	**Sampling Location of Maximum Concentration**
1,1-DCA	2.0*	0.5 to 27	DHP-S19-02
1,2-DCA	0.12	0.7	DHP-S19-04
1,2-DCP	0.16	2	M19-05
1,1,1-TCA	3,200	0.6 to 8	D19-01
Benzene	0.34	0.2 to 2	MWD13-4
PCE	0.66	0.4J to 22	MWD13-4
TCE	0.028	0.6 to 4.2	MWD13-4

Note: Residential PRGs are provided for reference only. Risks are quantified in the HHRA section of this document.

* Denotes California-modified PRG

VOCs in groundwater are most likely associated with the southwestern corner of Yard D-13 (see Figure 7-2). Halogenated solvents were stored in this area, and it is possible that spills during transport or storage of these chemicals occurred, thereby allowing them to enter the soil column through cracks or other openings in the floor of Yard D-13 or the surrounding grounds.

Several breakdown components of PCE and 1,1,1-TCA also are present at Site 19. The presence of TCE, 1,2-DCE, and 1,1-DCA is likely related to the storage of various hazardous materials at Site 19 and the breakdown of parent chemicals. TCE is a degradation product of PCE by way of dechlorination.

1,1-DCA is a breakdown product of TCA and has been detected in groundwater at relatively low concentrations at several locations at Site 19. The maximum concentration of 1,1-DCA was detected in a groundwater sample collected from 22 feet bgs from an area west of Building 616 at sampling location DHP-S19-02. Groundwater samples collected from monitoring well MWD13-2 also contain detectable concentrations (ranging from 0.5 to 2 µg/L) of 1,1-DCA. It has also been detected in monitoring wells MWD13-1 through MWD13-4 and at Hydropunch location DHP-S19-04 (see Figure 7-2).

1,2-DCA is most commonly used as an additive to solvents and leaded gasoline. 1,2-DCA was detected once in groundwater at Site 19; the sample was collected from Hydropunch sampling location DHP-S19-04 at a depth of 21 feet bgs. No other groundwater samples collected at Site 19 have detectable concentrations of 1,2-DCA.

1,2-DCP was detected in one groundwater sample collected at Site 19. A sample from monitoring well M19-05 exhibited 1,2-DCP at a concentration of 2 µg/L. No other groundwater samples collected at Site 19 have detectable concentrations of 1,2-DCP above reporting limits.

Relatively low concentrations of benzene have been detected in groundwater samples collected from monitoring well MWD13-4, in the southern portion of Yard D-13. Concentrations of benzene in groundwater samples collected at this location range from 2 µg/L (in a sample

collected in 1994) to 0.2 µg/L (in a sample collected in 2003). Benzene has not been detected above reporting limits in any other groundwater samples collected at Site 19.

7.4.3 Risk Drivers

Although numerous chemicals were detected at Site 19, most of the chemicals do not pose significant risk as defined by the risk assessments. As a result, the purpose of this section is to further characterize the nature and extent of CERCLA chemicals driving risk at Site 19 that are not background. Selection of these chemicals was based on the background comparison for metals and on results of the HHRA and ERA. Based on HHRA results, arsenic and BaP were identified as risk drivers in soil, and arsenic, manganese, PCE, and TCE were identified as risk drivers in groundwater at Site 19. Copper, barium, and lead in soil were determined to pose risk to terrestrial ecological receptors. Arsenic and barium in soil and arsenic in groundwater are attributed to background, so the nature and extent of these metals was not evaluated further.

7.4.3.1 Risk Drivers in Soil

This section summarizes on the nature and extent of BaP, copper, and lead in soil.

BaP

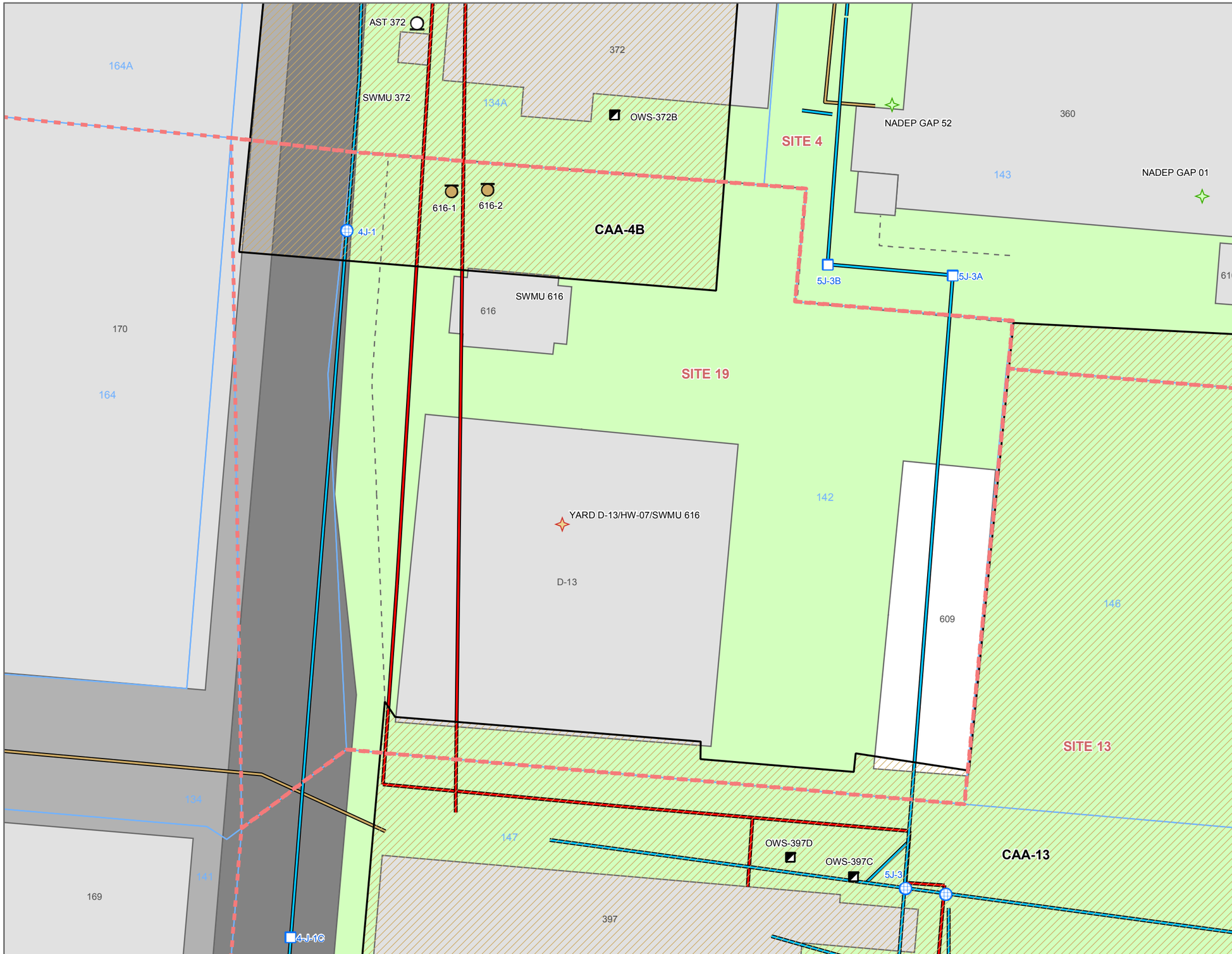
BaP ranged from concentrations of 0.000002 to 6 mg/kg, with the maximum concentration detected in a sample from location B009, at a depth of 0.5 to 2.0 feet bgs. Table 7-10 shows the BaP concentrations for all samples collected during the 2003 PAH study. Sampling locations are presented on Figure 7-4F.

Copper

Copper was identified as an ecological risk driver. It was detected in soil at concentrations ranging from 5.9 to 256 mg/kg, with the maximum concentration detected in the southern portion of Yard D-B at sample location BD13-15 at a depth of 8.5 to 9 feet bgs. Ambient concentrations of copper in soil range from 4.2 mg/kg to 89.4 mg/kg.

Lead

Lead was identified as an ecological risk driver. It was detected in soil at concentrations ranging from 6.2 to 385 mg/kg, with the maximum concentration detected in the southeast corner of Yard D-13 at sample location BD13-16 at a depth of 10.5 to 11 feet. Shallower or deeper samples at location BD12-15 are consistent with background concentrations. Ambient concentrations of lead in soil range from 1.3 mg/kg to 41 mg/kg.



ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), PRESENT

SOLID WASTE MANAGEMENT UNIT (SWMU)

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

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FIGURE 7-1
SITE 19 FEATURES

Operable Unit 2A
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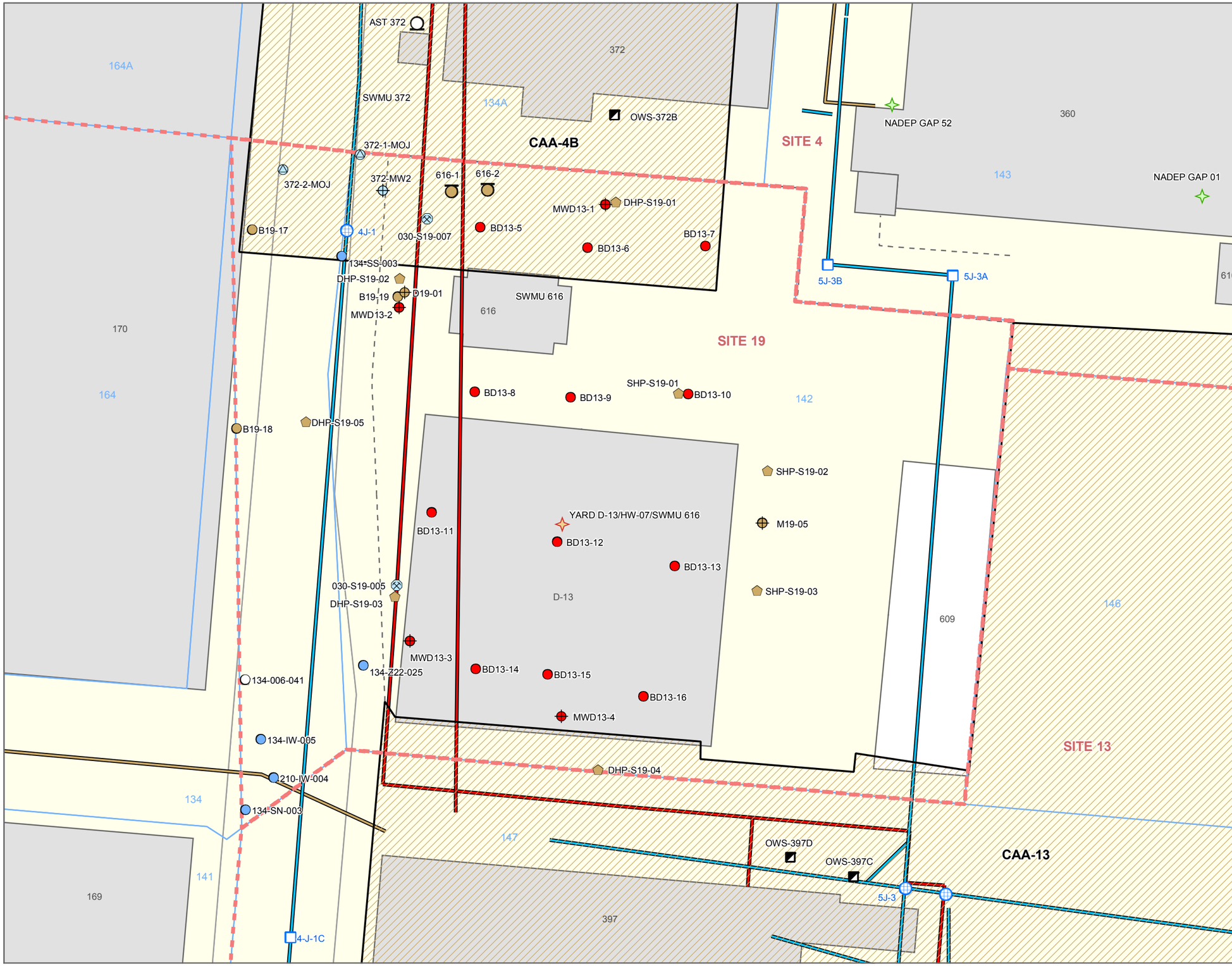

SAMPLE LOCATION
- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Soil Boring

KEY TO SAMPLE LOCATION INVESTIGATION
- Follow-On Investigation 1994
- Phase 1 & 2A, 1991
- Total Petroleum Hydrocarbon Program
- EBS Phase 2A
- EBS Phase 2B

- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

25 0 25 50 Feet

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FIGURE 7-3
SITE 19 SOIL AND GROUNDWATER SAMPLE LOCATIONS

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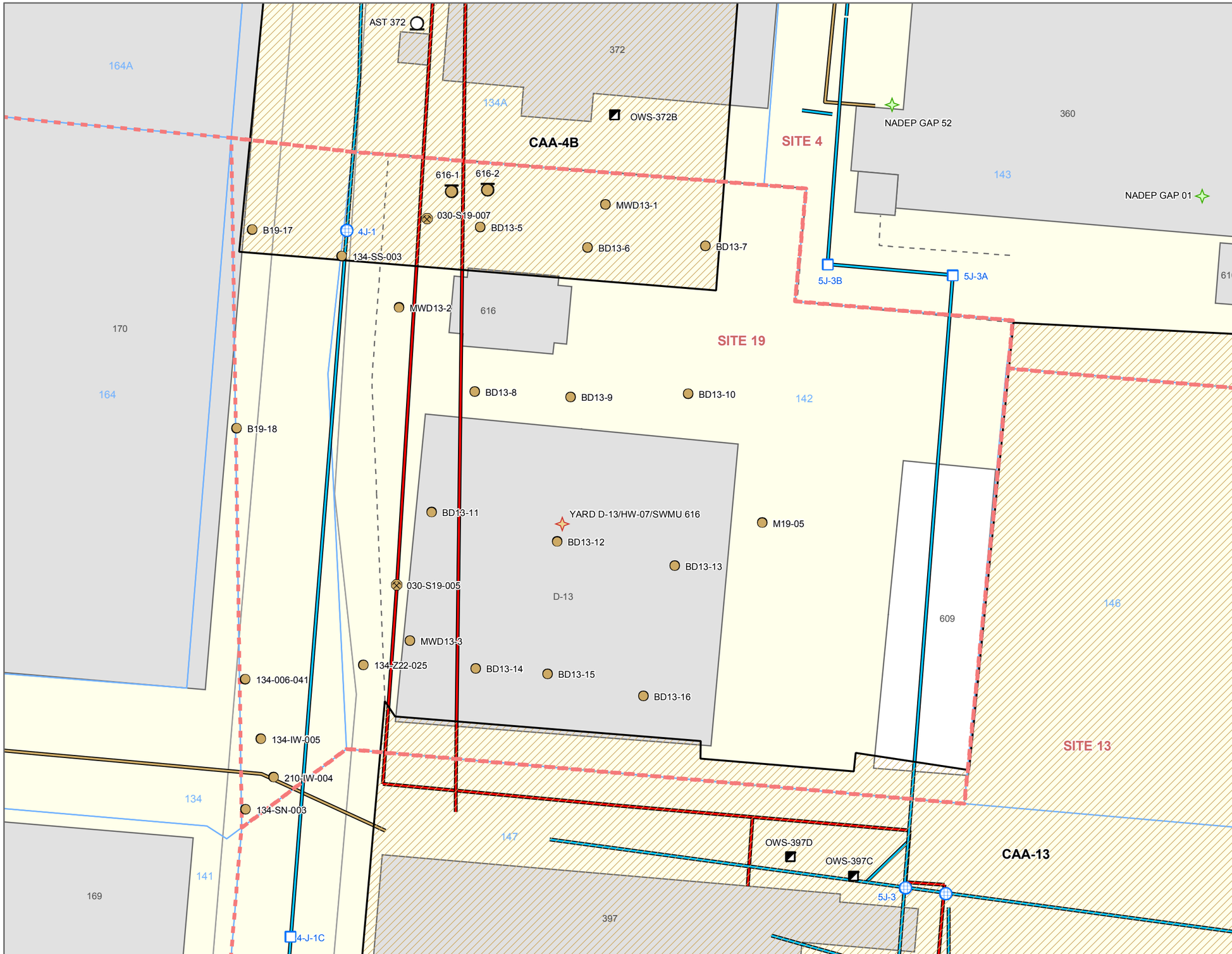

SAMPLING LOCATION

- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
SVOC = Semivolatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 7-4A
SITE 19 SAMPLING LOCATIONS FOR SVOCs IN SOIL

Operable Unit 2A
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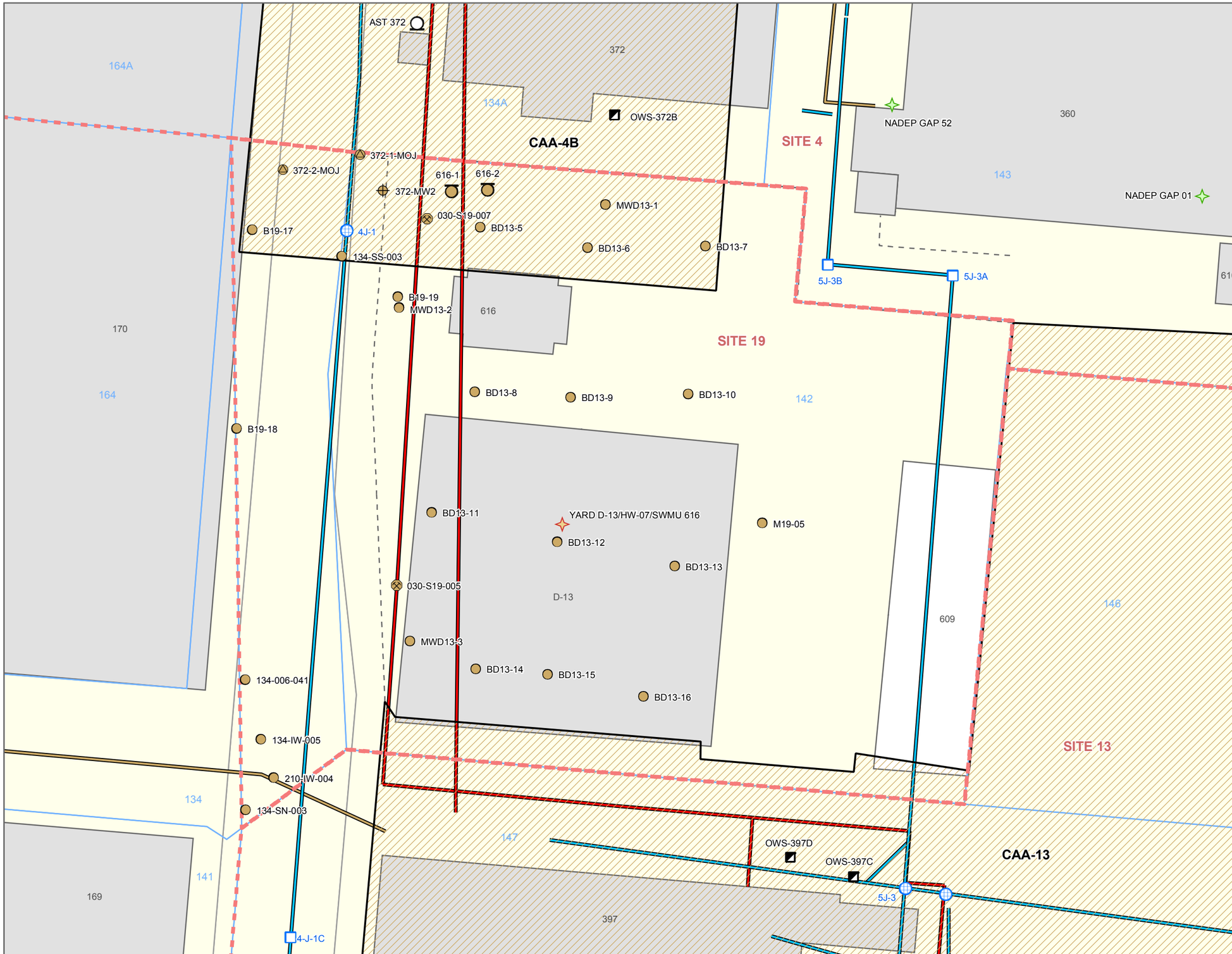

SAMPLING LOCATION

- Direct Push
- Excavation
- Monitoring Well
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 7-4B
SITE 19 SAMPLING LOCATIONS FOR VOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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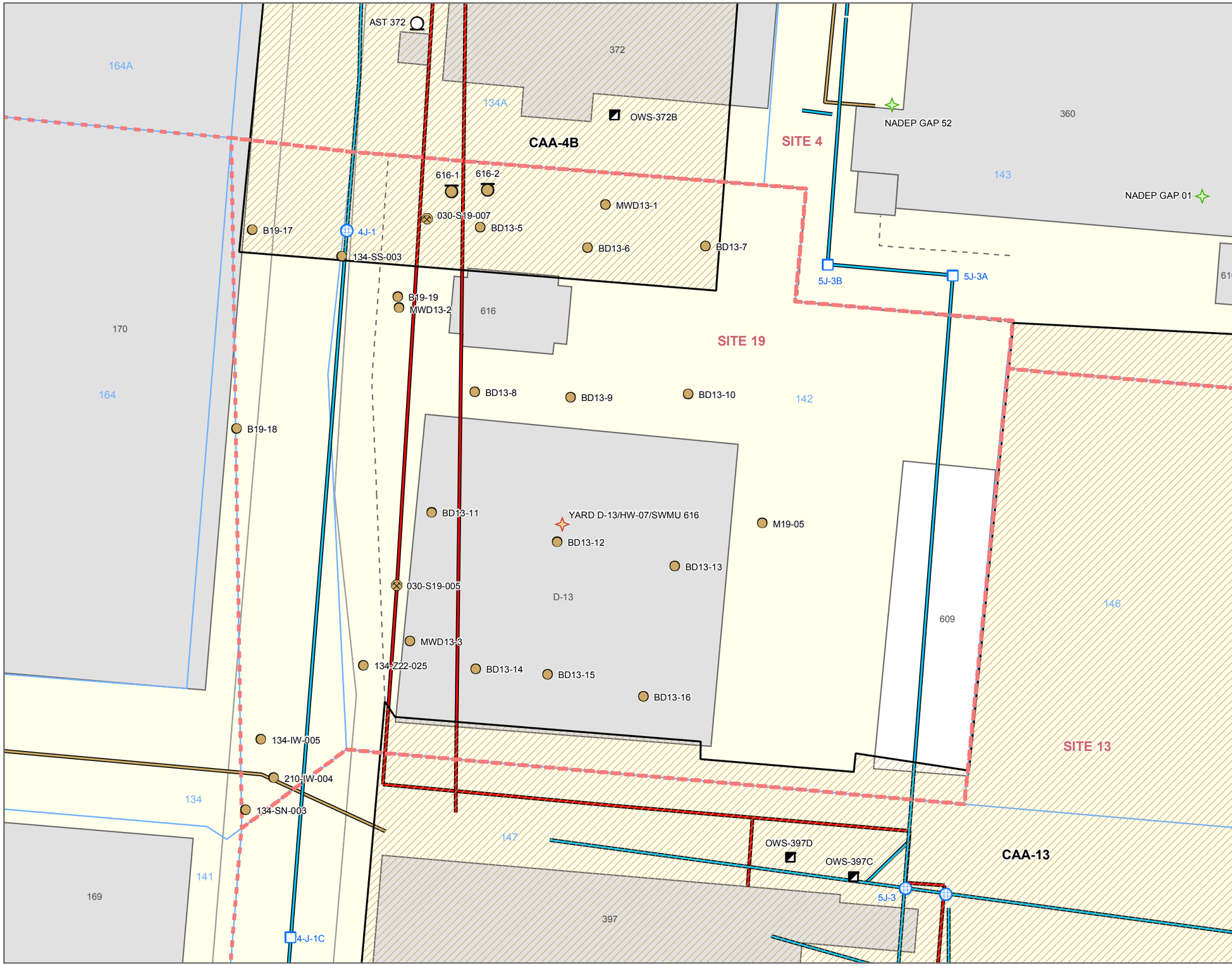

SAMPLING LOCATION

- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

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FIGURE 7-4C
SITE 19 SAMPLING LOCATIONS FOR METALS IN SOIL

Operable Unit 2A
Remedial Investigation Report

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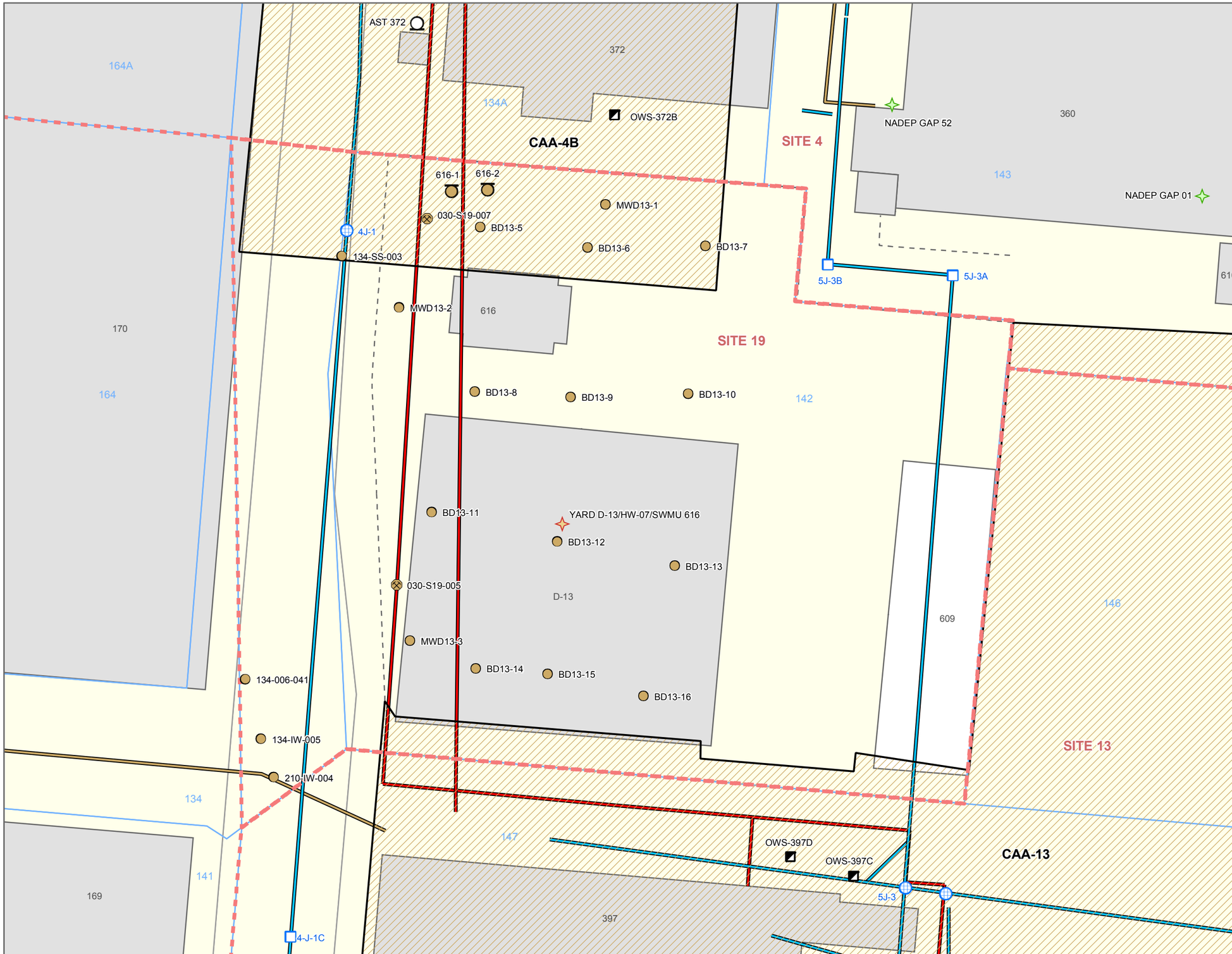

SAMPLING LOCATION

- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

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FIGURE 7-4D
SITE 19 SAMPLING LOCATIONS FOR PESTICIDES IN SOIL

Operable Unit 2A
Remedial Investigation Report

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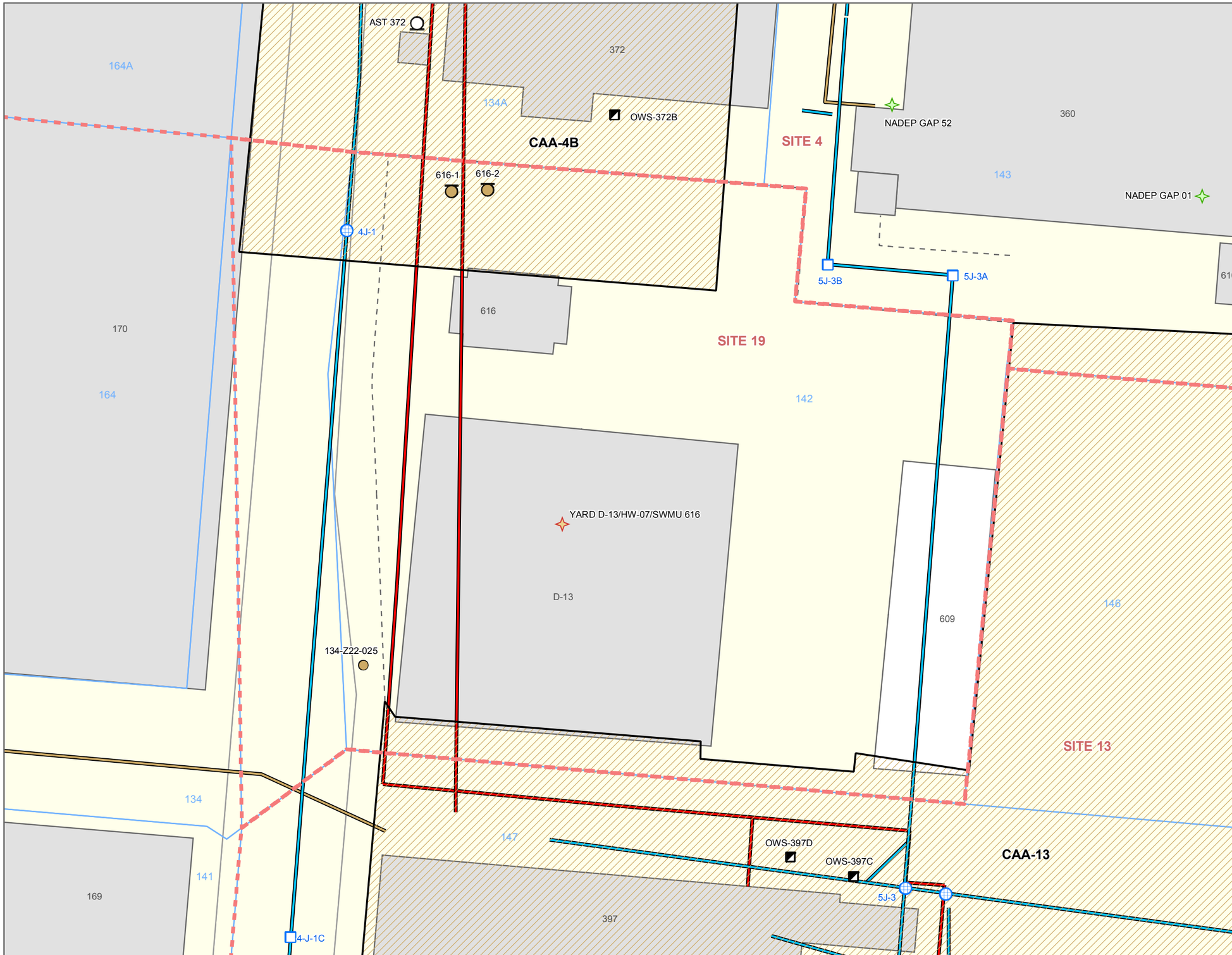

SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated Biphenyl

N

25 0 25 50 Feet

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FIGURE 7-4E
SITE 19 SAMPLING LOCATIONS FOR PCBs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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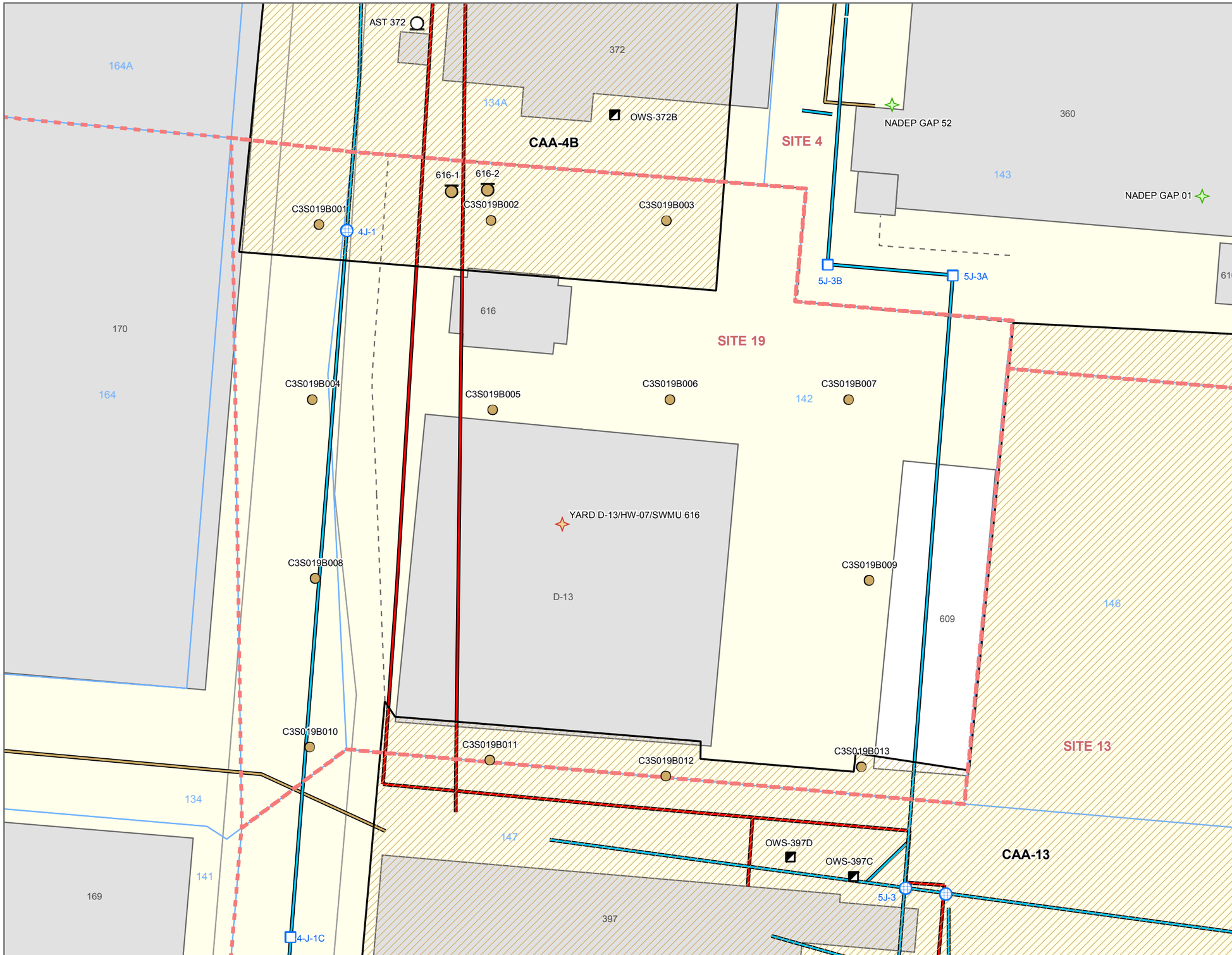

SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

25 0 25 50 Feet

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FIGURE 7-4F
SITE 19 SAMPLING LOCATIONS FOR PAH IN SOIL

Operable Unit 2A
Remedial Investigation Report

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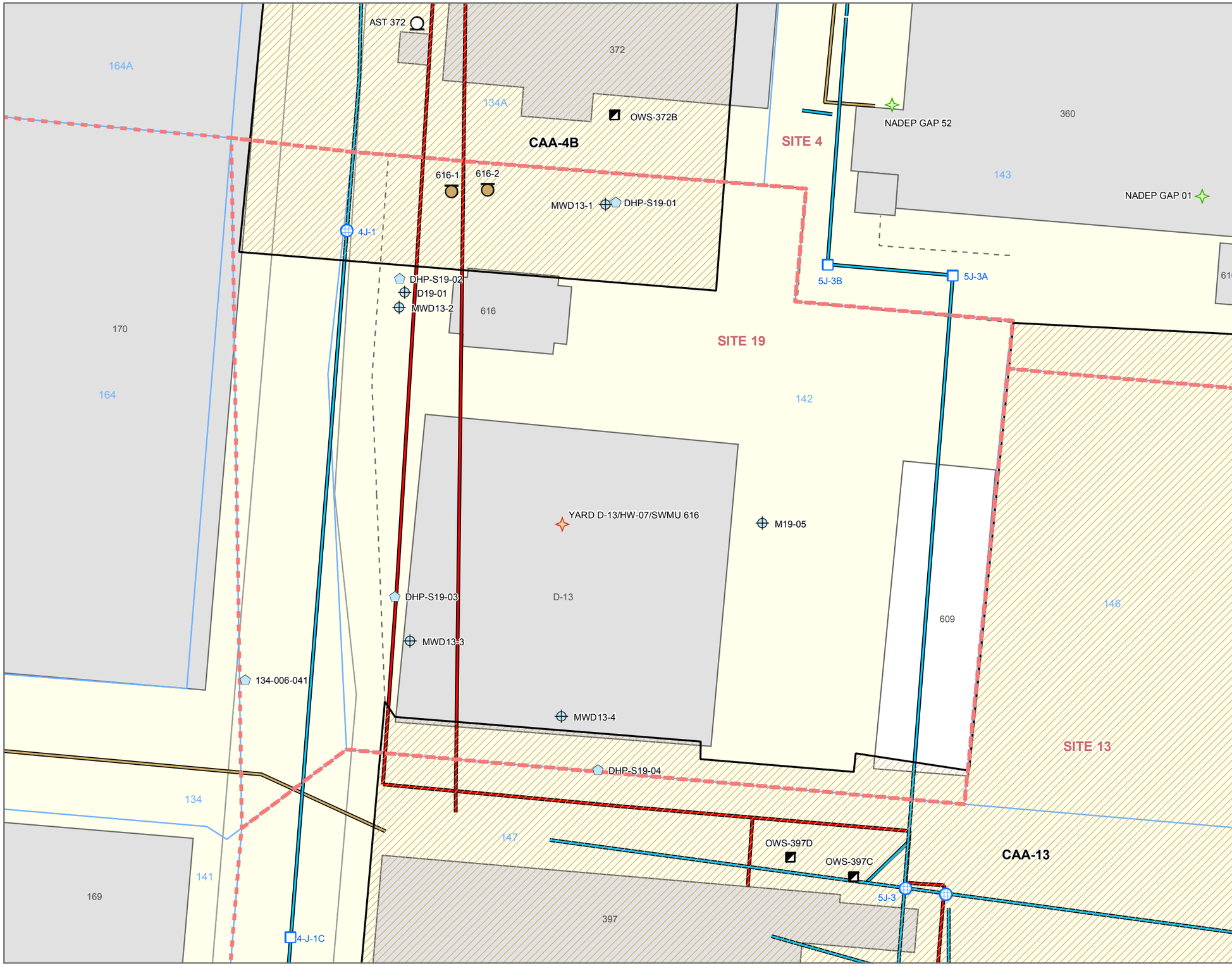

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
SVOC = Semivolatile Organic Compound

N

25 0 25 50 Feet

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FIGURE 7-4G
SITE 19 SAMPLING LOCATIONS FOR SVOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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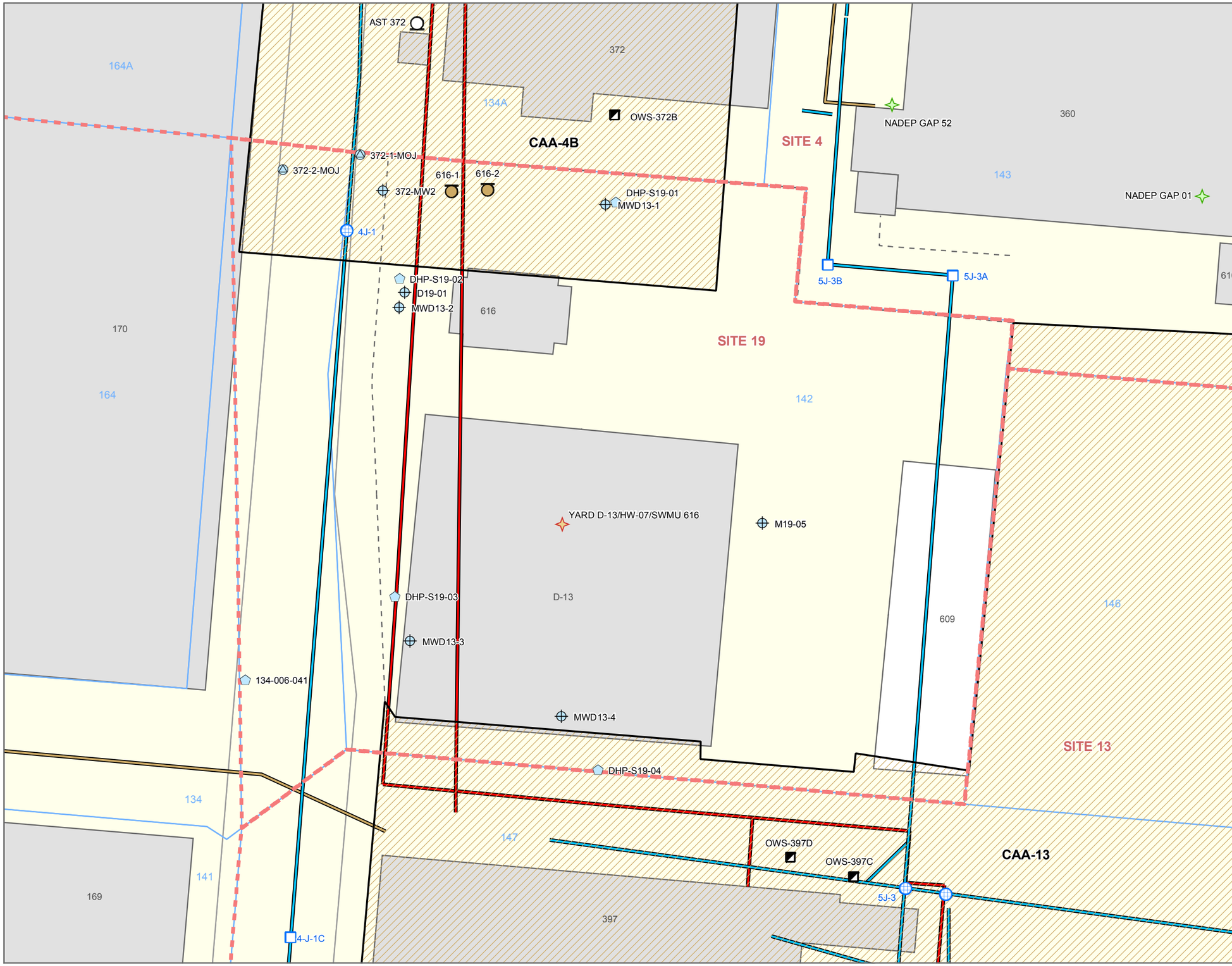

SAMPLING LOCATION

- Direct-Push
- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

N

25 0 25 50 Feet

Tetra Tech EM Inc.

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FIGURE 7-4H
SITE 19 SAMPLING LOCATIONS FOR VOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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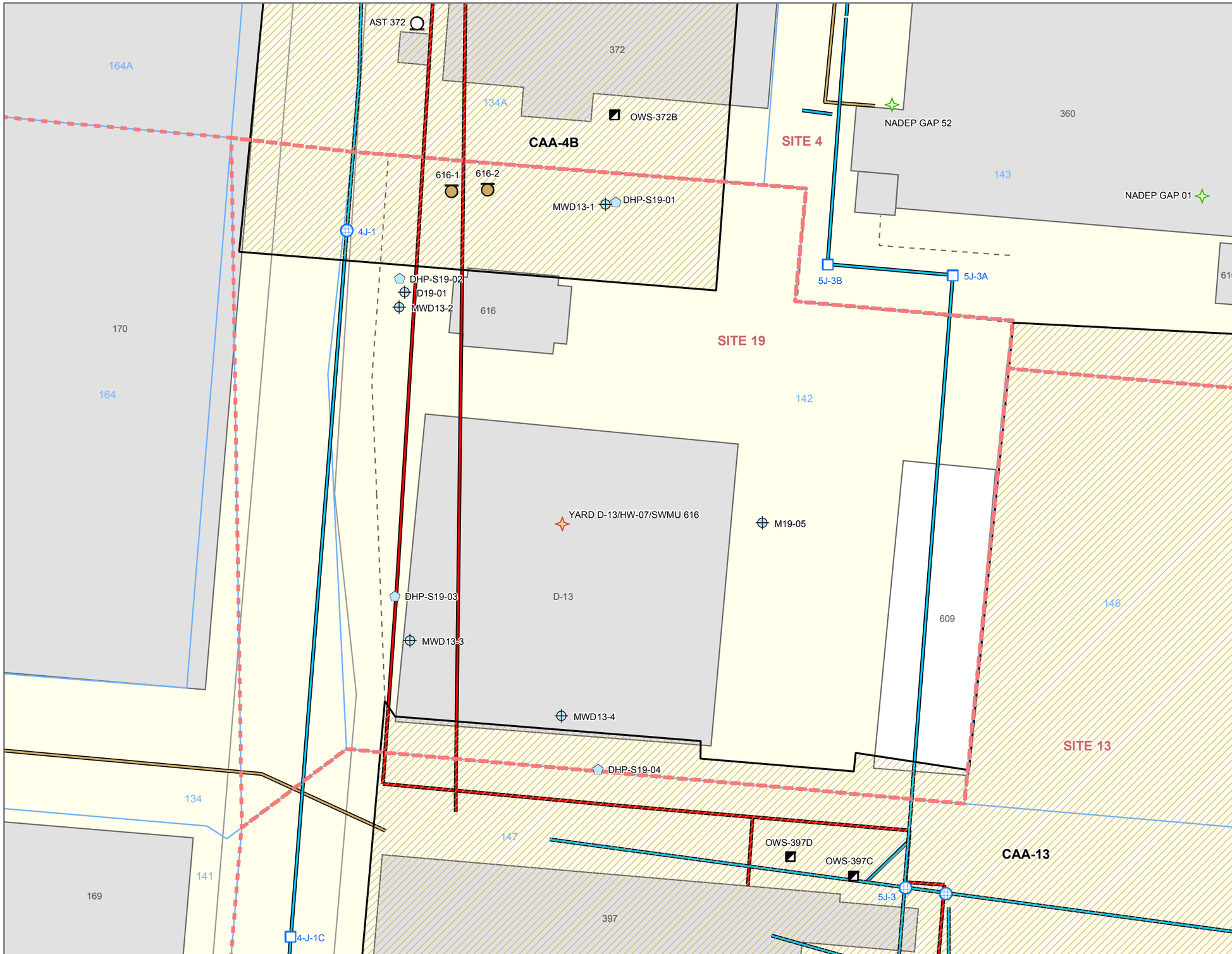

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-4I
SITE 19 SAMPLING LOCATIONS FOR METALS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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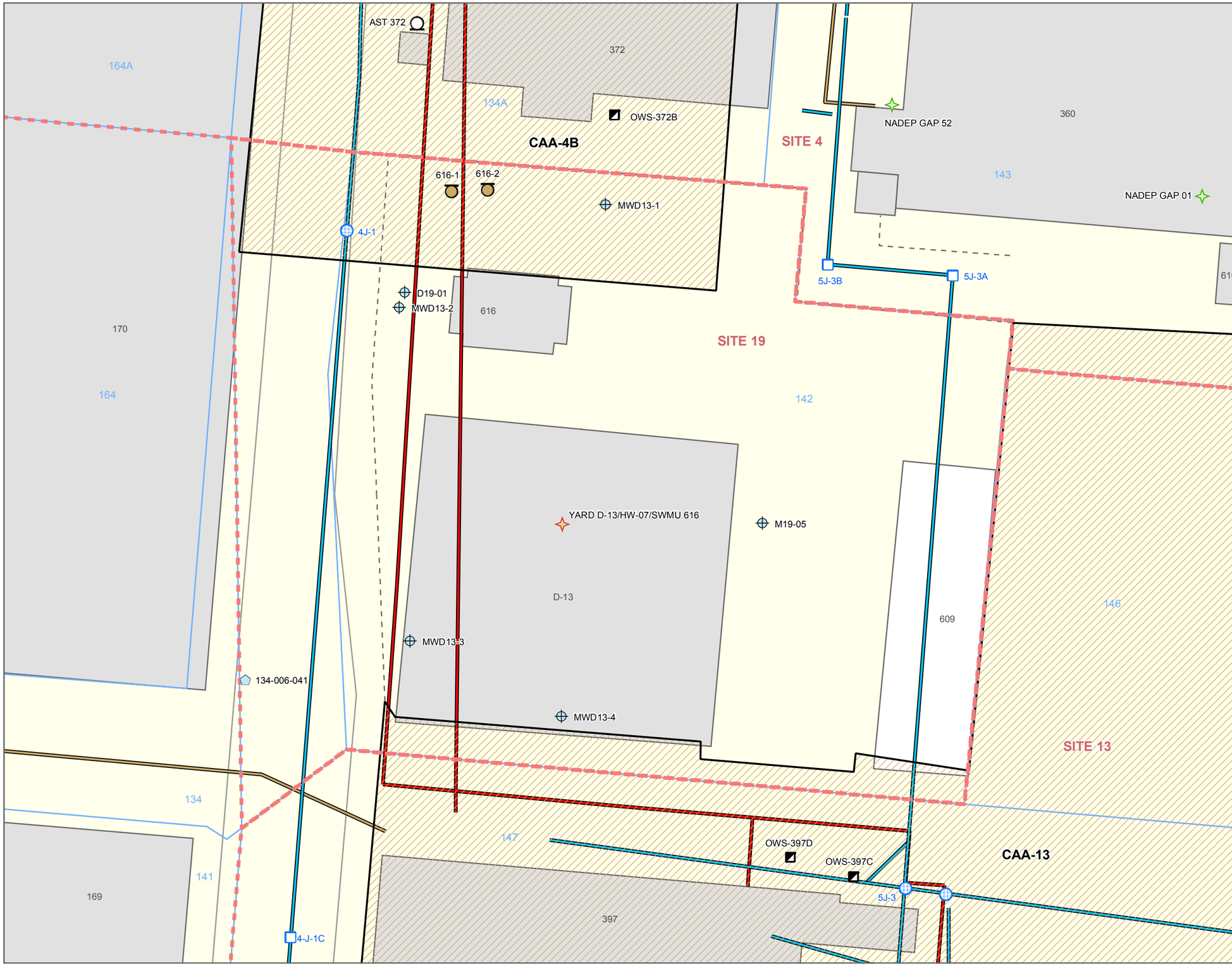

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-4J
SITE 19 SAMPLING LOCATIONS FOR PESTICIDES IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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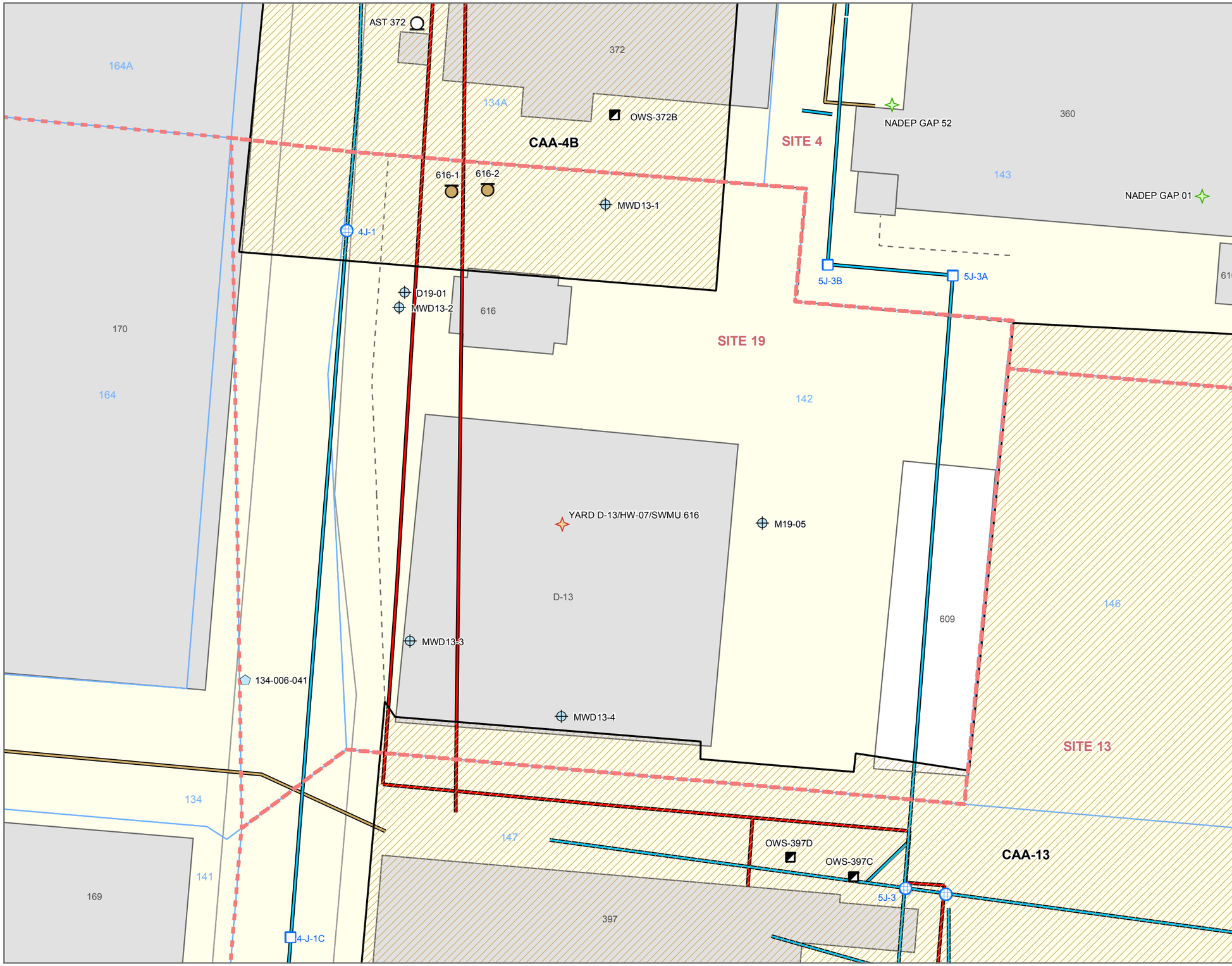

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated biphenyl

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-4K
SITE 19 SAMPLING LOCATIONS FOR PCBs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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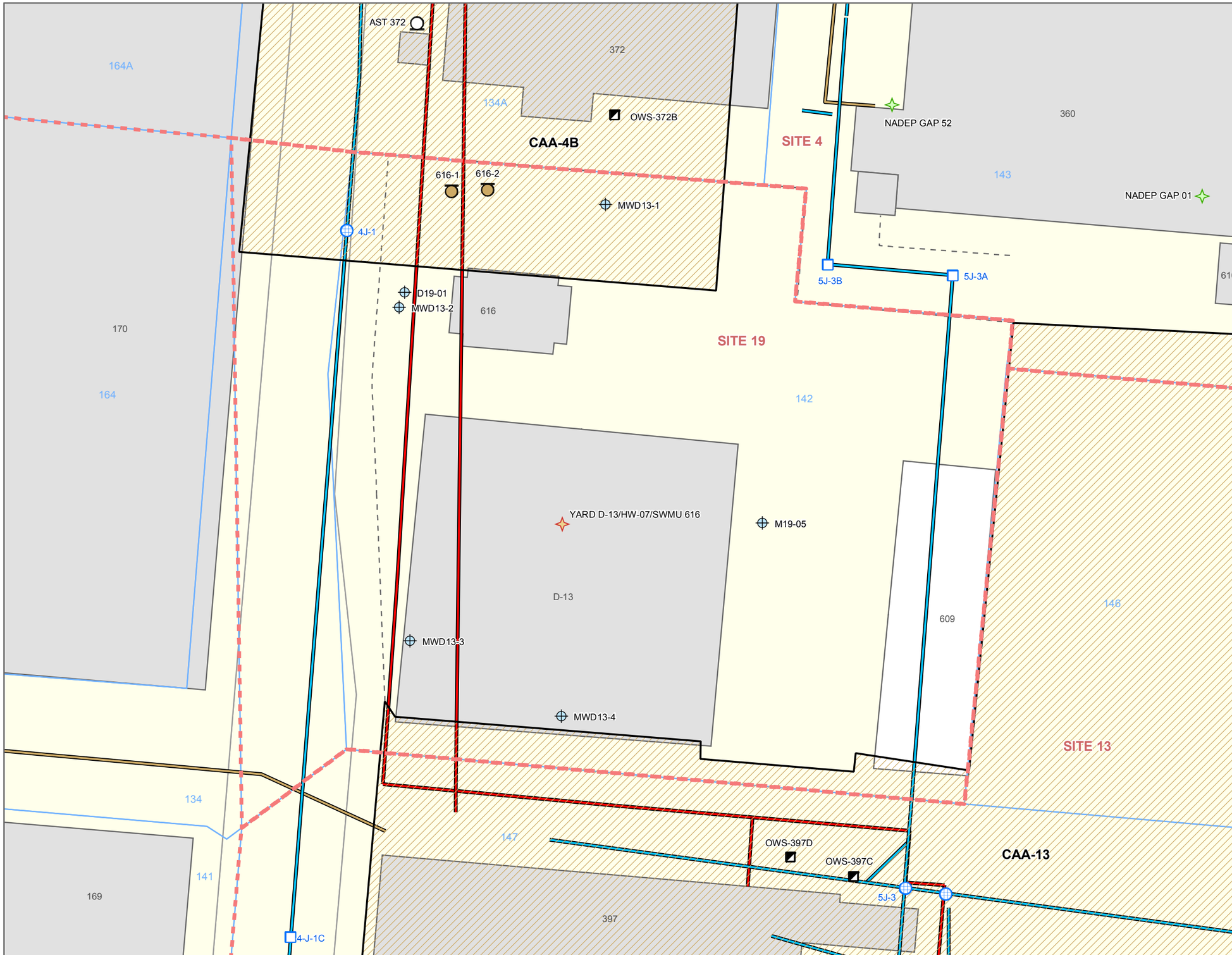

SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-4L
SITE 19 SAMPLING LOCATIONS FOR PAHs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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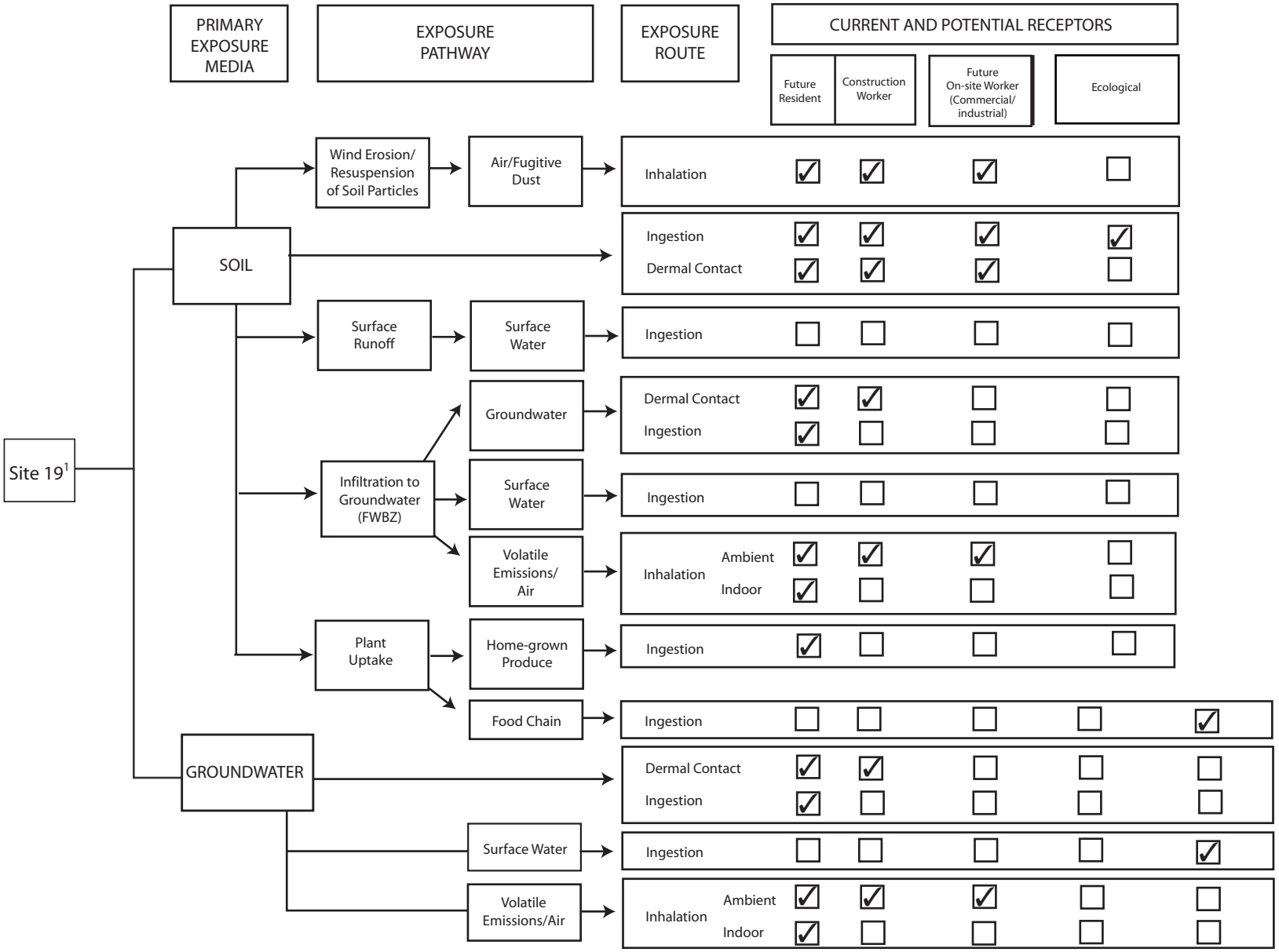

[1]Yard D-13, Building 616, fill material

☑ Potentially Complete Exposure Pathway

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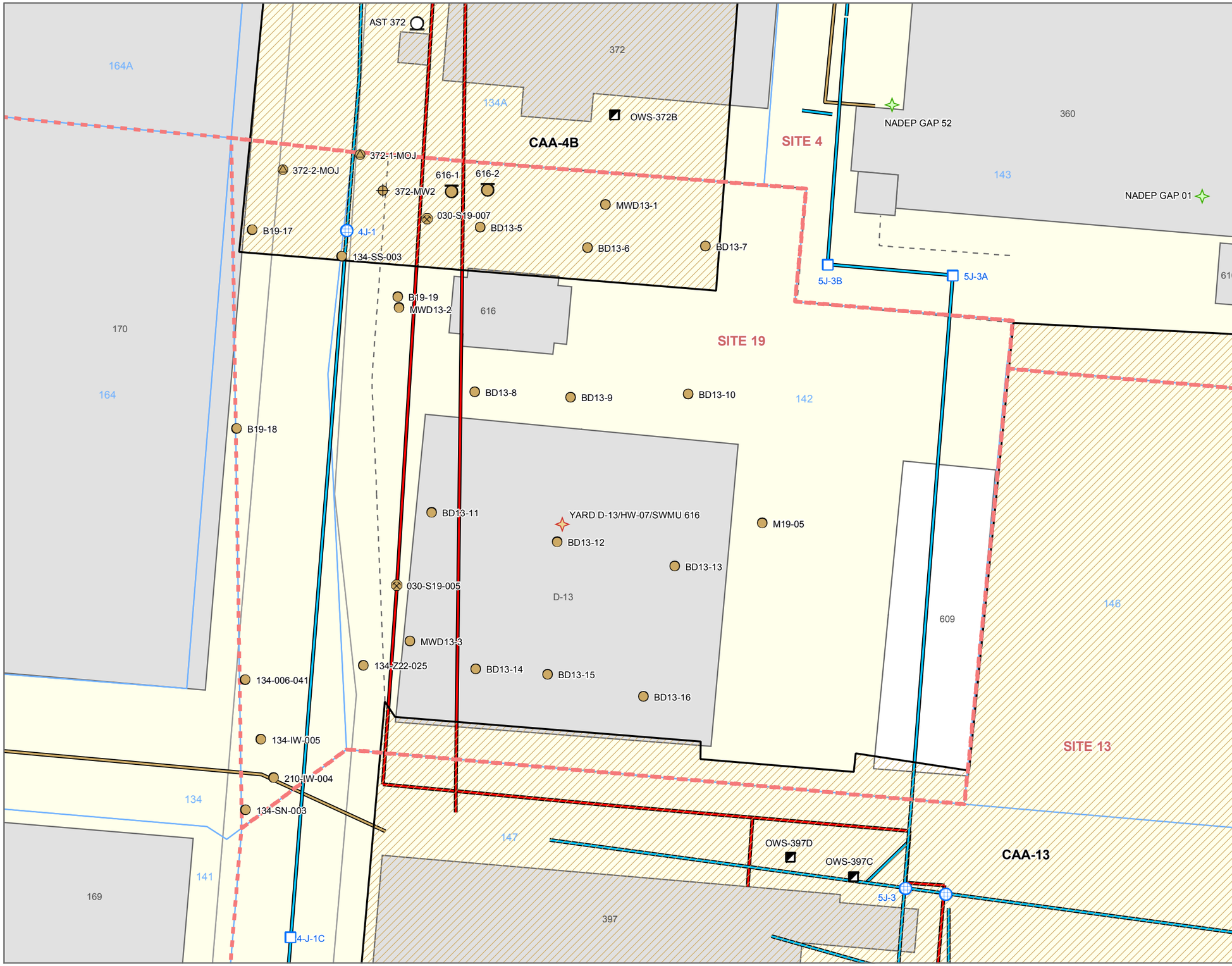
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-5
CONCEPTUAL SITE MODEL
Operable Unit 2A
Remedial Investigation Report



SAMPLING LOCATION

- Direct-Push
- Excavation
- Monitoring Well
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total Petroleum Hydrocarbon

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-6
SITE 19 SAMPLING LOCATIONS FOR TPH IN SOIL

Operable Unit 2A
Remedial Investigation Report

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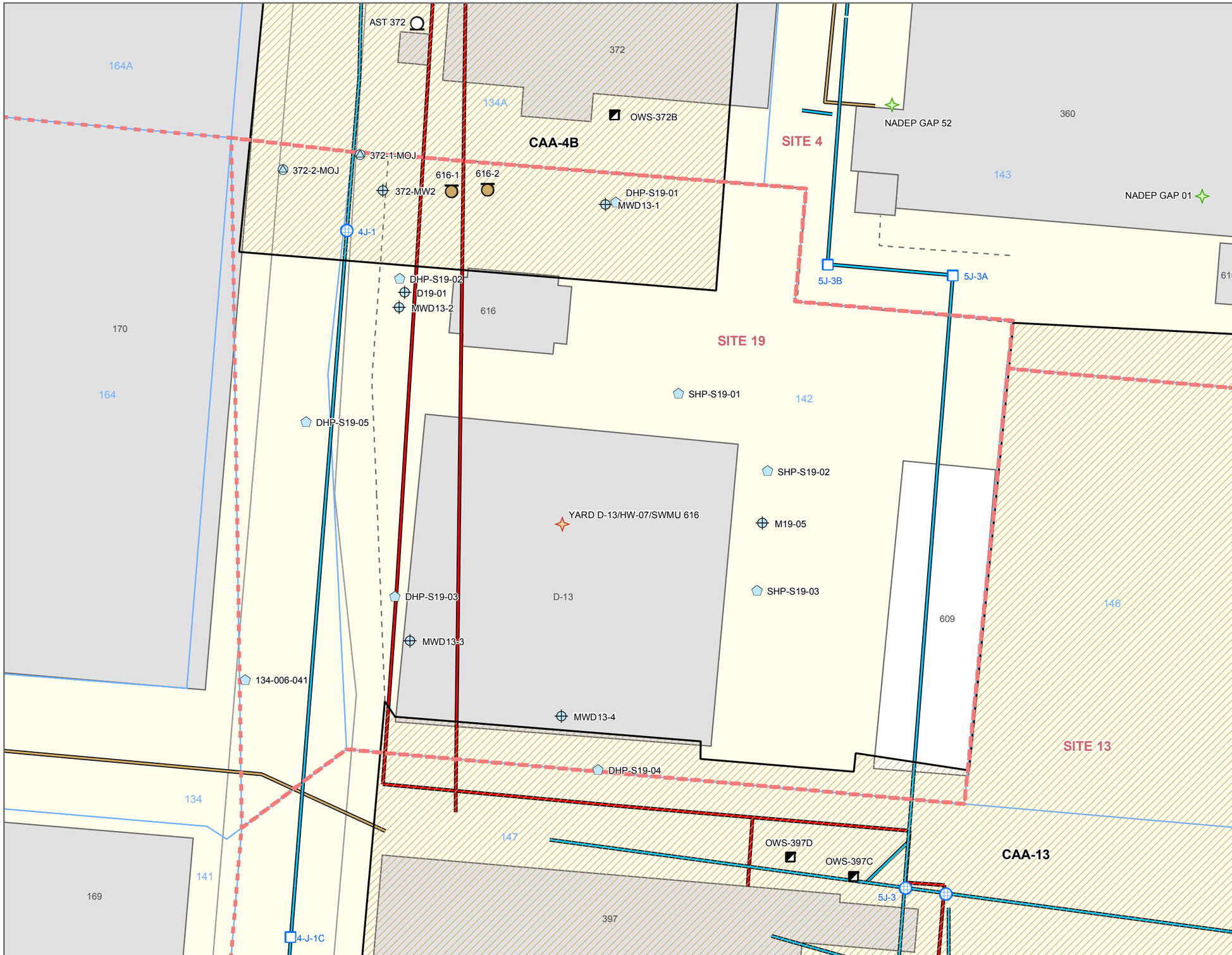

SAMPLING LOCATION

- Direct-Push
- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total Petroleum Hydrocarbon

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-7
SITE 19 SAMPLING LOCATIONS FOR TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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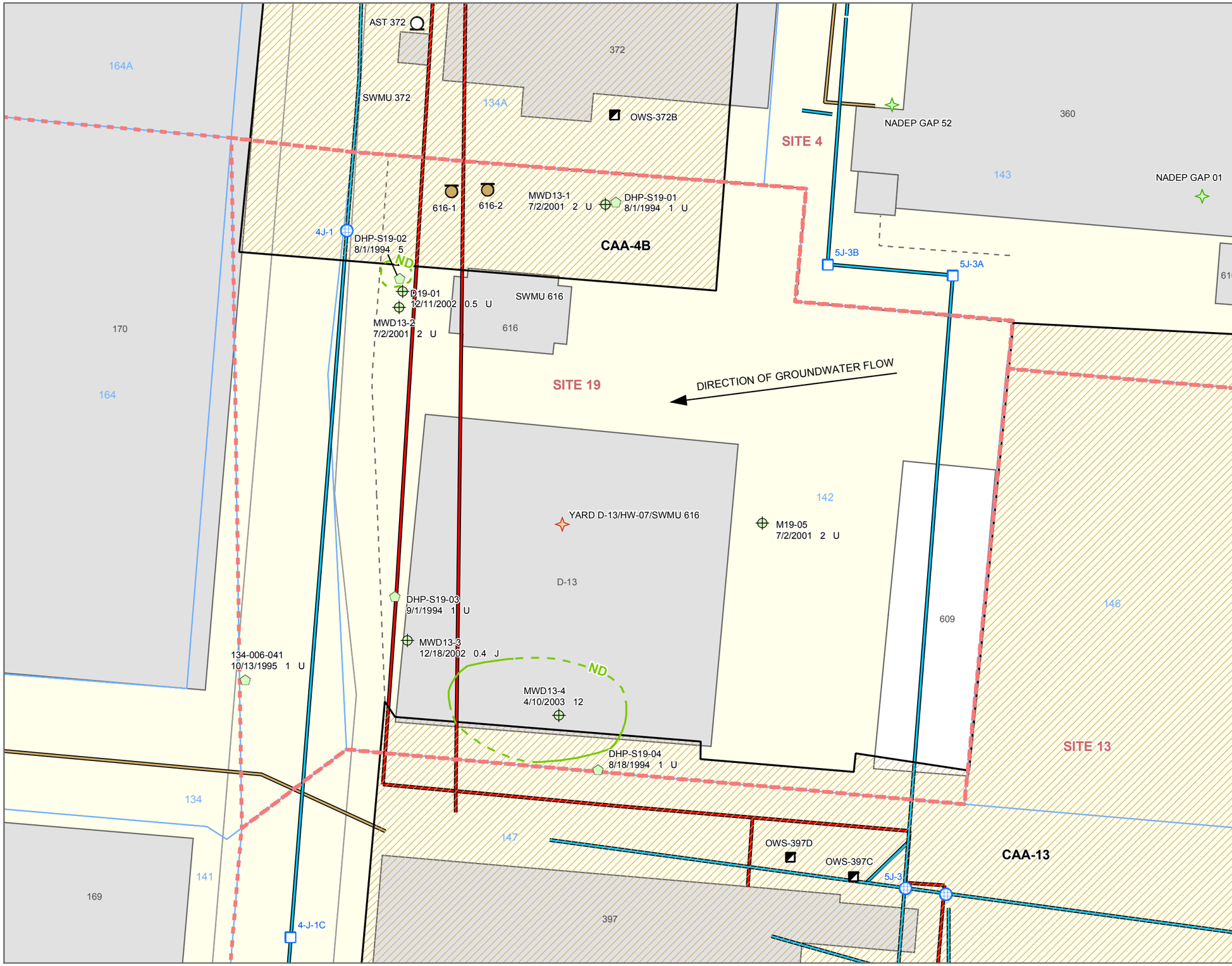


SAMPLE LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- APPROXIMATE EXTENT OF PCE PLUME (DASHED WHERE INFERRED)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
J = Estimated
NADEP = Naval Aviation Depot Alameda
ND = Non-detect
PCE= Tetrachloroethene
U = Not detected
Groundwater data used in the RI were collected between 1990 and April 2003.

25 0 25 50 Feet

N

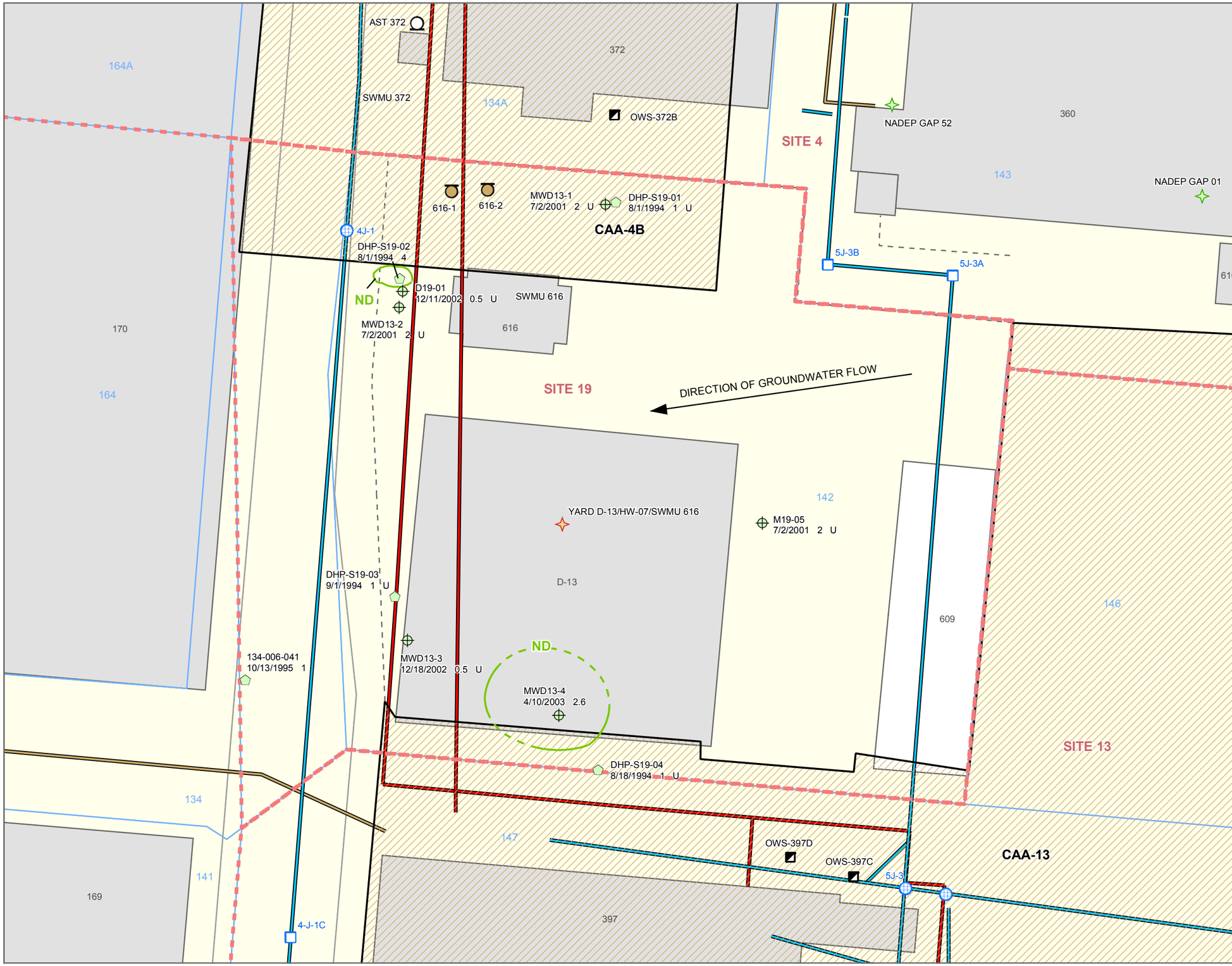
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-8
SITE 19
TETRACHLOROETHENE
IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-12 U:\almda_sa\DO028\OU2A\RI\mxd\fig07-08_s19_gw_pce.mxd TtEMI-SA K. Johnson



SAMPLE LOCATION

- Hydropunch
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL-WATER SEPARATOR (OWS)
- APPROXIMATE EXTENT OF TCE PLUME (DASHED WHERE INFERRED)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
ND = Non-detect
TCE = Trichloroethene
U = Not detected
Groundwater data used in the RI were collected between 1990 and April 2003.

25 0 25 50 Feet

N

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-9
SITE 19
TRICHLOROETHENE IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-12 U:\almda_sa\DO028\OU2A\RI\mxd\fig07-09_s19_gw_tce.mxd TtEMI-SA K. Johnson

TABLE 7-1: SITE 19 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
CERCLA INVESTIGATIONS														
Phases 1 & 2A Investigation, 1991														
BD13-5	BD13-5 [0.5-1.0]	07/03/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	X	--
	BD13-5 [1.0-1.5]	07/03/1990	1 - 1.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-5 [2.0-2.5]	07/03/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-5 [2.5-3.0]	07/03/1990	2.5 - 3	--	--	--	X	X	X	X	--	--	X	--
	BD13-5 [5.0-5.5]	07/03/1990	5 - 5.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-5 [5.5-6.0]	07/03/1990	5.5 - 6	X	--	--	X	X	--	X	--	--	X	--
	BD13-5 [9.5-10.0]	07/03/1990	9.5 - 10	--	X	--	--	--	--	--	--	--	--	--
	BD13-5 [10.0-10.5]	07/03/1990	10 - 10.5	X	--	--	X	X	--	X	--	--	X	--
	BD13-5 [11.0-11.5]	07/03/1990	11 - 11.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-5 [11.5-12.0]	07/03/1990	11.5 - 12	--	--	--	--	--	--	X	--	--	--	--
	BD13-5 [14.0-14.5]	07/03/1990	14 - 14.5	--	X	--	--	--	--	--	--	--	--	--
BD13-6	BD13-6 [0.5-1.0]	07/03/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	X	--
	BD13-6 [1.0-1.5]	07/03/1990	1 - 1.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-6 [2.0-2.5]	07/03/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-6 [2.5-3.0]	07/03/1990	2.5 - 3	--	--	--	X	X	X	X	--	--	X	--
	BD13-6 [5.0-5.5]	07/03/1990	5 - 5.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-6 [5.5-6.0]	07/03/1990	5.5 - 6	--	--	--	X	X	--	X	--	--	X	--
	BD13-6 [8.0-8.5]	07/03/1990	8 - 8.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-6 [8.5-9.0]	07/03/1990	8.5 - 9	--	--	--	X	X	--	X	--	--	X	--
	BD13-6 [9.5-10.0]	07/03/1990	9.5 - 10	--	--	--	X	X	--	X	--	--	X	--
	BD13-6 [11.0-11.5]	07/03/1990	11 - 11.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-6 [14.0-14.5]	07/03/1990	14 - 14.5	--	X	--	--	--	--	--	--	--	--	--
BD13-7	BD13-7 [0.5-1.0]	07/03/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	X	--
	BD13-7 [1.0-1.5]	07/03/1990	1 - 1.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-7 [1.5-2.0]	07/03/1990	1.5 - 2	X	X	--	--	--	--	--	--	--	--	--
	BD13-7 [2.0-2.5]	07/03/1990	2 - 2.5	--	--	--	X	X	X	X	--	--	X	--
	BD13-7 [4.5-5.0]	07/03/1990	4.5 - 5	X	X	--	--	--	--	--	--	--	--	--
	BD13-7 [5.0-5.5]	07/03/1990	5 - 5.5	--		--	X	X	--	X	--	--	X	--
	BD13-7 [8.0-8.5]	07/03/1990	8 - 8.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-7 [8.5-9.0]	07/03/1990	8.5 - 9	--	--	--	X	X	--	X	--		X	--
	BD13-7 [11.0-11.5]	07/03/1990	11 - 11.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-7 [11.5-12.0]	07/03/1990	11.5 - 12	--	--	--	--	--	--	X	--	--	--	--
	BD13-7 [14.0-14.5]	07/03/1990	14 - 14.5	--	X	--	--	--	--	--	--	--	--	--

TABLE 7-1: SITE 19 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)														
BD13-8	BD13-8 [0.5-1.0]	07/05/1990	0.5 - 1	X	--	--	X	X	--	X	--	--	X	--
	BD13-8 [1.0-1.5]	07/05/1990	1 - 1.5	--	--	--	--	--	--	--	--	--	--	--
	BD13-8 [2.5-3.0]	07/03/1990	2.5 - 3	X	X	--	--	--	--	--	--	--	--	--
	BD13-8 [3.0-3.5]	07/05/1990	3 - 3.5	--	--	--	X	X	X	X	--	--	X	--
	BD13-8 [6.0-6.5]	07/03/1990	6 - 6.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-8 [8.0-8.5]	07/05/1990	8 - 8.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-8 [10.5-11.0]	07/03/1990	10.5 - 11	X	X	--	--	--	--	--	--	--	--	--
	BD13-8 [11.0-11.5]	07/05/1990	11 - 11.5	--	--	--	X	X	--	X	--	--	X	--
	BD13-8 [12.5-13.0]	07/03/1990	12.5 - 13	X	X	--	--	--	--	--	--	--	--	--
	BD13-8 [13.0-13.5]	07/05/1990	13 - 13.5	--	--	--	X	X	--	X	--	--	X	--
	BD13-8 [14.5-15.0]	07/03/1990	14.5 - 15	--	X	--	--	--	--	--	--	--	--	--
BD13-9	BD13-9 [0.5-1.0]	07/05/1990	0.5 - 1	X	--	--	X	X	X	X	--	--	X	--
	BD13-9 [1.0-1.5]	07/05/1990	1 - 1.5	--	--	--	--	--	X	--	--	--	--	--
	BD13-9 [2.0-2.5]	07/03/1990	2 - 2.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-9 [3.5-4.0]	07/05/1990	3.5 - 4	--	--	--	X	X	X	X	--	--	X	--
	BD13-9 [5.0-5.5]	07/03/1990	5 - 5.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-9 [8.0-8.5]	07/05/1990	8 - 8.5	--	--	--	X	X	--	X	--	--	X	--
	BD13-9 [8.5-9.0]	07/05/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--	--
	BD13-9 [11.0-11.5]	07/05/1990	11 - 11.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-9 [11.5-12.0]	07/18/1990	11.5 - 12	--	X	--	--	--	--	--	--	--	--	--
	BD13-9 [14.0-14.5]	07/03/1990	14 - 14.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-9 [14.5-15.0]	07/05/1990	14.5 - 15	--	--	--	X	X	--	X	--	--	X	--
BD13-10	BD13-10 [0.5-1.0]	07/05/1990	0.5 - 1	--	--	--	X	X	X	--	--	--	X	--
	BD13-10 [1.5-2.0]	07/05/1990	1.5 - 2	--	--	--	--	--	X	--	--	--	--	--
	BD13-10 [2.0-2.5]	07/05/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--	--
	BD13-10 [3.0-3.5]	07/05/1990	3 - 3.5	--	--	--	X	X	--	X	--	--	X	--
	BD13-10 [4.5-5.0]	07/05/1990	4.5 - 5	--	X	--	--	--	--	--	--	--	--	--
	BD13-10 [5.0-5.5]	07/05/1990	5 - 5.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-10 [7.5-8.0]	07/05/1990	7.5 - 8	X	X	--	--	--	--	--	--	--	--	--
	BD13-10 [8.0-8.5]	07/05/1990	8 - 8.5	--	--	--	X	X	--	X	--	--	X	--
	BD13-10 [10.5-11.0]	07/05/1990	10.5 - 11	--	X	--	--	--	--	--	--	--	--	--
	BD13-10 [11.0-11.5]	07/05/1990	11 - 11.5	--	--	--	--	--	--	X	--	--	--	--
	BD13-10 [13.5-14.0]	07/05/1990	13.5 - 14	X	X	--	--	--	--	--	--	--	--	--
	BD13-10 [14.0-14.5]	07/05/1990	14 - 14.5	--	--	--	X	X	--	X	--	--	X	--

TABLE 7-1: SITE 19 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)														
BD13-11	BD13-11 [1.0-1.5]	07/10/1990	1 - 1.5	X	--	--	X	X	--	X	--	--	X	--
	BD13-11 [1.5-2.0]	07/10/1990	1.5 - 2	--	--	--	--	--	X	--	--	--	--	--
	BD13-11 [2.5-3.0]	07/10/1990	2.5 - 3	--	X	--	--	--	--	--	--	--	--	--
	BD13-11 [4.0-4.5]	07/10/1990	4 - 4.5	X	--	--	X	X	X	--	--	--	X	--
	BD13-11 [6.0-6.5]	07/10/1990	6 - 6.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-11 [9.0-9.5]	07/10/1990	9 - 9.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-11 [11.5-12.0]	07/10/1990	11.5 - 12	X	--	--	X	X	--	--	--	--	X	--
	BD13-11 [12.5-13.0]	07/10/1990	12.5 - 13	--	X	--	--	--	--	X	--	--	--	--
	BD13-11 [13.0-13.5]	07/10/1990	13 - 13.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-11 [15.0-15.5]	07/09/1990	15 - 15.5	--	X	--	X	--	--	--	--	--	--	--
BD13-12	BD13-12 [1.5-2.0]	07/09/1990	1.5 - 2	X	--	--	X	X	--	--	--	--	X	--
	BD13-12 [2.0-2.5]	07/09/1990	2 - 2.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-12 [3.0-3.5]	07/09/1990	3 - 3.5	--	--	--	--	--	X	X	--	--	--	--
	BD13-12 [4.5-5.0]	07/09/1990	4.5 - 5	X	--	--	X	X	X	--	--	--	X	--
	BD13-12 [5.0-5.5]	07/09/1990	5 - 5.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-12 [8.5-9.0]	07/09/1990	8.5 - 9	--	X	--	--	--	--	X	--	--	--	--
	BD13-12 [9.5-10.0]	07/09/1990	9.5 - 10	X	--	--	X	X	--	--	--	--	X	--
	BD13-12 [10.5-11.0]	07/09/1990	10.5 - 11	--	X	--	--	--	--	X	--	--	--	--
	BD13-12 [12.0-12.5]	07/09/1990	12 - 12.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-12 [14.5-15.0]	07/09/1990	14.5 - 15	X	--	--	X	X	--	--	--	--	X	--
	BD13-12 [15.0-15.5]	07/09/1990	15 - 15.5	--	X	--	--	--	--	X	--	--	--	--
BD13-13	BD13-13 [2.0-2.5]	07/11/1990	2 - 2.5	X	--	--	X	X	--	X	--	--	X	--
	BD13-13 [2.5-3.0]	07/11/1990	2.5 - 3	--	--	--	--	--	X	--	--	--	--	--
	BD13-13 [7.0-7.5]	07/09/1990	7 - 7.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-13 [8.0-8.5]	07/11/1990	8 - 8.5	X	--	--	X	X	X	--	--	--	X	--
	BD13-13 [8.5-9.0]	07/11/1990	8.5 - 9	--	X	--	--	--	--	X	--	--	--	--
	BD13-13 [9.5-10.0]	07/09/1990	9.5 - 10	--	X	--	--	--	--	X	--	--	--	--
	BD13-13 [11.0-11.5]	07/11/1990	11 - 11.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-13 [12.0-12.5]	07/09/1990	12 - 12.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-13 [14.0-14.5]	07/11/1990	14 - 14.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-13 [14.5-15.0]	07/09/1990	14.5 - 15	X	--	--	--	--	--	--	--	--	--	--
	BD13-13 [15.0-15.5]	07/09/1990	15 - 15.5	--	X	--	--	--	--	X	--	--	--	--

TABLE 7-1: SITE 19 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)														
BD13-14	BD13-14 [2.0-2.5]	07/09/1990	2 - 2.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-14 [2.5-3.0]	07/09/1990	2.5 - 3	--	--	--	--	--	X	X	--	--	--	--
	BD13-14 [3.5-4.0]	07/09/1990	3.5 - 4	--	X	--	--	--	--	--	--	--	--	--
	BD13-14 [4.0-4.5]	07/09/1990	4 - 4.5	X	--	--	X	X	X	--	--	--	X	--
	BD13-14 [9.5-10.0]	07/09/1990	9.5 - 10	--	X	--	--	--	--	X	--	--	--	--
	BD13-14 [13.5-14.0]	07/09/1990	13.5 - 14	--	X	--	--	--	--	X	--	--	--	--
	BD13-14 [14.0-14.5]	07/09/1990	14 - 14.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-14 [14.5-15.0]	07/09/1990	14.5 - 15	--	X	--	--	--	--	X	--	--	--	--
	BD13-14 [15.0-15.5]	07/09/1990	15 - 15.5	X	--	--	X	X	--	--	--	--	X	--
	BD13-14 [15.5-16.0]	07/09/1990	15.5 - 16	--	X	--	--	--	--	X	--	--	--	--
BD13-15	BD13-15 [2.0-2.5]	07/10/1990	2 - 2.5	X	--	--	X	X	--	X	--	--	X	--
	BD13-15 [2.5-3.0]	07/10/1990	2.5 - 3	--	--	--	--	--	X	--	--	--	--	--
	BD13-15 [4.0-4.5]	07/10/1990	4 - 4.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-15 [8.5-9.0]	07/10/1990	8.5 - 9	X	--	--	X	X	X	--	--	--	X	--
	BD13-15 [10.5-11.0]	07/10/1990	10.5 - 11	--	X	--	--	--	--	X	--	--	--	--
	BD13-15 [11.5-12.0]	07/10/1990	11.5 - 12	--	X	--	--	--	--	X	--	--	--	--
	BD13-15 [12.5-13.0]	07/10/1990	12.5 - 13	X		--	X	X	--	--	--	--	X	--
	BD13-15 [13.0-13.5]	07/10/1990	13 - 13.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-15 [13.5-14.0]	07/10/1990	13.5 - 14	X	--	--	X	X	--	--	--	--	X	--
	BD13-15 [14.5-15.0]	07/09/1990	14.5 - 15	--	X	--	X	--	X	--	--	--	X	--
BD13-16	BD13-16 [1.5-2.0]	07/10/1990	1.5 - 2	X	--	--	X	X	--	X	--	--	X	--
	BD13-16 [2.0-2.5]	07/10/1990	2 - 2.5	--	--	--	--	--	X	--	--	--	--	--
	BD13-16 [3.0-3.5]	07/10/1990	3 - 3.5	--	X	--	--	--	--	--	--	--	--	--
	BD13-16 [5.0-5.5]	07/10/1990	5 - 5.5	X	--	--	X	X	X	--	--	--	X	--
	BD13-16 [6.0-6.5]	07/10/1990	6 - 6.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-16 [9.0-9.5]	07/10/1990	9 - 9.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-16 [10.5-11.0]	07/10/1990	10.5 - 11	X	--	--	X	X	--	--	--	--	X	--
	BD13-16 [12.0-12.5]	07/10/1990	12 - 12.5	--	X	--	--	--	--	X	--	--	--	--
	BD13-16 [13.5-14.0]	07/10/1990	13.5 - 14	X	--	--	X	X	--	--	--	--	X	--
	BD13-16 [14.0-14.5]	07/10/1990	14 - 14.5	--	X	--	--	--	--	X	--	--	--	--
MWD13-1	MWD13-1 [0.5-1.0]	07/11/1990	0.5 - 1	X	--	--	X	X	--	X	--	--	X	--
	MWD13-1 [1.0-1.5]	07/11/1990	1 - 1.5	--	--	--	--	--	X	--	--	--	--	--
	MWD13-1 [3.5-4.0]	07/11/1990	3.5 - 4	--	X	--	--	--	--	--	--	--	--	--
	MWD13-1 [7.0-7.5]	07/11/1990	7 - 7.5	X	--	--	X	X	X	--	--	--	X	--

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SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
Phases 1 & 2A Investigation, 1991 (Continued)														
MWD13-1	MWD13-1 [8.5-9.0]	07/11/1990	8.5 - 9	--	X	--	--	--	--	X	--	--	--	--
(Continued)	MWD13-1 [9.5-10.0]	07/11/1990	9.5 - 10	--	X	--	--	--	--	X	--	--	--	--
	MWD13-1 [10.0-10.5]	07/11/1990	10 - 10.5	X	--	--	X	X	--	--	--	--	X	--
	MWD13-1 [12.5-13.0]	07/11/1990	12.5 - 13	--	X	--	--	--	--	X	--	--	--	--
	MWD13-1 [13.0-13.5]	07/11/1990	13 - 13.5	X	--	--	X	X	--	--	--	--	X	--
	MWD13-1 [14.0-14.5]	07/11/1990	14 - 14.5	--	X	--	--	--	--	X	--	--	--	--
MWD13-2	MWD13-2 [0.5-1.0]	07/06/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	X	--
	MWD13-2 [1.5-2.0]	07/06/1990	1.5 - 2	X	X	--	--	--	X	--	--	--	--	--
	MWD13-2 [2.0-2.5]	07/06/1990	2 - 2.5	--	--	--	X	X	--	X	--	--	X	--
	MWD13-2 [3.5-4.0]	07/27/1990	3.5 - 4	--	--	--	--	--	X	--	--	--	--	--
	MWD13-2 [5.0-5.5]	07/27/1990	5 - 5.5	--	X	--	--	--	--	--	--	--	--	--
	MWD13-2 [8.5-9.0]	07/27/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--	--
	MWD13-2 [9.0-9.5]	07/06/1990	9 - 9.5	--	--	--	X	X	--	X	--	--	X	--
	MWD13-2 [13.0-13.5]	07/27/1990	13 - 13.5	X	X	--	--	--	--	--	--	--	--	--
	MWD13-2 [13.5-14.0]	07/06/1990	13.5 - 14	--	--	--	X	X	--	X	--	--	X	--
	MWD13-2 [14.5-15.0]	07/06/1990	14.5 - 15	--	X	--	--	--	--	--	--	--	--	--
MWD13-3	MWD13-3 [0.5-1.0]	07/06/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	X	--
	MWD13-3 [2.0-2.5]	07/27/1990	2 - 2.5	--	--	--	--	--	X	--	--	--	--	--
	MWD13-3 [3.5-4.0]	07/27/1990	3.5 - 4	--	X	--	--	--	--	--	--	--	--	--
	MWD13-3 [4.0-4.5]	07/06/1990	4 - 4.5	X	X	--	--	--	--	--	--	--	--	--
	MWD13-3 [5.0-5.5]	07/06/1990	5 - 5.5	--	--	--	X	X	--	X	--	--	X	--
	MWD13-3 [11.5-12.0]	07/06/1990	11.5 - 12	X	X	--	--	--	--	--	--	--	--	--
	MWD13-3 [12.0-12.5]	07/27/1990	12 - 12.5	--	--	--	X	--	--	--	--	--	--	--
	MWD13-3 [14.0-14.5]	07/06/1990	14 - 14.5	X	X	--	--	--	--	--	--	--	--	--
	MWD13-3 [14.5-15.0]	07/27/1990	14.5 - 15	--	--	--	X	--	--	--	--	--	--	--
Follow-on Investigation, 1994														
B19-17	280-S19-001	08/22/1994	1 - 2	X	--	--	--	--	X	X	--	--	X	--
	280-S19-002	08/22/1994	2.5 - 3.5	X	X	--	--	--	X	X	--	--	X	--
	280-S19-003	08/22/1994	5 - 6	X	X	--	--	--	X	X	--	--	X	--
B19-18	280-S19-004	08/22/1994	1 - 2	X	--	--	--	--	X	X	--	--	X	--
	280-S19-005	08/22/1994	2 - 3	X	X	--	--	--	X	X	--	--	X	--
	280-S19-006	08/22/1994	4.5 - 5.5	X	X	--	--	--	X	X	--	--	X	--
B19-19	280-S19-008	08/22/1994	1 - 2	--	--	--	--	--	X	X	--	--	X	--
	280-S19-009	08/22/1994	2.5 - 3.5	--	X	--	--	--	X	X	--	--	X	--
	280-S19-010	08/22/1994	5 - 6	--	X	--	--	--	X	X	--	--	X	--
M19-05	280-S19-011	11/06/1994	0.5 - 1.5	X	X	--	--	--	X	X	--	--	X	--
	280-S19-012	11/06/1994	2.5 - 3.5	X	X	--	--	--	X	X	--	--	X	--
	280-S19-013	11/06/1994	4.5 - 5.5	X	X	--	--	--	X	X	--	--	X	--

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SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
PAH Study, 2003														
C3S019B001	C0591045	7/31/2003	0 - 0.5	--	--	X								
	C0591046	7/31/2003	0.5 - 2	--	--	X								
	C0591047	7/31/2003	2 - 4	--	--	X								
	C0591048	7/31/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B002	C0591049	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591050	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591051	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591052	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B003	C0591053	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591055	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591056	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591057	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B004	C0591058	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591059	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591060	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591061	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B005	C0591062	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591063	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591065	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591066	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B006	C0591067	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591068	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591069	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591070	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B007	C0591071	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591072	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591073	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591075	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B008	C0591076	7/31/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591077	7/31/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591078	7/31/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591079	7/31/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B009	C0591080	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591081	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591082	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591083	8/1/2003	4 - 8		--	X	--	--	--	--	--	--	--	--

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SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
PAH Study, 2003 (Continued)														
C3S019B010	C0591085	7/31/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591086	7/31/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591087	7/31/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591088	7/31/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B011	C0591089	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591090	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591091	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591092	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B012	C0591093	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591095	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591096	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591097	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
C3S019B013	C0591098	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--
	C0591099	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--
	C0591100	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--
	C0591101	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--
ENVIRONMENTAL BASELINE SURVEY														
Phase IIA Environmental Baseline Survey														
134-IW-005	134I-005	01/05/1995	7 - 7.5	X	X	--	X	X	X	X	X	X	--	X
	134I-005M	01/05/1995	7 - 7.5	--	X	--	--	X	--	--	--	--	--	--
134-SN-003	134S-003	01/25/1995	3 - 3.5	X	--	--	--	--	X	--	--	--	--	--
	134S-003M	01/25/1995	3 - 3.5	--	X	--	--	X	--	X	--	--	--	--
134-SS-003	134M-003	02/09/1995	7.5 - 8	X	--	--	X	--	X	--	--	X	--	X
	134M-003M	02/09/1995	7.5 - 8	--	X	--	--	X	--	X	--	--	--	--
134-Z22-025	134-0025	04/05/1995	2.5 - 3	X	--	--	--	--	X	--	--	--	--	--
	134-0025M	04/05/1995	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--
210-IW-004	210I-004	02/14/1995	4 - 4.5	X	X	--	X	X	X	X	X	X	--	X
	210I-004M	02/14/1995	4 - 4.5	--	X	--	--	X	--	--	--	--	--	--
Phase IIB Environmental Baseline Survey														
134-006-041	134-0071	10/13/1995	3 - 4	X	X	--	X	--	X	X	--	--	--	--
	134-0072	10/13/1995	5.5 - 6.5	X	X	--	X	--	X	X	--	--	--	--

TABLE 7-1: SITE 19 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED										
				SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Herbicides	Tin	Cyanide	Organic Lead
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS														
Fuel Line and Underground Storage Tank Investigations														
372-1-MOJ	372-P1	09/02/1997	6	--	X	--	--	--	--	X	--	--	--	--
372-2-MOJ	372-P2	09/02/1997	5.5	--	X	--	--	--	--	X	--	--	--	--
372-MW2	372-MW2	01/20/1995	3.5	--	X	--	--	--	--	X	--	--	--	--
REMOVAL ACTIONS														
Basewide Fuel Line Removal Action Confirmation Sampling														
030-S19-005	030-S19-005	10/22/1998	0 - 3	X	X	--	X	X	X	X	--	--	--	--
030-S19-007	030-S19-007	10/22/1998	0 - 2.5	X	X	--	X	X	X	X	--	--	--	--

Notes:

--	These analyses were not performed.
ft bgs	Feet below ground surface
General chemistry	Percent moisture, flashpoint, major anions, TKN, reactivity, TOC, and/or pH
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic compound
TKN	Total Kjelkahl nitrogen
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound
X	These analyses were performed.

TABLE 7-12: SITE 19 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.4	NA
1,1,1-TRICHLOROETHANE	55	15	27	2	0.6J	8	0.5	5	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	55	0	0	--	--	--	**0.5**	**5**	0	55	0.06	1
1,1,2-TRICHLOROETHANE	55	0	0	--	--	--	**0.5**	**5**	0	55	0.2	5
1,1-DICHLOROETHANE	55	36	65	**6**	0.5J	**27**	0.5	**5**	27	1	2 (CAL-modified)	5
1,1-DICHLOROETHENE	55	7	13	0.8	0.2J	2	0.5	5	0	0	340	6
1,1-DICHLOROPROPENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	8	0	0	--	--	--	**0.5**	**0.5**	0	8	0.006	NA
1,2,4-TRICHLOROBENZENE	16	1	6	0.1	0.1J	0.1J	0.5	1	0	0	190	5
1,2,4-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	16	0	0	--	--	--	**0.5**	**1**	0	16	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	22	0	0	--	--	--	0.5	2	0	0	370	600
1,2-DICHLOROETHANE	55	1	2	**0.7**	**0.7**	**0.7**	**0.5**	**5**	1	54	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	39	12	31	3	0.3J	8	1	5	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	55	1	2	**2**	**2**	**2**	**0.5**	**5**	1	54	0.2	5
1,3,5-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	12	NA
1,3-DICHLOROBENZENE	22	0	0	--	--	--	0.5	2	0	0	6	NA
1,3-DICHLOROPROPANE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
1,4-DICHLOROBENZENE	22	0	0	--	--	--	0.5	**2**	0	14	0.5	5
2,2-DICHLOROPROPANE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-BUTANONE	19	1	5	0.7	0.7J	0.7J	2	14	--	--	NA	NA
2-CHLOROTOLUENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
2-HEXANONE	49	0	0	--	--	--	2	10	--	--	NA	NA
4-CHLOROTOLUENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
4-METHYL-2-PENTANONE	55	0	0	--	--	--	2	10	--	--	NA	NA
ACETONE	21	2	10	20	1J	38J	0.5	10	0	0	610	NA
BENZENE	55	8	15	**0.7**	0.2J	**2**	0.3	**5**	4	46	0.3	1
BROMOBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	20	NA
BROMOCHLOROMETHANE	16	0	0	--	--	--	0.5	1	--	--	NA	NA
BROMODICHLOROMETHANE	55	0	0	--	--	--	**0.5**	**5**	0	55	0.2	80

TABLE 7-12: SITE 19 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMOFORM	55	0	0	--	--	--	1	5	0	0	9	80
BROMOMETHANE	55	0	0	--	--	--	1	**10**	0	4	9	NA
CARBON DISULFIDE	55	2	4	2	0.4J	4	0.5	5	0	0	1,000	NA
CARBON TETRACHLORIDE	55	0	0	--	--	--	**0.5**	**5**	0	55	0.2	0.5
CHLOROBENZENE	55	0	0	--	--	--	0.5	5	0	0	110	70
CHLOROETHANE	55	0	0	--	--	--	1	**10**	0	4	5	NA
CHLOROFORM	55	1	2	0.2	0.2J	0.2J	0.5	**5**	0	47	0.5 (CAL-modified)	80
CHLOROMETHANE	55	0	0	--	--	--	1	**10**	0	39	2	NA
CIS-1,2-DICHLOROETHENE	16	5	31	2	0.2J	3	0.5	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	47	0	0	--	--	--	**0.5**	**5**	0	47	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	55	0	0	--	--	--	**0.5**	**5**	0	55	0.1	80
DIBROMOMETHANE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
DICHLORODIFLUOROMETHANE	8	0	0	--	--	--	1	1	0	0	390	NA
DIISOPROPYL ETHER	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	55	1	2	0.1	0.1J	0.1J	0.5	**5**	0	4	3	300
ETHYLENE DIBROMIDE	16	0	0	--	--	--	0.5	1	--	--	NA	0.05
HEXACHLOROBUTADIENE	8	0	0	--	--	--	0.5	0.5	0	0	0.9	NA
ISOPROPYLBENZENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
M,P-XYLENE	8	1	13	0.4	0.4J	0.4J	0.5	0.5	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	14	1	7	0.3	0.3J	0.3J	0.2	5	0	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	55	0	0	--	--	--	0.2	**12**	0	8	4	NA
N-BUTYLBENZENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	240	NA
NAPHTHALENE	8	2	25	2	2J	2	2	3	0	0	6	NA
O-XYLENE	8	1	13	0.1	0.1J	0.1J	0.5	0.5	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
SEC-BUTYLBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	240	NA
STYRENE	55	0	0	--	--	--	0.5	5	0	0	1,600	100
TERT-AMYL METHYL ETHER	8	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	8	0	0	--	--	--	10	20	--	--	NA	NA

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Volatile Organic Compounds (µg/L)												
TERT-BUTYLBENZENE	8	0	0	--	--	--	0.5	0.5	0	0	240	NA
TETRACHLOROETHENE	55	16	29	**7**	0.4 J	**22**	0.5	**5**	14	37	0.7	5
TOLUENE	55	2	4	3	0.4 J	5	0.5	5	0	0	720	150
TRANS-1,2-DICHLOROETHENE	16	1	6	0.1	0.1 J	0.1 J	0.5	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	47	0	0	--	--	--	**0.5**	**5**	0	47	0.4 (not trans)	0.5
TRICHLOROETHENE	55	13	24	**2**	**0.6**	**4**	**0.5**	**5**	13	42	0.03	5
TRICHLOROFLUOROMETHANE	8	0	0	--	--	--	1	1	--	--	NA	NA
VINYL ACETATE	4	0	0	--	--	--	5	5	0	0	410	NA
VINYL CHLORIDE	55	0	0	--	--	--	**0.5**	**10**	0	55	0.02 (child or adult)	0.5
XYLENE (TOTAL)	47	1	2	2	2	2	1	5	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	39	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	39	0	0	--	--	--	5	10	0	0	370	600
1,3-DICHLOROBENZENE	39	0	0	--	--	--	5	**10**	0	5	6	NA
1,4-DICHLOROBENZENE	39	0	0	--	--	--	**5**	**10**	0	39	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	35	1	3	1	1 J	1 J	10	10	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	39	0	0	--	--	--	25	50	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	39	0	0	--	--	--	**10**	**10**	0	39	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	39	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	39	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	37	0	0	--	--	--	25	50	0	0	73	NA
2,4-DINITROTOLUENE	39	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	39	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	39	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	39	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	39	0	0	--	--	--	10	10	--	--	NA	NA
2-METHYLPHENOL	39	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	39	0	0	--	--	--	**25**	**50**	0	39	1	NA
2-NITROPHENOL	39	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	39	0	0	--	--	--	**10**	**20**	0	39	0.2	NA

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Semivolatile Organic Compounds (ug/L)												
3-NITROANILINE	39	0	0	--	--	--	25	50	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	39	0	0	--	--	--	25	50	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	39	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	39	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	39	0	0	--	--	--	10	17	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	39	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	39	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	39	0	0	--	--	--	25	50	--	--	NA	NA
4-NITROPHENOL	39	0	0	--	--	--	25	50	--	--	NA	NA
ACENAPHTHENE	39	1	3	0.5	0.5J	0.5J	10	10	0	0	370	NA
ACENAPHTHYLENE	39	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	39	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	39	0	0	--	--	--	**10**	**10**	0	39	0.09	0.1
BENZO(A)PYRENE	39	0	0	--	--	--	**1**	**10**	0	39	0.009	0.2
BENZO(B)FLUORANTHENE	39	0	0	--	--	--	**10**	**10**	0	39	0.09	NA
BENZO(G,H,I)PERYLENE	39	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	39	0	0	--	--	--	**10**	**10**	0	39	0.06 (CAL-modified)	NA
BENZOIC ACID	4	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	4	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	39	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	39	0	0	--	--	--	**10**	**10**	0	39	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	39	1	3	**180**	**180**	**180**	4	**10**	1	10	5	NA
BUTYLBENZYLPHTHALATE	39	0	0	--	--	--	10	10	0	0	7,300	NA
CARBAZOLE	35	0	0	--	--	--	**10**	**10**	0	35	3	NA
CHRYSENE	39	0	0	--	--	--	**10**	**10**	0	39	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	39	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	39	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	39	0	0	--	--	--	**10**	**20**	0	39	0.009	NA
DIBENZOFURAN	39	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	39	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	39	0	0	--	--	--	10	10	0	0	360,000	NA

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Semivolatile Organic Compounds (µg/L)												
FLUORANTHENE	39	1	3	0.6	0.6J	0.6J	10	10	0	0	1,500	NA
FLUORENE	39	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	39	0	0	--	--	--	**10**	**10**	0	39	0.04	1
HEXACHLOROBUTADIENE	39	0	0	--	--	--	**10**	**10**	0	39	0.9	NA
HEXACHLOROCYCLOPENTADIENE	39	0	0	--	--	--	10	11	0	0	220	NA
HEXACHLOROETHANE	39	0	0	--	--	--	**10**	**10**	0	39	5	NA
INDENO(1,2,3-CD)PYRENE	39	0	0	--	--	--	**10**	**10**	0	39	0.09	NA
ISOPHORONE	39	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	39	0	0	--	--	--	**10**	**10**	0	39	0.01	NA
N-NITROSODIPHENYLAMINE	39	0	0	--	--	--	10	10	0	0	14	NA
NAPHTHALENE	39	4	10	2	0.8J	2J	**10**	**10**	0	35	6	NA
NITROBENZENE	39	0	0	--	--	--	**10**	**10**	0	39	3	NA
PENTACHLOROPHENOL	39	0	0	--	--	--	**25**	**50**	0	39	0.6	1
PHENANTHRENE	39	3	8	0.8	0.5J	1J	10	10	--	--	NA	NA
PHENOL	39	0	0	--	--	--	10	10	0	0	22,000	NA
PYRENE	39	3	8	0.8	0.5J	1J	10	10	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	6	0	0	--	--	--	5	5	0	0	370	NA
ACENAPHTHYLENE	6	0	0	--	--	--	2	2	--	--	NA	NA
ANTHRACENE	6	1	17	0.1	0.1J	0.1J	0.2	0.2	0	0	1,800	NA
BENZO(A)ANTHRACENE	6	0	0	--	--	--	**0.2**	**0.2**	0	6	0.09	0.1
BENZO(A)PYRENE	6	0	0	--	--	--	**0.2**	**0.2**	0	6	0.009	0.2
BENZO(B)FLUORANTHENE	6	0	0	--	--	--	**0.2**	**0.2**	0	6	0.09	NA
BENZO(G,H,I)PERYLENE	6	0	0	--	--	--	0.2	0.2	--	--	NA	NA
BENZO(K)FLUORANTHENE	6	0	0	--	--	--	**0.2**	**0.2**	0	6	0.06 (CAL-modified)	NA
CHRYSENE	6	0	0	--	--	--	0.2	0.2	0	0	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	6	0	0	--	--	--	**0.5**	**0.5**	0	6	0.009	NA
FLUORANTHENE	6	2	33	0.2	0.1J	0.2J	0.2	0.2	0	0	1,500	NA
FLUORENE	6	1	17	0.7	0.7J	0.7J	1	1	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	6	0	0	--	--	--	**0.2**	**0.2**	0	6	0.09	NA

TABLE 7-12: SITE 19 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Polynuclear Aromatic Hydrocarbons (µg/L)												
NAPHTHALENE	6	1	17	4	4 J	4 J	5	5	0	0	6	NA
PHENANTHRENE	6	1	17	0.8	0.8 J	0.8 J	1	1	--	--	NA	NA
PYRENE	6	4	67	0.1	0.1 J	0.2 J	0.2	0.2	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	10	0	0	--	--	--	0.02	0.1	0	0	0.3	NA
4,4'-DDE	10	0	0	--	--	--	0.02	0.1	0	0	0.2	NA
4,4'-DDT	10	1	10	0.04	0.04	0.04	0.02	0.1	0	0	0.2	NA
ALDRIN	10	0	0	--	--	--	**0.02**	**0.05**	0	10	0.004	NA
ALPHA-BHC	10	0	0	--	--	--	0.02	0.05	--	--	NA	NA
ALPHA-CHLORDANE	6	0	0	--	--	--	0.05	0.05	0	0	0.2 (chlordane)	NA
AROCLOR-1016	11	0	0	--	--	--	0.3	**1**	0	1	1	NA
AROCLOR-1221	11	0	0	--	--	--	**0.3**	**2**	0	11	0.03	NA
AROCLOR-1232	11	0	0	--	--	--	**0.3**	**1**	0	11	0.03	NA
AROCLOR-1242	11	0	0	--	--	--	**0.3**	**1**	0	11	0.03	NA
AROCLOR-1248	11	0	0	--	--	--	**0.3**	**1**	0	11	0.03	NA
AROCLOR-1254	11	0	0	--	--	--	**0.5**	**1**	0	11	0.03	NA
AROCLOR-1260	11	0	0	--	--	--	**0.5**	**1**	0	11	0.03	NA
BETA-BHC	10	0	0	--	--	--	0.02	0.05	--	--	NA	NA
CHLORDANE	4	0	0	--	--	--	**0.3**	**0.3**	0	4	0.2	NA
DELTA-BHC	10	0	0	--	--	--	0.02	0.05	--	--	NA	NA
DIELDRIN	10	0	0	--	--	--	**0.02**	**0.1**	0	10	0.004	NA
ENDOSULFAN I	10	0	0	--	--	--	0.02	0.05	0	0	220	NA
ENDOSULFAN II	10	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDOSULFAN SULFATE	10	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDRIN	10	0	0	--	--	--	0.02	0.1	0	0	11	2
ENDRIN ALDEHYDE	10	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDRIN KETONE	6	0	0	--	--	--	0.1	0.1	--	--	NA	NA
GAMMA-BHC (LINDANE)	10	0	0	--	--	--	0.02	0.05	--	--	NA	NA
GAMMA-CHLORDANE	6	0	0	--	--	--	0.05	0.05	0	0	0.2 (chlordane)	NA
HEPTACHLOR	10	0	0	--	--	--	**0.02**	**0.05**	0	10	0.02	0.01

TABLE 7-12: SITE 19 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
PCBs/Pesticides (µg/L)												
HEPTACHLOR EPOXIDE	10	0	0	--	--	--	**0.01**	**0.02**	0	10	0.007	0.01
METHOXYCHLOR	10	0	0	--	--	--	0.05	0.5	0	0	180	30
TOXAPHENE	10	0	0	--	--	--	**1**	**3**	0	10	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	43	11	26	66,000	9.8J	**378,000**	6.4	81.9	3	0	36,000	NA
ANTIMONY	43	6	14	4.0	0.12J	12.6J	0.068	**60.0**	0	7	15.0	6.0
ARSENIC	43	12	28	**10.4**	**0.64J**	**59.0**	**1.0**	**100**	12	31	0.045	10.0
BARIUM	43	34	79	229	9.3J	**2,900**	12.6	266	1	0	2,600	1,000
BERYLLIUM	43	4	9	3.4	1.1J	9.0	0.10	5.0	0	0	73.0	4.0
CADMIUM	43	10	23	2.0	0.20J	6.0	0.15	5.0	0	0	18.0	5.0
CALCIUM	43	42	98	173,000	16,000	694,000	16,600	16,600	--	--	NA	NA
CHROMIUM	43	15	35	135	0.22J	1,000	0.35	16.0	--	--	NA	50.0
COBALT	43	11	26	40.8	0.046J	220	0.046	50.0	0	0	730	NA
COPPER	43	10	23	93.8	0.31J	550	0.35	25.0	0	0	1,500	1,300
CYANIDE	24	0	0	--	--	--	1.1	10.0	0	0	730	150
IRON	43	18	42	51,500	10.1J	**494,000**	3.2	130	4	0	11,000	NA
LEAD	43	6	14	139	0.20J	560	0.035	50.0	--	--	NA	15.0
MAGNESIUM	43	37	86	195,000	14.0J	780,000	13.2	6,090	--	--	NA	NA
MANGANESE	43	38	88	2,880	0.23J	**12,000J**	0.90	10.0	19	0	880	NA
MERCURY	39	0	0	--	--	--	0.095	0.20	0	0	11.0	2.0
MOLYBDENUM	43	7	16	4.1	0.56J	9.8J	1.8	50.0	0	0	180	NA
NICKEL	43	23	53	121	1.4J	**1,200**	2.1	27.7	1	0	730	100
POTASSIUM	43	41	95	13,600	2,600J	53,000	2,210	3,750	--	--	NA	NA
SELENIUM	41	10	24	40.9	0.85J	150	0.85	50.0	0	0	180	50.0
SILVER	42	1	2	0.43	0.43J	0.43J	0.078	10.0	0	0	180	NA
SODIUM	43	43	100	620,000	14,900	3,200,000	0.0	0.0	--	--	NA	NA
THALLIUM	43	1	2	**3.6**	**3.6J**	**3.6J**	0.12	**50.0**	1	27	2.4	2.0
TITANIUM	4	4	100	4,730	510	9,100	0.0	0.0	--	--	NA	NA
VANADIUM	43	10	23	181	1.5J	**930**	0.25	50.0	3	0	260	NA
ZINC	43	17	40	231	0.70J	1,700	3.8	83.9	0	0	11,000	NA

TABLE 7-12: SITE 19 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 7-14: SITE 19 SUMMARY OF HUMAN HEALTH RISKS; CENTRAL TENDENCY EXPOSURE

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	CANCER RISK					NONCANCER HAZARD				
EXPOSURE PATHWAY	**Current/ Future Industrial Worker (0-2 ft)**	**Future Construction Worker (0-2 ft)**	**Future Resident (Adult + Child) (0-2 ft)**	**Future Construction Worker (0-8 ft)**	**Future Resident (Adult + Child) (0-8 ft)**	**Current/ Future Industrial Worker (0-2 ft)**	**Future Construction Worker (0-2 ft)**	**Future Resident (Child) (0-2 ft)**	**Future Construction Worker (0-8 ft)**	**Future Resident (Child) (0-8 ft)**
Soil Exposure Pathways										
Soil Ingestion	2E-07	2E-08	4E-06	3E-08	5E-06	0.006	0.003	0.09	0.004	0.1
Dermal Contact with Soil	8E-09	2E-09	2E-07	3E-09	2E-07	0.0002	0.0003	0.003	0.0004	0.004
Inhalation of Particulates and Volatiles Released from Soil to Outdoor Air	7E-11	3E-11	2E-10	4E-11	2E-10	--	--	--	--	--
Ingestion of Homegrown Produce	--	--	1E-06	--	2E-06	--	--	0.01	--	0.02
Soil Total	**2E-07**	**2E-08**	**6E-06**	**3E-08**	**7E-06**	**0.006**	**0.004**	**0.1**	**0.005**	**0.1**
Groundwater Exposure Pathways										
Groundwater Ingestion	--	--	5E-05	--	5E-05	--	--	15	--	15
Dermal Contact with Groundwater	--	--	4E-07	--	4E-07	--	--	0.04	--	0.04
Inhalation of Volatiles Released from Household Use of Grou	--	--	1E-08	--	1E-08	--	--	0.0002	--	0.0002
Groundwater Total	--	--	**5E-05**	--	**5E-05**	--	--	**15**	--	**15**
Multipathway Total	**2E-07**	**2E-08**	**5E-05**	**3E-08**	**5E-05**	**0.006**	**0.004**	**15**	**0.005**	**15**

Notes:

-- Not applicable; exposure pathway is not complete for this receptor.
(0-2 ft) Interval of soil below ground surface evaluated in this exposure scenario
(0-8 ft) Interval of soil below ground surface evaluated in this exposure scenario

TABLE 7-15: RESULTS OF THE CHEMICAL OF POTENTIAL ECOLOGICAL CONCERN SCREENING FOR SOIL AT SITE 19

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

CHEMICAL OF POTENTIAL ECOLOGICAL CONCERN	SCREENING EVALUATION	
	Rejected	Retained
Metals		
Aluminum	CSB	--
Antimony	--	--
Arsenic	CSB	--
Barium	--	X
Beryllium	CSB	--
Cadmium	CSB	--
Chromium	CSB	--
Cobalt	CSB	--
Copper	--	X
Iron	EN	--
Lead	--	X
Manganese	CSB	--
Mercury	--	--
Molybdenum	FOD	--
Nickel	CSB	--
Selenium	--	--
Silver	CSB	--
Thallium	FOD	--
Titanium	CSB	--
Vanadium	CSB	--
Zinc	--	X
Pesticides and Polychlorinated Biphenyls		
alpha-Chlordane	--	--
Aroclor-1260	--	--
4,4'-Dichlorodiphenyldichloroethane	--	--
4,4'-Dichlorodiphenyldichloroethylene	--	--
4,4'-Dichlorodiphenyltrichloroethane	--	--
gamma-Chlordane	--	--
Heptachlor epoxide	--	--
Semivolatile Organic Compounds		
1,2,4-Trichlorobenzene	--	--
2,4-Dimethylphenol	--	--
2-Chlorophenol	FOD-NB	--
2-Methylnaphthalene	--	X
2-Methylphenol	--	--
4-Chloro-3-Methylphenol	--	X
4-Methylphenol	--	--
Acenaphthene	--	X
Acenaphthylene	--	X
Anthracene	--	X
Benzo(a)anthracene	--	X
Benzo(a)pyrene	--	X

TABLE 7-15: RESULTS OF THE CHEMICAL OF POTENTIAL ECOLOGICAL CONCERN SCREENING FOR SOIL AT SITE 19

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

CHEMICAL OF POTENTIAL ECOLOGICAL CONCERN	SCREENING EVALUATION	
	Rejected	Retained
Semivolatile Organic Compounds (Continued)		
Benzo(b)fluoranthene	--	X
Benzo(g,h,i)perylene	--	X
Benzo(k)fluoranthene	--	X
Bis(2-ethylhexyl)phthalate	--	X
Carbazole	--	--
Chrysene	--	X
Dibenzo(a,h)anthracene	--	X
Di-n-butylphthalate	--	X
Fluoranthene	--	X
Fluorene	--	X
Indeno(1,2,3-cd)pyrene	--	X
Naphthalene	--	X
n-Nitroso-diphenylamine	--	X
Pentachlorphenol	--	X
Phenanthrene	--	X
Pyrene	--	X
Volatile Organic Compounds		
1,2-Dichloroethene	--	--
1,3-Dichlorobenzene	--	X
2-Butanone	--	--
4-Methyl-2-Pentanone	--	--
Acetone	--	X
Benzene	--	--
Carbon Disulfide	--	--
Ethylbenzene	--	--
Methylene Chloride	--	X
Tetrachloroethene	--	X
Toluene	--	X
Trichloroethene	--	X
Xylene	--	X

Notes:

--	These analyses were not performed.
CSB	Concentrations within statistical background
EN	Essential nutrient
FOD	Frequency of detection five percent or lower
NB	Non-bioaccumulating
X	These analyses were performed.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
31	Petroleum Site CAA-4B	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2.4, Page 7-13, Figure 7-1. SulTech 2005.

address possible releases within Zone 22. This sample was analyzed for SVOCs, PCBs, metals, TPH-E, and TPH-P (IT 2001). Three locations were sampled (one sample from each location) in the sewer lines: storm sewer 134-SS-003, sanitary sewer 134-SN-003, and industrial waste line 134-IW-005 in Target Area 1 (Building 372), south and downgradient of Building 372 (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-E.

One additional industrial waste line sample was collected at location 210-IW-004 but was labeled incorrectly as belonging to Parcel 210 (see Figure 7-3). This sample was analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P. Results for this sample were reported in the EBS under Parcel 147 Phase 2A investigation (IT 2001). TPH-mo, PCB, and one SVOC were detected at low concentrations in the Zone 22 sample collected within Site 19. PAH and oil and grease were detected at low concentrations in the samples collected from the industrial waste and storm sewer lines. See Appendix E for further information.

Phase 2B. Soil and groundwater sampling was conducted at Subparcel 134A in October 1995 during the Phase 2B EBS investigation. Parcel sampling was conducted during Phase 2B to further address the possible release of compounds associated with Building 372. Two soil samples and one water sample were collected at point 134-006-041 located west of the southwestern corner of Yard D-13 in Target Area 6 (Parcel 134) (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P (IT 2001). Two pesticides and TPH-g were detected at low concentrations in the soil sample collected at a depth of 6 feet bgs. Low-concentration PAHs and VOCs were detected in the grab groundwater sample.

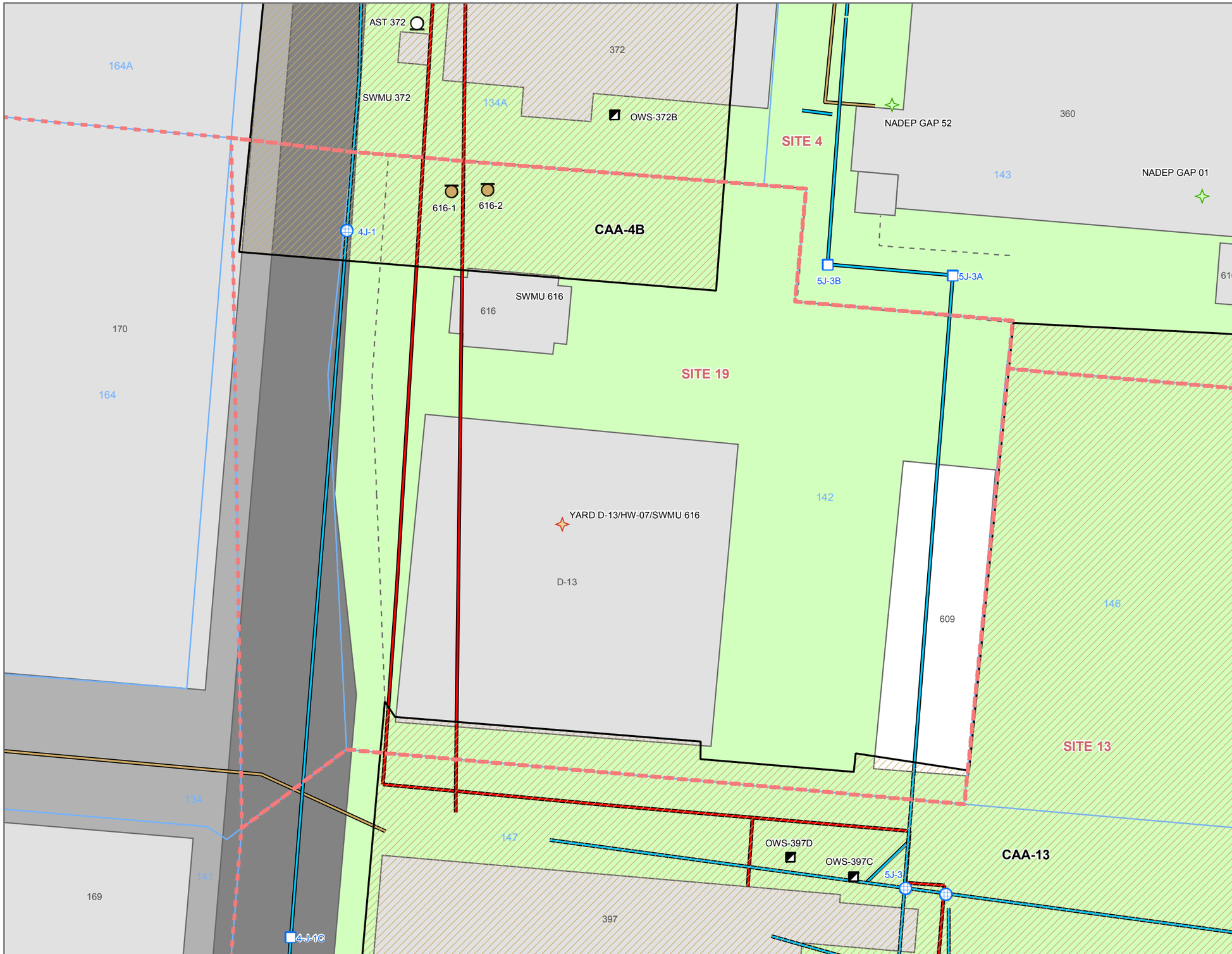
7.2.4 TPH Program

As defined under the Alameda TPH program, the northwestern corner of Site 19 is also part of CAA 4B (see Figure 7-1). CAA 4B was created to address TPH and lead contamination in soil and groundwater in the vicinity of Building 372 and two associated USTs (371-1 and 372-2), all of which are located in Site 4 in OU-2B, to the north of Site 19. Issues associated with CAA 4B will be addressed in the upcoming OU-2B RI report.

In 1995, several monitoring wells were installed to the north of Site 19 to monitor TPH-related chemicals in soil and groundwater at the location of former USTs 372-1 and 372-2. One of these wells (372-MW2) is located within the boundaries of Site 19. Soil samples were collected during the construction of this monitoring well, and groundwater has been sampled several times under the TPH program. Low-level TPH-d, TPH-g, and TPH-jet fuel have been detected in this well several times. One VOC has been detected once, at a low concentration.

7.2.5 Removal Actions

In 1998, a basewide removal action was conducted to address active and inactive fuel lines across Alameda Point (Tetra Tech and R&M 2000). Although no removal was conducted at Site 19, the inactive fuel line running north-south across the western portion of the site (Figure 7-1) was sampled at two locations (030-S19-005 and 030-S19-007) and subsequently



ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), PRESENT

SOLID WASTE MANAGEMENT UNIT (SWMU)

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-1
SITE 19 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig07-01_s19_features.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
32	hazardous waste storage	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 10.3.1, Pages 10-8 through 10-10. SulTech 2005.

provide a conservative estimate of risk. Risk to marine receptors was not evaluated because exposure pathways for aquatic receptors were considered incomplete. Assessment endpoints include small mammals, passerines, and raptors.

Results of the HQ calculations and qualitative evaluations indicate potential risk to small mammals from zinc. No significant risk to passerines and raptors occurs from exposure to Site 13 soils. However, based on the lack of habitat at Site 13 and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

10.2.3 Site 13 Recommendations

Based on the data and risks discussed previously, soil and groundwater at Site 13 are recommended for further evaluation in an FS, as defined under CERCLA, to address risks to residential receptors under the unrestricted reuse scenario. Total site risk to residential receptors (including background) is above the risk management range. BaP is identified as the only COC for soil. Arsenic in soil was identified as a risk driver, but is attributed to background. COCs identified for groundwater are benzene, manganese, PCP, and TCE. Although thallium was identified as a risk driver, it is attributed to background.

An evaluation of TPH in soil and groundwater also was conducted based on the TPH strategy for Alameda Point (Navy 2001a) (see Appendix F). Based on this evaluation, further action is recommended for TTPH and TPH-associated chemicals present in soil and groundwater within Plume 1 of Site 13 under the TPH program. Further action is recommended for TTPH and TPH-associated chemicals present in soil and groundwater within Plume 2 of Site 13 under the CERCLA program for commingled contaminants.

10.3 Site 19 Conclusions and Recommendations

The following text summarizes the conclusions and recommendations for Site 19.

10.3.1 Site 19 Nature and Extent Conclusions

The nature and extent evaluation concluded that most of the chemicals detected across Site 19 are consistent with historical activities that occurred at the site, which included hazardous material storage at Building 616 and Yard D-13. Physical features of Site 19, along with specific details on the hazardous waste storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results were evaluated. The following physical features and site activities were considered likely sources at Site 19:

- Yard D-13 (hazardous waste storage yard)
- Building 616 (hazardous materials storage area)
- Fill material containing PAHs

Most of the chemicals related to hazardous waste storage (DCA, TCA, benzene, PCE, TCE, and PAHs) were detected within the vicinity of Yard D-13 and Building 616, with the maximum detected concentrations near Yard D-13.

1,1-DCA, PCE, and TCE were detected in one to two samples of shallow soil near the area designated for halogenated solvent storage in the southern portion of Yard D-13. It is possible that spills occurred during transport or storage of these chemicals, thereby allowing them to enter the soil column through cracks or other openings in the floor of Yard D-13 or the surrounding grounds.

PCE and TCE were also detected in a groundwater monitoring well in the southern portion of Yard D-13 and in a deep monitoring well in the northern portion of Site 19 near Building 616. PCE and TCE were not detected in any other monitoring wells within the immediate vicinity of Building 616. Relatively low concentrations of benzene also were detected in groundwater in the southern portion of Yard D-13. The highest detected concentration of 1,1-DCA in groundwater was in a Hydropunch sample collected to the west of Building 616. 1,2-DCA was detected only in a Hydropunch sample collected south of Yard D-13. 1,2-DCP was detected once in a monitoring well east of Yard D-13. The full extent of VOCs in groundwater is not fully defined.

BaP is likely associated with PAHs present in fill material used to build Alameda Island. BaP concentrations ranged from 0.000002 to 6 mg/kg, with the maximum concentration detected in a soil sample at a depth of 0.5 to 2.0 feet bgs.

Although numerous chemicals were detected at Site 19, some of the chemicals do not pose significant risk as defined by the risk assessments. Significant risk to human health is potentially posed by arsenic and BaP in soil and by arsenic, manganese, PCE, and TCE in groundwater. Barium, copper, and lead were determined to pose risk to terrestrial ecological receptors. Arsenic and barium in soil and arsenic in groundwater are attributed to background concentrations.

Manganese is not believed to be associated with site activity, but its relatively high concentrations in deeper groundwater at Site 19 are likely associated with the prevalence of reducing conditions at the site from organic material present in the BSU and marsh crust and some contribution from saltwater intrusion. There is no discernable pattern to the distribution of elevated manganese in groundwater except for higher concentrations present in deeper groundwater at Site 19.

Data gaps for soil and groundwater at Site 19 were also identified. Detection limits were elevated in both soil and groundwater for some nondetected SVOCs; therefore, further sampling and analysis of soil and groundwater for SVOCs may be needed to confirm these chemicals are not present in soil or groundwater at Site 19. Because data are limited, the full extent of VOCs in groundwater still needs to be defined.

Although these data gaps were identified, it was determined that the types and numbers of samples collected at Site 19 and the analytical suite were adequate to characterize the site and to conduct risk assessments because data collection at the site focused mainly on potential sources and was conducted in phases. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of the data collected and the need for additional data to identify releases and complete the RI report. There is a low potential that a source at Site 19 was not adequately evaluated or that NFA would be recommended if it poses a potential risk to human health or the environment.

10.3.2 Site 19 Risk Assessment Conclusions

An HHRA and modified screening-level ERA were conducted to evaluate risk from chemicals detected at Site 19. The sections below present the conclusions for the HHRA and ERA, respectively.

10.3.2.1 Site 19 HHRA Conclusions

According to reuse plans for Alameda Point (EDAW 1996), commercial/industrial and construction worker exposures are the most likely future exposures at Site 19. Human health risk was evaluated for commercial/industrial and construction worker exposures, along with residential exposures. The residential exposure scenario was evaluated to allow for flexibility in implementing the reuse plan (or modifications thereto) at Alameda Point, and because EPA risk assessment guidance (EPA 1989) includes a strong preference for evaluation of the residential pathway. Tables 10-1 and 10-2 present risk drivers and their relative contributions to carcinogenic risk and the noncancer HI for exposure to soil and groundwater.

For the commercial/industrial and construction worker scenarios, the most conservative carcinogenic risks for soil and groundwater are within the risk management range. The highest HIs calculated for these pathways were less than 1 for soil. The pathway for exposure to groundwater was incomplete.

For the residential scenario, the HHRA indicated that carcinogenic risk from exposure to soil is within the risk management range and that noncancer risk from soil is less than 1; furthermore, risk from soil is attributable to PAHs and background concentrations of arsenic. The carcinogenic and noncancer risks for groundwater exceed the risk management range and are attributable to the following:

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
33	soil at IR Site 19	Section 2.3.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.3.2, Pages 3-9 through 3-10, Figure 3-6 and Table 3-5. Oneida Total Integrated Enterprises LLC 2011.

were analyzed for pH as a part of SCAPS TRW investigation based on historic refinery operations and the occurrence of low pH in soil samples previously collected at OU-2A. Near neutral pH values were reported between 6.75 and 8.97 in 15 of the 16 soil samples collected during this investigation. Sample AP13-169-S-02 had a pH of 4.09 and is in an area east of IR Site 13 that is inferred to not contain TRW. Thus it appears the low pH conditions reported in previous investigations are localized and may have been removed during previous trenching operations at the site. Based on the results of SCAPS TRW investigation and previous investigations at the site, it was concluded that the TRW contains very low volatile or semi-volatile fraction as expected from a refinery waste that has been in-place for over 100 years. The TRW appears to be mainly comprised of solid long chain alkanes. In addition, it should be noted that based on boring logs prepared during basewide soil PAH investigation conducted in 2003 as part of the RI (SulTech 2005b), TRW occurs mainly at a depth greater than 5 feet bgs and is mainly below the water table. As reported in the Final Semiannual Groundwater Monitoring Report (ITSI 2009b), depth to water at IR Site 13 generally ranges from 4.03 to 6.51 feet bgs, with water table as high as 0.25 feet bgs as observed at MWOR-3 in March 2005. Although TRW mainly occurs at depth and below the water table, surface manifestations of this asphalt-like refining residue have been observed at several locations within IR Site 13.

3.2.3 IR Site 19

3.2.3.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI Report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 19 are consistent with historical activities that occurred at the site, which included hazardous material storage at Building 616 and Yard D-13. Physical features of IR Site 19, along with specific details on the hazardous waste storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil, and the analytical results were evaluated. The following physical features and site activities were considered likely sources at IR Site 19:

- Yard D-13 (hazardous waste storage yard),
- Building 616 (hazardous materials storage area), and
- Fill material containing PAHs.

3.2.3.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 19:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P

equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels in soil from 0 feet to 8 feet bgs are summarized in Table 3-5.

These results indicated the following:

- Pesticides and PCBs were not reported above their respective laboratory reporting limits.
- None of the reported VOCs, SVOCs, and metals (except lead) in IR Site 19 soil exceeded screening criteria.
- One out of 51 soil samples reported lead (303 mg/kg at a depth of 2 to 2.5 feet bgs at location BD13-13) at concentrations exceeding its screening level of 207 mg/kg near the eastern corner of Yard D-13. The reasonable maximum EPC of the 51 soil samples analyzed for lead was estimated to be 39 mg/kg, which is less its screening level of 207 mg/kg. The deeper and adjacent soil samples collected at/around this location were not reported or less than its screening level.

  PAHs, expressed as B(a)P equivalent concentrations ranged from non-detect to a maximum reported value of 1.1 mg/kg in IR Site 19 soil. The reasonable maximum EPC associated with the 78 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.15 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The PAH, expressed as B(a)P equivalent concentrations, are localized in two regions, south-west of Yard D-13 (1.1 mg/kg at depth of 4.5 feet to 5 feet bgs) and in the north-east portion of IR Site 19 (0.71 mg/kg at a depth of 0.5 to 2 feet bgs). However, the concentrations of PAHs, expressed as B(a)P equivalent concentrations, were not reported above the screening level of 0.62 mg/kg in the three step-out samples collected adjacent to this location south-west of Yard D-13. In addition, the surface soil (0 feet to 0.5 feet bgs) and deeper soil samples (2 feet to 4 feet bgs and 4 feet to 8 feet bgs) collected at this location to the north-east of IR Site 19 were less than the screening level (see Figure 3-6).

3.2.4 IR Site 22

3.2.4.1 Source and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that occurrence of the chemicals reported across IR Site 22 is consistent with the historical activities known to occur at the site, which included a gasoline station and car wash. Physical features of IR Site 22, along with specific details on the waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. IR Site 22 was a gasoline station and there were no documented uses of CERCLA constituents during the site's history. However, environmental investigations were conducted at the site to identify and assess the extent of CERCLA chemicals in soil and groundwater. Of the potential sources, the following physical features and site activities were considered likely sources at IR Site 22:

Former gas station and associated USTs 547-1 through 547-3 and fuel lines

OWS 547 associated with the car wash

Fill material containing PAHs

Because IR Site 22 was considered significantly impacted by TPH, corrective action for free TPH product in soil and groundwater is currently underway using a combination of dual vapor extraction.

Legend

- Total Benzo(a) Pyrene Equivalents > 1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Runway
- Paved

IR Site 19, OU2A, Benzo(a)P yrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) P yrene Equivalents (mg/kg)
C3S019B009	01 -Aug -03	0.5 -2	0.71
S19 -B07	03 -Oct -07	4.5 -5	1.10

N

100 50 0 100 Feet

OU-2A FS

Final

Nature and Extent of PAHs in Soil at IR Site 19

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-6

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Table 3-3: Summary of Chemicals in IR Site 9 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
None							

Notes:
mg/kg = milligrams per kilogram

Table 3-4: Summary of Chemicals in IR Site 13 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Volatile Organic Compounds (VOCs) (mg/kg)							
Benzene	1.1	24/137	1	AP13-148	04-Dec-07	5.5-7	1.9
Ethylbenzene	5.7	27/137	1	AP13-148	04-Dec-07	5.5-7	6.4
Metals (mg/kg)							
Arsenic	16.55	151/192	4	S13-B18	13-Sep-07	4-4.5	20.3
Chromium	280	192/192	1	B13-30	09-Dec-94	1-2	337
Cobalt	23	165/192	1	S13-B30	04-Oct-07	0.5-1	28.9
Iron	55,000	112/112	1	B13-32	12-Aug-94	0.5-1.5	74,800
Lead	207	180/215	7	S13-B12	11-Sep-07	4.7-5.2	815
Vanadium	550	192/192	1	MWOR-4	19-Jul-90	7-7.5	1,780
PAHs (mg/kg)							
B(a)P equivalents	0.62	237/382	13	C3S0133B051	30-Jul-03	4-8	7.6

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-5: Summary of Chemicals in IR Site 19 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	53/78	2	S19-B07	03-Oct-07	4.5-5	1.1
Metals (mg/kg)							
Lead	207	28/51	1	BD13-13	11-July-90	2-2.5	303

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
34	groundwater at IR Site 19	Section 2.3.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.3.2, Pages 3-19 through 3-20, Figure 3-9 and Tables 3-12, and 3-13. Oneida Total Integrated Enterprises LLC 2011.

monitoring well M13-07 relatively consistently during Basewide sampling events from Summer 2002 to Spring 2007. However, arsenic was reported at 2.4 µg/L (estimated) (less than its MCL of 10 µg/L) during the Spring 2008 monitoring event in a sample collected from M13-07.

3.3.3 IR Site 19

3.3.3.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of the sources of the impacted soil and groundwater at IR Site 19 based on past investigations. Based on the RI (Sul Tech 2005b), the likely sources of impacted groundwater at IR Site 19 include:

Yard D-13 – Hazardous waste storage yard; concrete area with built-in berms around individual containment areas; stored wastes such as corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel; documented releases during operation included spills of nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel; no spills were reported to enter the secondary containment overflow system, and

Building 616 – Constructed for use as office and storage space; served as a hazardous materials storage area until Yard D-13 was built; potentially stored wastes such as corrosives, organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel releases of petroleum fuel from storage and defueling activities near Building 410.

3.3.3.2 Nature and Extent of Impact

The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 19 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and U&A 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech 2002)

Phase 2B Environmental Baseline Survey (IT 2001)

Petroleum Program Investigations and Removal Actions (Tetra Tech and R&M 2000)

Basewide Groundwater Sampling (ITSI 2009a and ITSI 2009b)

Data Gap Study in 2008 (Tetra Tech EC 2009)

Supplemental DGI (Tetra Tech 2010)

These investigations included collection of groundwater samples from monitoring wells and hydropunch locations and analyses for VOCs, SVOCs, dissolved and total metals, pesticides/PCBs, general chemistry, TPH and/or PAHs. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). A summary of reported constituents in groundwater during investigations conducted from 2002 to Fall 2008 at IR Site 19 is presented in Table 3-12.

The most current assessment (at the time of issuance of the Draft Final FS) of the nature and extent of CERCLA constituents in groundwater at IR Site 19 is provided by the data collected during the following investigations:

Data Gap Study conducted at OU-2A and OU-2B in 2008 for assessment of the lateral and vertical extent of VOCs in groundwater (Tetra Tech 2009).

Groundwater sampling at OU-2A conducted as part of basewide groundwater monitoring events conducted from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b).

Supplemental DGI (Tetra Tech 2010) at OU-2A and OU-2B (August 2009 to February 2010) to address the uncertainties following Data Gap Study.

Figure 3-9 presents the sampling locations for the Data Gap Study, Basewide groundwater sampling events, and Supplemental DGI at IR Site 19. Table 3-13 presents a summary of the constituents reported in IR Site 19 groundwater above their respective screening levels during the Data Gap Study (Tetra Tech EC 2009) and Fall 2008 Basewide groundwater sampling events (ITSI 2009a and ITSI 2009b). The screening levels for VOCs and metals are Federal or State MCLs, whichever is less.

The Data Gap Study at IR Site 19 included hydropunch sampling (S19-HP02) of shallow groundwater (5 feet to 10 feet bgs) and installation of a shallow groundwater monitoring well S19-TT-MW01 (Figure 3-9) for assessment of VOCs in groundwater. The hydropunch sample was analyzed for VOCs, SVOCs, TPH-e, TPH-p, metals, and natural attenuation parameters. The groundwater monitoring well samples were analyzed for VOCs and metals. TCE was reported at a concentration of 9.1 µg/L (exceeding its MCL of 5 µg/L) in monitoring well S19-TT-MW01 during the Data Gap Study. PCE was reported at 0.66 µg/L (estimated) (less than its MCL) in S19-TT-MW01, located 40 feet southwest of MWD13-4.

As part of Basewide groundwater sampling, two monitoring wells, MWD13-3 and MWD13-4 are routinely sampled. PCE has been consistently reported above its MCL of 5 µg/L in monitoring well MWD13-4 during Basewide groundwater monitoring from Summer 2002 to Fall 2008 (see Figure 3-9). In addition, VC has been consistently reported at concentrations ranging from 0.1 µg/L to 0.9 µg/L in monitoring well MWD13-4 during basewide groundwater monitoring from Fall 2006 to Fall 2008.

Based on these results, following additional investigations were conducted as part of Supplemental DGI (Tetra Tech 2010) to delineate the extent of TCE in groundwater.

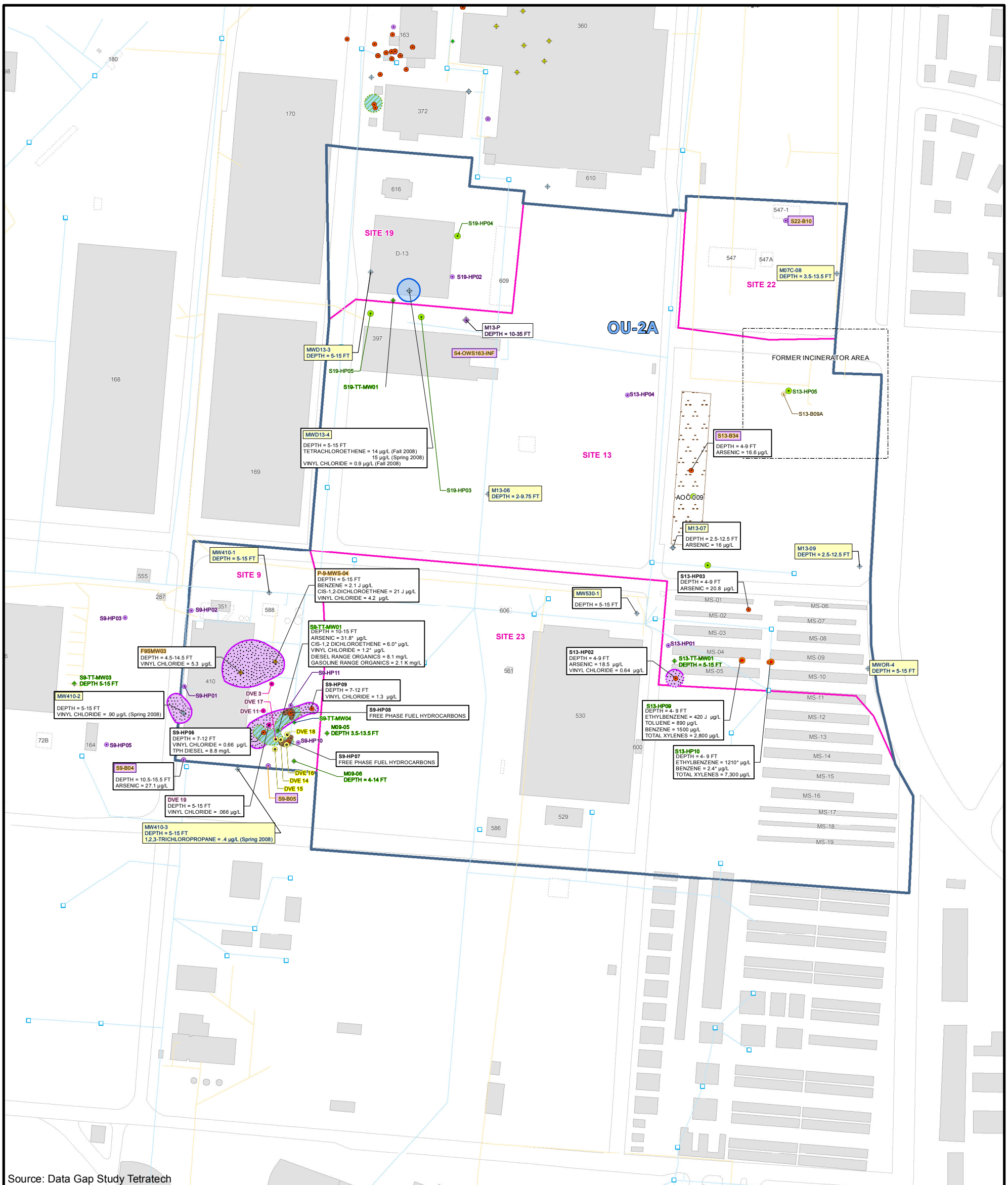
Three hydropunch boreholes (S19-HP03, -HP04, -HP05) were advanced in the vicinity of S19-TTMW01 and groundwater samples were collected from 5 feet to 10 feet, 10 feet to 15 feet, and 20 feet to 25 feet bgs for VOC analysis to assess the horizontal and vertical extents of the VOC plume (Figure 3-9).

Groundwater samples were collected from wells M13-P and S19-TTMW01 for VOC analysis.

Figure 3-9 shows the extent of VOCs in IR Site 19 groundwater based on the Supplemental DGI and Spring/Fall 2008 basewide groundwater monitoring data. TCE was reported above the screening level at well S19-TT-MW01 during the Data Gap Study (Table 3-13). However, TCE was reported at concentrations of 0.5 J µg/L and 0.49 J µg/L in groundwater samples collected from S19-TT-MW01 during Supplemental DGI indicating that TCE concentration has decreased in the interim between Data Gap Study and Supplemental DGI to a concentration below MCL. Therefore, TCE plume depicted in the Technical Memorandum for Data Gap Investigation (Tetra Tech EC 2009), is no longer representative of site conditions.

3.3.4 IR Site 22

Table 3-14 presents summary statistics for the constituents reported in groundwater at IR Site 22 based on the investigations conducted from 2002 through 2008. The following constituents exceeded their



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

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Table 3-12: Summary of Detected Groundwater Analytes at Site 19 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Volatile Organic Compounds												
1,1,1-Trichloroethane	71-55-6	50	46	92.0%	0.2	4.7	MWD13-4	3/27/2008	200	--	--	--
1,1-Dichloroethane[b]	75-34-3	49	46	93.9%	0.5	9.8	MWD13-4	9/5/2002	5	20	--	--
1,1-Dichloroethene	75-35-4	50	24	48.0%	0.1	0.5	MWD13-4	10/16/2006	6	--	--	--
1,2,4-Trichlorobenzene	120-82-1	50	3	6.0%	0.1	0.2	MWD13-4	10/16/2006	5	--	--	--
1,2,4-Trimethylbenzene	95-63-6	47	1	2.1%	0.1	0.1	MWD13-4	10/16/2006	--	--	--	--
1,3,5-Trimethylbenzene	108-67-8	47	1	2.1%	0.09	0.09	MWD13-4	10/16/2006	--	--	--	--
1,3-Dichlorobenzene	541-73-1	48	4	8.3%	0.07	0.2	MWD13-3	10/16/2006	--	--	--	--
4-Chlorotoluene	106-43-4	47	1	2.1%	0.09	0.09	MWD13-4	10/16/2006	--	--	--	--
Acetone	67-64-1	50	6	12.0%	1.1	4.4	MWD13-4	3/3/2004	--	--	--	--
Benzene	71-43-2	50	20	40.0%	0.07	0.3	MWD13-4	12/16/2002	1	--	--	--
Carbon disulfide	75-15-0	47	15	31.9%	0.08	4.4	MWD13-3	6/19/2002	--	--	--	--
Chloroethane	75-00-3	50	1	2.0%	0.5	0.5	MWD13-3	11/12/2004	--	--	--	--
Chloroform	67-66-3	50	2	4.0%	0.2	0.2	MWD13-4	4/10/2003	80	--	--	--
cis-1,2-Dichloroethene	156-59-2	50	42	84.0%	0.2	4.2	MWD13-4	9/8/2005	6	--	--	--
Ethylbenzene	100-41-4	50	3	6.0%	0.06	0.1	MWD13-4	9/5/2002	300	--	--	--
Methyl Tert-Butyl Ether	1634-04-4	49	23	46.9%	0.09	0.53	MWD13-4	12/11/2003	13	--	--	--
N-Butylbenzene	104-51-8	47	1	2.1%	0.2	0.2	MWD13-4	10/16/2006	--	--	--	--
N-Propylbenzene	103-65-1	47	1	2.1%	0.1	0.1	MWD13-4	10/16/2006	--	--	--	--
o-Xylene	95-47-6	47	2	4.3%	0.1	0.1	MWD13-4	9/5/2002	1750	--	--	--
Tetrachloroethene	127-18-4	50	43	86.0%	0.2	24	MWD13-4	12/11/2003	5	28	--	--
Toluene	108-88-3	50	3	6.0%	0.08	0.4	MWD13-4	6/19/2002	150	--	--	--
trans-1,2-Dichloroethene	156-60-5	50	9	18.0%	0.08	0.2	MWD13-4	9/8/2005 10/2/2007 9/30/2008	10	--	--	--
Trichloroethene	79-01-6	49	43	87.8%	0.2	9.1	S19-TT-MW01	5/5/2008	5	2	--	--
Vinyl chloride	75-01-4	50	5	10.0%	0.1	0.9	MWD13-4	9/30/2008	0.5	1	--	--
Xylenes, m & p	7816-60-0	47	2	4.3%	0.4	0.4	MWD13-4	9/5/2002	1750	--	--	--
Metals												
Antimony	7440-36-0	8	4	50.0%	0.13	0.871	S19-HP02	10/3/2007	6	--	37.5	--
Arsenic	7440-38-2	4	4	100.0%	1.7	5.58	S19-TT-MW01	5/5/2008	10	--	20.72	--
Barium	7440-39-3	4	4	100.0%	10.9	29.5	S19-HP02	10/3/2007	1000	--	569.5	--
Calcium	7440-70-2	1	1	100.0%	37000	37000	MWD13-3	7/7/2004		--	--	--
Chromium, Total	7440-47-3	4	3	75.0%	0.34	0.688	S19-TT-MW01	5/5/2008	50	--	12.45	--
Cobalt	7440-48-4	4	1	25.0%	2.92	2.92	S19-HP02	10/3/2007		--	--	--
Copper	7440-50-8	4	2	50.0%	0.28	6.34	S19-HP02	10/3/2007	1300	--	24.03	--
Iron	7439-89-6	1	1	100.0%	60	60	MWD13-3	7/7/2004	300	--	6585.5	--
Lead	7439-92-1	4	1	25.0%	0.06	0.06	MWD13-3	7/7/2004	15	--	11.45	--
Magnesium	7439-95-4	1	1	100.0%	6000	6000	MWD13-3	7/7/2004		--	--	--
Manganese	7439-96-5	1	1	100.0%	41	41	MWD13-3	7/7/2004	50	--	1741	--
Mercury	7439-97-6	21	2	9.5%	0.064	0.064	MWD13-3	7/7/2004	2	--	--	--
Molybdenum	7439-98-7	4	4	100.0%	2.3	15.4	S19-HP02	10/3/2007		--	--	--
Nickel	7440-02-0	4	4	100.0%	1.5	17.8	S19-HP02	10/3/2007	100	--	--	--
Potassium	7440-09-7	1	1	100.0%	8200	8200	MWD13-3	7/7/2004		--	--	--
Selenium	7782-49-2	4	2	50.0%	0.62	0.901	S19-HP02	10/3/2007	50	--	8.58	--
Sodium	7440-23-5	1	1	100.0%	38000	38000	MWD13-3	7/7/2004		--	--	--

Table 3-12: Summary of Detected Groundwater Analytes at Site 19 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Vanadium	7440-62-2	4	4	100.0%	0.54	18.8	S19-TT-MW01	5/5/2008		--	26.27	--
Zinc	7440-66-6	4	4	100.0%	3.8	13	S19-TT-MW01	5/5/2008	5000	--	36.39	--
Dissolved Metals												
Aluminum, dissolved	7429-90-5	28	22	78.6%	9.8	507	MWD13-4	7/1/2003	1000	--	1070	--
Antimony, dissolved	7440-36-0	28	17	60.7%	0.15	2	MWD13-4	7/8/2004	6	--	37.5	--
Arsenic, dissolved	7440-38-2	32	22	68.8%	0.55	6.36	MWD13-4	7/1/2003	10	--	20.72	--
Barium, dissolved	7440-39-3	28	26	92.9%	7.7	34.6	MWD13-3	7/1/2003	1000	--	569.5	--
Beryllium, dissolved	7440-41-7	32	2	6.3%	0.49	0.7	MWD13-4	4/3/2007	4	--	2.5	--
Cadmium, dissolved	7440-43-9	32	2	6.3%	0.47	0.77	MWD13-4	4/3/2007	5	--	--	--
Calciuim, dissolved	7440-70-2	28	28	100.0%	6300	41000	MWD13-3	11/12/2004		--	--	--
Chromium, dissolved	7440-47-3	32	18	56.3%	0.33	2.9	MWD13-4	4/3/2007	50	--	12.45	--
Cobalt, dissolved	7440-48-4	28	9	32.1%	0.046	0.17	MWD13-3	12/18/2002		--	--	--
Copper, dissolved	7440-50-8	32	20	62.5%	0.31	5.3	MWD13-4	9/8/2005 3/27/2008	1300	--	24.03	--
Iron, dissolved	7439-89-6	28	17	60.7%	36	170	MWD13-3	9/8/2005	300	--	6585.5	--
Lead, dissolved	7439-92-1	32	8	25.0%	0.12	0.31	MWD13-3	11/12/2004	15	--	11.45	--
Magnesium, dissolved	7439-95-4	28	19	67.9%	7.6	8000	MWD13-3	3/27/2008		--	--	--
Manganese, dissolved	7439-96-5	28	19	67.9%	0.23	87	MWD13-3	3/27/2008	50	4	1741	--
Mercury, dissolved	7439-97-6	10	2	20.0%	0.096	0.096	MWD13-3	9/8/2005	2	--	--	--
Molybdenum, dissolved	7439-98-7	28	16	57.1%	1	8.84	MWD13-4	7/1/2003		--	--	--
Nickel, dissolved	7440-02-0	32	21	65.6%	0.93	2.8	MWD13-4	4/3/2007	100	--	--	--
Potassium, dissolved	7440-09-7	28	28	100.0%	3500	18100	MWD13-4	7/1/2003		--	--	--
Selenium, dissolved	7782-49-2	32	11	34.4%	0.2	1.3	MWD13-3	6/19/2002	50	--	8.58	--
Silver, dissolved	7440-22-4	32	2	6.3%	0.5	0.85	MWD13-4	4/3/2007	100	--	--	--
Sodium, dissolved	7440-23-5	28	28	100.0%	28000	220000	MWD13-4	12/16/2002		--	--	--
Thallium, dissolved	7440-28-0	24	5	20.8%	0.18	1.3	MWD13-3	5/1/2006	2	--	16.15	--
Vanadium, dissolved	7440-62-2	28	24	85.7%	0.53	25.7	MWD13-4	7/1/2003		--	26.27	--
Zinc, dissolved	7440-66-6	32	18	56.3%	0.7	120	MWD13-3	12/18/2002	5000	--	36.39	2
Polycylclic Aromatic Hydrocarbons												
Naphthalene	91-20-3	48	22	45.8%	0.5	3.1	MWD13-4	9/8/2005	--	--	--	--
Naphthalene	91-20-3	48	22	45.8%	0.5	3.1	MWD13-4	10/16/2006	--	--	--	--
Semi-volatile Organic Compounds												
1,4-Dioxane (P-Dioxane)	123-91-1	6	3	50.0%	2.6	4.1	MWD13-4	9/30/2008	--	--	--	--

Notes

[a] The lesser of Federal primary MCL and State (primary or secondary) MCL.

[b] Highlighted cells indicate analytes exceeding MCLs.

Table 3-13: Summary of the Analytes Exceeding Federal/State MCLs at IR Site 19 – Data Gap Study, Spring/Fall 2008 Basewide Groundwater Monitoring, and Supplemental DGI

Analytes Exceeding MCL/Screening Level	Federal/State MCL (µg/L)	Minimum Concentration Exceeding MCL/Screening Level (µg/L)	Maximum Concentration Exceeding MCL/Screening Levels (µg/L)	Depth Range for Detection Above MCL/Screening Level (feet bgs)
Trichloroethene	5	8.8[a]	9.1[a]	5 – 15
Tetrachloroethene	5	14	14	5 – 15
Vinyl Chloride	0.5	0.4J	0.9	5 – 15

Notes:

Project screening levels for groundwater are Federal or State MCLs, whichever is less.

[a] Sample results for duplicate samples collected from S19-TT-MW01. TCE concentrations in samples collected from well S19-TT-MW01 during Supplemental DGI were reported to be below its MCL.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
35	removal action	Section 2.3.3	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 7.2.5, Pages 7-13 through 7-14, Figure 7-1. SulTech 2005.

address possible releases within Zone 22. This sample was analyzed for SVOCs, PCBs, metals, TPH-E, and TPH-P (IT 2001). Three locations were sampled (one sample from each location) in the sewer lines: storm sewer 134-SS-003, sanitary sewer 134-SN-003, and industrial waste line 134-IW-005 in Target Area 1 (Building 372), south and downgradient of Building 372 (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-E.

One additional industrial waste line sample was collected at location 210-IW-004 but was labeled incorrectly as belonging to Parcel 210 (see Figure 7-3). This sample was analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P. Results for this sample were reported in the EBS under Parcel 147 Phase 2A investigation (IT 2001). TPH-mo, PCB, and one SVOC were detected at low concentrations in the Zone 22 sample collected within Site 19. PAH and oil and grease were detected at low concentrations in the samples collected from the industrial waste and storm sewer lines. See Appendix E for further information.

Phase 2B. Soil and groundwater sampling was conducted at Subparcel 134A in October 1995 during the Phase 2B EBS investigation. Parcel sampling was conducted during Phase 2B to further address the possible release of compounds associated with Building 372. Two soil samples and one water sample were collected at point 134-006-041 located west of the southwestern corner of Yard D-13 in Target Area 6 (Parcel 134) (see Figure 7-3). These samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P (IT 2001). Two pesticides and TPH-g were detected at low concentrations in the soil sample collected at a depth of 6 feet bgs. Low-concentration PAHs and VOCs were detected in the grab groundwater sample.

7.2.4 TPH Program

As defined under the Alameda TPH program, the northwestern corner of Site 19 is also part of CAA 4B (see Figure 7-1). CAA 4B was created to address TPH and lead contamination in soil and groundwater in the vicinity of Building 372 and two associated USTs (371-1 and 372-2), all of which are located in Site 4 in OU-2B, to the north of Site 19. Issues associated with CAA 4B will be addressed in the upcoming OU-2B RI report.

In 1995, several monitoring wells were installed to the north of Site 19 to monitor TPH-related chemicals in soil and groundwater at the location of former USTs 372-1 and 372-2. One of these wells (372-MW2) is located within the boundaries of Site 19. Soil samples were collected during the construction of this monitoring well, and groundwater has been sampled several times under the TPH program. Low-level TPH-d, TPH-g, and TPH-jet fuel have been detected in this well several times. One VOC has been detected once, at a low concentration.

7.2.5 Removal Actions

In 1998, a basewide removal action was conducted to address active and inactive fuel lines across Alameda Point (Tetra Tech and R&M 2000). Although no removal was conducted at Site 19, the inactive fuel line running north-south across the western portion of the site (Figure 7-1) was sampled at two locations (030-S19-005 and 030-S19-007) and subsequently

filled with grout as part of the in-place closure. TPH-g was detected at a concentration of 0.05 mg/kg in one sample.

7.2.6 Treatability Studies

No treatability studies were conducted at Site 19 during the RI.

7.3 INITIAL DATA EVALUATION

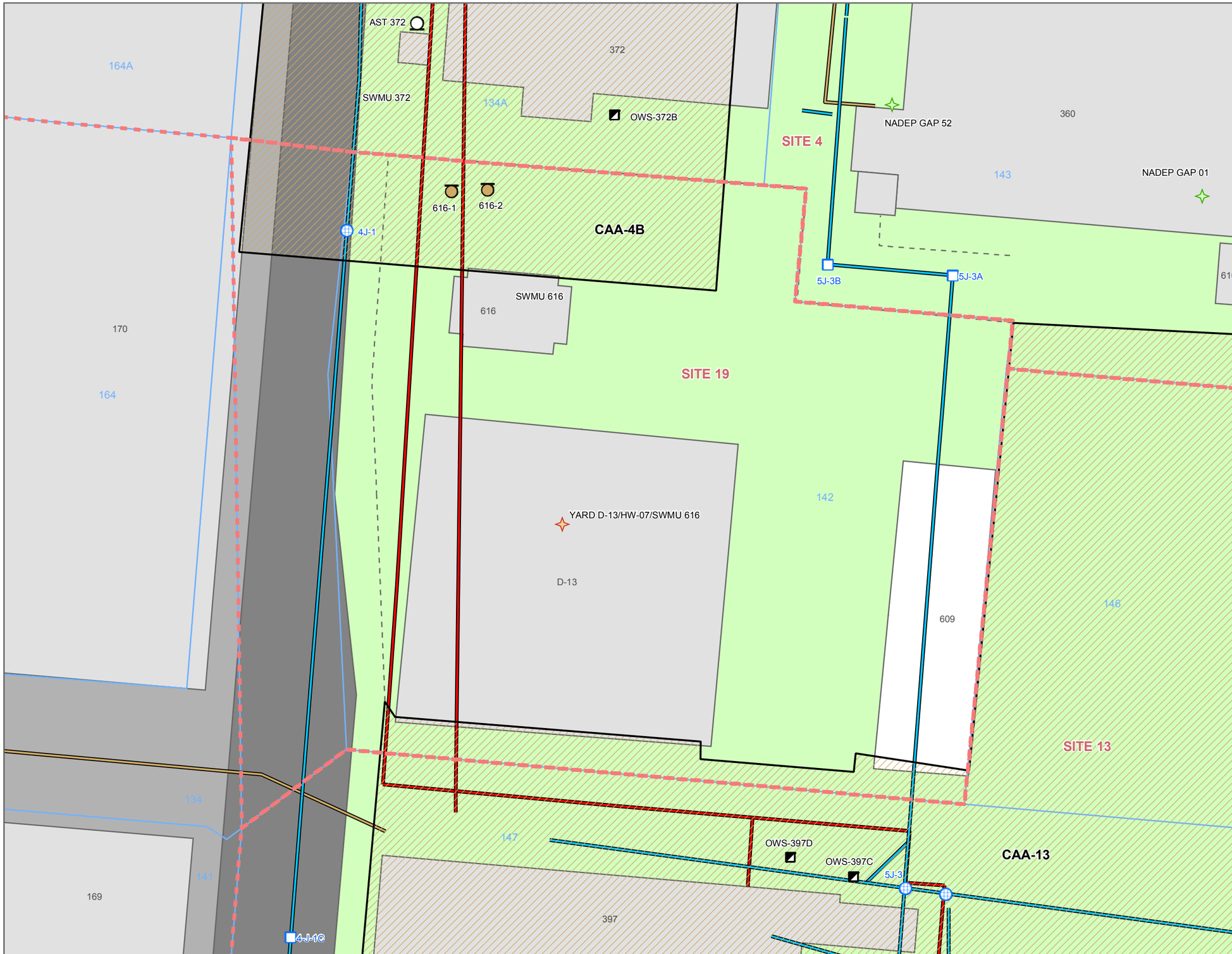
Based on the investigations described in Section 7.2, the Navy completed an initial data evaluation for Site 19. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

7.3.1 Site 19 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 19 and identification of remaining data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 19 is described in the following text and presented on Figure 7-5.

Through environmental investigations and literature searches for Site 19, physical features and activities at Site 19 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination:

- Yard D-13 (RCRA site HW-07) – Hazardous waste storage yard; concrete area with built-in berms around individual containment areas; stored wastes such as corrosives, halogenated and nonhalogenated organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel; documented releases during operation included spills of nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel; no spills were reported to enter the secondary containment overflow system.
- Building 616 – Constructed for use as office and storage space; served as a hazardous materials storage area until Yard D-13 was built; potentially stored wastes such as corrosives, organic compounds, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel.



ABOVEGROUND STORAGE TANK (AST), REMOVED

UNDERGROUND STORAGE TANK (UST), PRESENT

SOLID WASTE MANAGEMENT UNIT (SWMU)

GENERATOR ACCUMULATION POINT (GAP)

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL BOUNDARY AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 7-1
SITE 19 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig07-01_s19_features.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
36	RI Report for IR Site 22	Section 2.3.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8-2 through 8-4, Pages 8-3 through 8-29, Figures 8-1 through 8-3 and 8-5 through 8-7; Tables 8-1 through 8-14. SulTech 2005.

A corrective action plan (CAP) to address petroleum contamination at Site 22 was submitted to RWQCB on July 30, 2003 (Tetra Tech 2003c). RWQCB issued a letter concurring with the cleanup method proposed in the CAP on September 15, 2003.

8.2 SITE 22 ENVIRONMENTAL INVESTIGATIONS

This section describes the environmental investigations conducted at Site 22, which include investigations conducted before the IRP, under CERCLA, under the EBS and TPH programs, and during removal actions.

Tables 8-1 and 8-2 summarize the soil and groundwater samples collected by the environmental investigations conducted at Site 22 and the types of analyses conducted. Sampling locations are shown on Figure 8-2 and are categorized by investigation. Results for each investigation are presented in Tables 8-3 through 8-12. The tables are organized by analyte group; the number and percent of detections; the minimum, average, and maximum detected concentration; the minimum and maximum detection limit; the number of detections over the 2002 residential or tap water PRG (EPA 2002a); the number of analytical detection limits exceeding the PRG, and the PRG.

8.2.1 Investigations Conducted Before the IRP

Before the inception of the IRP, UST testing was performed at Site 22 in 1987 and 1988. The 1987 testing performed by ERM-West revealed that the fuel lines to the tanks were leaking; they were subsequently replaced. In 1988, the UST that had been repaired failed a precision tightness test and was taken out of service.

8.2.2 CERCLA Investigations

Investigations conducted at Site 22 under CERCLA include the Phase 1 and 2A investigation performed in 1991, the follow-on investigations conducted in 1994 and 1998, the storm sewer investigation in 2000, the supplemental RI data gap sampling performed in 2001, the basewide groundwater monitoring conducted in 2002 and 2003, and the PAH study in 2003.

Boring logs for all investigations are presented in Appendix B.

8.2.2.1 Phase 1 and 2A Investigation, 1991

The Navy contracted with Canonie to conduct the Phase 1 and 2A investigation to determine whether activities related to the service station and associated USTs and a suspected waste oil UST impacted soils and groundwater at Site 22 (Canonie 1989). The investigation included performing a soil gas survey, drilling boreholes, constructing monitoring wells, and sampling groundwater. Sampling locations for this investigation are shown on Figure 8-2. Tables 8-3 and 8-4 list the soil and groundwater samples and the analyses performed.

Soil

During the 1991 investigation, 10 soil borings (B547-1 through B547-10) were drilled and five monitoring wells (MW547-1 through MW547-5) were installed at five of the boring locations (B547-1 through B547-5). To evaluate if chemicals were present in the areas investigated, 127 soil samples were collected at 1.0- to 1.5-foot intervals and analyzed for VOCs, SVOCs, pesticides and PCBs, metals, TRPH, TOC, pH, and general chemistry characteristics. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 22 1991 Phase 1 and 2A Investigation Soil Summary

Analytical Group	Detected Chemicals Exceeding 2002 Residential PRG	Location of Highest Concentration
VOCs	Ethylbenzene	MW547-3
SVOCs	Benzo(a)pyrene*	MW547-5
Pesticides and PCBs	None	Not Applicable
Metals	Arsenic and iron	MW547-3
	Lead	MW547-5

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No PCBs or pesticides were detected in soil above their respective residential PRGs.

Ethylbenzene was detected at a concentration exceeding the PRG in one soil sample collected at a depth of 3.5 to 4 feet bgs during installation of monitoring well MW547-3. No other VOCs were detected at concentrations over their respective PRGs in soil samples collected during this investigation.

No SVOCs were detected in soil at concentrations exceeding their respective residential PRGs. Benzo(a)pyrene was detected at a concentrations exceeding the 2002 residential PRG in the SVOC analytical run in one soil sample collected at a depth of 5 to 5.5 feet bgs during installation of monitoring well MW547-5.

Arsenic (30 samples), iron (MW547-3 [5.5 to 6.0]), and lead (MW547-5 [0.5 to 1.0]) concentrations exceeded the 2002 residential PRG.

Groundwater

Five of the 10 borings mentioned previously were completed as monitoring wells, one in each corner of Site 12 and one southwest of the pump island. Five groundwater samples were collected, one from each monitoring well, and were analyzed for VOCs, SVOCs, pesticides metals, TRPH, TOC, and cations and anions. The table below summarizes the chemicals

detected at concentrations exceeding the tap water PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 22 1991 Phase 1 and 2A Investigation Groundwater Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration**
VOCs	Benzene	MW547-3
	Ethylbenzene	MW547-5
SVOCs	Naphthalene	MW547-3
Pesticides	None	Not Applicable
Metals	Aluminum, iron, manganese, nickel, and vanadium	MW547-2
	Arsenic	MW547-1

Notes:

PAHs analyzed with SVOC analytical group

Benzene and ethylbenzene were detected at concentrations exceeding the tap water PRG (EPA 2002a) in three of five groundwater samples collected from monitoring wells MW547-3 through MW547-5. No other VOCs were detected at concentrations exceeding their respective tap water PRGs in groundwater samples collected during this investigation.

No SVOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs (EPA 2002a). Naphthalene was detected at concentrations exceeding the 2002 residential PRG in the SVOC analytical run in two groundwater samples collected from monitoring wells MW547-3 and MW547-4.

No pesticides were detected in groundwater at concentrations exceeding their tap water PRGs (EPA 2002a).

Various metals that exceeded the 95 percent/95 percent statistical tolerance level for background were detected in groundwater (PRC and JMM 1992). Aluminum, arsenic, iron, manganese, nickel, and vanadium exceeded 2002 tap water PRGs (EPA 2002a).

Soil Gas

A soil gas survey targeting BTEX and TPH was conducted using a grid with approximately 50-foot spacing (Canonie 1989). Sixty-two samples were collected to evaluate the extent of hydrocarbons in soil vapors. Benzene and TPH were detected in many locations, but the highest concentrations were found west of the fuel pump island and along the western edge of Site 22. Soil gas sampling locations were not surveyed and are not shown on Figure 8-2.

Analytical detection limits of numerous VOC, SVOC, and metals in soil and groundwater exceeded 2002 residential PRGs (EPA 2002a). Furthermore, QA/QC information was not

available for data validation when the investigation report was prepared. As a result, groundwater and soil data were used for qualitative purposes only for the investigation report, but the Navy and agencies deemed the data acceptable for inclusion in the risk assessments.

Recommendations for future work included collection of additional soil samples to evaluate the extent of light and heavy hydrocarbons at Site 22. The collection of additional groundwater samples was recommended to evaluate tidal influence on the shallow and deep water-bearing zone, to better characterize the quality of groundwater, and to evaluate whether groundwater beneath Site 22 was considered a potential drinking water source. It was noted that no groundwater monitoring well was located downgradient of the southern edge of Site 22 to characterize groundwater in that area.

The investigation report concluded that based on the samples collected sufficient metals data were collected in soil for the RI/FS and that VOCs, SVOCs, and petroleum detected at Site 22 would be addressed during the risk assessments (PRC and JMM 1992).

8.2.2.2 Follow-On Investigation, 1994

Based on recommendations of the 1991 investigation (PRC and JMM 1992) and discussions with the regulatory agencies, a follow-on investigation was conducted to provide additional lithologic, chemical, and hydrogeologic information to assess the nature and extent of soil and groundwater contamination at Site 22 for the RI/FS (PRCEMI and MW 1994). Analytical data from the initial Phase 2A investigation indicated the presence of elevated concentrations of VOCs, SVOCs, pesticides, metals, TRPH, and EDB in soil and of VOCs, SVOCs, metals, and TRPH in groundwater at Site 22. Activities conducted under the follow-on investigation included performing a geophysical survey, drilling boreholes, constructing monitoring wells, performing a CPT analysis, sampling groundwater using a Hydropunch, sampling at nonpoint sources, and performing quarterly groundwater monitoring (PRC and MW 1995). Sampling locations for this investigation are shown on Figure 8-2.

A geophysical survey was conducted across Site 22 to determine the presence and location of two waste oil tanks suspected to be near the western portion of the site, but the tanks were not located (PRC and MW 1995).

Four CPT locations were driven to evaluate lithology and hydrogeologic characteristics below a depth of 15 feet. Hydropunch groundwater sampling was conducted adjacent to these locations to assess the impact of chemicals to deeper groundwater. Results of both activities identified the need for deeper monitoring wells at Site 22 (PRC and MW 1995).

Soil

Twenty-nine soil samples were collected from 10 boreholes during this investigation. The boreholes were logged continuously to provide for additional lithologic information about Site 22. Three of these soil borings were located near the USTs in the northwest corner of Site 22 to

characterize light and heavy fractions of petroleum hydrocarbons. The samples were analyzed for VOCs, SVOCs, and metals (see Table 8-5). The table below summarizes the chemicals detected at concentrations exceeding the residential PRG and the location with the highest concentration for each chemical.

Site 22 1994 Follow-On Investigation Soil Summary

Analytical Group	Detected Chemicals Exceeding 2002 Residential PRG	Location of Highest Concentration
VOCs	Benzene	B07C-12
	Ethylbenzene, toluene, and total Xylenes	B07C-14
SVOCs	Benzo(a)pyrene	M07C-08
Metals	Arsenic	B07C-15

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

TPH-E and TPH-P, petroleum-related VOCs, and PAHs were detected in soil samples collected at Site 22. Impacted areas were mainly northwest of the fuel island, in the vicinity of the fuel lines.

BTEX was detected in soil at concentrations exceeding their respective residential PRGs (EPA 2002a). SVOCs were detected in soil samples collected during this investigation. Benzo(a)pyrene was detected at a concentrations exceeding the 2002 residential PRG (EPA 2002a) in the SVOC analytical run in boring M07C-08 (0.5 to 1 feet bgs).

Arsenic was detected in 10 of 16 soil samples at concentrations exceeding the residential PRG (EPA 2002a). No other VOCs, SVOCs, or metals were detected at concentrations exceeding their respective residential PRGs.

Groundwater

Four of the boreholes were converted to shallow monitoring wells. One borehole was converted to a deep monitoring well (D7C-01) (see Figure 8-2). The wells were installed to (1) characterize the lateral extent of VOCs detected in groundwater downgradient of Site 22; (2) further characterize VOCs, metals, and petroleum hydrocarbons concentrations in the shallow groundwater aquifer; and (3) further characterize groundwater gradients and flow directions at Site 22. The wells installed during this phase and existing wells were sampled on a quarterly basis for 1 year. Water levels were also measured quarterly to characterize seasonal changes in groundwater flow directions and gradients. Five of the wells were not sampled during the fourth quarter (PRC and MW 1996). Table 8-6 presents the groundwater analytical results for the 1994 investigation. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRG and the location with the highest concentration for each chemical.

Site 22 1994 Follow-On Investigation Groundwater Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration**
VOCs	1,2-DCA	DHP-S07C-03
	Benzene and ethylbenzene	MW547-3
SVOCs	Naphthalene	MW547-3
	Pentachlorophenol	DHP-S07C-02
Metals	Arsenic	MW547-3
	Manganese and thallium	DHP-S07C-01

Note:

PAHs analyzed with SVOC analytical group

VOCs, SVOCs, metals, and TPH, were detected in groundwater samples collected during the 1994 follow-on investigation at concentrations exceeding 2002 tap water PRGs (EPA 2002a). Various metals that exceeded the 95 percent/95 percent statistical tolerance level for background were detected in groundwater (PRC and JMM 1992). Arsenic, manganese, and thallium exceeded the 2002 tap water PRGs (EPA 2002a).

Analytical detection limits of numerous VOC, SVOC, and metals in soil and groundwater exceeded the 2002 tap water PRGs (EPA 2002a).

Nonpoint Source Samples

One nonpoint source sample was collected from the storm drain catch basin 6J-1A, southwest of Site 22 on Eleventh Avenue, downstream of the inlets located on the western portion of the site. Figure 8-2 shows the nonpoint sampling location.

Based on the data collected, it was determined that chemicals detected during this investigation were similar in nature to those found during previous investigations. The extent of chemicals appeared to be adequately characterized; however, the need for additional investigation was recommended to evaluate if a human health or environmental risk was defined during the risk assessment (PRC and MW 1995).

8.2.2.3 Follow-On Investigation, 1998

This investigation consisted of basewide quarterly groundwater monitoring to assess and monitor the extent of plumes at various sites at Alameda Point. Four wells at Site 22 were sampled to monitor the migration and degradation of a petroleum and VOC plume at the site. Monitoring well MW547-4 was selected because it exhibited the highest concentrations of petroleum hydrocarbons at Site 22. Three other wells near the outer edge and downgradient of the plume were also selected for groundwater monitoring. One well (M07C-07) was not sampled during quarters three and four (Tetra Tech and U&A 1998). Sampling locations are presented on Figure 8-2. Table 8-7 is a statistical summary of groundwater samples collected during the 1998

investigation. The table below summarizes the chemicals detected at concentrations exceeding the PRG and the sampling location with the highest concentration for each chemical.

Site 22 1998 Follow-On Investigation Groundwater Summary		
Analytical Group	**Detected Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
VOCs	Benzene and ethylbenzene	MW547-4
	TCE	M07C-08
Metals	Arsenic and manganese	MW547-4

Benzene and ethylbenzene were detected in samples collected from monitoring well MW547-4 at concentrations exceeding their respective tap water PRGs (EPA 2002a). TCE was detected in a sample from monitoring well M07C-08 on the eastern border of Site 22 at a concentration exceeding the tap water PRG (EPA 2002a).

Various unfiltered and filtered metals were detected at concentrations above reporting limits in groundwater samples collected during this investigation, but only arsenic and manganese were detected at concentrations exceeding the tap water PRGs (EPA 2002a).

Petroleum was detected frequently in several sampling locations.

Data from this investigation were used in the basewide analysis of ambient water quality (Tetra Tech 1998) and in the evaluation of the beneficial uses of groundwater (Tetra Tech 2000a). Samples from the first quarter of groundwater monitoring were also analyzed for TOC to help evaluate the degradation potential for petroleum hydrocarbons.

8.2.2.4 Storm Sewer Investigation, 2000

This basewide investigation evaluated the physical conditions of storm sewers and the places where storm sewers are submerged below groundwater; identified locations where contaminated groundwater intercept submerged, damaged sections of storm sewers; and identified significant data gaps for further evaluation (Tetra Tech 2000b). During this investigation, the conditions of storm sewer conditions were assessed and manholes 6J-1A to 6J-1B (the portion of the storm drain located within Site 22) were logged by video. The storm drain from manholes 6J-1A to 6J-1B is a 332-foot long, 12-inch reinforced concrete pipe. The depth of the storm drain is unknown. Video logging detected a damaged area in the section of the storm drain between manholes 6J-1A and 6J-1B. It is unknown whether groundwater infiltration is occurring in the damaged area. A TTPH plume with concentrations of 1.4 mg/L and an ethylbenzene plume with concentrations of 0.005 mg/L that intersect the southern portion of the storm drain from manholes 6J-1A to 6J-1B were delineated (Tetra Tech 2000b); plume contours were developed using averages of the data collected from each monitoring well between June 1990 and April 2000. The section of the storm drain from manholes 6J-1A to 6J-1B was ranked as “low priority” because the plumes do not intersect the damaged section of the storm drain.

8.2.2.5 Supplemental Data Gaps Investigation, 2001

Based on identified data gaps, a supplemental data gap sampling effort was conducted at OU-2A to address two primary data gaps categories: (1) the status of groundwater contaminant plumes and (2) preferential flow paths associated with the storm sewer system (Tetra Tech 2002a). The investigation at Site 22 included sampling of groundwater monitoring wells, but did not include sampling of bedding material at the storm sewers. Additional sampling for secondary data gaps, including collecting soil gas samples, was conducted within Site 22.

Groundwater

Seven groundwater monitoring wells at and three wells adjacent to Site 22 were sampled to establish current site conditions, identify point-of-compliance wells for long-term monitoring, and approximate exposure areas for the risk assessments (Tetra Tech 2002a). See Tabel 8-8. Water level elevations were also collected to provide local conditions of groundwater flow. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRG and the sampling location with the highest concentration for each chemical.

Site 22 2001 Supplemental Data Gaps Sampling Investigation

Analytical Group	Detected Chemicals Exceeding the 2002 Tap Water PRG	Location of Highest Concentration
VOCs	1,2-DCA and carbon disulfide	CAA4C-DGS-DP05
	Acetone, ethylbenzene, and total xylenes	CAA4C-DGS-PZ01
	Benzene and toluene	CAA4C-DGS-DP01
PAHs	Naphthalene	MW547-3

VOCs detected in groundwater at concentrations exceeding their respective tap water PRGs (EPA 2002a) included 1,2-DCA, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and total xylenes. TPH constituents, most commonly TPH-g and TPH-jet fuel, were detected in all groundwater samples collected.

Naphthalene was detected at concentrations exceeding the tap water PRG (EPA 2002a) in samples from one well (MW547-3) during both the SVOC and PAH analytical runs. No other PAHs were detected at concentrations exceeding the tap water PRG in groundwater samples.

Soil Gas

Soil gas sampling was conducted to refine risk assessment calculations associated with the exposure route for volatilization of chemicals into buildings (Tetra Tech 2002a).

Two borings for soil gas sampling were advanced at locations selected with assistance from the BCT for use in future risk assessment (see Figure 8-2). At each soil gas sampling location, two continuous core soil borings were completed to determine specific groundwater depths and

evaluate physical soil parameters required for the risk assessment model. Samples were collected at depths of 1.5 and 4.0 feet bgs. BTEX was detected in all four of the soil gas samples.

Results of this investigation provided further information about the extent of contaminants at Site 22 (Tetra Tech 2002a). The benzene plume in groundwater was found to extend south of the former fuel pump island. Sampling was conducted in accordance with the FSP and accompanying QAPP and project-specific DQOs (Tetra Tech 2001a). Analytical detection limits were established based on MCLs and not 2002 residential PRGs (EPA 2002a).

8.2.2.6 Basewide Groundwater Monitoring, 2002 and 2003

The specific objectives of the 2002 and 2003 basewide groundwater monitoring were (1) to evaluate contaminant plumes in groundwater and (2) to determine the main chemicals of concern (Shaw 2003a). The monitoring scheme for OU-2A included 23 of the 46 wells located within the five sites of OU-2A (Sites 9, 13, 19, 22, and 23). One well (MW547-3) located within Site 22 was sampled quarterly. Two other wells (D07C-01 and M07C-08) were sampled semi-annually (two times per year). The first round of sampling was conducted in June 2002 (IT 2002). Samples were analyzed for VOCs, dissolved metals, TPH-E and TPH-P (see Table 8-9). Sampling locations are presented on Figure 8-2. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRGs (EPA 2002a) and the sampling location with the highest concentration for each chemical.

Site 19 2002 and 2003 Basewide Groundwater Monitoring Investigation

Analytical Group	Detected Chemicals Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOCs	Benzene, chloroform, ethylbenzene, n-propylbenzene, naphthalene, PCE, and TCE	MW547-3
Metals	Arsenic, iron, and manganese	MW547-3

VOCs were detected at concentrations exceeding tap water PRGs (EPA 2002a) in groundwater samples from well MW547-3 only. These VOCs included benzene, chloroform, ethylbenzene, n-propylbenzene, naphthalene, PCE, and TCE. TPH-g, TPH-d, and TPH-jet fuel were also detected. Arsenic, iron, and manganese were detected at concentrations exceeding their respective PRGs (EPA 2002a) were detected in samples from monitoring well MW547-3.

8.2.2.7 Basewide PAH Study, 2003

The objective of the PAH study was to collect sufficient PAH data to calculate EPCs for risk assessments at CERCLA sites (Bechtel 2003). Historical PAH data collected at each CERCLA site were used to estimate the mean and standard deviation of BaP concentrations to determine the appropriate number of PAH samples to collect at each site. At Site 22, 22 soil borings were advanced using direct-push sampling methods. Samples were collected from each of the borings

at the following four depth intervals: 0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs. In general, PAHs were detected at concentrations less than PRGs and below the action level (see Table 8-10). Sampling locations for the PAH study are presented on Figure 8-3. The table below summarizes PAHs detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest concentration for each chemical.

Site 22 2003 PAH Study		
Analytical Group	**Detected Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
PAH	BaP, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene	C3S022B009
	Chrysene	C3S022B018
	Naphthalene	C3S022B007

8.2.3 EBS

The EBS was performed to identify the environmental condition of all base property and facilities to facilitate transfer to the community as expeditiously as possible. Two phases of the EBS were conducted at the installation. Results for the EBS investigations are presented in Table 8-13.

Phase 1. The first phase of investigation comprised an examination of aerial photographs and historical records as well as the performance of site inspections and interviews with current and former employees involved in operations. The Phase 1 EBS investigation concluded that many parcels had insufficient information to classify them as transferable; therefore, recommendations for additional investigation were prepared and presented in the zone analysis plans and parcel evaluation plans (ERM-West 1995a, 1995b).

Phase 2A. As recommended by the IAS (E&E 1983), the Phase 2 investigation did not focus on areas already under evaluation. Other Navy land uses or areas that may impact transfer were the subject of the investigations. Site 22 lies within EBS Zone 22 and consists solely of Parcel 145. Soil sampling was conducted at this parcel in January 1995 during the Phase 2A investigation. No zone- or parcel-specific sampling was conducted in Parcel 145 (IT 2001).

During Phase 2A, one sediment sample was collected in a storm sewer at the southwestern corner of Site 22 . The sample was analyzed for CLP SVOCs, VOCs, X-ray fluorescence metals, TPH-E and TPH-P, and reactivity (IT 2001). A low concentration of BaP was detected in the sample. The location of this EBS sample is depicted on Figure 8-2.

8.2.4 TPH Program

The borders of Site 22 are roughly the same as CAA 4C. Three investigations conducted under the TPH program at Alameda Point included Site 22. These studies were a metal detector survey

(Precision Locating 1998), a free-phase floating product investigation (Tetra Tech 2000c), a data gaps investigation for CAAs (Tetra Tech 2001e), and a CAP for CAA 4C (Tetra Tech 2003c).

Metal Detector Survey. In August 1998, a metal detector survey was conducted to locate the reported 5,000- and 10,000-gallon metal USTs (547-4 and 547-5). CAA 4C was searched on a 5-foot grid using a Fisher TW-6 split box locator mounted on a staff. No indications of a metallic anomaly indicative of an UST were found within CAA 4C (Precision Locating 1998).

Floating Product Investigation. In October 1999, the possible presence of floating product was investigation at selected UST sites at Alameda Point. The investigation included assessing organic vapors in monitoring wells using a flame ionization detector (FID) and a photoionization detector (PID), measuring the groundwater elevation using a water level meter, and measuring possible floating product using an oil/water interface probe (Tetra Tech 2000c).

Seven monitoring wells (MW547-1 through MW547-5, M07C-08, and M07C-09) were investigated for floating product (as shown on Figure 8-2). VOCs were detected with the PID/FID in ambient air and at the open wellheads of monitoring wells MW547-3 and M07C-08. Floating product was not detected with the oil/water interface probe in any of the monitoring wells (Tetra Tech 2000c).

Data Gaps Investigation at CAAs. In April 2000, a data gaps investigation was conducted at CAA 4C to determine whether MTBE and chlorinated hydrocarbons were present in groundwater. MTBE (not analyzed during previous investigations) and chlorinated hydrocarbons were detected in groundwater north of CAA 4C in Site 4. Chlorinated hydrocarbons were possibly associated with operations conducted in Building 360 (a former plating shop), located northwest of CAA 4C. However, if chlorinated hydrocarbons had been present in groundwater at concentrations that presented a risk to human health or the environment, then contaminated groundwater would have been addressed under the CERCLA program (Tetra Tech 2001e).

Four Hydropunch samples were collected at depths of 10 and 50 feet bgs at two sampling locations (CA04-05 and CA04-06), north and northwest of the Site 22 boundary. Groundwater samples were collected from monitoring wells MW547-1, MW547-4, M07C-08, and M07C-09. These sampling locations are shown in Figure 8-2. Groundwater samples were analyzed for VOCs. MTBE was not detected in any of the groundwater samples; however, toluene was detected in four of the samples. Chlorinated hydrocarbons were not detected above the laboratory reporting limits (Tetra Tech 2001e).

CAP for CAA-4C. The widespread presence of petroleum in soil and groundwater at Site 22 is directly related to operation of the gas station and fuel releases that occurred during that time; therefore, this site is addressed under the TPH program. A TPH evaluation was conducted, and results of the evaluation are presented in the draft CAP for CAA 4C (Tetra Tech 2003c); the CAP addresses remedial alternatives for the cleanup of all TPH-related compounds at Site 22. The RWQCB has approved this CAP and the remedial design for CAA-4C. Remedial action consisting of DVE began in July 2004.

8.2.5 Removal Actions

In November 1994, PWC removed USTs 547-1 through 547-3 (see Figure 8-1). At the time of removal, the condition of the USTs was not noted; however, the excavation sidewalls had visible signs of contamination at approximately 5 feet bgs. PWC collected three soil samples (547-W1 through 547-W3) and two groundwater samples (547-L1 and 547-L8) from the UST excavation at the soil/groundwater interface (approximately 9.5 feet bgs). Soil and groundwater samples were analyzed for BTEX, lead, TPH-E and TPH-P, and TRPH. Appendix E provides the complete analytical results for this removal action. Benzene, ethylbenzene, and xylene were detected in all three soil samples, and toluene was detected in two soil samples. Lead was not detected in any of the three soil samples analyzed. TPH-g and TPH-d were detected in all three soil samples, TPH-jet fuel was detected in two soil samples, and TPH-mo was detected in one soil sample. The groundwater sample exhibited concentrations of BTEX, lead, and TTPH.

In January 1995, PWC removed about 1,500 feet of fuel lines from the pump island area and collected 14 soil samples (547-1 through 547-14) from the base of the fuel line excavations, as shown on Figure 8-2. Soil samples were analyzed for BTEX, lead, and TPH-E and TPH-P. The maximum BTEX concentrations were detected at sampling locations 547-3 and 547-5. Lead was detected in all 14 samples, with the maximum concentrations detected at sampling locations 547-6 and 547-11 (located in the northeast and southern portion of the fuel pump island area, respectively). TPH-d and TPH-jet fuel were detected in all 14 soil samples; TPH-g was detected in 7 samples and TPH-mo was detected in 13 samples (see Appendix E). The maximum TPH fraction concentrations were detected at sampling locations 547-3 and 547-5 (located in the northern portion of the fuel pump island area). Sampling locations for this investigation are presented on Figure 8-2.

In July 2004, remedial action using DVE began to remove floating petroleum product and vent the vadose zone above groundwater at Site 22.

8.2.6 Treatability Studies

No treatability studies were conducted within Site 22.

8.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 8.2, the Navy completed an initial data evaluation for Site 22. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

8.3.1 Site 22 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment,

and filling data gaps. This iterative process resulted in a CSM specific to Site 22 and identification of remaining data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 22 is described below and presented on Figure 8-5.

Through environmental investigations and literature searches for Site 22, physical features and activities at Site 22 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination:

- Former gasoline service station and associated USTs 547-1 through 547-3 (UST(R)-17) and fuel lines – USTs 547-1 through 547-3 stored gasoline; at least one UST and fuel lines were confirmed to have leaked fuel; potential source of petroleum products.
- Building 547-1 (car wash) and associated OWS 547 – potential source of petroleum products.
- Placement of dredged fill material used to build the island – potential source of PAHs.

Sufficient sampling has not been conducted near OWS 547, which is associated with the car wash, to determine whether soil or groundwater contamination occurred during operation of the car wash. The SWMU evaluation report (see Appendix G) indicates a data gap for OWS 547.

Of these potential sources, (1) the former gas station and associated USTs 547-1 through -3 and fuel lines, (2) OWS 547 associated with the car wash, and (3) fill material containing PAHs were identified as likely sources of contaminants in soil and groundwater at Site 22. The exposure pathways and primary and secondary release mechanisms may include the following:

- Direct release of petroleum products associated with the former gas station and associated USTs 547-1 through 547-3 and fuel lines to soil and groundwater.
- Direct release of petroleum products associated with OWS 547 to soil.
- Placement of fill material that contained PAHs.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration uptake.
- Secondary release from groundwater to air through volatilization.
- Secondary release from groundwater into domestic use through a well.

As shown in the CSM for Site 22 (see Figure 8-5), residential, commercial/industrial, and construction worker receptors were identified as potential human receptors, and exposure scenarios, including ingestion of homegrown produce and ingestion, inhalation, and dermal contact with soil and groundwater, are evaluated in the HHRA (see Appendix H). Exposure of potential ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ERA (see Appendix I).

Exposure of potential ecological receptors to groundwater from migration to surface water was considered an incomplete pathway. Site 22 is not tidally influenced, groundwater contamination has not migrated to San Francisco Bay, and the storm sewer system at Site 22 is not considered a preferential pathway for contaminant migration to San Francisco Bay. In addition, samples collected from the storm drain bedding downstream at Site 22 did not exhibit VOCs at concentrations exceeding the detection limits, indicating that the bedding is not a migration pathway.

A storm sewer line runs along the western border of Site 22 from manholes 6J-1A to 6J-1B. The storm drain from manholes 6J-1A to 6J-1B is a 332-foot long, 12-inch reinforced concrete pipe. The depth of the storm drain is unknown. Video logging during 2000 detected a damaged area in the section of the storm drain between manholes 6J-1A and 6J-1B (Tetra Tech 2000b). It is unknown whether groundwater infiltration is occurring in the damaged area. A TTPH and ethylbenzene plume intersecting the southern portion of the storm drain from manholes 6J-1A to 6J-1B was delineated in the storm sewer addendum report (Tetra Tech 2000b); plume contours were developed using averages of the data collected from each monitoring well between June 1990 and April 2000. The section of the storm drain from manholes 6J-1A to 6J-1B was ranked as “low priority” because the plumes do not intersect the damaged section of the storm drain.

8.3.2 Site 22 Data Quality Assessment

As discussed in Section 8.2, several environmental investigations were conducted at Site 22 as a part of the CERCLA and EBS programs to identify and assess the extent of contamination in soil and groundwater and to determine risk. Data were collected over a period of approximately 13 years from 1990 through 2003 using a biased and phased sampling approach. Sampling focused on the following:

- Gasoline station and associated USTs, and soil and groundwater suspected to be impacted by a waste oil UST
- VOCs, SVOCs, pesticides, metals, and TPH in soil, and VOCs, SVOCs, metals, and TPH in groundwater
- Monitoring the migration and degradation of a petroleum and VOC plume
- Industrial, sanitary, and storm sewers
- Fill material and native sediments to assess the presence of PAHs

These data, through an iterative process, were used to construct and refine the site-specific CSM conceptual site model presented in Section 8.3.1 and to identify and fill data gaps until the quantity and quality of the data at Site 22 were judged to be sufficient to complete the RI report, as determined by applying the DQOs presented in Section 3.4.

Detection limits for some of the data used to evaluate Site 22 are elevated over residential PRGs (EPA 2002a); these elevated detection limits are the consequence of one or more of the following circumstances: (1) the evolution of lower detection limits as technology improves, (2) the revision of PRGs over time (which are not always technologically feasible), (3) and matrix interference. The first two of these circumstances generally do not result in significantly elevated detection limits. However, matrix interferences sometimes cause significant elevations in the detection limits for a chemical contaminant, which leads to uncertainty as to whether that undetected compound could be present in significant concentrations at a site. Although some detection limits (SQL) were elevated above 2002 residential PRGs, detection limits for nondetected chemicals were typically sufficiently low to permit identification of potential health risks. However, detection limits were elevated for nondetected SVOCs in soil and groundwater and for VOCs, PCBs, and thallium in groundwater. These elevated detection limits are likely related to matrix interference from high concentrations of TPH in soil and groundwater. Further sampling and analysis of soil and groundwater may be needed to confirm that these chemicals are not present or to determine the extent of contamination.

Although soil and groundwater data gaps were identified, it was determined that the types and numbers of samples collected at Site 22 (see Figures 8-6A through 8-6L) and the analyses conducted were sufficient to characterize the site and to conduct risk assessments because data collection at the site focused mainly on potential sources and was conducted in phases. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of the collected data and the need to collect additional data to identify releases and complete the RI report. There is a low potential of any source at Site 22 not being adequately evaluated or of recommending NFA if it poses a potential risk to human health or the environment.

Both definitive and screening-level data were generated. Screening data were considered appropriate for use only in evaluations of nature and extent and fate and transport of chemicals. Section 3.4.2 provides further detail on the assessment of data quality and the use of definitive and screening-level data.

Data generated during the environmental investigations that were considered to be of sufficient quality for use in the RI report are presented in Appendix E and in the subsections below. Tables 8-13 and 8-14 summarize results of the CERCLA and EBS investigations for soil and groundwater. Soil gas results can be found in Appendix E. No data were collected at Site 22 under the TPH investigations. The summaries are organized according to analytical group and include the following: (1) the number and percent of detections of chemicals; (2) the average, minimum, and maximum detected concentrations; (3) minimum and maximum detection limits for nondetected samples; and (4) whether the maximum detected concentrations or detection limits exceed Region 9 residential PRGs or Cal-modified PRGs (EPA 2002a). Cal-modified

PRGs are used for some chemicals if the California EPA PRG is more protective than the federal EPA value. PRGs and MCLs are provided in the tables for comparison only.

8.3.2.1 Soil

Soil samples collected at Site 22 under the environmental investigations were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and TPH as well as selected organic metals, pH, TOC, and percent moisture (see Table 8-13). Of the samples collected and analyzed, 64 samples for VOCs, 79 samples for SVOCs, 88 samples from the additional PAH sampling conducted in 2003, 63 samples for pesticides and PCBs, and 78 samples for metals were considered acceptable for use in this RI report. PAH data for soil samples collected during previous investigations were not evaluated because of the high detection limits associated with these data. Laboratory detection limits for some other chemicals exceeded residential PRGs (EPA 2002a); these exceedances are noted in Table 8-13. Detection limits for a few of the nondetected VOCs, SVOCs, pesticides and PCBs, and thallium in soil also exceeded residential PRGs (EPA 2002a); however, most of the nondetected samples had detection limits below PRGs except for the following SVOCs: 2-nitroaniline, hexachlorobenzene, and n-nitroso-di-n-propylamine, for which more than 50 percent of the detection limits exceeded PRGs in soil. These elevated detection limits are likely related to matrix interference from high concentrations of TPH. Detection limits for VOCs, SVOCs, pesticides and PCBs, and thallium were sufficiently low to permit identification of potential health risks.

A subset of these data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Only data collected with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS program are more of a screening nature, and inclusion of these data could add more uncertainty to the risk assessments. Risk from TPH was assessed separately (see Appendix F). Soil samples collected from petroleum-saturated soil were not included in the risk assessments. Petroleum-saturated soil was encountered in the area of the fuel island. Data for soils that are no longer present at Site 22 due to removal actions were not included because they do not reflect current conditions at the site.

Data for soil from each site were aggregated in depth intervals of 0 to 2, 0 to 4, and 0 to 8 feet bgs. The depth intervals evaluate potential exposures associated with site use. The 0-to-2-feet and 0-to-8-feet-bgs depth intervals evaluate potential human health exposures, and the 0-to-4-feet-bgs depth interval evaluates potential ecological exposures. The total number of samples for each analytical group included in the data set for each of these depth intervals is presented in the table below.

Number of Suitable Soil Data for Site 22 Risk Assessments			
Analytical Group	**(0 to 2 feet bgs)**	**(0 to 4 feet bgs)**	**(0 to 8 feet bgs)**
VOCs	6	20	37
SVOCs	15	30	49
PAHs	44	66	88
Pesticides and PCBs	9	19	34
Metals	15	29	50

The minimal data for VOCs in soil from 0 to 2 feet bgs is not perceived as a data gap because Site 22 is predominantly paved, and VOCs in surface soil would likely volatilize and no longer be present in soil at the site. Data for 2 to 8 feet bgs are sufficient to capture the nature and extent and risk from VOCs at Site 22.

Although nine soil samples collected between 0 to 2 feet bgs were analyzed for pesticides and PCBs, these data were not included in the risk assessments because they were nondetected. The lack of PCB and pesticide data was not perceived as a data gap because Site 22 is predominantly paved and pesticide and PCB use was not an activity identified at Site 22.

8.3.2.2 Groundwater

Groundwater samples collected at Site 22 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals as well as physical parameters (hardness, acidity, pH, anions, specific conductance, total dissolved solids) dissolved gases, sulphides, biological and chemical oxygen demand (see Table 8-14). Of the samples collected and analyzed, 75 samples for VOCs, 29 samples for SVOCs, 7 samples for PAHs, 5 samples for pesticides and PCBs, and 52 samples for metals were considered acceptable for use in this RI report. Laboratory detection limits for some chemicals in groundwater exceeded tap water PRGs (EPA 2002a); these exceedances are shown in Table 8-14. Some VOCs, SVOCs, and PCBs that were nondetected or detected in groundwater at a low frequency had detection limits exceeding tap water PRGs and MCLs. Elevated detection limits are likely due to matrix interference from the high concentrations of TPH present in groundwater. PAHs and pesticides in groundwater had detection limits exceeding tap water PRGs (EPA 2002a); however, they were not significantly elevated and are likely due to the revision of PRGs over time and detection limits that are not always technologically feasible. Detection limits for nondetected thallium in groundwater were also elevated, and a few soil samples also had elevated detection limits for thallium.

A subset of the groundwater data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Groundwater data for Site 13 were aggregated by contaminant plume rather than by site. Data for groundwater later replaced with more current data were not included because they do not reflect current conditions at Site 13. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data collected as part of the EBS were not used to evaluate risk because they were collected with DQOs that differ from the CERCLA investigations. At least four

quarters of groundwater data from monitoring wells were used. However, if data were lacking for an analytical group, older data were included for all analytical groups. Groundwater data included samples collected from April 1994 to September 2002. Field and screening-level data typically were not used; however, data obtained using direct-push methods were used because of a lack of data from monitoring wells in the concentrated plume areas.

Groundwater samples collected from floating product areas were not included in the risk assessments. Floating product encountered in the center of Site 22 was associated with gasoline releases from the UST fuel island.

Number of Suitable Groundwater Data for Site 22		
Analytical Group	**Suitable for RI**	**Used in Risk Assessments**
VOCs	75	55
SVOCs	29	15
Pesticides and PCBs	5	0
PAHs	7	0
Metals	52	33

Five samples were analyzed for pesticides, three samples were analyzed for PCBs, and seven samples were analyzed for PAHs; however, data from these samples were not included in the risk assessments because all results were nondetected. The limited PCB and pesticide data was not perceived as a data gap because pesticide and PCB use was not an activity identified at Site 22.

8.3.2.3 Soil Gas

Data for soil gas were collected to evaluate indoor air risk in the HHRA. Four soil gas samples were collected at Site 22; two were collected at a depth of 1.5 feet bgs and two at a depth of 4 feet bgs. One sampling location is located in an area near the former USTs, and the other sampling location is southwest of the former fuel islands. Samples were analyzed for VOCs and SVOCs (see Appendix E). Detection limits for some of nondetected chemicals exceeded ambient air PRGs (EPA 2002a); however, SQLs were not set to meet these requirements.

8.3.3 Site 22 Background Comparison

A background comparison was conducted for Site 22 by comparing a background data set with analytical results for metals in samples representative of Site 22. This comparison was used to determine which metals in soil and groundwater are statistically similar to background and could be considered to be either naturally occurring (background) or potentially resulting from historical site activities. The complete approach is presented in Appendix A and summarized previously in Section 3.4.3.

Metals that exceeded background in soil included barium, beryllium, lead, manganese, selenium, vanadium, and zinc.

The statistical evaluation of lead in soil determined that lead exceeds background at Site 22. A review of the range of concentrations shows that lead concentrations at Site 22 are well above background concentrations (see Appendix A). Background concentrations ranged from 1.3 to 41 mg/kg, while site concentrations ranged from 2.1 to 9,890 mg/kg. Three soil samples (locations 547-6, 547-11 and MW-547-5) exhibited lead at concentrations of 160, 330, and 9,890 mg/kg, respectively. Samples from locations 547-6 and 547-11 were collected at a depth of 2 feet bgs from below the fuel islands. Soil from locations MW547-5 was collected at a depth between 0.5 and 1 foot bgs from an open area east of the paved refueling area. Based on these results, lead concentrations detected at Site 22 are considered above the range of background for Alameda Point.

Arsenic, iron, manganese, and thallium exceeded background in groundwater at Site 22.

The statistical evaluation for arsenic in Site 22 groundwater was only based on a comparison of detection frequencies using the test of proportions; that is, comparison of median concentrations was not possible because of the low detection frequency in the background data set, and comparison of the upper quantiles was not possible because the maximum concentration in both populations was a nondetect. Additional comparison of the two populations was conducted qualitatively using outlier box plots and quantile tables (see Appendix A). This comparison showed that the site median concentration (0.0064 mg/L) was only slightly higher than the background median concentration (0.0052 mg/L), but that the site population exhibited greater skewness (that is, a longer right-hand tail), resulting in higher concentrations for the upper quantiles of the site data set. Arsenic was detected four times at Site 22 at concentrations exceeding the maximum detected background concentration of 0.04 mg/L. The maximum detected concentration (0.086 mg/L) at the site was approximately two times the maximum detected background concentration. Except for four site concentrations that exceed the maximum detected background concentration, the site and background distributions are quite similar. There is no discernable pattern to the distribution of arsenic in groundwater at the site. The concentrations of arsenic detected at Site 22 are considered within the range of background for Alameda Point.

8.4 NATURE AND EXTENT OF CHEMICALS IN SOIL AND GROUNDWATER

This section summarizes the nature and extent of contamination in soil and groundwater at Site 22. The nature and extent evaluation summarizes (1) TPH detected at the site, (2) types and concentrations of CERCLA chemicals that most likely were used at the site, and (3) CERCLA chemicals that demonstrate significant risk to human health or the environment (also known as "risk drivers"). Only chemicals that pose risk to human health or the environment (see Appendices H and I) or relate to past site activity are discussed in the sections below. Section 8.4.2, Chemicals Used at Site 22, assisted the Navy in determining whether contamination "hot spots" were present at Site 22. The nature and extent of risk drivers, excluding those that may occur naturally at the site, are evaluated in Section 8.4.3. Risk drivers

are those chemicals that pose a cancer risk above 1E-06 or an HI above 1 to human receptors or pose significant risk to ecological receptors. The evaluation of risk drivers includes (1) site-specific figures to assess the spatial distribution and concentration patterns of risk drivers and (2) a review of the figures, data, and site hydrology to identify the boundaries of the contamination, the volume of the affected media, and, if possible, the suspected source of the risk drivers at the site.

8.4.1 TPH

Even though TPH is not a CERCLA contaminant, soil and groundwater were sampled at various locations across Site 22 for analysis of TTPH, which includes all TPH-fractions (TPH-d, TPH-g, TPH-jet fuel, or TPH-mo) and TPH-associated constituents (BTEX, lead, and MTBE) (see Figure 8-2).

An evaluation of TPH in soil and groundwater at Site 22 was conducted based on the TPH strategy for Alameda Point (see Appendix F) to assess contamination and possible risk at the site. On the basis of this evaluation, further action is not warranted for soil at Site 22. Further action is warranted for groundwater at Site 22. TPH in groundwater may be commingled with other CERCLA contaminants and should be further evaluated under the CERCLA program after floating petroleum product is removed from Site 22.

Because Site 22 was considered significantly impacted by TPH, corrective action for free TPH product in soil and groundwater is currently underway using a combination of DVE and biosparging. Pilot-scale operation of the DVE system began on June 21, 2004.

The following potential sources of TPH contamination were identified at Site 22:

- Storage of petroleum products – spills and leaks of petroleum products from the USTs and fuel lines were documented during operation of this facility until it was closed
- Fueling of automobiles
- Operation of a car wash – OWS 357 located near the car wash gathered runoff from its operation, including debris washed off of vehicles

Petroleum products and related compounds (BTEX and lead) were detected in soil at significant concentrations at Site 22 during several investigations. Generally the extent of these chemicals in soil is restricted to the immediate area around the fuel island. The nature and extent of petroleum-related compounds is addressed in the CAP for CAA-4C (Tetra Tech 2004) and is summarized below.

Soil

The maximum concentrations of TPH fractions and TPH-associated compounds detected during previous investigations were collected from 6 feet bgs in the area of the former fuel pump islands (see Figure 8-2). TPH-g was the main TPH fraction detected at concentrations of 10,200, 11,700, and 66,900 mg/kg at sampling locations B07C-12, B07C-13, and B07C-14 (see Table 8-11); these locations are 5 feet west of the fuel line that connected USTs 547-1 through 547-3 to the fuel pump islands, in the center of the fuel pump islands, and 30 feet south of the fuel pump islands.

BTEX was detected at concentrations ranging from 3.3 to 2,600 mg/kg in samples collected at 6 feet bgs from locations B07C-12, B07C-13, and B07C-14. TRPH was detected at a concentration of 10,800 mg/kg in a sample collected at 6 feet bgs from location B547-7, which is 15 feet north of the former fuel pump islands.

A soil source area was delineated in the area of the former fuel pump islands based on TTPH concentrations in soil or groundwater that exceeded the floating product screening levels (14,000 mg/kg for soil and 20 mg/L for groundwater) for floating product. The source area boundaries were drawn within close proximity (5 to 10 feet bgs) of sampling locations B07C-14, CAA4C-DGS-DP01 through CAA4C-DGS-DP06, and CAA4C-DGS-PZ01, where TTPH concentrations in soil or groundwater exceeded the floating product screening levels. The maximum concentrations of TPH fractions and TPH-associated compounds were detected in samples collected from 6 feet bgs at the soil-groundwater interface when the groundwater table is at its highest after the rainy season. Therefore, the depth of the soil source area near the former fuel pump islands was defined as 7 feet bgs (or 1 foot below the soil-groundwater interface).

Groundwater

Based on the elevated concentrations of TPH-g detected at 6 feet bgs in the area of the former fuel pump islands, groundwater samples were collected at sampling locations CAA4C-DG-DP01 through CAA4C-DGS-DP05 in April 2002 (see Figure 8-2 and Table 8-12). One sample was collected from each location at the soil-groundwater interface (between 7 and 12 feet bgs), and one samples was collected from each location at 5 feet below the soil-groundwater interface (or between 12 and 17 feet bgs).

In April 2002, samples of floating product were collected at sampling location CAA4C-DGS-PZ01. TTPH was detected above the floating product screening level (20 mg/L) at concentrations ranging from of 122.12 to 245.2 mg/L in samples collected between 7 and 10 feet bgs at locations CAA4C-DGS-DP01, CAA4C-DGS-DP04, and CAA4C-DGS-DP05; these locations are in the center of the former fuel pump islands and at 13 and 14 feet south of the former fuel pump islands. Benzene was also detected in all 10 Hydropunch samples collected between 7 and 17 feet bgs at concentrations ranging from 0.004 to 34 mg/L. Floating product of 1 mm thick was detected in shake tests conducted on soil samples collected at depths of 1.5, 3, 10, and 10.5 feet bgs and 2 mm thick on samples collected at 5 and 6 feet bgs from sampling location CAA4C-DGS-PZ01. However, floating product was not detected in the

piezometer with the oil-water interface probe, but an emulsion layer (with some small globules of floating product) was observed on the groundwater sample collected with the bailer from sampling location CAA4C-DGS-PZ01. The globules of floating product were not observed as a measurable layer after the groundwater sample was poured from the bailer into the volatile organic analysis vials. The top portion of the sample (the emulsion layer) was analyzed. The emulsion layer contained concentrations of TTPH and benzene (237 and 36 mg/L, respectively) that exceeded the floating product screening level.

In May 2002, a groundwater step-out investigation was conducted based on the results from the April 2002 event. Five additional Hydropunch® groundwater samples (locations CAA4C-DGS-DP06 through CAA4C-DGS-DP10) were collected at 4 feet bgs at 50-foot intervals from the locations where the Hydropunch samples were collected. TTPH was detected above the floating product screening level (20 mg/L) at a concentration of 108 mg/L at sampling location CAA4C-DGS-DP06, which is 10 feet northeast of the former fuel pump islands. A benzene groundwater plume was delineated with a surface area of about 40,807 square feet based on concentrations greater than 0.001 mg/L and according to data collected between July 2001 and May 2002.

8.4.2 Chemicals Used at Site 22

This section focuses on CERCLA chemicals detected in soil and groundwater that were used historically at Site 22. Chemicals that most likely were used at Site 22 and their breakdown products included petroleum fuels (TPH-d and TPH-g) and other chemicals associated with gasoline station operation or additives used in gasoline (for example, the anti-knock additive 1,2-DCA). Numerous releases of petroleum fuels directly from punctured USTs and fuel lines were reported to have occurred during the gas station's operation (IT 2001). These chemical concentrations and a general description of their extent are presented below by medium. Most of the chemicals detected across Site 22 are consistent with the historical activities known to occur at the site. Statistical summaries of all results for soil and groundwater are presented in Tables 8-13 and 8-14. Soil gas analytical results are presented in Appendix E.

Soil

Site 22 was a gasoline station, and there were no documented uses of CERCLA contaminants during the site's history. The table below identifies petroleum-related chemicals, the residential PRG (EPA 2002a), the range of concentrations detected in soil at the site, and the sampling locations where the maximum concentration of each chemical was detected. Figure 8-2 shows the sampling locations at Site 22. It also lists chemicals that were not detected in soil but were detected in groundwater at Site 22.

Soil Analytical Results for Chemicals Used at Site 22			
Chemical	**2002 Residential PRG (mg/kg)**	**Range of Concentrations (mg/kg)**	**Sampling Location of Maximum Concentration**
2-Methylnapthalene	NA	0.00026 to 220	C3S022B007
Benzene	0.6	0.006 to 3.8	547-1
Ethylbenzene	8.9	0.003 to 570	B07C-14
Lead	150	9,890 to 2.1	MW-547-5
Naphthalene	56	0.0027 to 110	B07C-14
Isopropylbenzene	160	Not Detected	Not Applicable
n-propylbenzene	240	Not Detected	Not Applicable
Toluene	520	0.002 to 840	B07C-14
Xylene (total)	270	0.002 to 2,600	B07C-14

Note: Residential PRG is provided for reference only. Risks are quantified in the HHRA section of this document.

* Denotes California-modified PRG

Petroleum fuels used at the site throughout its operation contained BTEX, specifically toluene and xylene. High concentrations of these chemicals were detected in soil samples collected across Site 22, but generally around and north of the fuel islands. Benzene was detected at concentrations exceeding the residential PRG in soil at four sampling locations, 547-1, 547-W3, B07C-12, and 547-12 (see Figure 8-2). All of these locations (except for B07C-12) are at or adjacent to the fuel delivery system at Site 22, and samples were collected from these locations during the removal and closure of the fuel lines. Benzene contamination at Site 22 is associated with petroleum use and is being addressed in the CAP (Tetra Tech 2004).

Lead detected in soil at Site 22 is likely associated with (1) the use of leaded gasoline at the fuel islands, (2) lead-based paint, and (3) background. Concentrations of lead in 50 of 53 samples collected at Site 22 are relatively consistent with background concentrations. However, three soil samples from locations 547-6, 547-11, and MW-547-5 exhibited lead at concentrations ranging from 330 to 9,890 mg/kg, which are above the Cal-modified PRG of 150 mg/kg (EPA 2002a). Soil from boring MW547-5 was collected near the surface in an open area east of the paved refueling area and may have contained lead-based paint. Sampling locations 547-6 and 547-11 are located below the fuel islands. Figure 8-2 shows the sampling locations at Site 22.

Naphthalene and 2-methylnaphthalene were detected across Site 22 in almost every PAH sampling location. Fossil fuels, such as petroleum and coal, naturally contain naphthalene compounds. It is assumed that the 2-methylnaphthalene and naphthalene detected at Site 22 are from petroleum hydrocarbons used at the site.

Groundwater

Site 22 was a gasoline station, and there were no documented uses of CERCLA contaminants during the site's history. The table below lists the chemicals that were most likely used at Site 13, the tap water PRGs (EPA 2002a), the range of concentrations detected in groundwater,

and the sampling location of the maximum detected concentration. Figure 8-2 shows the groundwater sampling locations at Site 22.

Groundwater Analytical Results for Chemicals Used at Site 22

Chemical	2002 Tap Water PRG (mg/kg)	Range of Concentrations (mg/kg)	Sampling Location of Maximum Concentration
2-Methylnapthalene	NA	1 to 60	MW547-3
Benzene	0.34	0.3 to 34	MW547-3
Ethylbenzene	1,300	0.7 to 7,100	CAA4C-DGS-PZ01
Naphthalene	0.093	15 to 380	W547-3
Isopropylbenzene	660	100 to 120	MW547-3
n-Propylbenzene	240	260 to 280	MW547-3
Toluene	720	0.3 to 34,000	CAA4C-DGS-DP01
Xylene (total)	210	1 to 36,000	CAA4C-DGS-PZ01

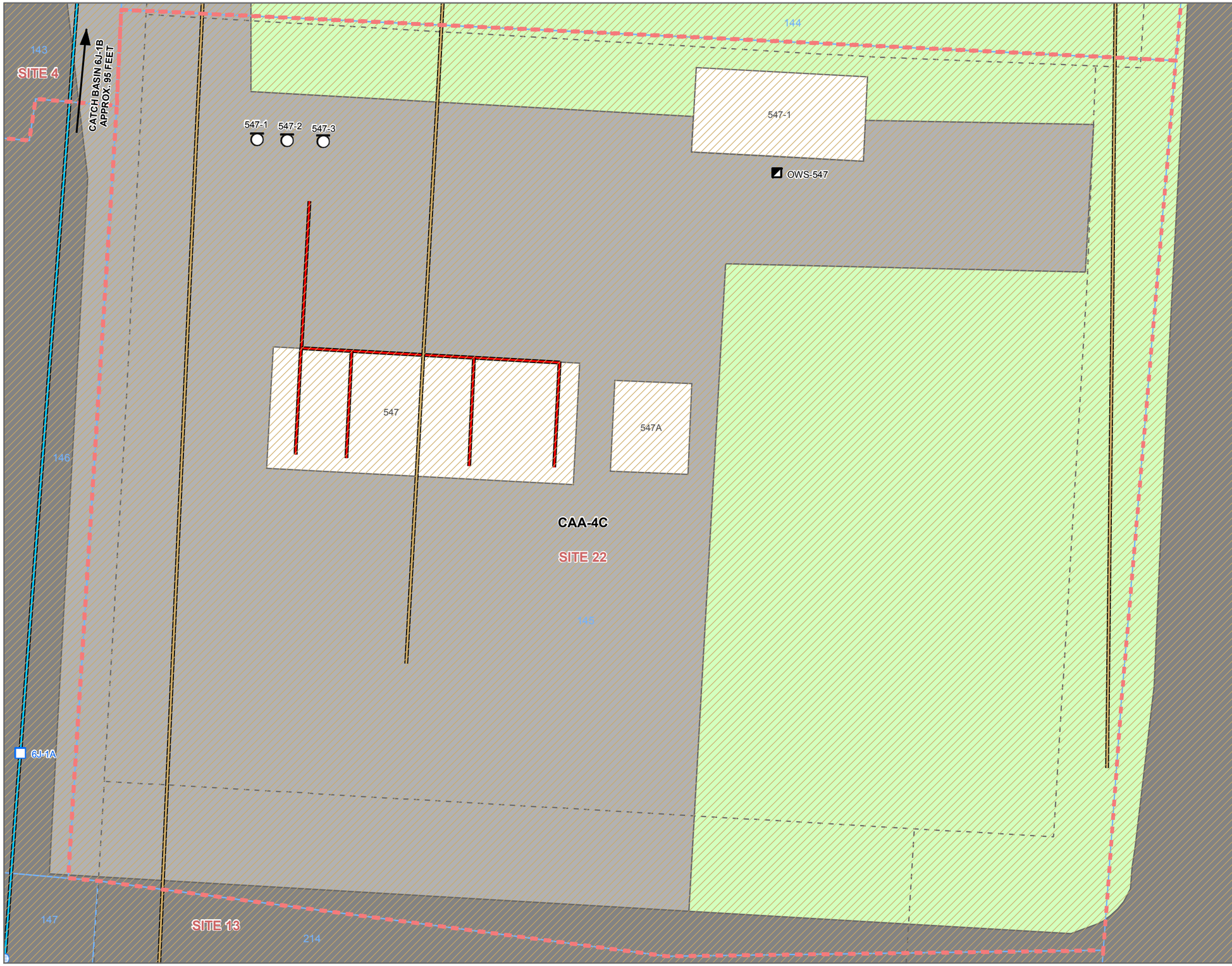
Note: PRG is provided for reference only. Risks are quantified in the Section 8.6 of this RI report.

High concentrations of BTEX were detected in groundwater samples collected across Site 22, but generally around and north of the fuel islands. Petroleum contamination at Site 22 is being addressed in the CAP (Tetra Tech 2004).

The presence of 2-methylnaphthalene, isopropylbenzene, naphthalene, and n-propylbenzene in groundwater is most likely related to the use of petroleum hydrocarbons. Isopropylbenzene and n-propylbenzene occur naturally in petroleum and bituminous coal and were detected only in groundwater samples collected from location MW547-3 during the last three quarters of 2002 to 2003 groundwater sampling. Naphthalene and 2-methylnaphthalene were detected across Site 22, with the highest concentrations detected in groundwater to the south of the fuel islands.

8.4.3 Risk Drivers

Although numerous chemicals were detected at Site 22, most of the chemicals do not pose significant risk as defined by the risk assessments. As a result, the purpose of this section is to further characterize the nature and extent of CERCLA chemicals driving risk at Site 22 that are not background. Selection of these chemicals was based on the background comparison for metals and the results of HHRA and ERA. Based on the HHRA, arsenic, BaP, benzene, ethylbenzene, and lead were identified as risk drivers in soil. Arsenic, 1,2-DCA, benzene, chloroform, ethylbenzene, manganese, naphthalene, PCE, thallium, TCE, and xylene were identified as risk drivers in groundwater. Based on the ERA, lead in soil was determined to pose a risk to terrestrial ecological receptors. Arsenic in soil and groundwater is attributed to background, so the nature and extent of this metal was not evaluated further.



UNDERGROUND STORAGE TANK (UST), REMOVED

CATCH BASIN

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

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FIGURE 8-1
SITE 22 FEATURES

Operable Unit 2A
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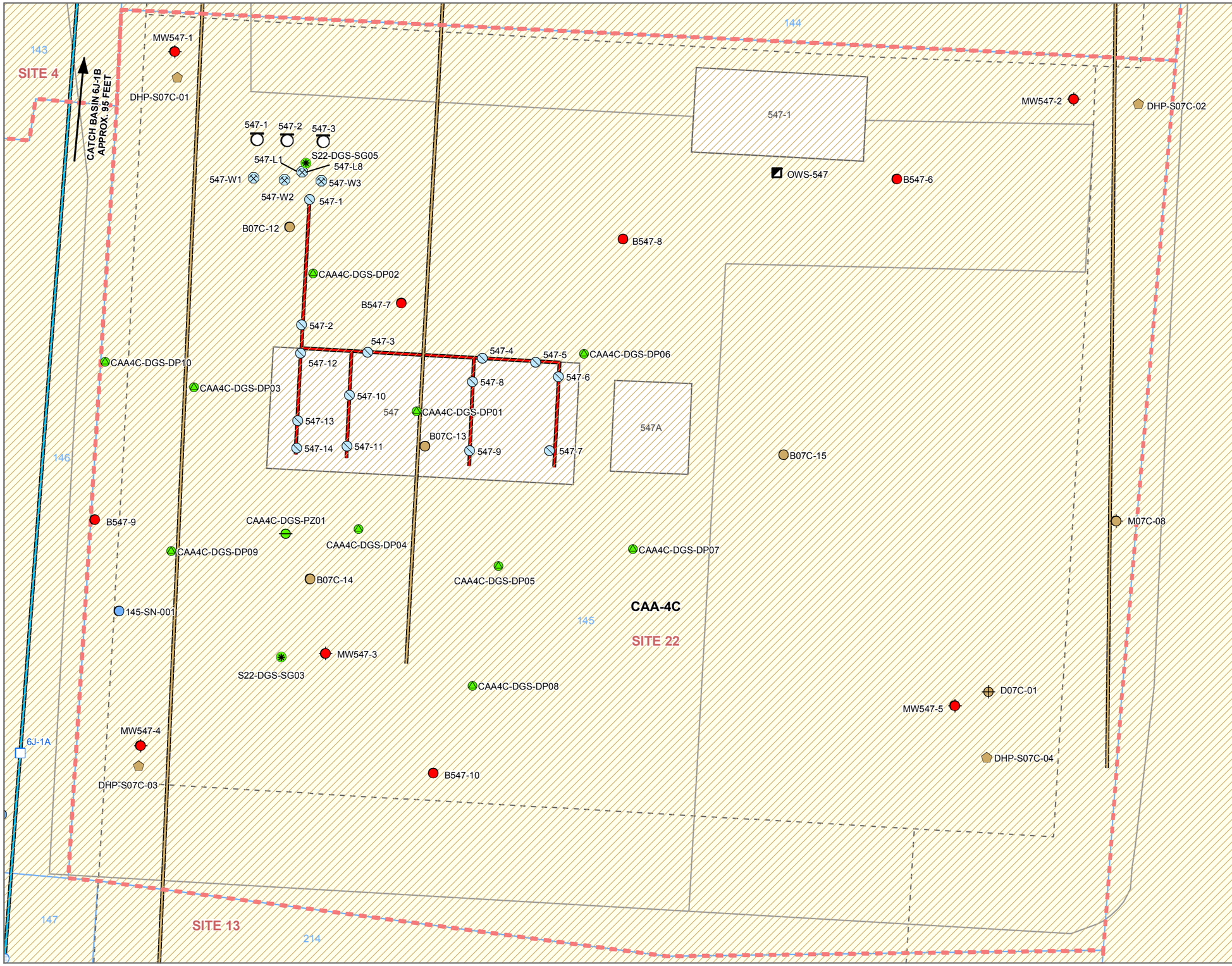

SAMPLE LOCATION

- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Piezometer
- Pipe
- Soil Gas
- Soil Boring

SAMPLE INVESTIGATION

- Total Petroleum Hydrocarbon Program
- Phase 1 & 2A, 1991
- Follow-On Investigation 1994
- Data Gap Sampling 2001
- EBS Phase 2A

- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

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FIGURE 8-2
SITE 22 RI, TPH AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

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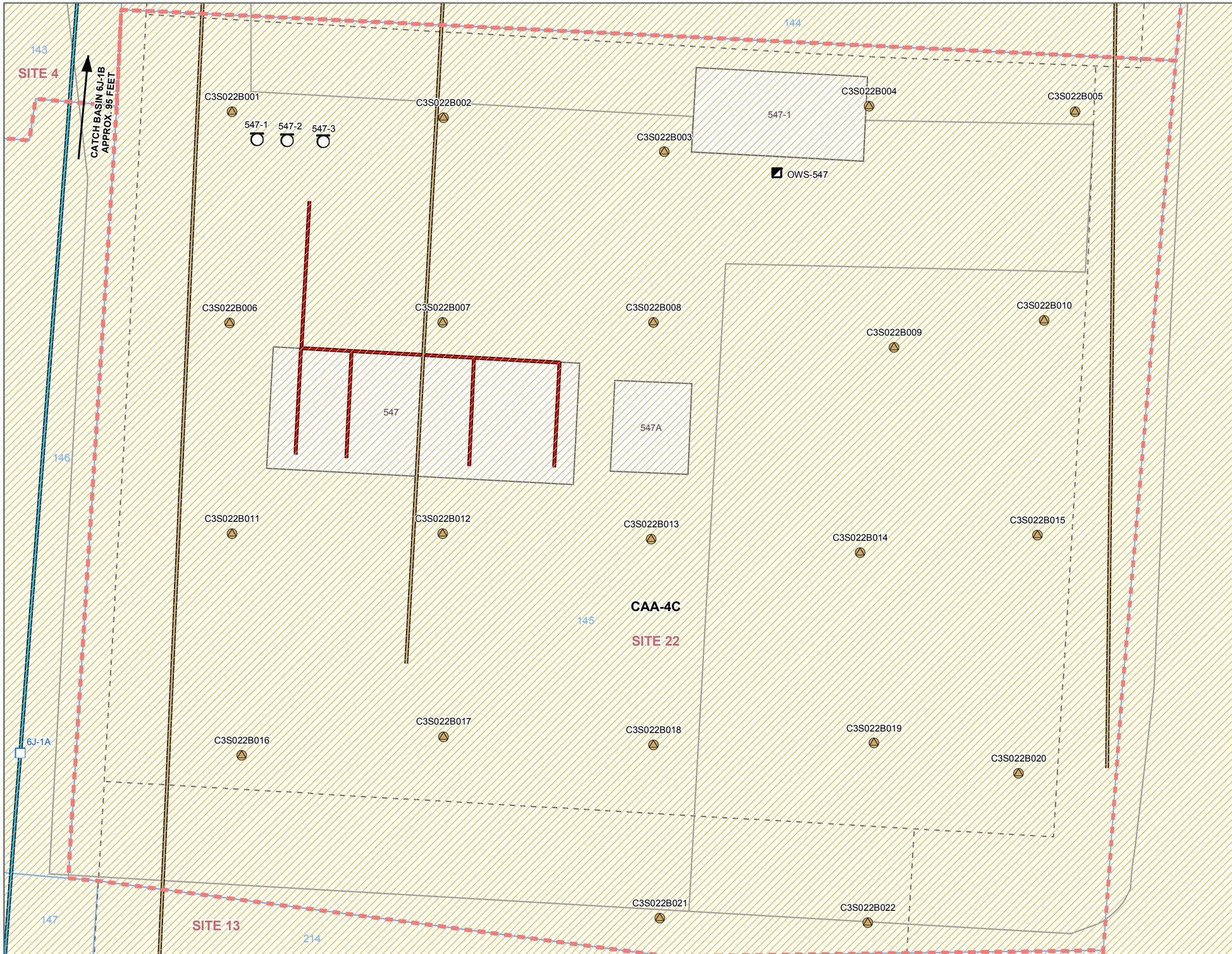

PAH SAMPLE LOCATION

- Direct-Push
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PAH = Polynuclear aromatic hydrocarbon

N

15 0 15 30 Feet

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FIGURE 8-3
SITE 22 REMEDIAL INVESTIGATION
POLYNUCLEAR AROMATIC HYDROCARBON
INVESTIGATION SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

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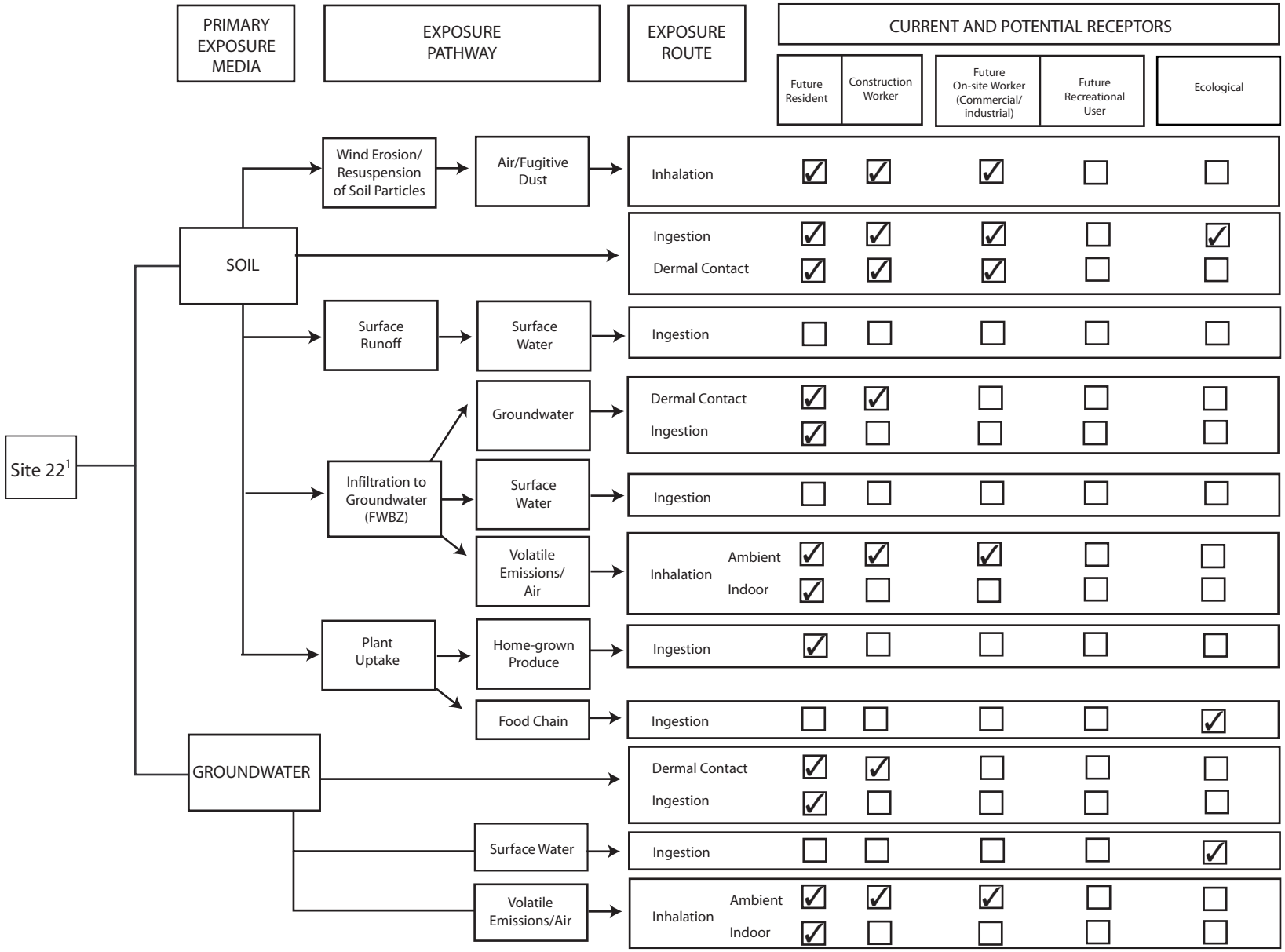

[1]Former gas station USTs 547-1 through 547-3 and fuel lines, car wash OWS 547, fill material

☑ Potentially Complete Exposure Pathway

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FIGURE 8-5
CONCEPTUAL SITE MODEL
Operable Unit 2A
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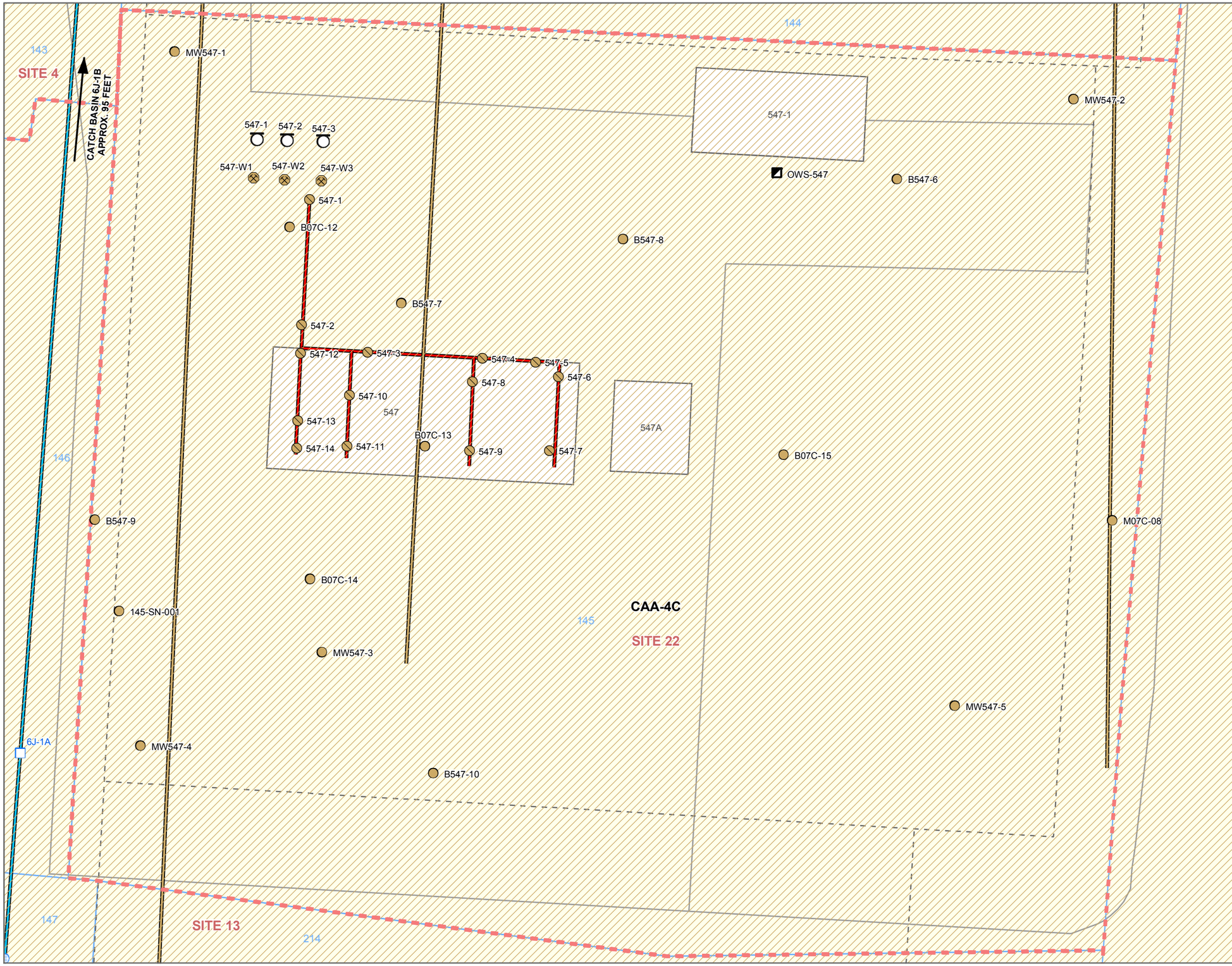

SAMPLING LOCATION

- Excavation
- Pipe
- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
VOC = Volatile Organic Compound

N

15 0 15 30 Feet

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FIGURE 8-6A
SITE 22 SAMPLING LOCATIONS FOR VOCs IN SOIL

Operable Unit 2A
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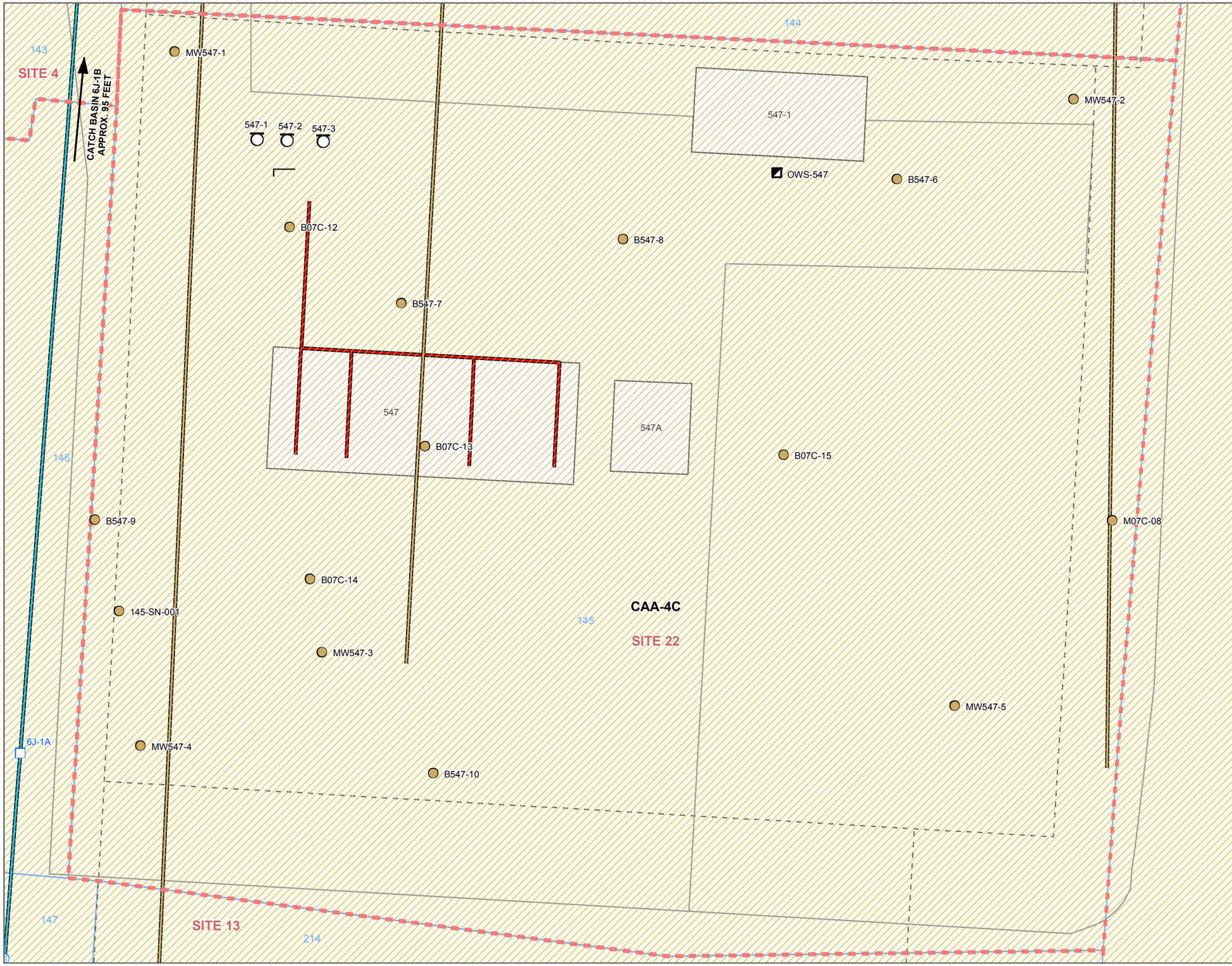

SAMPLING LOCATION

- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
SVOC = Semivolatile Organic Compound

N

15 0 15 30 Feet

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FIGURE 8-6B
SITE 22 SAMPLING LOCATIONS FOR SVOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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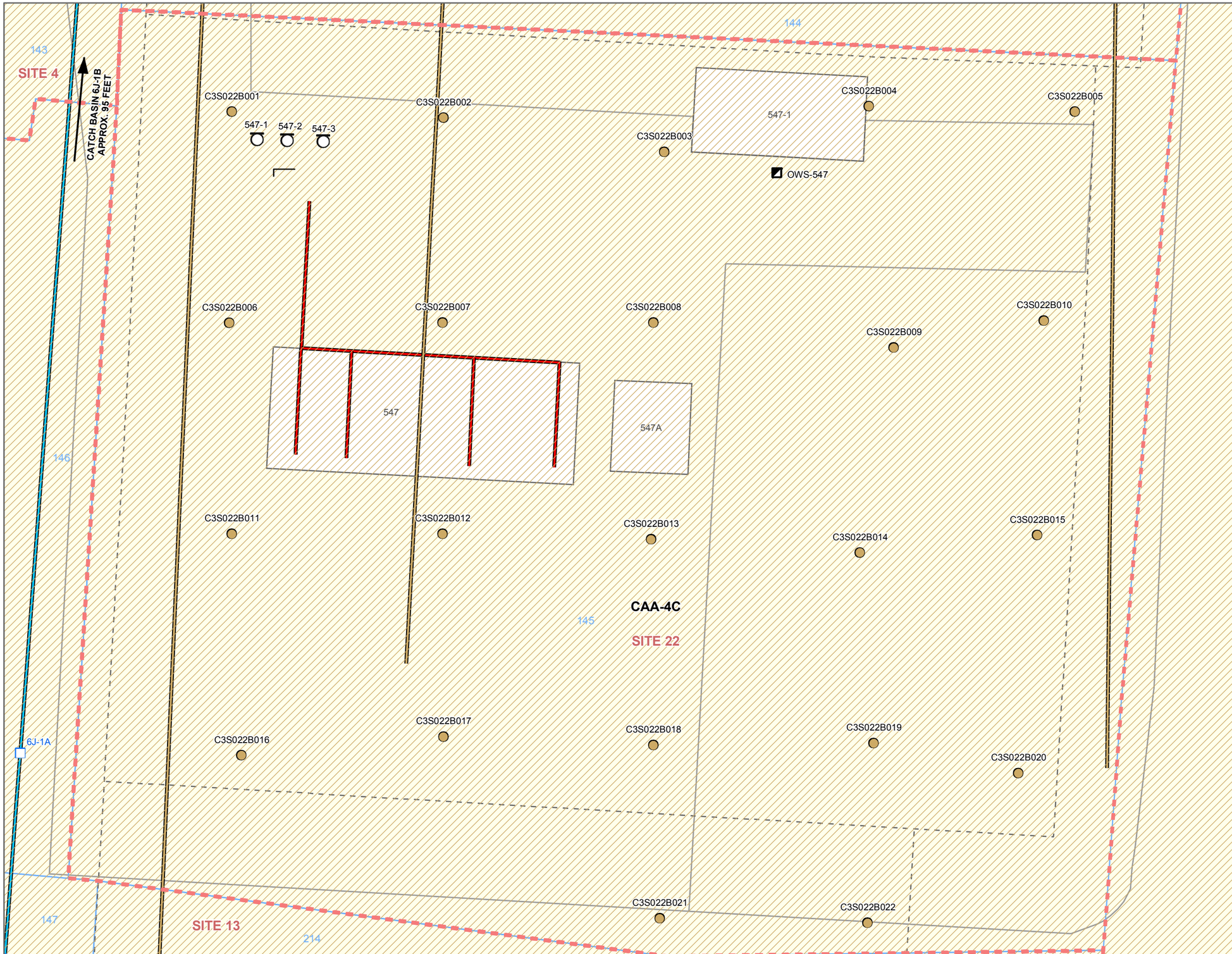

SAMPLING LOCATION

- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PAH = Polynuclear Aromatic Hydrocarbon

N

15 0 15 30 Feet

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FIGURE 8-6C
SITE 22 SAMPLING LOCATIONS FOR PAHs IN SOIL

Operable Unit 2A
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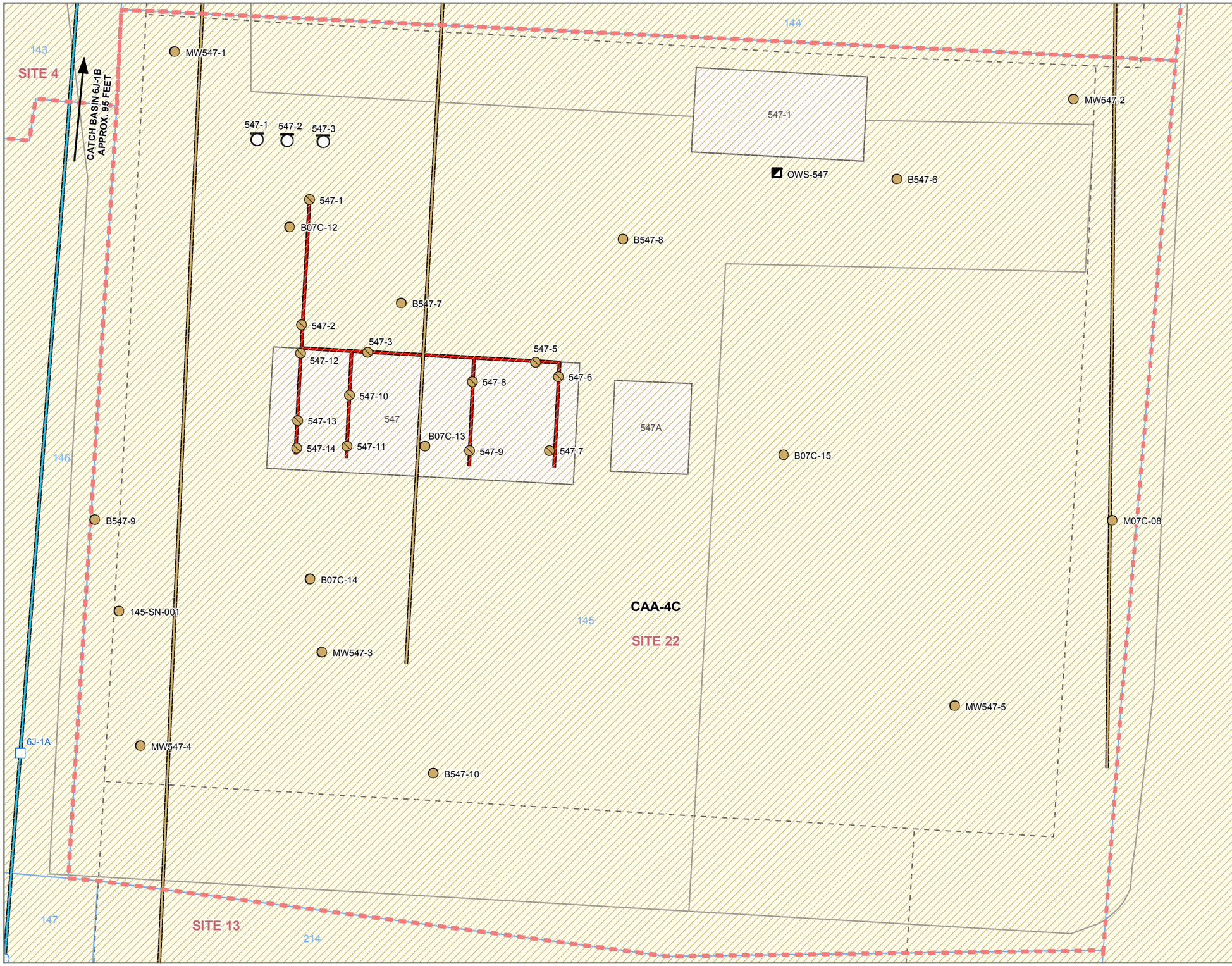

SAMPLING LOCATION

- Pipe
- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

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FIGURE 8-6D
SITE 22 SAMPLING LOCATIONS FOR METALS IN SOIL

Operable Unit 2A
Remedial Investigation Report

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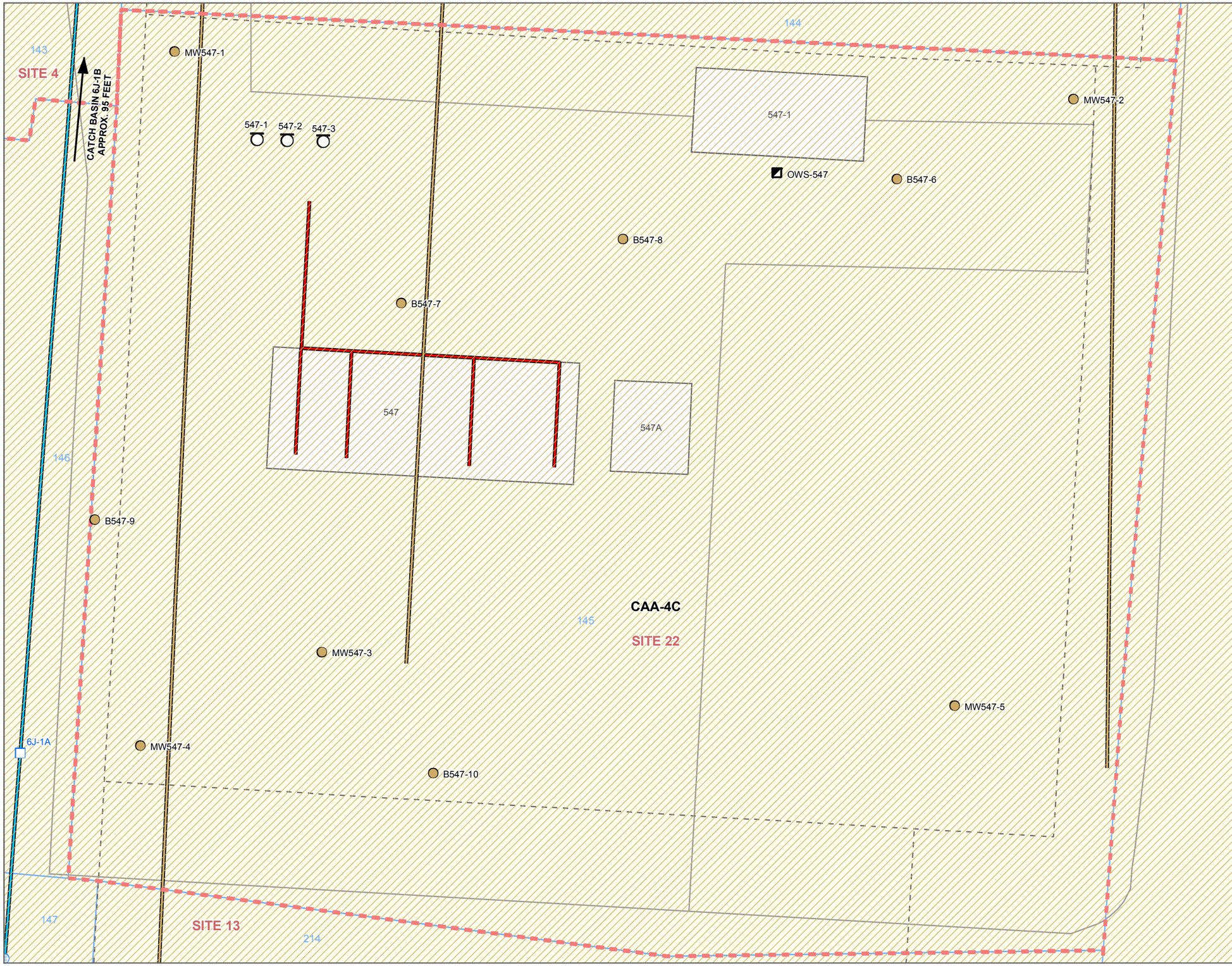

SAMPLING LOCATION

- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

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FIGURE 8-6E
SITE 22 SAMPLING LOCATIONS FOR PESTICIDES IN SOIL

Operable Unit 2A
Remedial Investigation Report

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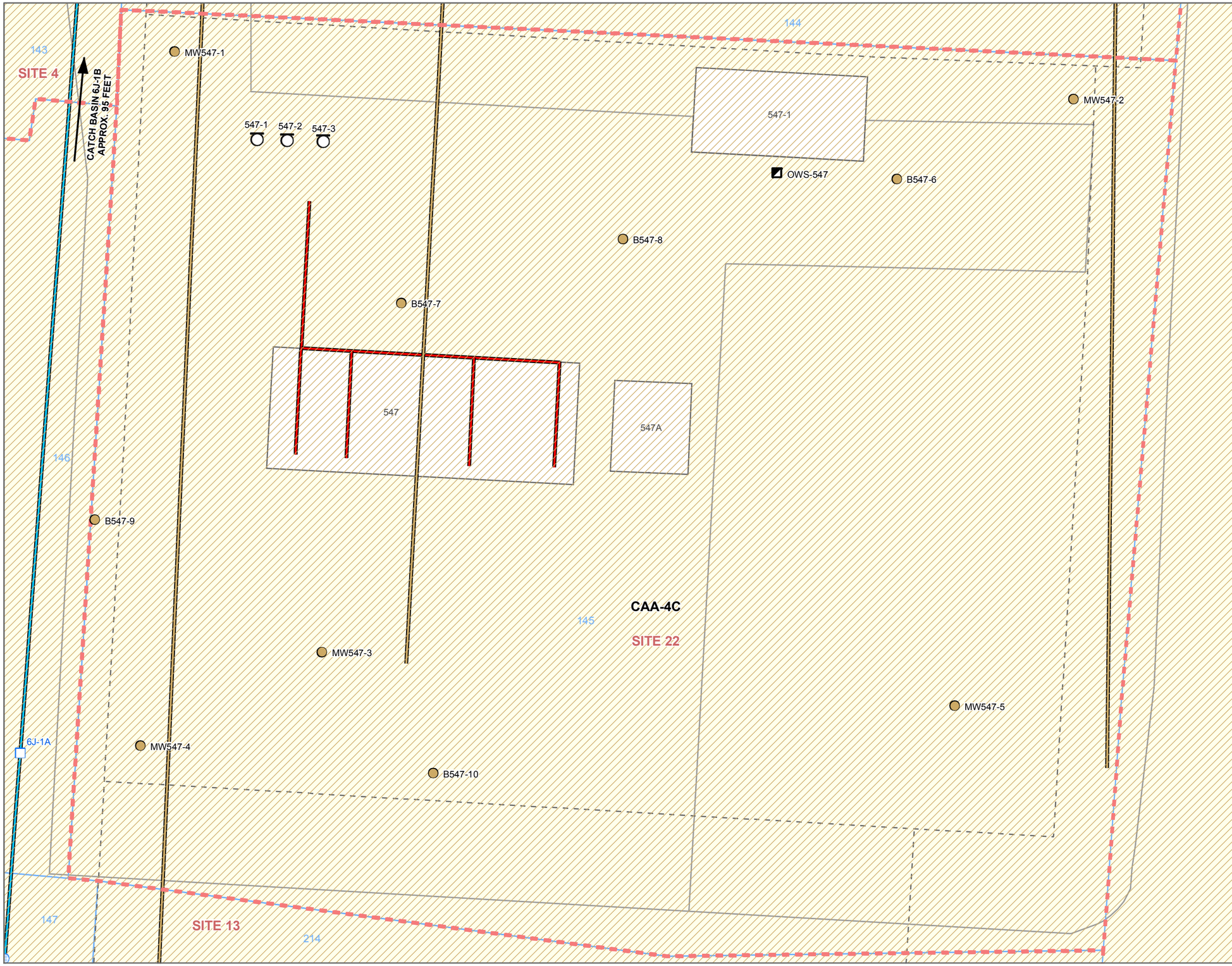

SAMPLING LOCATION

- Soil Boring
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PCB = Polychlorinated biphenyl

N

15 0 15 30 Feet

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U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6F
SITE 22 SAMPLING LOCATIONS FOR PCBs IN SOIL

Operable Unit 2A
Remedial Investigation Report

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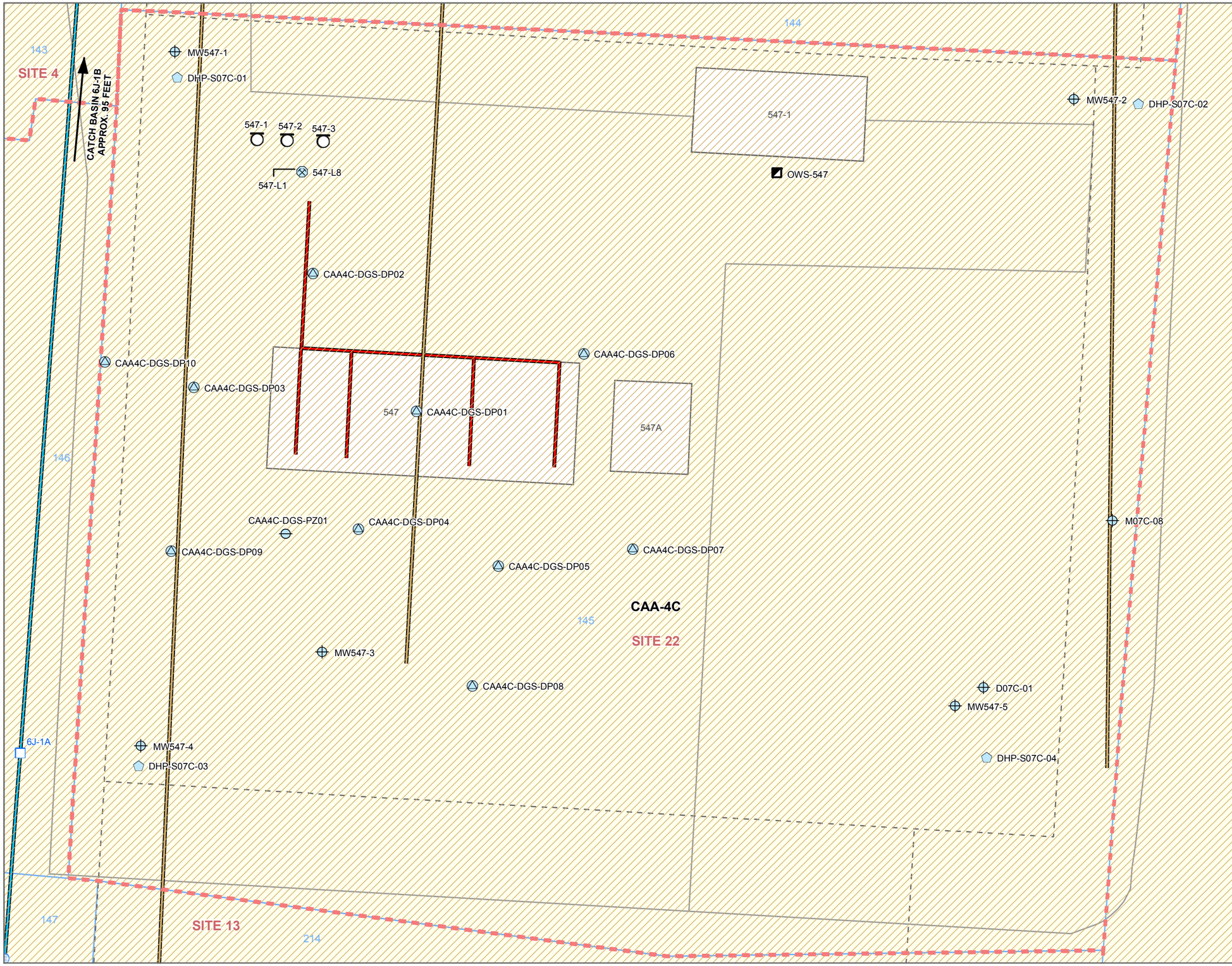

SAMPLING LOCATION

- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Piezometer
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
VOC = Volatile Organic Compound

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6G
SITE 22 SAMPLING LOCATIONS FOR VOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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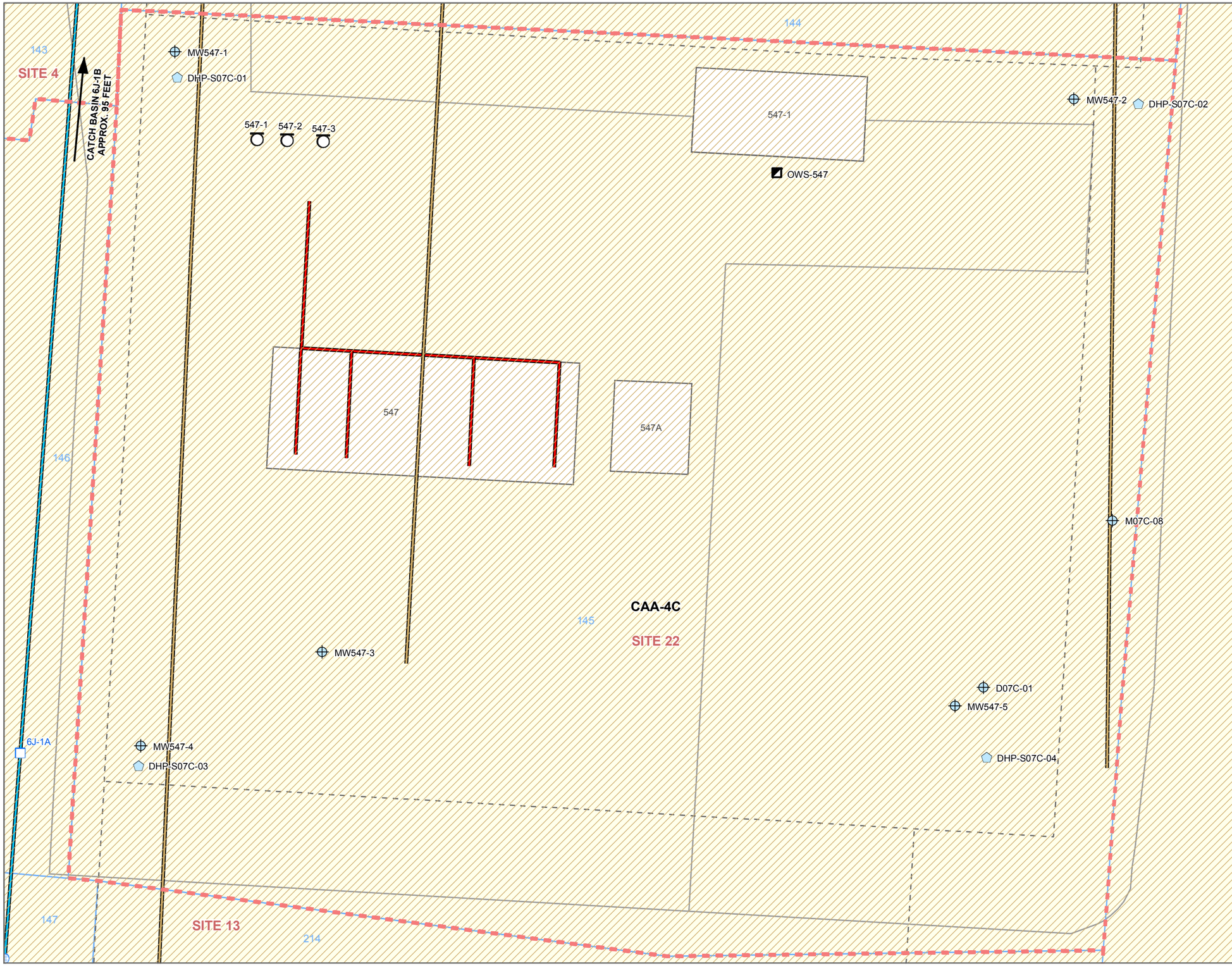

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
SVOC = Semivolatile Organic Compound

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6H
SITE 22 SAMPLING LOCATIONS FOR SVOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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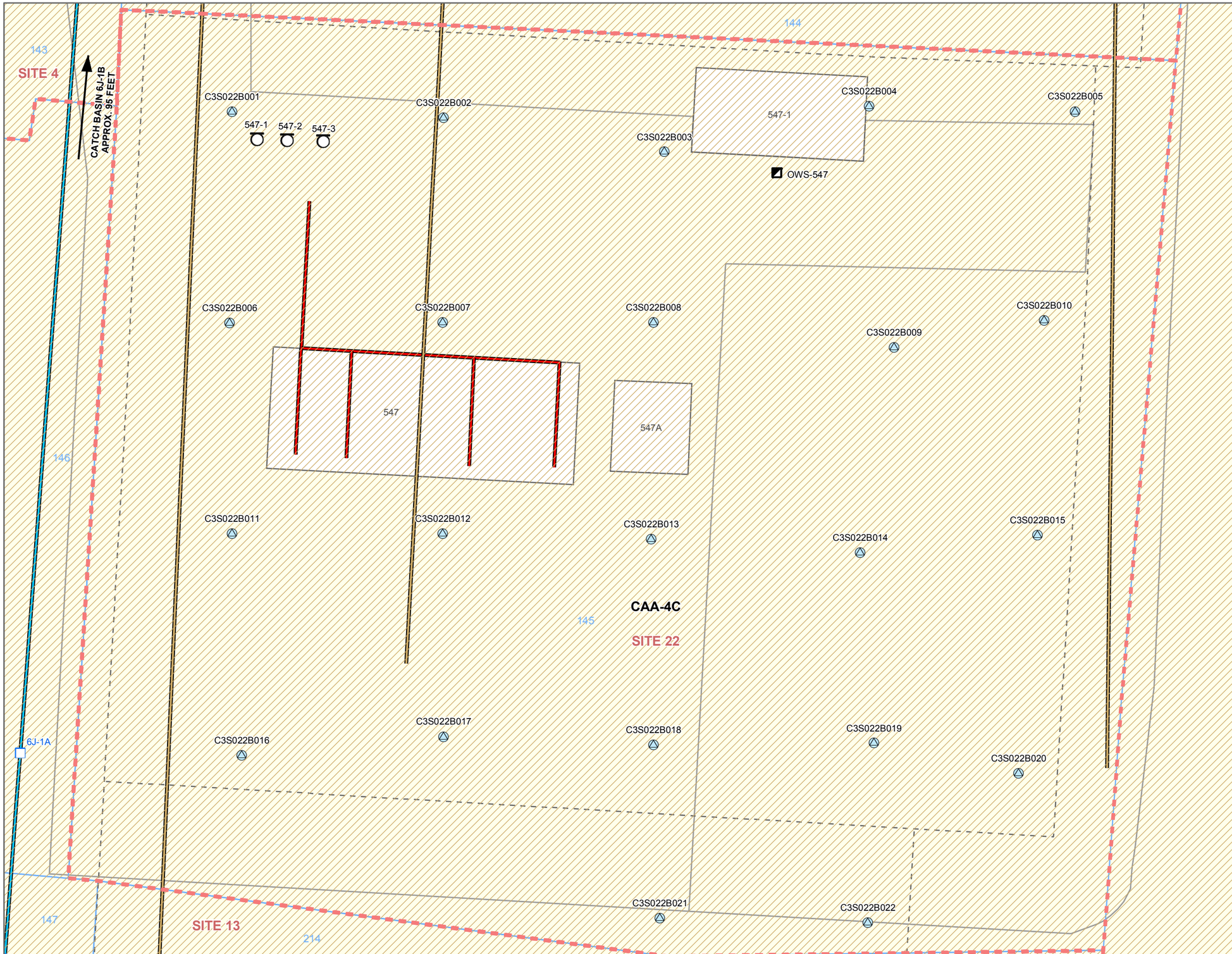

PAH SAMPLE LOCATION

- Direct-Push
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PAH = Polynuclear aromatic hydrocarbon

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6I
SITE 22 SAMPLING LOCATIONS FOR PAHs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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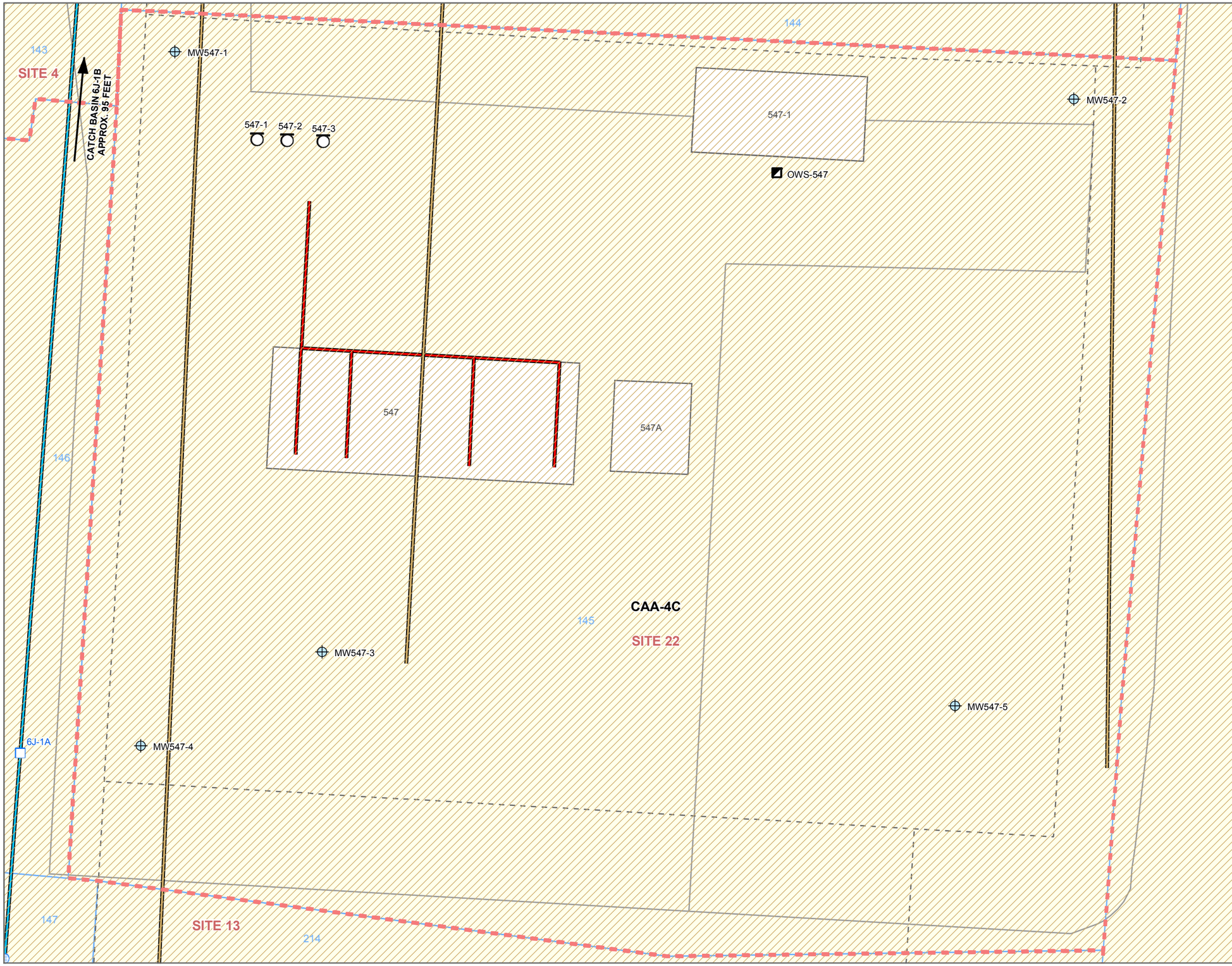

SAMPLING LOCATION

- Monitoring Well
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6J
SITE 22 SAMPLING LOCATIONS FOR PESTICIDES IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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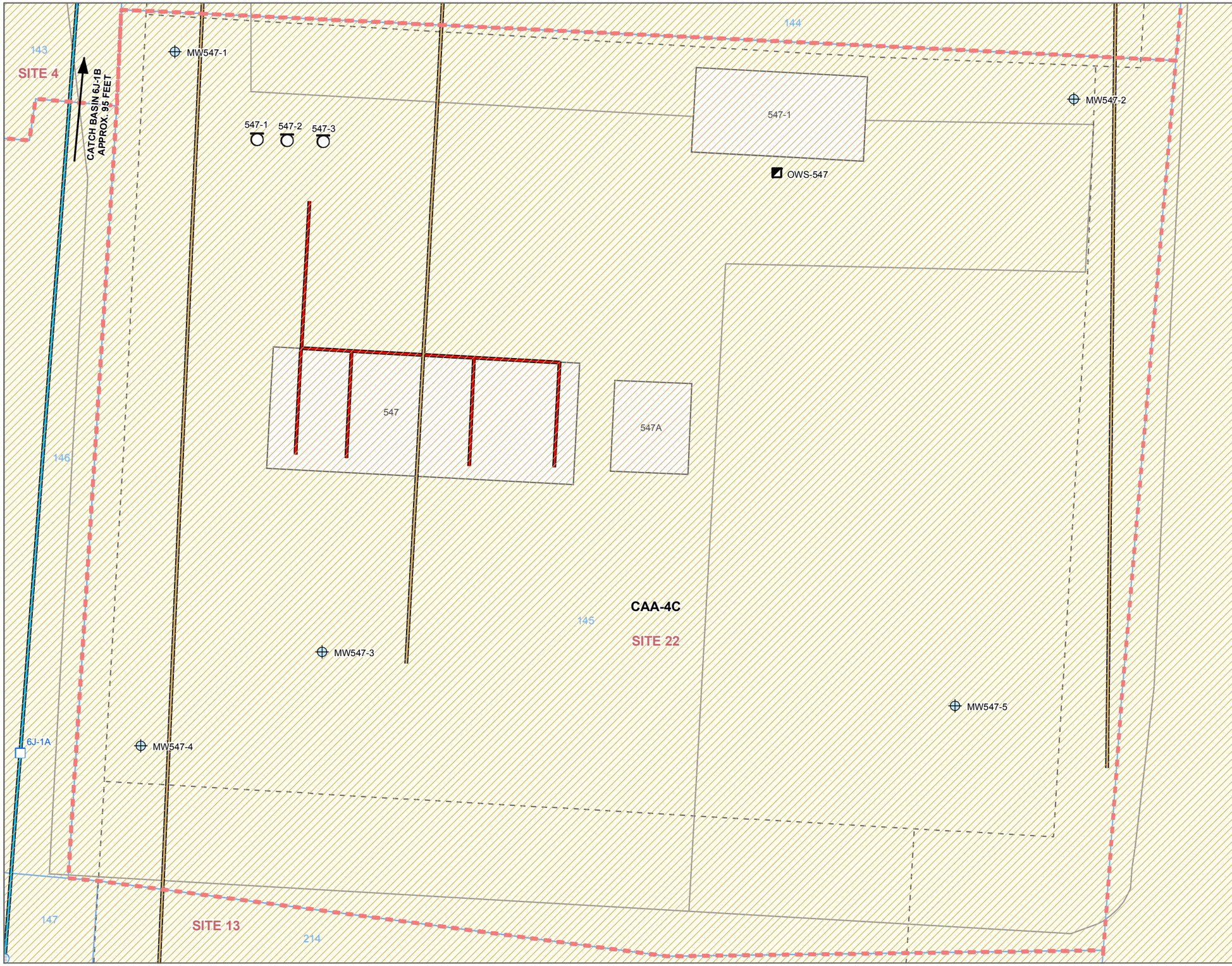

SAMPLING LOCATION

- Monitoring Well
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PCB = Polychlorinated biphenyl

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6K
SITE 22 SAMPLING LOCATIONS FOR PCBs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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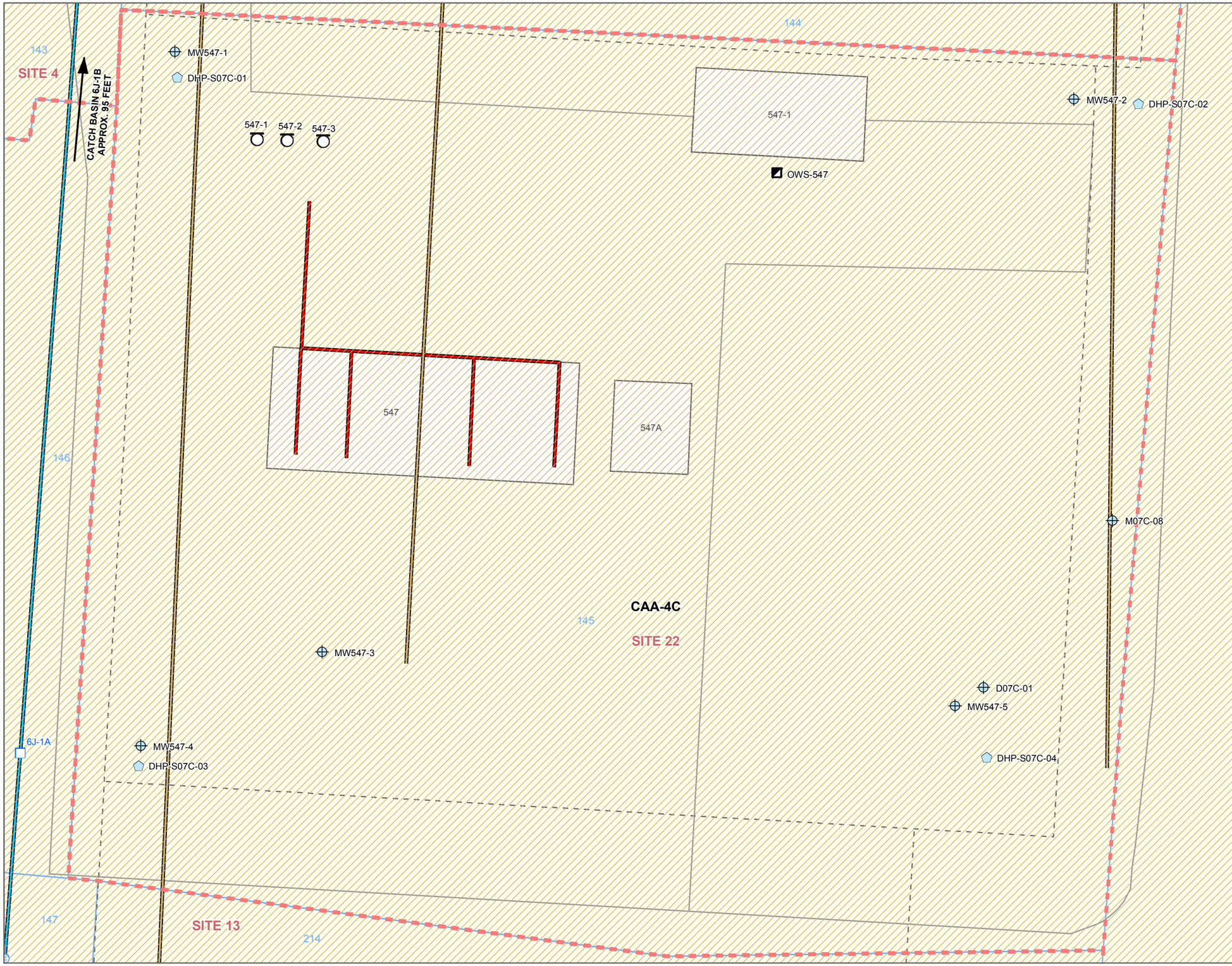

SAMPLING LOCATION

- Hydropunch
- Monitoring Well
- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER
- BUILDING, REMOVED

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-6L
SITE 22 SAMPLING LOCATIONS FOR METALS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

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TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
REMEDIAL INVESTIGATION										
Phases 1 & 2A Investigation, 1991										
B547-6	B547-6 [2.0-2.5]	07/02/1990	2 - 2.5	X	--	--	X	X	--	--
	B547-6 [2.5-3.0]	07/02/1990	2.5 - 3	--	--	--	--	--	X	X
	B547-6 [3.5-4.0]	07/02/1990	3.5 - 4	--	--	--	--	--	X	X
	B547-6 [4.5-5.0]	07/02/1990	4.5 - 5	X	X	--	--	--	--	--
	B547-6 [5.0-5.5]	07/02/1990	5 - 5.5	--	--	--	X	X	--	X
	B547-6 [6.0-6.5]	07/02/1990	6 - 6.5	X	X	--	--	--	--	--
	B547-6 [6.5-7.0]	07/02/1990	6.5 - 7	--	--	--	X	X	--	X
	B547-6 [9.0-9.5]	07/02/1990	9 - 9.5	X	X	--	--	--	--	--
	B547-6 [9.5-10.0]	07/02/1990	9.5 - 10	--	--	--	X	X	--	X
	B547-6 [11.0-11.5]	07/02/1990	11 - 11.5	X	X	--	--	--	--	--
	B547-6 [11.5-12.0]	07/02/1990	11.5 - 12	--	--	--	X	X	--	X
	B547-6 [14.0-14.5]	07/02/1990	14 - 14.5	X	X	--	--	--	--	--
	B547-6 [14.5-15.0]	07/02/1990	14.5 - 15	--	--	--	X	X	--	X
B547-7	B547-7 [0.5-1.0]	06/28/1990	0.5 - 1	X	--	--	X	X	--	X
	B547-7 [1.0-1.5]	06/28/1990	1 - 1.5	--	--	--	--	--	X	--
	B547-7 [2.0-2.5]	06/28/1990	2 - 2.5	X	X	--	--	--	--	--
	B547-7 [2.5-3.0]	06/28/1990	2.5 - 3	--	--	--	X	X	X	X
	B547-7 [5.0-5.5]	06/28/1990	5 - 5.5	X	X	--	--	--	--	--
	B547-7 [5.5-6.0]	06/28/1990	5.5 - 6	--	--	--	X	X	--	X
	B547-7 [8.0-8.5]	06/28/1990	8 - 8.5	X	X	--	--	--	--	--
	B547-7 [8.5-9.0]	06/28/1990	8.5 - 9	--	--	--	X	X	--	X
	B547-7 [9.0-9.5]	06/28/1990	9 - 9.5	--	--	--	X	X	--	X
	B547-7 [11.0-11.5]	06/28/1990	11 - 11.5	X	X	--	--	--	--	--
	B547-7 [11.5-12.0]	06/28/1990	11.5 - 12	--	--	--	X	X	--	X
	B547-7 [14.0-14.5]	06/28/1990	14 - 14.5	X	X	--	--	--	--	--
	B547-7 [14.5-15.0]	06/28/1990	14.5 - 15	--	--	--	X	X	--	X
B547-8	B547-8 [1.0-1.5]	07/03/1990	1 - 1.5	X	--	--	X	X	--	--
	B547-8 [2.0-2.5]	07/03/1990	2 - 2.5	--	--	--	--	--	X	X
	B547-8 [3.5-4.0]	07/03/1990	3.5 - 4	X	X	--	--	--	--	--
	B547-8 [4.0-4.5]	07/03/1990	4 - 4.5	--	--	--	X	X	X	X
	B547-8 [5.0-5.5]	07/03/1990	5 - 5.5	X	X	--	--	--	--	--
	B547-8 [5.5-6.0]	07/03/1990	5.5 - 6	--	--	--	X	X	--	X

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
Phases 1 & 2A Investigation, 1991 (Continued)										
B547-8	B547-8 [8.0-8.5]	07/03/1990	8 - 8.5	X	X	--	--	--	--	--
(Continued)	B547-8 [8.5-9.0]	07/03/1990	8.5 - 9	--	--	--	X	X	--	X
	B547-8 [11.0-11.5]	07/03/1990	11 - 11.5	X	X	--	--	--	--	--
	B547-8 [11.5-12.0]	07/03/1990	11.5 - 12	--	--	--	X	X	--	X
	B547-8 [12.5-13.0]	07/03/1990	12.5 - 13	X	X	--	--	--	--	--
	B547-8 [13.0-13.5]	07/03/1990	13 - 13.5	--	--	--	X	X	--	X
B547-9	B547-9 [1.0-1.5]	07/02/1990	1 - 1.5	X	--	--	X	X	--	--
	B547-9 [2.5-3.0]	07/03/1990	2.5 - 3	--	--	--	--	--	X	X
	B547-9 [3.5-4.0]	07/02/1990	3.5 - 4	X	X	--	--	--	--	--
	B547-9 [4.0-4.5]	07/02/1990	4 - 4.5	--	--	--	X	X	X	X
	B547-9 [5.0-5.5]	07/02/1990	5 - 5.5	X	X	--	--	--	--	--
	B547-9 [5.5-6.0]	07/02/1990	5.5 - 6	--	--	--	X	X	--	X
	B547-9 [8.0-8.5]	07/02/1990	8 - 8.5	X	X	--	--	--	--	--
	B547-9 [8.5-9.0]	07/02/1990	8.5 - 9	--	--	--	X	X	--	X
	B547-9 [11.0-11.5]	07/02/1990	11 - 11.5	X	--	--	--	--	--	--
	B547-9 [11.5-12.0]	07/02/1990	11.5 - 12	--	--	--	--	X	--	X
	B547-9 [14.0-14.5]	07/02/1990	14 - 14.5	X	X	--	--	--	--	--
	B547-9 [14.5-15.0]	07/02/1990	14.5 - 15	--	--	--	X	X	--	X
B547-10	B547-10 [0.5-1.0]	07/02/1990	0.5 - 1	X	--	--	X	X	--	--
	B547-10 [1.0-1.5]	07/02/1990	1 - 1.5	--	--	--	--	--	X	X
	B547-10 [2.0-2.5]	07/02/1990	2 - 2.5	X	X	--	--	--	--	--
	B547-10 [2.5-3.0]	07/02/1990	2.5 - 3	--	--	--	X	X	X	X
	B547-10 [5.0-5.5]	07/02/1990	5 - 5.5	X	X	--	--	--	--	--
	B547-10 [5.5-6.0]	07/02/1990	5.5 - 6	--	--	--	X	X	--	X
	B547-10 [8.0-8.5]	07/02/1990	8 - 8.5	X	X	--	--	--	--	--
	B547-10 [8.5-9.0]	07/02/1990	8.5 - 9	--	--	--	X	X	--	X
	B547-10 [11.0-11.5]	07/02/1990	11 - 11.5	X	X	--	--	--	--	--
	B547-10 [11.5-12.0]	07/02/1990	11.5 - 12	--	--	--	X	X	--	X
	B547-10 [14.0-14.5]	07/02/1990	14 - 14.5	X	X	--	--	--	--	--
	B547-10 [14.5-15.0]	07/02/1990	14.5 - 15	--	--	--	X	X	--	X
MW547-1	MW547-1 [0.5-1.0]	06/29/1990	0.5 - 1	X	--	--	X	X	--	X
	MW547-1 [1.0-1.5]	06/29/1990	1 - 1.5	--	--	--	--	--	X	--
	MW547-1 [2.0-2.5]	06/29/1990	2 - 2.5	X	X	--	--	--	--	--

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
Phases 1 & 2A Investigation, 1991 (Continued)										
MW547-1 (Continued)	MW547-1 [2.5-3.0]	06/29/1990	2.5 - 3	--	--	--	X	X	X	X
	MW547-1 [4.5-5.0]	06/29/1990	4.5 - 5	X	X	--	--	--	--	--
	MW547-1 [5.0-5.5]	06/29/1990	5 - 5.5	--	--	--	X	X	--	X
	MW547-1 [8.0-8.5]	06/29/1990	8 - 8.5	X	X	--	--	--	--	--
	MW547-1 [8.5-9.0]	06/29/1990	8.5 - 9	--	--	--	X	X	--	X
	MW547-1 [11.0-11.5]	06/29/1990	11 - 11.5	X	X	--	--	--	--	--
	MW547-1 [11.5-12.0]	06/29/1990	11.5 - 12	--	--	--	X	X	--	X
	MW547-1 [14.0-14.5]	06/29/1990	14 - 14.5	X	X	--	--	--	--	--
	MW547-1 [14.5-15.0]	06/29/1990	14.5 - 15	--	--	--	X	X	--	X
MW547-2	MW547-2 [0.5-1.0]	06/29/1990	0.5 - 1	X	--	--	X	X	--	X
	MW547-2 [1.5-2.0]	06/29/1990	1.5 - 2	--	--	--	--	--	X	--
	MW547-2 [2.0-2.5]	06/29/1990	2 - 2.5	X	X	--	--	--	--	--
	MW547-2 [2.5-3.0]	06/29/1990	2.5 - 3	--	--	--	X	X	X	X
	MW547-2 [5.0-5.5]	06/29/1990	5 - 5.5	X	--	--	--	--	--	--
	MW547-2 [5.5-6.0]	06/29/1990	5.5 - 6	X	X	--	--	--	--	--
	MW547-2 [6.0-6.5]	06/29/1990	6 - 6.5	--	--	--	X	X	--	X
	MW547-2 [6.5-7.0]	06/29/1990	6.5 - 7	--	--	--	X	X	--	X
	MW547-2 [9.5-10.0]	06/29/1990	9.5 - 10	X	X	--	--	--	--	--
	MW547-2 [10.0-10.5]	06/29/1990	10 - 10.5	--	--	--	X	X	--	X
	MW547-2 [12.5-13.0]	06/29/1990	12.5 - 13	X	X	--	--	--	--	--
	MW547-2 [13.0-13.5]	06/29/1990	13 - 13.5	--	--	--	X	X	--	X
	MW547-2 [14.0-14.5]	06/29/1990	14 - 14.5	X	X	--	--	--	--	--
	MW547-2 [14.5-15.0]	06/29/1990	14.5 - 15	--	--	--	X	X	--	X
MW547-3	MW547-3 [1.0-1.5]	07/02/1990	1 - 1.5	X	--	--	X	X	--	--
	MW547-3 [2.0-2.5]	07/13/1990	2 - 2.5	--	--	--	--	--	X	X
	MW547-3 [3.5-4.0]	07/02/1990	3.5 - 4	X	X	--	--	--	--	--
	MW547-3 [4.0-4.5]	07/02/1990	4 - 4.5	--	--	--	X	X	X	X
	MW547-3 [5.0-5.5]	07/02/1990	5 - 5.5	X	X	--	--	--	--	--
	MW547-3 [5.5-6.0]	07/02/1990	5.5 - 6	--	--	--	X	X	--	X
	MW547-3 [8.0-8.5]	07/02/1990	8 - 8.5	X	X	--	--	--	--	--
	MW547-3 [8.5-9.0]	07/02/1990	8.5 - 9	--	--	--	X	X	--	X
	MW547-3 [10.5-11.0]	07/02/1990	10.5 - 11	X	X	--	--	--	--	--
	MW547-3 [11.0-11.5]	07/13/1990	11 - 11.5	--	--	--	X	--	--	X

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
Phases 1 & 2A Investigation, 1991 (Continued)										
MW547-3	MW547-3 [11.5-12.0]	07/02/1990	11.5 - 12	X	--	--	X	--	--	X
(Continued)	MW547-3 [14.0-14.5]	07/02/1990	14 - 14.5	X	X	--	--	--	--	--
	MW547-3 [14.5-15.0]	07/02/1990	14.5 - 15	--	--	--	X	X	--	X
MW547-4	MW547-4 [0.5-1.0]	06/28/1990	0.5 - 1	X	--	--	X	X	--	X
	MW547-4 [1.0-1.5]	06/28/1990	1 - 1.5	--	--	--	--	--	X	--
	MW547-4 [2.0-2.5]	06/28/1990	2 - 2.5	--	X	--	--	--	--	--
	MW547-4 [2.5-3.0]	06/29/1990	2.5 - 3	X	--	--	X	X	X	X
	MW547-4 [5.0-5.5]	06/28/1990	5 - 5.5	--	X	--	--	--	--	--
	MW547-4 [5.5-6.0]	06/28/1990	5.5 - 6	X	--	--	X	X	--	X
	MW547-4 [8.0-8.5]	06/28/1990	8 - 8.5	--	X	--	--	--	--	--
	MW547-4 [8.5-9.0]	06/28/1990	8.5 - 9	X	--	--	X	X	--	X
	MW547-4 [10.5-11.0]	06/28/1990	10.5 - 11	--	X	--	--	--	--	--
	MW547-4 [11.0-11.5]	06/28/1990	11 - 11.5	X	--	--	X	X	--	X
	MW547-4 [14.0-14.5]	06/28/1990	14 - 14.5	--	X	--	--	--	--	X
	MW547-4 [14.5-15.0]	06/28/1990	14.5 - 15	X	--	--	X	X	--	X
MW547-5	MW547-5 [0.5-1.0]	06/29/1990	0.5 - 1	X	--	--	X	X	--	X
	MW547-5 [1.0-1.5]	06/29/1990	1 - 1.5	--	--	--	--	--	X	--
	MW547-5 [2.0-2.5]	06/29/1990	2 - 2.5	X	X	--	--	--	--	--
	MW547-5 [2.5-3.0]	06/29/1990	2.5 - 3	--	--	--	X	X	X	X
	MW547-5 [5.0-5.5]	06/29/1990	5 - 5.5	X	X	--	--	--	--	--
	MW547-5 [5.5-6.0]	06/29/1990	5.5 - 6	--	--	--	X	X	--	X
	MW547-5 [8.0-8.5]	06/29/1990	8 - 8.5	X	X	--	--	--	--	--
	MW547-5 [8.5-9.0]	06/29/1990	8.5 - 9	--	--	--	X	X	--	X
	MW547-5 [10.5-11.0]	06/29/1990	10.5 - 11	X	--	--	--	--	--	--
	MW547-5 [11.0-11.5]	06/29/1990	11 - 11.5	X	X	--	--	--	--	--
	MW547-5 [11.5-12.0]	06/29/1990	11.5 - 12	--	--	--	X	X	--	X
	MW547-5 [12.0-12.5]	06/29/1990	12 - 12.5	--	--	--	X	X	--	X
	MW547-5 [14.0-14.5]	07/13/1990	14 - 14.5	X	X	--	--	--	--	--
	MW547-5 [14.5-15.0]	06/29/1990	14.5 - 15	--	--	--	X	X	--	X
Follow-on Investigation, 1994										
B07C-12	280-S7C-004	08/17/1994	0.5 - 1.5	X	X	--	--	X	X	X
	280-S7C-005	08/17/1994	2.5 - 3.5	X	X	--	--	X	X	X
	280-S7C-006	08/17/1994	5 - 6	X	X	--	--	X	X	X

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
Follow-on Investigation, 1994 (Continued)										
B07C-13	280-S7C-007	08/23/1994	0.5 - 1.5	X	X	--	--	X	X	X
	280-S7C-008	08/23/1994	1.5 - 2.5	X	X	--	--	X	X	X
	280-S7C-009	08/23/1994	2.5 - 3.5	X	X	--	--	X	X	X
	280-S7C-010	08/23/1994	5 - 6	X	--	--	--	X	X	X
B07C-14	280-S7C-011	08/17/1994	0.5 - 1.5	X	X	--	--	X	X	X
	280-S7C-012	08/17/1994	2.5 - 3.5	X	X	--	--	X	X	X
	280-S7C-013	08/17/1994	5 - 6	X	X	--	--	X	X	X
B07C-15	280-S7C-014	08/17/1994	0.5 - 1.5	X	X	--	--	X	X	X
	280-S7C-015	08/17/1994	2.5 - 3.5	X	X	--	--	X	X	X
	280-S7C-016	08/17/1994	5 - 6	X	X	--	--	X	X	X
M07C-08	280-S7C-024	08/18/1994	0.5 - 1.5	X	X	--	--	X	X	X
	280-S7C-025	08/18/1994	2.5 - 3.5	X	X	--	--	X	X	X
	280-S7C-026	08/18/1994	5 - 5.5	X	X	--	--	X	X	X
PAH Study, 2003										
C3S022B001	C0590947	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590948	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590949	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590950	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B002	C0590951	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590952	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590953	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590954	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B003	C0590955	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590957	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590958	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590959	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B004	C0590960	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590961	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590962	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590963	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B005	C0590964	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590965	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590967	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590968	7/31/2003	4 - 8	--	--	X	--	--	--	--

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
PAH Study, 2003 (Continued)										
C3S022B006	C0590969	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590970	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590971	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590972	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B007	C0590973	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590974	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590975	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590977	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B008	C0590978	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590979	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590980	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590981	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B009	C0590982	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590983	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590984	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590985	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B010	C0590987	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590988	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590989	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590990	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B011	C0590991	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590992	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590993	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590994	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B012	C0590995	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0590997	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0590998	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0590999	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B013	C0591000	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591001	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591002	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591003	7/31/2003	4 - 8	--	--	X	--	--	--	--

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
PAH Study, 2003 (Continued)										
C3S022B014	C0591004	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591005	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591007	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591008	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B015	C0591009	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591010	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591011	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591012	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B016	C0591013	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591014	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591015	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591017	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B017	C0591018	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591019	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591020	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591021	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B018	C0591022	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591023	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591024	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591025	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B019	C0591027	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591028	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591029	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591030	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B020	C0591031	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591032	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591033	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591034	7/31/2003	4 - 8	--	--	X	--	--	--	--
C3S022B021	C0591035	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591037	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591038	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591039	7/31/2003	4 - 8	--	--	X	--	--	--	--

TABLE 8-1: SITE 22 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED						
				SVOC	VOC	PAH	Pesticides/PCB	Total Metals	General Chemistry	TPH
PAH Study, 2003 (Continued)										
C3S022B022	C0591040	7/31/2003	0 - 0.5	--	--	X	--	--	--	--
	C0591041	7/31/2003	0.5 - 2	--	--	X	--	--	--	--
	C0591042	7/31/2003	2 - 4	--	--	X	--	--	--	--
	C0591043	7/31/2003	4 - 8	--	--	X	--	--	--	--
ENVIRONMENTAL BASELINE SURVEY										
Phase IIA Environmental Baseline Survey										
145-SN-001	145S-001	01/27/1995	4.5 - 5.5	X	--	--	--	--	X	--
	145S-001M	01/27/1995	4.5 - 5.5	--	X	--	--	X	--	X
TOTAL PETROLEUM HYDROCARBON INESTIGATIONS										
Fuel Line and Underground Storage Tank Investigations										
547-1	547-1	01/20/1995	2	--	X	--	--	X	--	X
547-2	547-2	01/20/1995	2	--	X	--	--	X	--	X
547-3	547-3	01/20/1995	2	--	X	--	--	X	--	X
547-4	547-4	01/20/1995	2	--	X	--	--	--	--	X
547-5	547-5	01/20/1995	2	--	X	--	--	X	--	X
547-6	547-6	01/20/1995	2	--	X	--	--	X	--	X
547-7	547-7	01/20/1995	2	--	X	--	--	X	--	X
547-8	547-8	01/20/1995	2	--	X	--	--	X	--	X
547-9	547-9	01/20/1995	2	--	X	--	--	X	--	X
547-10	547-10	01/20/1995	2	--	X	--	--	X	--	X
547-11	547-11	01/20/1995	2	--	X	--	--	X	--	X
547-12	547-12	01/20/1995	2	--	X	--	--	X	--	X
547-13	547-13	01/20/1995	2	--	X	--	--	X	--	X
547-14	547-14	01/20/1995	2	--	X	--	--	X	--	X
547-W1	547-W1	11/03/1994	9.5	--	X	--	--	--	--	X
547-W2	547-W2	11/03/1994	9.5	--	X	--	--	--	--	X
547-W3	547-W3	11/03/1994	9.5	--	X	--	--	--	--	X

Notes:

--	These analyses were not performed.
ft bgs	Feet below ground surface
General chemistry	Flashpoint, major anions, percent moisture, pH, reactivity, TKN, and/or TOC
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic compound
TKN	Total Kjelkahl nitrogen
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound
X	These analyses were performed.

TABLE 8-2: SITE 22 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	Landfill Gases	PAH
REMEDIAL INVESTIGATION												
Phases 1 & 2A Investigation, 1991												
MW547-1	MW547-1 [08/07/90]	08/07/1990		X	X	X	--	X	--	X	--	--
MW547-2	MW547-2 [08/08/90]	08/08/1990		X	X	X	--	X	--	X	--	--
MW547-3	MW547-3 [08/07/90]	08/07/1990		X	X	X	--	X	--	X	--	--
MW547-4	MW547-4 [08/06/90]	08/06/1990		X	X	--	--	X	--	X	--	--
MW547-5	MW547-5 [08/06/90]	08/06/1990		X	X	X	--	X	--	X	--	--
	MW547-5A [08/06/90]	08/06/1990		--	--	X	--	--	--	--	--	--
Follow-on Investigation, 1994												
D07C-01	280-S7C-088	12/16/1994		X	X	X	--	--	X	X	--	--
	280-S7C-089	02/20/1995		--	X	X	--	--	X	X	--	--
	280-S7C-090	06/22/1995		--	X	X	--	--	X	--	--	--
	280-S7C-091	09/20/1995		--	X	X	--	--	X	--	--	--
DHP-S07C-01	280-S7C-066	07/28/1994	22.5	X	X	X	--	--	X	X	--	--
DHP-S07C-02	280-S7C-067	08/02/1994	21	X	X	X	--	--	X	X	--	--
DHP-S07C-03	280-S7C-069	07/29/1994	26	X	X	X	--	--	X	X	--	--
DHP-S07C-04	280-S7C-070	08/01/1994	16	X	X	X	--	--	X	X	--	--
M07C-08	280-S7C-058	11/07/1994		X	X	X	--	--	X	X	--	--
	280-S7C-059	02/17/1995		--	X	X	--	--	X	X	--	--
	280-S7C-060	06/21/1995		X	X	X	--	--	X	X	--	--
	280-S7C-061	08/31/1995		--	X	X	--	--	X	X	--	--
MW547-1	280-S7C-028	11/08/1994		X	X	X	--	--	X	X	--	--
	280-S7C-029	02/20/1995		--	X	X	--	--	X	X	--	--
	280-S7C-030	06/20/1995		X	X	X	--	--	X	X	--	--
	280-S7C-031	08/31/1995		--	X	X	--	--	X	X	--	--
MW547-2	280-S7C-032	11/08/1994		X	X	X	--	--	X	X	--	--
	280-S7C-033	02/20/1995		--	X	X	--	--	X	X	--	--
	280-S7C-034	06/20/1995		X	X	X	--	--	X	X	--	--
	280-S7C-035	08/29/1995		--	X	X	--	--	X	X	--	--
MW547-3	280-S7C-036	11/07/1994		X	X	X	--	--	X	X	--	--
	280-S7C-037	02/17/1995		--	X	X	--	--	X	X	--	--
	280-S7C-038	06/21/1995		X	X	X	--	--	X	X	--	--
	280-S7C-039	08/31/1995		--	X	X	--	--	X	X	--	--
MW547-4	280-S7C-040	11/07/1994		X	X	X	--	--	X	X	--	--
	280-S7C-042	02/17/1995		--	X	X	--	--	X	X	--	--
	280-S7C-043	06/21/1995		X	X	X	--	--	X	X	--	--
	280-S7C-044	08/29/1995		--	X	X	--	--	X	X	--	--
MW547-5	280-S7C-045	11/10/1994		X	X	X	--	--	X	X	--	--
	280-S7C-046	02/20/1995		--	X	X	--	--	X	X	--	--
	280-S7C-047	06/21/1995		X	X	X	--	--	X	X	--	--
	280-S7C-048	08/29/1995		--	X	X	--	--	X	X	--	--
Follow-on Investigation, 1998												
D07C-01	108-S22-003	11/11/1997		--	X	X	--	--	X	X	--	--
	108-S22-005	02/04/1998		--	X	X	--	--	X	X	--	--
	108-S22-009	05/14/1998		--	X	X	--	--	X	--	--	--
	108-S22-013	08/07/1998		--	X	--	X	--	X	X	--	--

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Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	Landfill Gases	PAH
Follow-on Investigation, 1998 (Continued)												
M07C-08	108-S22-002	11/07/1997		--	X	X	--	--	X	X	--	--
	108-S22-007	02/11/1998		--	X	X	--	--	X	X	--	--
	108-S22-011	05/13/1998		--	X	X	--	--	X	X	--	--
	108-S22-014	08/11/1998		--	X	--	X	--	X	X	--	--
MW547-4	108-S22-004	11/10/1997		--	X	X	--	--	X	X	--	--
	108-S22-008	02/11/1998		--	X	X	--	--	X	X	--	--
	108-S22-012	05/13/1998		--	X	X	--	--	X	X	--	--
	108-S22-015	08/11/1998		--	X	--	X	--	X	X	--	--
Supplemental Remedial Investigation Data Gap Sampling, 2001												
CAA4C-DGS-DP01	385-CAA4C-001	04/18/2002	10	--	X	--	X	--	--	X	--	--
	385-CAA4C-002	04/18/2002	15	--	X	--	X	--	--	X	--	--
CAA4C-DGS-DP02	385-CAA4C-003	04/18/2002	12	--	X	--	X	--	--	X	--	--
	385-CAA4C-004	04/18/2002	17	--	X	--	X	--	--	X	--	--
CAA4C-DGS-DP03	385-CAA4C-005	04/17/2002	7	--	X	--	X	--	--	X	--	--
	385-CAA4C-006	04/17/2002	12	--	X	--	X	--	--	X	--	--
CAA4C-DGS-DP04	385-CAA4C-007	04/18/2002	8	--	X	--	X	--	--	X	--	--
	385-CAA4C-008	04/18/2002	13	--	X	--	X	--	--	X	--	--
CAA4C-DGS-DP05	385-CAA4C-009	04/18/2002	8	--	X	--	X	--	--	X	--	--
	385-CAA4C-010	04/18/2002	14	--	X	--	X	--	--	X	--	--
CAA4C-DGS-DP06	385-CAA4C-011A	05/08/2002	4 - 8	--	X	--	--	--	--	X	--	--
CAA4C-DGS-DP07	385-CAA4C-012	05/08/2002	8 - 12	--	X	--	--	--	--	X	--	--
CAA4C-DGS-DP08	385-CAA4C-013	05/08/2002	4 - 8	--	X	--	--	--	--	X	--	--
CAA4C-DGS-DP09	385-CAA4C-014	05/08/2002	4 - 8	--	X	--	--	--	--	X	--	--
CAA4C-DGS-DP10	385-CAA4C-015	05/08/2002	4 - 8	--	X	--	--	--	--	X	--	--
CAA4C-DGS-PZ01	385-CAA4C-011	04/22/2002	5	--	X	--	--	--	--	X	--	--
D07C-01	385-S22-010	07/09/2001		X	X	--	--	--	--	X	--	X
M07C-08	385-S22-008	07/05/2001		X	X	--	--	--	--	X	--	X
MW547-1	385-S22-001	07/05/2001		X	X	--	--	--	--	X	--	X
MW547-2	385-S22-002	07/05/2001		X	X	--	--	--	--	X	--	X
MW547-3	385-S22-003	07/05/2001		X	X	--	--	--	--	X	--	X
MW547-4	385-S22-004	07/05/2001		X	X	--	--	--	--	X	--	X
MW547-5	385-S22-005	07/05/2001		X	X	--	--	--	--	X	--	X
S22-DGS-SG03	385-S22-013	07/26/2001	1.5	--	X	--	--	--	--	--	X	--
	385-S22-014	07/26/2001	4	--	X	--	--	--	--	--	X	--
S22-DGS-SG05	385-S22-016	09/13/2001	1.5	--	X	--	--	--	--	--	X	--
	385-S22-017	09/13/2001	4	--	X	--	--	--	--	--	X	--
Basewide Groundwater Monitoring, 2002												
D07C-01	D07C-01-A1135	07/11/2002		--	X	X	--	--	X	X	X	--
	D07C-01-A1636	12/17/2002		--	X	X	--	--	X	X	X	--
M07C-08	M07C-08-A1140	07/24/2002		--	X	X	--	--	X	X	X	--
	M07C-08-A1310	07/24/2002		--	X	X	--	--	X	X	X	--
	M07C-08-A1641	12/17/2002		--	X	X	--	--	X	X	X	--
MW547-3	MW547-3-A1156	06/20/2002		--	X	X	--	--	X	X	X	--
	MW547-3-A1348	09/05/2002		--	X	--	--	--	--	X	--	--
	MW547-3-A1657	12/17/2002		--	X	X	--	--	X	X	X	--
	MW547-3-A2000	04/10/2003		--	X	--	--	--	--	X	--	--

TABLE 8-2: SITE 22 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	Landfill Gases	PAH
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS												
Fuel Line and Underground Storage Tank Investigations												
547-L1	547-L1	11/03/1994	9.5	--	X	X	--	--	--	X	--	--
547-L8	547L8	11/03/1994	9.5	--	X	--	--	--	--	X	--	--
M07C-08	030-CAP-063	04/27/2000		--	X	--	--	--	--	--	--	--
MW547-1	030-CAP-062	04/27/2000		--	X	--	--	--	--	--	--	--
	030-CAP-064	04/27/2000		--	X	--	--	--	--	--	--	--
MW547-4	030-CAP-066	04/27/2000		--	X	--	--	--	--	--	--	--

Notes:

--	These analyses were not performed.
ft bgs	Feet below ground surface
General chemistry	Acidity, alkalinity, conductivity, hardness, major anions, oxydation, pH, TDS, TOC, and/or sulfide
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic compound
TDS	Total dissolved solids
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound
X	These analyses were performed.

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	42	0	0	--	--	--	5	7,200	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	42	0	0	--	--	--	5	**7,200**	0	3	410
1,1,2-TRICHLOROETHANE	42	0	0	--	--	--	5	**7,200**	0	2	730
1,1-DICHLOROETHANE	48	0	0	--	--	--	5	**7,200**	0	2	2,800 (CAL-modified)
1,1-DICHLOROETHENE	42	0	0	--	--	--	5	7,200	0	0	120,000
1,2-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	370,000
1,2-DICHLOROETHANE	47	2	4	11	7	14	5	**7,200**	0	4	280
1,2-DICHLOROETHENE (TOTAL)	42	0	0	--	--	--	5	7,200	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	42	0	0	--	--	--	5	**7,200**	0	3	340
1,3-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	16,000
1,4-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	3,400
2-BUTANONE	42	0	0	--	--	--	10	14,000	--	--	NA
2-CHLOROETHYLVINYLETHER	18	0	0	--	--	--	10	13	--	--	NA
2-HEXANONE	42	0	0	--	--	--	10	14,000	--	--	NA
4-METHYL-2-PENTANONE	40	1	3	72,000	72,000	72,000	6	6,600	--	--	NA
ACETONE	42	1	2	690	690	690	10	14,000	0	0	1,600,000
BENZENE	42	5	12	140	13	430	5	**7,200**	0	3	600
BROMODICHLOROMETHANE	42	0	0	--	--	--	5	**7,200**	0	2	820
BROMOFORM	42	0	0	--	--	--	5	7,200	0	0	62,000
BROMOMETHANE	42	0	0	--	--	--	10	**14,000**	0	2	3,900
CARBON DISULFIDE	42	0	0	--	--	--	5	7,200	0	0	360,000
CARBON TETRACHLORIDE	42	0	0	--	--	--	5	**7,200**	0	3	250
CHLOROBENZENE	42	0	0	--	--	--	5	7,200	0	0	150,000
CHLOROETHANE	42	0	0	--	--	--	10	**14,000**	0	2	3,000
CHLOROFORM	42	0	0	--	--	--	5	**7,200**	0	2	940 (CAL-modified)
CHLOROMETHANE	42	0	0	--	--	--	10	**14,000**	0	3	1,200
CIS-1,3-DICHLOROPROPENE	42	0	0	--	--	--	5	**7,200**	0	2	780 (not cis)
DIBROMOCHLOROMETHANE	42	0	0	--	--	--	5	**7,200**	0	2	1,100
ETHYLBENZENE	42	8	19	6,700	3J	**52,000**	5	6,600	1	0	8,900
METHYLENE CHLORIDE	42	0	0	--	--	--	5	**54,000**	0	1	9,100
STYRENE	42	0	0	--	--	--	5	7,200	0	0	1,700,000

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TETRACHLOROETHENE	42	0	0	--	--	--	5	**7,200**	0	2	1,500
TOLUENE	47	44	94	1,600	2J	39,000	6	6	0	0	520,000
TRANS-1,3-DICHLOROPROPENE	42	0	0	--	--	--	5	**7,200**	0	2	780 (not trans)
TRICHLOROETHENE	42	3	7	5	2J	11	5	**7,200**	0	3	53
TRICHLOROFLUOROMETHANE	18	0	0	--	--	--	5	7	0	0	390,000
VINYL ACETATE	42	0	0	--	--	--	10	14,000	0	0	430,000
VINYL CHLORIDE	42	0	0	--	--	--	10	**14,000**	0	3	79 (child or adult)
XYLENE (TOTAL)	42	12	29	5,300	2J	33,000	5	7	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	63	0	0	--	--	--	330	14,000	0	0	650,000
1,2-DICHLOROBENZENE	63	0	0	--	--	--	330	14,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	32	0	0	--	--	--	330	**720**	0	1	610
1,3-DICHLOROBENZENE	63	0	0	--	--	--	330	14,000	0	0	16,000
1,4-DICHLOROBENZENE	63	0	0	--	--	--	330	**14,000**	0	1	3,400
2,4,5-TRICHLOROPHENOL	63	0	0	--	--	--	1,600	67,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	63	0	0	--	--	--	330	**14,000**	0	1	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	63	0	0	--	--	--	330	14,000	0	0	180,000
2,4-DIMETHYLPHENOL	63	0	0	--	--	--	330	14,000	0	0	1,200,000
2,4-DINITROPHENOL	63	0	0	--	--	--	1,600	67,000	0	0	120,000
2,4-DINITROTOLUENE	62	0	0	--	--	--	330	14,000	0	0	120,000
2,6-DINITROTOLUENE	63	0	0	--	--	--	330	14,000	0	0	61,000
2-CHLORONAPHTHALENE	63	0	0	--	--	--	330	14,000	--	--	NA
2-CHLOROPHENOL	63	0	0	--	--	--	330	14,000	0	0	63,000
2-METHYLNAPHTHALENE	63	5	8	7,100	1,500	16,000	330	14,000	--	--	NA
2-METHYLPHENOL	63	0	0	--	--	--	330	14,000	--	--	NA
2-NITROANILINE	63	0	0	--	--	--	1,600	**67,000**	0	52	1,700
2-NITROPHENOL	63	0	0	--	--	--	330	14,000	--	--	NA
3,3'-DICHLOROBENZIDINE	63	0	0	--	--	--	660	**28,000**	0	8	1,100
3-NITROANILINE	63	0	0	--	--	--	1,600	67,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	63	0	0	--	--	--	1,600	67,000	--	--	NA

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
4-BROMOPHENYL-PHENYLETHER	63	0	0	--	--	--	330	14,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	63	0	0	--	--	--	330	14,000	--	--	NA
4-CHLOROANILINE	63	0	0	--	--	--	330	14,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	63	0	0	--	--	--	330	14,000	--	--	NA
4-METHYLPHENOL	63	0	0	--	--	--	330	14,000	0	0	310,000
4-NITROANILINE	63	0	0	--	--	--	1,600	67,000	--	--	NA
4-NITROPHENOL	63	0	0	--	--	--	1,600	67,000	--	--	NA
ACENAPHTHENE	63	2	3	83	46 J	120 J	330	14,000	0	0	3,700,000
ACENAPHTHYLENE	63	0	0	--	--	--	330	14,000	--	--	NA
ANTHRACENE	63	2	3	73	50 J	96 J	330	14,000	0	0	22,000,000
BENZO(A)ANTHRACENE	63	4	6	76	56 J	100 J	330	**14,000**	0	7	620
BENZO(A)PYRENE	63	2	3	**94**	48 J	**140 J**	**330**	**14,000**	1	61	62
BENZO(B)FLUORANTHENE	63	1	2	94	94 J	94 J	330	**14,000**	0	8	620
BENZO(G,H,I)PERYLENE	63	1	2	160	160 J	160 J	330	14,000	--	--	NA
BENZO(K)FLUORANTHENE	63	1	2	120	120 J	120 J	330	**14,000**	0	43	380 (CAL-modified)
BENZOIC ACID	63	0	0	--	--	--	1,600	67,000	0	0	100,000,000
BENZYL ALCOHOL	63	0	0	--	--	--	330	14,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	63	0	0	--	--	--	330	14,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	63	0	0	--	--	--	**330**	**14,000**	0	63	210
BIS(2-ETHYLHEXYL)PHTHALATE	63	0	0	--	--	--	330	14,000	0	0	35,000
BUTYLBENZYLPHTHALATE	63	0	0	--	--	--	330	14,000	0	0	12,000,000
CHRYSENE	63	3	5	95	58 J	140 J	330	**14,000**	0	1	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	63	1	2	6,300	6,300	6,300	330	14,000	--	--	NA
DI-N-OCTYLPHTHALATE	63	0	0	--	--	--	330	14,000	--	--	NA
DIBENZO(A,H)ANTHRACENE	63	0	0	--	--	--	**330**	**14,000**	0	63	62
DIBENZOFURAN	63	0	0	--	--	--	330	14,000	0	0	290,000
DIETHYLPHTHALATE	63	0	0	--	--	--	330	14,000	0	0	49,000,000
DIMETHYLPHTHALATE	63	0	0	--	--	--	330	14,000	0	0	100,000,000
FLUORANTHENE	63	4	6	180	76 J	300 J	330	14,000	0	0	2,300,000
FLUORENE	63	2	3	88	46 J	130 J	330	14,000	0	0	2,700,000
HEXACHLOROBENZENE	63	0	0	--	--	--	**330**	**14,000**	0	63	300

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
HEXACHLOROBUTADIENE	63	0	0	--	--	--	330	**14,000**	0	1	6,200
HEXACHLOROCYCLOPENTADIENE	63	0	0	--	--	--	330	14,000	0	0	370,000
HEXACHLOROETHANE	63	0	0	--	--	--	330	14,000	0	0	35,000
INDENO(1,2,3-CD)PYRENE	63	1	2	140	140 J	140 J	330	**14,000**	0	8	620
ISOPHORONE	63	0	0	--	--	--	330	14,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	63	0	0	--	--	--	**330**	**14,000**	0	63	69
N-NITROSODIPHENYLAMINE	63	0	0	--	--	--	330	14,000	0	0	99,000
NAPHTHALENE	63	5	8	6,200	100 J	16,000	330	14,000	0	0	56,000
NITROBENZENE	63	0	0	--	--	--	330	14,000	0	0	20,000
PENTACHLOROPHENOL	63	0	0	--	--	--	1,600	**67,000**	0	8	3,000
PHENANTHRENE	63	3	5	220	57 J	410 J	330	14,000	--	--	NA
PHENOL	63	2	3	200	100 J	300 J	330	14,000	0	0	37,000,000
PYRENE	63	4	6	180	93 J	340 J	330	14,000	0	0	2,300,000
PCBs/Pesticides (µg/kg)											
4,4'-DDD	61	2	3	6	2	9 J	2	200	0	0	2,400
4,4'-DDE	61	4	7	14	6	23 J	2	200	0	0	1,700
4,4'-DDT	61	3	5	22	3 J	53 J	2	200	0	0	1,700
ALDRIN	61	0	0	--	--	--	1	**99**	0	6	29
ALPHA-BHC	61	0	0	--	--	--	1	99	--	--	NA
ALPHA-CHLORDANE	31	2	6	14	0.9 J	27 J	82	990	0	0	1,600 (chlordane)
AROCLOR-1016	61	0	0	--	--	--	26	990	0	0	3,900
AROCLOR-1221	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1232	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1242	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1248	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1254	61	0	0	--	--	--	53	**2,000**	0	8	220
AROCLOR-1260	61	0	0	--	--	--	53	**2,000**	0	8	220
BETA-BHC	61	0	0	--	--	--	1	99	--	--	NA
CHLORDANE	30	0	0	--	--	--	11	52	0	0	1,600
DELTA-BHC	61	0	0	--	--	--	1	99	--	--	NA

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
PCBs/Pesticides (µg/kg)											
DIELDRIN	61	0	0	--	--	--	2	**200**	0	7	30
ENDOSULFAN I	60	0	0	--	--	--	2	99	0	0	370,000
ENDOSULFAN II	62	0	0	--	--	--	2	200	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	61	0	0	--	--	--	2	200	--	--	NA
ENDRIN	61	0	0	--	--	--	2	200	0	0	18,000
ENDRIN ALDEHYDE	30	0	0	--	--	--	2	10	--	--	NA
ENDRIN KETONE	32	0	0	--	--	--	17	200	--	--	NA
GAMMA-BHC (LINDANE)	61	0	0	--	--	--	1	99	--	--	NA
GAMMA-CHLORDANE	31	2	6	12	1 J	22 J	82	990	0	0	1,600 (chlordane)
HEPTACHLOR	61	0	0	--	--	--	1	99	0	0	110
HEPTACHLOR EPOXIDE	63	0	0	--	--	--	1	**99**	0	4	53
METHOXYCHLOR	61	2	3	16	11	20	5	990	0	0	310,000
TOXAPHENE	61	0	0	--	--	--	53	**2,000**	0	6	440
Metals (mg/kg)											
ALUMINUM	62	62	100	8,700	3,120	26,800	0.0	0.0	0	0	76,000
ANTIMONY	62	0	0	--	--	--	2.1	10.0	0	0	31.0
ARSENIC	62	30	48	**9.2**	**2.7**	**24.0**	**2.5**	**13.0**	30	32	0.39
BARIUM	62	62	100	67.4	0.30	200	0.0	0.0	0	0	5,400
BERYLLIUM	62	21	34	0.34	0.20	0.50	0.20	1.7	0	0	150
CADMIUM	62	26	42	0.43	0.20	1.0	0.20	1.7	0	0	37.0
CALCIUM	62	62	100	2,540	15.3	15,500	0.0	0.0	--	--	NA
CHROMIUM	62	62	100	38.5	11.4	71.8	0.0	0.0	0	0	210
COBALT	62	46	74	6.9	3.6	17.0	5.2	6.1	0	0	900
COPPER	62	62	100	16.2	5.6	86.2	0.0	0.0	0	0	3,100
IRON	62	62	100	12,700	760	**29,600**	0.0	0.0	1	0	23,000
LEAD	62	26	42	**394**	6.1	**9,890**	5.2	60.0	1	0	150 (CAL-modified)
MAGNESIUM	62	62	100	3,570	1,510	42,400	0.0	0.0	--	--	NA
MANGANESE	62	62	100	174	72.4	734	0.0	0.0	0	0	1,800
MOLYBDENUM	62	0	0	--	--	--	1.0	8.4	0	0	390
NICKEL	62	62	100	38.3	11.6	89.0	0.0	0.0	0	0	1,600

TABLE 8-3: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Phases 1 and 2A Investigation, 1991

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
POTASSIUM	62	59	95	958	497	2,300	530	610	--	--	NA
SELENIUM	62	1	2	5.7	5.7	5.7	4.3	17.0	0	0	390
SILVER	62	2	3	0.95	0.70	1.2	0.60	8.4	0	0	390
SODIUM	62	40	65	557	112	1,810	520	630	--	--	NA
THALLIUM	62	0	0	--	--	--	2.7	**17.0**	0	29	5.2
TITANIUM	62	62	100	439	183	704	0.0	0.0	--	--	NA
VANADIUM	62	62	100	26.2	13.9	62.3	0.0	0.0	0	0	550
ZINC	62	62	100	97.1	14.0	3,880	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
mg/kg	Milligrams per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Micrograms per kilogram

TABLE 8-4: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Phases 1 and 2A Investigation, 1991

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Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	5	0	0	--	--	--	5	50	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	5	0	0	--	--	--	**5**	**50**	0	5	0.06	1
1,1,2-TRICHLOROETHANE	5	0	0	--	--	--	**5**	**50**	0	5	0.2	5
1,1-DICHLOROETHANE	5	0	0	--	--	--	**5**	**50**	0	5	2 (CAL-modified)	5
1,1-DICHLOROETHENE	5	0	0	--	--	--	5	50	0	0	340	6
1,2-DICHLOROETHANE	5	0	0	--	--	--	**5**	**50**	0	5	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	5	0	0	--	--	--	5	50	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	5	0	0	--	--	--	**5**	**50**	0	5	0.2	5
2-BUTANONE	5	0	0	--	--	--	10	100	--	--	NA	NA
2-HEXANONE	5	0	0	--	--	--	10	100	--	--	NA	NA
4-METHYL-2-PENTANONE	5	0	0	--	--	--	10	100	--	--	NA	NA
ACETONE	5	0	0	--	--	--	10	100	0	0	610	NA
BENZENE	5	3	60	**660**	**530**	**900**	**5**	**5**	3	2	0.3	1
BROMODICHLOROMETHANE	5	0	0	--	--	--	**5**	**50**	0	5	0.2	80
BROMOFORM	5	0	0	--	--	--	5	**50**	0	3	9	80
BROMOMETHANE	5	0	0	--	--	--	**10**	**100**	0	5	9	NA
CARBON DISULFIDE	5	0	0	--	--	--	5	50	0	0	1,000	NA
CARBON TETRACHLORIDE	5	0	0	--	--	--	**5**	**50**	0	5	0.2	0.5
CHLOROBENZENE	5	0	0	--	--	--	5	50	0	0	110	70
CHLOROETHANE	5	0	0	--	--	--	**10**	**100**	0	5	5	NA
CHLOROFORM	5	0	0	--	--	--	**5**	**50**	0	5	0.5 (CAL-modified)	80
CHLOROMETHANE	5	0	0	--	--	--	**10**	**100**	0	5	2	NA
CIS-1,3-DICHLOROPROPENE	5	0	0	--	--	--	**5**	**50**	0	5	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	5	0	0	--	--	--	**5**	**50**	0	5	0.1	80
ETHYLBENZENE	5	3	60	1,500	**1,100**	**1,800**	**5**	**5**	3	2	3	300
METHYLENE CHLORIDE	5	0	0	--	--	--	**5**	**190**	0	5	4	NA
STYRENE	5	0	0	--	--	--	5	50	0	0	1,600	100
TETRACHLOROETHENE	5	0	0	--	--	--	**5**	**50**	0	5	0.7	5
TOLUENE	5	0	0	--	--	--	5	50	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	5	0	0	--	--	--	**5**	**50**	0	5	0.4 (not trans)	0.5
TRICHLOROETHENE	5	0	0	--	--	--	**5**	**50**	0	5	0.03	5

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Phases 1 and 2A Investigation, 1991

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
VINYL ACETATE	5	0	0	--	--	--	5	50	0	0	410	NA
VINYL CHLORIDE	5	0	0	--	--	--	**10**	**100**	0	5	0.02 (child or adult)	0.5
XYLENE (TOTAL)	5	1	20	110	110	110	5	50	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	5	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	5	0	0	--	--	--	10	10	0	0	370	600
1,2-DIPHENYLHYDRAZINE	3	0	0	--	--	--	10	10	--	--	NA	NA
1,3-DICHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	6	NA
1,4-DICHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	0.5	5
2,4,5-TRICHLOROPHENOL	5	0	0	--	--	--	10	50	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	5	0	0	--	--	--	**10**	**10**	0	5	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	5	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	5	1	20	39	39	39	10	10	0	0	730	NA
2,4-DINITROPHENOL	5	0	0	--	--	--	10	50	0	0	73	NA
2,4-DINITROTOLUENE	5	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	5	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	5	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	5	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	5	2	40	8	6J	9J	10	10	--	--	NA	NA
2-METHYLPHENOL	5	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	5	0	0	--	--	--	**50**	**50**	0	5	1	NA
2-NITROPHENOL	5	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	5	0	0	--	--	--	**20**	**20**	0	5	0.2	NA
3-NITROANILINE	5	0	0	--	--	--	50	50	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	5	0	0	--	--	--	10	50	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	5	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	5	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLOROANILINE	5	0	0	--	--	--	10	10	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	5	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	5	0	0	--	--	--	10	10	0	0	180	NA

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Semivolatile Organic Compounds (µg/L)												
4-NITROANILINE	5	0	0	--	--	--	50	50	--	--	NA	NA
4-NITROPHENOL	5	0	0	--	--	--	10	50	--	--	NA	NA
ACENAPHTHENE	5	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	5	0	0	--	--	--	10	10	--	--	NA	NA
ANILINE	5	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	5	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	0.1
BENZO(A)PYRENE	5	0	0	--	--	--	**10**	**10**	0	5	0.009	0.2
BENZO(B)FLUORANTHENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	NA
BENZO(G,H,I)PERYLENE	5	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	5	0	0	--	--	--	**10**	**10**	0	5	0.06 (CAL-modified)	NA
BENZOIC ACID	5	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	5	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	5	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	5	0	0	--	--	--	**10**	**10**	0	5	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	5	0	0	--	--	--	**10**	**10**	0	5	5	NA
BUTYLBENZYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	7,300	NA
CHRYSENE	5	0	0	--	--	--	**10**	**10**	0	5	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	5	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	5	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	5	0	0	--	--	--	**10**	**10**	0	5	0.009	NA
DIBENZOFURAN	5	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	5	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	5	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	5	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	0.04	1
HEXACHLOROBUTADIENE	5	0	0	--	--	--	**10**	**10**	0	5	0.9	NA
HEXACHLOROCYCLOPENTADIENE	5	0	0	--	--	--	10	10	0	0	220	NA
HEXACHLOROETHANE	5	0	0	--	--	--	**10**	**10**	0	5	5	NA
INDENO(1,2,3-CD)PYRENE	5	0	0	--	--	--	**10**	**10**	0	5	0.09	NA

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Semivolatile Organic Compounds (µg/L)												
ISOPHORONE	5	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	2	0	0	--	--	--	**10**	**10**	0	2	0.01	NA
N-NITROSODIMETHYLAMINE	5	0	0	--	--	--	10	10	--	--	NA	NA
N-NITROSODIPHENYLAMINE	5	0	0	--	--	--	10	10	0	0	14	NA
NAPHTHALENE	5	2	40	**55**	**53**	**56**	**10**	**10**	2	3	6	NA
NITROBENZENE	5	0	0	--	--	--	**10**	**10**	0	5	3	NA
PENTACHLOROPHENOL	5	0	0	--	--	--	**50**	**50**	0	5	0.6	1
PHENANTHRENE	5	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	5	2	40	9	4 J	13	10	10	0	0	22,000	NA
PYRENE	5	0	0	--	--	--	10	10	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	3	0	0	--	--	--	0.1	**1**	0	1	0.3	NA
4,4'-DDE	3	0	0	--	--	--	0.1	**1**	0	1	0.2	NA
4,4'-DDT	3	0	0	--	--	--	0.1	**1**	0	1	0.2	NA
ALDRIN	3	0	0	--	--	--	**0.05**	**0.5**	0	3	0.004	NA
ALPHA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
AROCLOR-1016	3	0	0	--	--	--	0.8	**8**	0	1	1	NA
AROCLOR-1221	3	0	0	--	--	--	**2**	**20**	0	3	0.03	NA
AROCLOR-1232	3	0	0	--	--	--	**2**	**20**	0	3	0.03	NA
AROCLOR-1242	3	0	0	--	--	--	**0.8**	**8**	0	3	0.03	NA
AROCLOR-1248	3	0	0	--	--	--	**0.5**	**5**	0	3	0.03	NA
AROCLOR-1254	3	0	0	--	--	--	**1**	**10**	0	3	0.03	NA
AROCLOR-1260	3	0	0	--	--	--	**1**	**10**	0	3	0.03	NA
BETA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
CHLORDANE	3	0	0	--	--	--	**0.2**	**2**	0	3	0.2	NA
DELTA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
DIELDRIN	3	0	0	--	--	--	**0.02**	**0.2**	0	3	0.004	NA
ENDOSULFAN I	3	0	0	--	--	--	0.05	0.5	0	0	220	NA
ENDOSULFAN II	5	0	0	--	--	--	0.1	1	--	--	NA	NA
ENDOSULFAN SULFATE	3	0	0	--	--	--	0.1	1	--	--	NA	NA

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PCBs/Pesticides (µg/L)												
ENDRIN	3	0	0	--	--	--	0.06	0.6	0	0	11	2
ENDRIN ALDEHYDE	5	0	0	--	--	--	0.1	1	--	--	NA	NA
ENDRIN KETONE	5	0	0	--	--	--	0.05	0.5	--	--	NA	NA
GAMMA-BHC (LINDANE)	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
HEPTACHLOR	3	0	0	--	--	--	**0.02**	**0.2**	0	3	0.02	0.01
HEPTACHLOR EPOXIDE	5	0	0	--	--	--	**0.05**	**0.5**	0	5	0.007	0.01
METHOXYCHLOR	5	0	0	--	--	--	0.1	1	0	0	180	30
TOXAPHENE	3	0	0	--	--	--	**1**	**10**	0	3	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	5	5	100	186,000	**137,000**	**305,000**	0.0	0.0	5	0	36,000	NA
ANTIMONY	5	0	0	--	--	--	**60.0**	**60.0**	0	5	15.0	6.0
ARSENIC	5	3	60	**67.0**	**54.0**	**86.0**	**50.0**	**100**	3	2	0.045	10.0
BARIUM	5	5	100	1,120	710	1,900	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	5	1	20	7.0	7.0	7.0	5.0	5.0	0	0	73.0	4.0
CADMIUM	5	0	0	--	--	--	5.0	5.0	0	0	18.0	5.0
CALCIUM	5	5	100	45,200	24,000	91,000	0.0	0.0	--	--	NA	NA
CHROMIUM	5	5	100	8,250	370	39,000	0.0	0.0	--	--	NA	50.0
COBALT	5	5	100	93.4	57.0	160	0.0	0.0	0	0	730	NA
COPPER	5	5	100	152	100	260	0.0	0.0	0	0	1,500	1,300
IRON	5	5	100	222,000	**152,000**	**376,000**	0.0	0.0	5	0	11,000	NA
LEAD	5	2	40	69.0	56.0	82.0	50.0	50.0	--	--	NA	15.0
MAGNESIUM	5	5	100	67,200	46,000	94,000	0.0	0.0	--	--	NA	NA
MANGANESE	5	5	100	3,340	**1,900**	**4,900**	0.0	0.0	5	0	880	NA
MOLYBDENUM	5	0	0	--	--	--	50.0	50.0	0	0	180	NA
NICKEL	5	5	100	676	490	**1,100**	0.0	0.0	1	0	730	100
POTASSIUM	5	5	100	17,200	10,000	23,000	0.0	0.0	--	--	NA	NA
SELENIUM	5	2	40	113	75.0	150	50.0	59.0	0	0	180	50.0
SILVER	5	2	40	14.5	12.0	17.0	10.0	10.0	0	0	180	NA
SODIUM	5	5	100	254,000	203,000	388,000	0.0	0.0	--	--	NA	NA
THALLIUM	5	0	0	--	--	--	**50.0**	**100**	0	5	2.4	2.0

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
TITANIUM	5	5	100	4,340	2,500	7,700	0.0	0.0	--	--	NA	NA
VANADIUM	5	5	100	**398**	**280**	**690**	0.0	0.0	5	0	260	NA
ZINC	5	5	100	390	270	680	0.0	0.0	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 8-5: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	13	0	0	--	--	--	10	140,000	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	13	0	0	--	--	--	10	**140,000**	0	2	410
1,1,2-TRICHLOROETHANE	13	0	0	--	--	--	10	**140,000**	0	2	730
1,1-DICHLOROETHANE	13	0	0	--	--	--	10	**140,000**	0	1	2,800 (CAL-modified)
1,1-DICHLOROETHENE	13	0	0	--	--	--	10	**140,000**	0	1	120,000
1,2-DICHLOROETHANE	13	0	0	--	--	--	10	**140,000**	0	2	280
1,2-DICHLOROETHENE (TOTAL)	13	0	0	--	--	--	10	**140,000**	0	1	43,000 (cis)
1,2-DICHLOROPROPANE	13	0	0	--	--	--	10	**140,000**	0	2	340
2-BUTANONE	13	0	0	--	--	--	10	140,000	--	--	NA
2-HEXANONE	13	0	0	--	--	--	10	140,000	--	--	NA
4-METHYL-2-PENTANONE	13	0	0	--	--	--	10	140,000	--	--	NA
ACETONE	13	0	0	--	--	--	10	170,000	0	0	1,600,000
BENZENE	13	2	15	1,700	6 J	**3,300**	10	**140,000**	1	1	600
BROMODICHLOROMETHANE	13	0	0	--	--	--	10	**140,000**	0	2	820
BROMOFORM	13	0	0	--	--	--	10	**140,000**	0	1	62,000
BROMOMETHANE	13	0	0	--	--	--	10	**140,000**	0	1	3,900
CARBON DISULFIDE	13	0	0	--	--	--	10	140,000	0	0	360,000
CARBON TETRACHLORIDE	13	0	0	--	--	--	10	**140,000**	0	2	250
CHLOROBENZENE	13	0	0	--	--	--	10	140,000	0	0	150,000
CHLOROETHANE	13	0	0	--	--	--	10	**140,000**	0	1	3,000
CHLOROFORM	13	0	0	--	--	--	10	**140,000**	0	2	940 (CAL-modified)
CHLOROMETHANE	13	0	0	--	--	--	10	**140,000**	0	2	1,200
CIS-1,3-DICHLOROPROPENE	13	0	0	--	--	--	10	**140,000**	0	2	780 (not cis)
DIBROMOCHLOROMETHANE	13	0	0	--	--	--	10	**140,000**	0	2	1,100
ETHYLBENZENE	13	6	46	100,000	12	**570,000**	10	13	2	0	8,900
ETHYLENE DIBROMIDE	15	0	0	--	--	--	5	72,000	--	--	NA
METHYLENE CHLORIDE	13	0	0	--	--	--	10	**140,000**	0	1	9,100
STYRENE	13	0	0	--	--	--	10	140,000	0	0	1,700,000
TETRACHLOROETHENE	13	0	0	--	--	--	10	**140,000**	0	2	1,500
TOLUENE	13	3	23	290,000	20	**840,000**	10	160	1	0	520,000
TRANS-1,3-DICHLOROPROPENE	13	0	0	--	--	--	10	**140,000**	0	2	780 (not trans)

TABLE 8-5: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
TRICHLOROETHENE	13	0	0	--	--	--	10	**140,000**	0	3	53
VINYL CHLORIDE	13	0	0	--	--	--	10	**140,000**	0	2	79 (child or adult)
XYLENE (TOTAL)	13	5	38	550,000	70	**2,600,000**	10	27	1	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	16	1	6	2,000	2,000 J	2,000 J	340	410	0	0	650,000
1,2-DICHLOROBENZENE	16	0	0	--	--	--	340	24,000	0	0	370,000
1,3-DICHLOROBENZENE	16	0	0	--	--	--	340	**24,000**	0	1	16,000
1,4-DICHLOROBENZENE	16	0	0	--	--	--	340	**24,000**	0	1	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	16	0	0	--	--	--	340	24,000	--	--	NA
2,4,5-TRICHLOROPHENOL	16	0	0	--	--	--	820	59,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	16	0	0	--	--	--	340	**24,000**	0	1	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	16	0	0	--	--	--	340	24,000	0	0	180,000
2,4-DIMETHYLPHENOL	16	0	0	--	--	--	340	24,000	0	0	1,200,000
2,4-DINITROPHENOL	16	0	0	--	--	--	820	59,000	0	0	120,000
2,4-DINITROTOLUENE	16	0	0	--	--	--	340	24,000	0	0	120,000
2,6-DINITROTOLUENE	16	0	0	--	--	--	340	24,000	0	0	61,000
2-CHLORONAPHTHALENE	16	0	0	--	--	--	340	24,000	--	--	NA
2-CHLOROPHENOL	16	1	6	3,100	3,100 J	3,100 J	340	410	0	0	63,000
2-METHYLNAPHTHALENE	16	11	69	12,000	20 J	110,000 J	360	390	--	--	NA
2-METHYLPHENOL	16	0	0	--	--	--	340	24,000	--	--	NA
2-NITROANILINE	16	0	0	--	--	--	820	**59,000**	0	1	1,700
2-NITROPHENOL	16	0	0	--	--	--	340	24,000	--	--	NA
3,3'-DICHLOROBENZIDINE	16	0	0	--	--	--	340	**24,000**	0	1	1,100
3-NITROANILINE	16	0	0	--	--	--	820	59,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	16	0	0	--	--	--	820	59,000	--	--	NA
4-BROMOPHENYL-PHENYLETHER	16	0	0	--	--	--	340	24,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	16	1	6	5,700	5,700 J	5,700 J	340	410	--	--	NA
4-CHLOROANILINE	16	0	0	--	--	--	340	24,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	16	0	0	--	--	--	340	24,000	--	--	NA
4-METHYLPHENOL	16	0	0	--	--	--	340	24,000	0	0	310,000

TABLE 8-5: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
4-NITROANILINE	16	0	0	--	--	--	820	59,000	--	--	NA
4-NITROPHENOL	16	0	0	--	--	--	820	59,000	--	--	NA
ACENAPHTHENE	16	4	25	830	18 J	3,200 J	340	390	0	0	3,700,000
ACENAPHTHYLENE	16	1	6	44	44 J	44 J	340	24,000	--	--	NA
ANTHRACENE	16	3	19	62	41 J	76 J	340	24,000	0	0	22,000,000
BENZO(A)ANTHRACENE	16	4	25	140	24 J	350	340	**24,000**	0	1	620
BENZO(A)PYRENE	16	5	31	**140**	26 J	**400**	**340**	**24,000**	3	11	62
BENZO(B)FLUORANTHENE	16	7	44	130	19 J	520	340	**24,000**	0	1	620
BENZO(G,H,I)PERYLENE	16	5	31	130	24 J	390	340	24,000	--	--	NA
BENZO(K)FLUORANTHENE	16	3	19	51	34 J	73 J	340	**24,000**	0	3	380 (CAL-modified)
BIS(2-CHLOROETHOXY)METHANE	16	0	0	--	--	--	340	24,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	16	0	0	--	--	--	**340**	**24,000**	0	16	210
BIS(2-ETHYLHEXYL)PHTHALATE	16	0	0	--	--	--	340	24,000	0	0	35,000
BUTYLBENZYLPHTHALATE	16	0	0	--	--	--	340	24,000	0	0	12,000,000
CARBAZOLE	16	2	13	21	18 J	24 J	340	24,000	0	0	24,000
CHRYSENE	16	5	31	120	24 J	350	340	**24,000**	0	1	3,800 (CAL-modified)
DI-N-BUTYLPHTHALATE	16	0	0	--	--	--	340	24,000	--	--	NA
DI-N-OCTYLPHTHALATE	16	0	0	--	--	--	340	24,000	--	--	NA
DIBENZO(A,H)ANTHRACENE	16	0	0	--	--	--	**340**	**24,000**	0	16	62
DIBENZOFURAN	16	0	0	--	--	--	340	24,000	0	0	290,000
DIETHYLPHTHALATE	16	0	0	--	--	--	340	24,000	0	0	49,000,000
DIMETHYLPHTHALATE	16	0	0	--	--	--	340	24,000	0	0	100,000,000
FLUORANTHENE	16	9	56	350	29 J	1,400 J	340	390	0	0	2,300,000
FLUORENE	16	3	19	43	35 J	60 J	340	24,000	0	0	2,700,000
HEXACHLOROBENZENE	16	0	0	--	--	--	**340**	**24,000**	0	16	300
HEXACHLOROBUTADIENE	16	0	0	--	--	--	340	**24,000**	0	1	6,200
HEXACHLOROCYCLOPENTADIENE	16	0	0	--	--	--	340	24,000	0	0	370,000
HEXACHLOROETHANE	16	0	0	--	--	--	340	24,000	0	0	35,000
INDENO(1,2,3-CD)PYRENE	16	5	31	130	19 J	420	340	**24,000**	0	1	620
ISOPHORONE	16	0	0	--	--	--	340	24,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	16	0	0	--	--	--	**340**	**24,000**	0	16	69

TABLE 8-5: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
N-NITROSODIPHENYLAMINE	16	0	0	--	--	--	340	24,000	0	0	99,000
NAPHTHALENE	16	11	69	11,000	22 J	**110,000**	360	390	1	0	56,000
NITROBENZENE	16	0	0	--	--	--	340	**24,000**	0	1	20,000
PENTACHLOROPHENOL	16	0	0	--	--	--	820	**59,000**	0	1	3,000
PHENANTHRENE	16	7	44	550	20 J	2,700 J	340	390	--	--	NA
PHENOL	16	0	0	--	--	--	340	24,000	0	0	37,000,000
PYRENE	16	9	56	780	37 J	4,900 J	340	390	0	0	2,300,000
Metals (mg/kg)											
ALUMINUM	16	16	100	6,200	4,140	9,460	0.0	0.0	0	0	76,000
ANTIMONY	16	0	0	--	--	--	0.48	3.0	0	0	31.0
ARSENIC	16	10	63	**2.7**	**1.4 J**	**8.8**	**0.59**	**2.7**	10	6	0.39
BARIUM	16	16	100	63.0	24.5 J	140	0.0	0.0	0	0	5,400
BERYLLIUM	16	16	100	0.88	0.52 J	1.8	0.0	0.0	0	0	150
CADMIUM	16	9	56	0.66	0.10 J	4.3	0.080	0.10	0	0	37.0
CALCIUM	16	16	100	3,610	1,400	6,960	0.0	0.0	--	--	NA
CHROMIUM	16	16	100	33.3	19.9 J	48.1 J	0.0	0.0	0	0	210
COBALT	16	10	63	5.4	4.0 J	7.1 J	5.1	7.9	0	0	900
COPPER	16	16	100	11.6	5.7	27.0	0.0	0.0	0	0	3,100
IRON	16	16	100	9,620	7,150	13,700	0.0	0.0	0	0	23,000
LEAD	16	14	88	21.1	2.1 J	67.8	2.5	2.9	0	0	150 (CAL-modified)
MAGNESIUM	16	16	100	2,330	1,570	3,510	0.0	0.0	--	--	NA
MANGANESE	16	16	100	161	89.2	312	0.0	0.0	0	0	1,800
MERCURY	16	1	6	0.46	0.46	0.46	0.15	0.19	0	0	23.0
MOLYBDENUM	16	0	0	--	--	--	2.8	3.5	0	0	390
NICKEL	16	14	88	26.3	20.3	39.4	17.1	18.7	0	0	1,600
POTASSIUM	16	16	100	819	530 J	1,470	0.0	0.0	--	--	NA
SELENIUM	16	5	31	0.78	0.66 J	1.0 J	0.54	0.63	0	0	390
SILVER	16	0	0	--	--	--	0.18	2.8	0	0	390
SODIUM	16	16	100	201	74.6 J	739 J	0.0	0.0	--	--	NA
THALLIUM	16	0	0	--	--	--	0.40	0.58	0	0	5.2

TABLE 8-5: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
VANADIUM	16	16	100	23.9	19.7	32.0	0.0	0.0	0	0	550
ZINC	16	16	100	39.7	15.8	126	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 8-6: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	32	2	6	2	0.7J	3	1	17	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	32	0	0	--	--	--	**1**	**17**	0	32	0.06	1
1,1,2-TRICHLOROETHANE	32	0	0	--	--	--	**1**	**17**	0	32	0.2	5
1,1-DICHLOROETHANE	32	0	0	--	--	--	1	**17**	0	1	2 (CAL-modified)	5
1,1-DICHLOROETHENE	32	0	0	--	--	--	1	17	0	0	340	6
1,2-DICHLOROETHANE	32	1	3	**10**	**10**	**10**	**0.5**	**8**	1	31	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	32	0	0	--	--	--	1	17	0	0	61 (cis)	NA
1,2-DICHLOROPROPANE	32	0	0	--	--	--	**1**	**17**	0	32	0.2	5
2-BUTANONE	1	0	0	--	--	--	18	18	--	--	NA	NA
2-HEXANONE	31	0	0	--	--	--	2	33	--	--	NA	NA
4-METHYL-2-PENTANONE	32	0	0	--	--	--	2	33	--	--	NA	NA
ACETONE	2	1	50	65	65J	65J	4	4	0	0	610	NA
BENZENE	32	8	25	**490**	**2**	**1,600**	**0.5**	**1**	8	24	0.3	1
BROMODICHLOROMETHANE	32	0	0	--	--	--	**1**	**17**	0	32	0.2	80
BROMOFORM	32	0	0	--	--	--	1	**17**	0	1	9	80
BROMOMETHANE	32	0	0	--	--	--	1	**33**	0	1	9	NA
CARBON DISULFIDE	32	0	0	--	--	--	1	17	0	0	1,000	NA
CARBON TETRACHLORIDE	32	0	0	--	--	--	**0.5**	**8**	0	32	0.2	0.5
CHLOROBENZENE	32	0	0	--	--	--	1	17	0	0	110	70
CHLOROETHANE	32	0	0	--	--	--	2	**33**	0	1	5	NA
CHLOROFORM	32	0	0	--	--	--	**1**	**17**	0	32	0.5 (CAL-modified)	80
CHLOROMETHANE	32	0	0	--	--	--	**2**	**33**	0	32	2	NA
CIS-1,3-DICHLOROPROPENE	32	0	0	--	--	--	**0.5**	**8**	0	32	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	32	0	0	--	--	--	**1**	**17**	0	32	0.1	80
ETHYLBENZENE	32	9	28	**210**	0.8J	**910**	1	1	8	0	3	300
ETHYLENE DIBROMIDE	10	0	0	--	--	--	1	17	--	--	NA	0.05
METHYLENE CHLORIDE	32	0	0	--	--	--	1	**17**	0	1	4	NA
STYRENE	32	0	0	--	--	--	1	17	0	0	1,600	100
TETRACHLOROETHENE	32	0	0	--	--	--	**1**	**17**	0	32	0.7	5
TOLUENE	32	3	9	1	0.9J	1	1	17	0	0	720	150
TRANS-1,3-DICHLOROPROPENE	32	0	0	--	--	--	**0.5**	**8**	0	32	0.4 (not trans)	0.5

TABLE 8-6: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TRICHLOROETHENE	32	0	0	--	--	--	**1**	**17**	0	32	0.03	5
VINYL CHLORIDE	32	0	0	--	--	--	**0.5**	**8**	0	32	0.02 (child or adult)	0.5
XYLENE (TOTAL)	32	2	6	5	4	6	1	17	0	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	17	0	0	--	--	--	10	30	0	0	190	5
1,2-DICHLOROBENZENE	17	0	0	--	--	--	5	15	0	0	370	600
1,3-DICHLOROBENZENE	17	0	0	--	--	--	5	**15**	0	1	6	NA
1,4-DICHLOROBENZENE	17	0	0	--	--	--	**5**	**15**	0	17	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	17	0	0	--	--	--	10	30	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	17	0	0	--	--	--	25	75	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	17	0	0	--	--	--	**10**	**30**	0	17	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	17	0	0	--	--	--	10	30	0	0	110	NA
2,4-DIMETHYLPHENOL	17	0	0	--	--	--	10	30	0	0	730	NA
2,4-DINITROPHENOL	11	0	0	--	--	--	25	**75**	0	1	73	NA
2,4-DINITROTOLUENE	17	0	0	--	--	--	10	30	0	0	73	NA
2,6-DINITROTOLUENE	17	0	0	--	--	--	10	30	0	0	36	NA
2-CHLORONAPHTHALENE	17	0	0	--	--	--	10	30	--	--	NA	NA
2-CHLOROPHENOL	17	0	0	--	--	--	10	30	0	0	30	NA
2-METHYLNAPHTHALENE	17	4	24	12	1 J	31	10	30	--	--	NA	NA
2-METHYLPHENOL	17	0	0	--	--	--	10	30	0	0	1,800	NA
2-NITROANILINE	17	0	0	--	--	--	**25**	**75**	0	17	1	NA
2-NITROPHENOL	17	0	0	--	--	--	10	30	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	17	0	0	--	--	--	**10**	**30**	0	17	0.2	NA
3-NITROANILINE	17	0	0	--	--	--	25	75	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	17	0	0	--	--	--	25	75	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	17	0	0	--	--	--	10	30	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	17	0	0	--	--	--	10	30	--	--	NA	NA
4-CHLOROANILINE	17	0	0	--	--	--	10	30	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	17	0	0	--	--	--	10	30	--	--	NA	NA
4-METHYLPHENOL	17	0	0	--	--	--	10	30	0	0	180	NA

TABLE 8-6: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-NITROANILINE	17	0	0	--	--	--	25	75	--	--	NA	NA
4-NITROPHENOL	17	0	0	--	--	--	25	75	--	--	NA	NA
ACENAPHTHENE	17	0	0	--	--	--	10	30	0	0	370	NA
ACENAPHTHYLENE	17	0	0	--	--	--	10	30	--	--	NA	NA
ANTHRACENE	17	0	0	--	--	--	10	30	0	0	1,800	NA
BENZO(A)ANTHRACENE	17	0	0	--	--	--	**10**	**30**	0	17	0.09	0.1
BENZO(A)PYRENE	17	0	0	--	--	--	**10**	**30**	0	17	0.009	0.2
BENZO(B)FLUORANTHENE	17	0	0	--	--	--	**10**	**30**	0	17	0.09	NA
BENZO(G,H,I)PERYLENE	17	0	0	--	--	--	10	30	--	--	NA	NA
BENZO(K)FLUORANTHENE	17	0	0	--	--	--	**10**	**30**	0	17	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	17	0	0	--	--	--	10	30	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	17	0	0	--	--	--	**10**	**30**	0	17	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	17	0	0	--	--	--	4	**32**	0	3	5	NA
BUTYLBENZYLPHTHALATE	17	0	0	--	--	--	10	30	0	0	7,300	NA
CARBAZOLE	17	0	0	--	--	--	**10**	**30**	0	17	3	NA
CHRYSENE	17	0	0	--	--	--	**10**	**30**	0	17	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	17	0	0	--	--	--	10	30	--	--	NA	NA
DI-N-OCTYLPHTHALATE	17	0	0	--	--	--	10	30	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	17	0	0	--	--	--	**10**	**30**	0	17	0.009	NA
DIBENZOFURAN	17	0	0	--	--	--	10	**30**	0	1	24	NA
DIETHYLPHTHALATE	17	0	0	--	--	--	10	30	0	0	29,000	NA
DIMETHYLPHTHALATE	17	0	0	--	--	--	10	30	0	0	360,000	NA
FLUORANTHENE	17	0	0	--	--	--	10	30	0	0	1,500	NA
FLUORENE	17	0	0	--	--	--	10	30	0	0	240	NA
HEXACHLOROBENZENE	17	0	0	--	--	--	**10**	**30**	0	17	0.04	1
HEXACHLOROBUTADIENE	17	0	0	--	--	--	**10**	**30**	0	17	0.9	NA
HEXACHLOROCYCLOPENTADIENE	17	0	0	--	--	--	10	30	0	0	220	NA
HEXACHLOROETHANE	17	0	0	--	--	--	**10**	**30**	0	17	5	NA
INDENO(1,2,3-CD)PYRENE	17	0	0	--	--	--	**10**	**30**	0	17	0.09	NA
ISOPHORONE	17	0	0	--	--	--	10	30	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	17	0	0	--	--	--	**10**	**30**	0	17	0.01	NA

TABLE 8-6: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
N-NITROSODIPHENYLAMINE	17	0	0	--	--	--	10	**30**	0	1	14	NA
NAPHTHALENE	17	4	24	**63**	**22**	**140**	**10**	**30**	4	13	6	NA
NITROBENZENE	17	0	0	--	--	--	**10**	**30**	0	17	3	NA
PENTACHLOROPHENOL	17	1	6	**100**	**100**	**100**	**25**	**75**	1	16	0.6	1
PHENANTHRENE	17	0	0	--	--	--	10	30	--	--	NA	NA
PHENOL	17	2	12	45	36	54	10	30	0	0	22,000	NA
PYRENE	17	0	0	--	--	--	10	30	0	0	180	NA
Metals (µg/L)												
Filtered												
ALUMINUM	32	3	9	606	304	1,140	8.4	60.7	0	0	36,000	NA
ANTIMONY	32	3	9	5.1	3.7J	7.1J	2.2	7.3	0	0	15.0	6.0
ARSENIC	32	22	69	**12.7**	**2.7J**	**32.3**	**2.6**	**5.0**	22	10	0.045	10.0
BARIUM	32	30	94	138	17.4J	311	9.9	14.6	0	0	2,600	1,000
BERYLLIUM	32	8	25	1.2	0.75J	1.4J	0.10	2.7	0	0	73.0	4.0
CADMIUM	32	4	13	3.3	0.36J	9.0	0.30	1.2	0	0	18.0	5.0
CALCIUM	32	32	100	71,400	7,170	156,000	0.0	0.0	--	--	NA	NA
CHROMIUM	32	1	3	3.1	3.1J	3.1J	0.40	1.6	--	--	NA	50.0
COBALT	32	1	3	8.5	8.5J	8.5J	3.8	10.2	0	0	730	NA
COPPER	32	5	16	20.1	16.1J	25.1	2.0	21.5	0	0	1,500	1,300
IRON	32	13	41	3,060	71.1J	9,520	3.2	172	0	0	11,000	NA
LEAD	32	0	0	--	--	--	1.0	1.5	--	--	NA	15.0
MAGNESIUM	32	32	100	51,200	5,890	132,000	0.0	0.0	--	--	NA	NA
MANGANESE	32	32	100	2,330	10.6J	**12,100**	0.0	0.0	25	0	880	NA
MERCURY	32	0	0	--	--	--	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	32	2	6	15.7	14.0J	17.4J	7.9	34.4	0	0	180	NA
NICKEL	32	6	19	21.3	12.6J	33.6J	7.5	23.0	0	0	730	100
POTASSIUM	32	27	84	12,500	2,250J	32,600	1,420	2,840	--	--	NA	NA
SELENIUM	32	0	0	--	--	--	2.4	3.0	0	0	180	50.0
SILVER	31	0	0	--	--	--	0.90	2.0	0	0	180	NA
SODIUM	32	32	100	166,000	19,200J	306,000	0.0	0.0	--	--	NA	NA
THALLIUM	32	5	16	**9.6**	**4.2J**	**20.3**	2.0	**5.8**	5	21	2.4	2.0

TABLE 8-6: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1994

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
VANADIUM	32	3	9	7.4	7.2J	7.6J	3.7	11.9	0	0	260	NA
ZINC	32	4	13	110	23.1	268	5.3	50.7	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

MCL Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Micrograms per liter

TABLE 8-7: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	12	0	0	--	--	--	1	1	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	12	0	0	--	--	--	**1**	**1**	0	12	0.06	1
1,1,2-TRICHLOROETHANE	12	0	0	--	--	--	**1**	**1**	0	12	0.2	5
1,1-DICHLOROETHANE	12	0	0	--	--	--	1	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	12	0	0	--	--	--	1	1	0	0	340	6
1,2,4-TRICHLOROBENZENE	12	0	0	--	--	--	1	1	0	0	190	5
1,2-DIBROMO-3-CHLOROPROPANE	12	0	0	--	--	--	**1**	**1**	0	12	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	12	1	8	3	3 J	3 J	1	1	0	0	370	600
1,2-DICHLOROETHANE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.1	0.5
1,2-DICHLOROPROPANE	12	0	0	--	--	--	**1**	**1**	0	12	0.2	5
1,3-DICHLOROBENZENE	12	0	0	--	--	--	1	1	0	0	6	NA
1,4-DICHLOROBENZENE	12	0	0	--	--	--	**1**	**1**	0	12	0.5	5
2-BUTANONE	2	0	0	--	--	--	5	5	--	--	NA	NA
2-HEXANONE	9	0	0	--	--	--	5	5	--	--	NA	NA
4-METHYL-2-PENTANONE	12	0	0	--	--	--	5	5	--	--	NA	NA
BENZENE	12	2	17	**13**	**12 J**	**13**	**0.5**	**0.5**	2	10	0.3	1
BROMOCHLOROMETHANE	12	0	0	--	--	--	1	1	--	--	NA	NA
BROMODICHLOROMETHANE	12	0	0	--	--	--	**1**	**1**	0	12	0.2	80
BROMOFORM	12	0	0	--	--	--	1	1	0	0	9	80
BROMOMETHANE	12	0	0	--	--	--	1	1	0	0	9	NA
CARBON DISULFIDE	12	0	0	--	--	--	1	1	0	0	1,000	NA
CARBON TETRACHLORIDE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.2	0.5
CHLOROBENZENE	12	0	0	--	--	--	1	1	0	0	110	70
CHLOROETHANE	12	0	0	--	--	--	1	1	0	0	5	NA
CHLOROFORM	12	0	0	--	--	--	**1**	**1**	0	12	0.5 (CAL-modified)	80
CHLOROMETHANE	12	0	0	--	--	--	1	1	0	0	2	NA
CIS-1,2-DICHLOROETHENE	12	0	0	--	--	--	1	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	12	0	0	--	--	--	**1**	**1**	0	12	0.1	80
ETHYLBENZENE	12	2	17	**5**	**3**	**7**	1	1	2	0	3	300
ETHYLENE DIBROMIDE	12	0	0	--	--	--	1	1	--	--	NA	0.05

TABLE 8-7: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
METHYLENE CHLORIDE	12	0	0	--	--	--	2	2	0	0	4	NA
STYRENE	12	0	0	--	--	--	1	1	0	0	1,600	100
TETRACHLOROETHENE	12	0	0	--	--	--	**1**	**1**	0	12	0.7	5
TOLUENE	12	0	0	--	--	--	1	1	0	0	720	150
TRANS-1,2-DICHLOROETHENE	12	0	0	--	--	--	1	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.4 (not trans)	0.5
TRICHLOROETHENE	12	1	8	**20**	**20 J**	**20J**	**1**	**1**	1	11	0.03	5
VINYL CHLORIDE	12	0	0	--	--	--	**0.5**	**0.5**	0	12	0.02 (child or adult)	0.5
XYLENE (TOTAL)	12	1	8	1	1	1	1	1	0	0	210	1,800
Metals (µg/L)												
Filtered												
ALUMINUM	9	2	22	1,450	291	2,600	8.7	66.6	0	0	36,000	NA
ANTIMONY	9	1	11	1.9	1.9 J	1.9 J	0.70	2.8	0	0	15.0	6.0
ARSENIC	9	6	67	**14.2**	**2.6 J**	**35.7**	**0.80**	**1.0**	6	3	0.045	10.0
BARIUM	9	9	100	177	62.3 J	353	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	9	0	0	--	--	--	0.10	0.15	0	0	73.0	4.0
CADMIUM	9	6	67	0.54	0.18 J	1.7 J	0.20	0.32	0	0	18.0	5.0
CALCIUM	9	9	100	69,300	33,700	99,000	0.0	0.0	--	--	NA	NA
CHROMIUM	9	2	22	5.6	1.7 J	9.5	0.20	1.9	--	--	NA	50.0
COBALT	9	7	78	1.2	0.44 J	1.7 J	0.26	0.50	0	0	730	NA
COPPER	9	4	44	14.2	2.8 J	25.1	0.35	2.1	0	0	1,500	1,300
IRON	9	4	44	6,220	3,160	8,920	5.6	211	0	0	11,000	NA
LEAD	9	0	0	--	--	--	0.50	3.6	--	--	NA	15.0
MAGNESIUM	9	9	100	45,300	4,770	101,000	0.0	0.0	--	--	NA	NA
MANGANESE	9	8	89	1,660	141	**3,850**	3.9	3.9	3	0	880	NA
MERCURY	9	0	0	--	--	--	0.10	0.10	0	0	11.0	2.0
MOLYBDENUM	9	4	44	3.4	0.30 J	8.1	0.55	4.6	0	0	180	NA
NICKEL	9	9	100	11.6	1.3 J	29.4	0.0	0.0	0	0	730	100
POTASSIUM	9	9	100	10,900	2,300 J	21,900 J	0.0	0.0	--	--	NA	NA
SELENIUM	6	1	17	1.6	1.6 J	1.6 J	1.0	1.8	0	0	180	50.0
SILVER	9	1	11	0.21	0.21 J	0.21 J	0.15	0.77	0	0	180	NA

TABLE 8-7: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Follow-on Investigation, 1998

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Metals (µg/L)												
Filtered												
SODIUM	9	9	100	109,000	8,300 J	200,000	0.0	0.0	--	--	NA	NA
THALLIUM	9	0	0	--	--	--	0.90	1.4	0	0	2.4	2.0
VANADIUM	9	1	11	12.4	12.4 J	12.4 J	0.43	7.0	0	0	260	NA
ZINC	9	6	67	40.8	9.7 J	105	1.4	11.4	0	0	11,000	NA

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

J Estimated value

MCL Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Micrograms per liter

TABLE 8-8: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1-TRICHLOROETHANE	16	0	0	--	--	--	2	500	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	16	0	0	--	--	--	**1**	**250**	0	16	0.06	1
1,1,2-TRICHLOROETHANE	16	0	0	--	--	--	**2**	**500**	0	16	0.2	5
1,1-DICHLOROETHANE	16	0	0	--	--	--	0.5	**130**	0	8	2 (CAL-modified)	5
1,1-DICHLOROETHENE	16	0	0	--	--	--	2	**500**	0	4	340	6
1,2-DICHLOROBENZENE	16	0	0	--	--	--	2	**500**	0	4	370	600
1,2-DICHLOROETHANE	16	5	31	**18**	**0.8**	**38**	**0.5**	**130**	5	11	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	16	0	0	--	--	--	2	**500**	0	6	61 (cis)	NA
1,2-DICHLOROPROPANE	16	0	0	--	--	--	**2**	**500**	0	16	0.2	5
1,3-DICHLOROBENZENE	16	0	0	--	--	--	2	**500**	0	8	6	NA
1,4-DICHLOROBENZENE	16	0	0	--	--	--	**2**	**500**	0	16	0.5	5
2-BUTANONE	16	0	0	--	--	--	2	500	--	--	NA	NA
2-HEXANONE	16	0	0	--	--	--	2	500	--	--	NA	NA
4-METHYL-2-PENTANONE	16	0	0	--	--	--	2	500	--	--	NA	NA
ACETONE	16	1	6	9,100	**9,100 J**	**9,100J**	2	500	1	0	610	NA
BENZENE	23	18	78	**8,500**	0.3J	**34,000**	**0.5**	**0.5**	17	5	0.3	1
BROMODICHLOROMETHANE	16	0	0	--	--	--	**2**	**500**	0	16	0.2	80
BROMOFORM	16	0	0	--	--	--	2	**500**	0	8	9	80
BROMOMETHANE	16	0	0	--	--	--	2	**500**	0	8	9	NA
CARBON DISULFIDE	16	2	13	2,900	**1,200**	**4,600**	2	500	2	0	1,000	NA
CARBON TETRACHLORIDE	16	0	0	--	--	--	**0.5**	**130**	0	16	0.2	0.5
CHLOROBENZENE	16	0	0	--	--	--	2	**500**	0	4	110	70
CHLOROETHANE	16	0	0	--	--	--	2	**500**	0	8	5	NA
CHLOROFORM	16	0	0	--	--	--	**2**	**500**	0	16	0.5 (CAL-modified)	80
CHLOROMETHANE	16	0	0	--	--	--	**2**	**500**	0	16	2	NA
CIS-1,3-DICHLOROPROPENE	16	0	0	--	--	--	**0.5**	**130**	0	16	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	16	0	0	--	--	--	**2**	**500**	0	16	0.1	80
ETHYLBENZENE	23	16	70	1,400	0.7J	**7,100**	1	**400**	14	1	3	300
METHYL-T-BUTYL ETHER	18	5	28	2	0.7J	5J	5	**1,300**	0	7	6 (CAL-modified)	13
METHYLENE CHLORIDE	16	0	0	--	--	--	2	**500**	0	8	4	NA
STYRENE	16	0	0	--	--	--	2	500	0	0	1,600	100

TABLE 8-8: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TETRACHLOROETHENE	16	0	0	--	--	--	**2**	**500**	0	16	0.7	5
TOLUENE	23	14	61	7,500	0.3J	**34,000**	0.7	400	6	0	720	150
TRANS-1,3-DICHLOROPROPENE	16	0	0	--	--	--	**0.5**	**130**	0	16	0.4 (not trans)	0.5
TRICHLOROETHENE	16	0	0	--	--	--	**2**	**500**	0	16	0.03	5
VINYL CHLORIDE	16	0	0	--	--	--	**0.5**	**130**	0	16	0.02 (child or adult)	0.5
XYLENE (TOTAL)	23	15	65	6,400	6	**36,000**	2	100	8	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	7	0	0	--	--	--	10	10	0	0	190	5
1,2-DICHLOROBENZENE	7	0	0	--	--	--	5	5	0	0	370	600
1,3-DICHLOROBENZENE	7	0	0	--	--	--	5	5	0	0	6	NA
1,4-DICHLOROBENZENE	7	0	0	--	--	--	**5**	**5**	0	7	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	7	0	0	--	--	--	10	10	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	7	0	0	--	--	--	25	25	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	7	0	0	--	--	--	**10**	**10**	0	7	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	7	0	0	--	--	--	10	10	0	0	110	NA
2,4-DIMETHYLPHENOL	7	0	0	--	--	--	10	10	0	0	730	NA
2,4-DINITROPHENOL	7	0	0	--	--	--	25	50	0	0	73	NA
2,4-DINITROTOLUENE	7	0	0	--	--	--	10	10	0	0	73	NA
2,6-DINITROTOLUENE	7	0	0	--	--	--	10	10	0	0	36	NA
2-CHLORONAPHTHALENE	7	0	0	--	--	--	10	10	--	--	NA	NA
2-CHLOROPHENOL	7	0	0	--	--	--	10	10	0	0	30	NA
2-METHYLNAPHTHALENE	7	1	14	60	60	60	10	10	--	--	NA	NA
2-METHYLPHENOL	7	0	0	--	--	--	10	10	0	0	1,800	NA
2-NITROANILINE	7	0	0	--	--	--	**25**	**25**	0	7	1	NA
2-NITROPHENOL	7	0	0	--	--	--	10	10	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	7	0	0	--	--	--	**12**	**12**	0	7	0.2	NA
3-NITROANILINE	7	0	0	--	--	--	25	25	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	7	0	0	--	--	--	25	25	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	7	0	0	--	--	--	10	10	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	7	0	0	--	--	--	10	10	--	--	NA	NA

TABLE 8-8: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
4-CHLOROANILINE	7	0	0	--	--	--	17	19	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	7	0	0	--	--	--	10	10	--	--	NA	NA
4-METHYLPHENOL	7	0	0	--	--	--	10	10	0	0	180	NA
4-NITROANILINE	7	0	0	--	--	--	25	25	--	--	NA	NA
4-NITROPHENOL	7	0	0	--	--	--	25	25	--	--	NA	NA
ACENAPHTHENE	7	0	0	--	--	--	10	10	0	0	370	NA
ACENAPHTHYLENE	7	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	7	0	0	--	--	--	10	10	0	0	1,800	NA
BENZO(A)ANTHRACENE	7	0	0	--	--	--	**10**	**10**	0	7	0.09	0.1
BENZO(A)PYRENE	7	0	0	--	--	--	**1**	**3**	0	7	0.009	0.2
BENZO(B)FLUORANTHENE	7	0	0	--	--	--	**10**	**10**	0	7	0.09	NA
BENZO(G,H,I)PERYLENE	7	0	0	--	--	--	10	10	--	--	NA	NA
BENZO(K)FLUORANTHENE	7	0	0	--	--	--	**10**	**10**	0	7	0.06 (CAL-modified)	NA
BIS(2-CHLOROETHOXY)METHANE	7	0	0	--	--	--	10	10	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	7	0	0	--	--	--	**10**	**10**	0	7	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	7	0	0	--	--	--	4	4	0	0	5	NA
BUTYLBENZYLPHTHALATE	7	0	0	--	--	--	10	10	0	0	7,300	NA
CARBAZOLE	7	0	0	--	--	--	**10**	**14**	0	7	3	NA
CHRYSENE	7	0	0	--	--	--	**10**	**10**	0	7	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	7	0	0	--	--	--	10	10	--	--	NA	NA
DI-N-OCTYLPHTHALATE	7	0	0	--	--	--	10	10	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	7	0	0	--	--	--	**20**	**20**	0	7	0.009	NA
DIBENZOFURAN	7	0	0	--	--	--	10	10	0	0	24	NA
DIETHYLPHTHALATE	7	0	0	--	--	--	10	10	0	0	29,000	NA
DIMETHYLPHTHALATE	7	0	0	--	--	--	10	10	0	0	360,000	NA
FLUORANTHENE	7	0	0	--	--	--	10	10	0	0	1,500	NA
FLUORENE	7	0	0	--	--	--	10	10	0	0	240	NA
HEXACHLOROBENZENE	7	0	0	--	--	--	**10**	**10**	0	7	0.04	1
HEXACHLOROBUTADIENE	7	0	0	--	--	--	**10**	**10**	0	7	0.9	NA
HEXACHLOROCYCLOPENTADIENE	7	0	0	--	--	--	11	16	0	0	220	NA
HEXACHLOROETHANE	7	0	0	--	--	--	**10**	**10**	0	7	5	NA

TABLE 8-8: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (µg/L)												
INDENO(1,2,3-CD)PYRENE	7	0	0	--	--	--	**10**	**10**	0	7	0.09	NA
ISOPHORONE	7	0	0	--	--	--	10	10	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	7	0	0	--	--	--	**10**	**10**	0	7	0.01	NA
N-NITROSODIPHENYLAMINE	7	0	0	--	--	--	10	**18**	0	6	14	NA
NAPHTHALENE	7	2	29	**200**	**15**	**380**	**10**	**10**	2	5	6	NA
NITROBENZENE	7	0	0	--	--	--	**10**	**10**	0	7	3	NA
PENTACHLOROPHENOL	7	0	0	--	--	--	**25**	**25**	0	7	0.6	1
PHENANTHRENE	7	0	0	--	--	--	10	10	--	--	NA	NA
PHENOL	7	1	14	42	42	42	10	10	0	0	22,000	NA
PYRENE	7	0	0	--	--	--	10	10	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	7	0	0	--	--	--	5	25	0	0	370	NA
ACENAPHTHYLENE	7	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	7	0	0	--	--	--	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	0.1
BENZO(A)PYRENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.009	0.2
BENZO(B)FLUORANTHENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	NA
BENZO(G,H,I)PERYLENE	7	0	0	--	--	--	0.2	1	--	--	NA	NA
BENZO(K)FLUORANTHENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.06 (CAL-modified)	NA
CHRYSENE	7	0	0	--	--	--	0.2	**1**	0	1	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	7	0	0	--	--	--	**0.5**	**3**	0	7	0.009	NA
FLUORANTHENE	7	0	0	--	--	--	0.2	1	0	0	1,500	NA
FLUORENE	7	0	0	--	--	--	1	5	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	NA
NAPHTHALENE	7	1	14	**140**	**140**	**140**	5	5	1	0	6	NA
PHENANTHRENE	7	0	0	--	--	--	1	5	--	--	NA	NA
PYRENE	7	0	0	--	--	--	0.2	1	0	0	180	NA

TABLE 8-8: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 8-9: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
1,1,1,2-TETRACHLOROETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.4	NA
1,1,1-TRICHLOROETHANE	8	0	0	--	--	--	0.5	8	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.06	1
1,1,2-TRICHLOROETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.2	5
1,1-DICHLOROETHANE	8	0	0	--	--	--	0.5	**8**	0	3	2 (CAL-modified)	5
1,1-DICHLOROETHENE	8	0	0	--	--	--	0.5	8	0	0	340	6
1,1-DICHLOROPROPENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.006	NA
1,2,4-TRICHLOROBENZENE	8	0	0	--	--	--	0.5	8	0	0	190	5
1,2,4-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	8	2	25	2	0.8 J	2 J	0.5	8	0	0	370	600
1,2-DICHLOROETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.1	0.5
1,2-DICHLOROPROPANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.2	5
1,3,5-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	12	NA
1,3-DICHLOROBENZENE	8	0	0	--	--	--	0.5	**8**	0	1	6	NA
1,3-DICHLOROPROPANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,4-DICHLOROBENZENE	8	0	0	--	--	--	0.5	**8**	0	3	0.5	5
2,2-DICHLOROPROPANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
2-BUTANONE	8	0	0	--	--	--	10	170	--	--	NA	NA
2-CHLOROTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
2-HEXANONE	8	0	0	--	--	--	10	170	--	--	NA	NA
4-CHLOROTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
4-METHYL-2-PENTANONE	8	0	0	--	--	--	10	170	--	--	NA	NA
ACETONE	8	2	25	5	1 J	8 J	0.9	170	0	0	610	NA
BENZENE	8	4	50	**1,500**	**690**	**2,800**	**0.5**	**0.5**	4	4	0.3	1
BROMOBENZENE	8	0	0	--	--	--	0.5	8	0	0	20	NA
BROMOCHLOROMETHANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
BROMODICHLOROMETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.2	80
BROMOFORM	8	0	0	--	--	--	1	**17**	0	1	9	80

TABLE 8-9: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
BROMOMETHANE	8	1	13	0.6	0.6J	0.6J	1	**17**	0	1	9	NA
CARBON DISULFIDE	8	0	0	--	--	--	0.5	8	0	0	1,000	NA
CARBON TETRACHLORIDE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.2	0.5
CHLOROBENZENE	8	0	0	--	--	--	0.5	8	0	0	110	70
CHLOROETHANE	8	0	0	--	--	--	1	**17**	0	3	5	NA
CHLOROFORM	8	1	13	**19**	**19**	**19**	0.5	**8**	1	2	0.5 (CAL-modified)	80
CHLOROMETHANE	8	1	13	0.2	0.2J	0.2J	1	**17**	0	3	2	NA
CIS-1,2-DICHLOROETHENE	8	0	0	--	--	--	0.5	8	0	0	61	6
DIBROMOCHLOROMETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.1	80
DIBROMOMETHANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
DICHLORODIFLUOROMETHANE	8	0	0	--	--	--	1	17	0	0	390	NA
DIISOPROPYL ETHER	8	1	13	0.3	0.3J	0.3J	0.5	8	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	8	0	0	--	--	--	0.5	8	--	--	NA	NA
ETHYLBENZENE	8	4	50	**33**	**26**	**38**	0.5	0.5	4	0	3	300
ETHYLENE DIBROMIDE	8	0	0	--	--	--	0.5	8	--	--	NA	0.05
HEXACHLOROBUTADIENE	8	0	0	--	--	--	0.5	**8**	0	3	0.9	NA
ISOPROPYLBENZENE	8	4	50	110	100	120	0.5	0.5	--	--	NA	NA
M,P-XYLENE	8	3	38	4	2	8J	0.5	4	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	8	0	0	--	--	--	0.5	4	0	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	8	0	0	--	--	--	0.2	**36**	0	7	4	NA
N-BUTYLBENZENE	8	4	50	20	18	21	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	8	4	50	**270**	**260**	**280**	0.5	0.5	4	0	240	NA
NAPHTHALENE	8	4	50	**330**	**280**	**380**	2	2	4	0	6	NA
O-XYLENE	8	1	13	0.7	0.7	0.7	0.5	8	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
SEC-BUTYLBENZENE	8	4	50	14	3J	18	0.5	0.5	0	0	240	NA
STYRENE	8	0	0	--	--	--	0.5	8	0	0	1,600	100
TERT-AMYL METHYL ETHER	8	0	0	--	--	--	0.5	8	--	--	NA	NA
TERT-BUTANOL	8	3	38	150	110J	210	10	330	--	--	NA	NA
TERT-BUTYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	240	NA
TETRACHLOROETHENE	8	1	13	**3**	**3J**	**3J**	0.5	**8**	1	2	0.7	5

TABLE 8-9: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/L)												
TOLUENE	8	3	38	1	0.7J	1J	0.5	8	0	0	720	150
TRANS-1,2-DICHLOROETHENE	8	0	0	--	--	--	0.5	8	0	0	120	10
TRICHLOROETHENE	8	1	13	**2**	**2J**	**2J**	**0.5**	**8**	1	7	0.03	5
TRICHLOROFLUOROMETHANE	8	0	0	--	--	--	1	17	--	--	NA	NA
VINYL CHLORIDE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.02 (child or adult)	0.5
Metals (µg/L)												
Filtered												
ALUMINUM	6	6	100	58.8	3.5J	210	0.0	0.0	0	0	36,000	NA
ANTIMONY	6	4	67	1.3	0.079J	3.2J	**50.0**	**60.0**	0	2	15.0	6.0
ARSENIC	6	6	100	**14.5**	**0.96J**	**41.0**	0.0	0.0	6	0	0.045	10.0
BARIUM	6	6	100	232	72.0	490J	0.0	0.0	0	0	2,600	1,000
BERYLLIUM	6	0	0	--	--	--	2.0	2.0	0	0	73.0	4.0
CADMIUM	6	1	17	0.78	0.78J	0.78J	0.11	5.0	0	0	18.0	5.0
CALCIUM	6	6	100	76,300	40,000	100,000	0.0	0.0	--	--	NA	NA
CHROMIUM	6	2	33	0.97	0.23J	1.7J	5.8	10.0	--	--	NA	50.0
COBALT	6	5	83	2.7	0.34J	6.3J	20.0	20.0	0	0	730	NA
COPPER	6	5	83	10.5	0.62J	38.0	10.0	10.0	0	0	1,500	1,300
IRON	6	5	83	10,500	46.0J	**26,000**	100	100	2	0	11,000	NA
LEAD	6	1	17	0.33	0.33J	0.33J	0.25	3.0	--	--	NA	15.0
MAGNESIUM	6	6	100	56,300	4,900	94,000	0.0	0.0	--	--	NA	NA
MANGANESE	6	6	100	3,790	2.1J	**11,000J**	0.0	0.0	2	0	880	NA
MERCURY	6	1	17	0.15	0.15J	0.15J	0.20	0.20	0	0	11.0	2.0
MOLYBDENUM	6	5	83	3.5	0.50J	6.7J	20.0	20.0	0	0	180	NA
NICKEL	6	2	33	13.9	6.8J	21.0	20.0	20.0	0	0	730	100
POTASSIUM	6	6	100	12,400	1,200	26,000	0.0	0.0	--	--	NA	NA
SELENIUM	6	3	50	1.1	0.38J	2.2J	5.0	5.0	0	0	180	50.0
SILVER	6	0	0	--	--	--	5.0	5.0	0	0	180	NA
SODIUM	6	6	100	138,000	13,000	240,000	0.0	0.0	--	--	NA	NA
THALLIUM	6	0	0	--	--	--	0.056	**5.0**	0	1	2.4	2.0
VANADIUM	6	4	67	6.7	3.4J	8.6J	10.0	10.0	0	0	260	NA
ZINC	6	4	67	11.8	4.1J	26.0J	20.0	20.0	0	0	11,000	NA

TABLE 8-9: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

Basewide Groundwater Monitoring, 2002 and 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

TABLE 8-10: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES

Basewide Polynuclear Aromatic Hydrocarbon Investigation, 2003

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	88	67	76	630	0.001 J	22,000	0.005	5	--	--	NA
ACENAPHTHENE	74	31	42	6	0.001 J	49	0.02	55	0	0	3,700
ACENAPHTHYLENE	88	38	43	4	0.002 J	30	0.01	55	--	--	NA
ANTHRACENE	74	45	61	7	0.002 J	59	0.005	55	0	0	22,000
BENZ(A)ANTHRACENE	79	68	86	12	0.003 J	160	0.005	55	--	--	NA
BENZO(A)PYRENE	79	72	91	**19**	0.002 J	**510**	0.005	**6**	51	3	0.06
BENZO(B)FLUORANTHENE	82	74	90	**14**	0.002 J	**300**	0.005	**6**	39	4	0.6
BENZO(G,H,I)PERYLENE	81	71	88	17	0.003 J	440 J	0.005	55	--	--	NA
BENZO(K)FLUORANTHENE	78	67	86	**12**	0.003 J	**240**	0.005	**6**	38	5	0.4 (CAL-modified)
CHRYSENE	81	74	91	**14**	0.002 J	**220**	0.005	**6**	28	3	4 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	88	47	53	4	0.002 J	51	0.005	55	--	--	NA
FLUORANTHENE	82	74	90	28	0.002 J	460	0.005	55	0	0	2,300
FLUORENE	74	33	45	9	0.002 J	81	0.01	55	0	0	2,700
INDENO(1,2,3-CD)PYRENE	76	63	83	**16**	0.003 J	**330**	0.005	**55**	35	11	0.6
NAPHTHALENE	88	69	78	**620**	0.001 J	**25,000**	0.01	5	7	0	56
PHENANTHRENE	78	66	85	27	0.002 J	540 J	0.005	55	--	--	NA
PYRENE	83	71	86	41	0.002 J	820	0.005	6	0	0	2,300

NOTES:

Bold denotes values elevated above the PRG

J Estimated value

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/kg Micrograms per kilogram

TABLE 8-11: SITE 22 STATISTICAL SUMMARY OF SOIL

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Residential PRG
Volatile Organic Compounds (mg/kg)											
BENZENE	17	7	41	**1**	0.009	**4**	0.005	**5**	3	2	0.6
ETHYLBENZENE	17	10	59	7	0.02	**35**	0.005	0.005	2	0	9
TOLUENE	17	8	47	15	0.02	52	0.005	0.005	0	0	520
XYLENE (TOTAL)	17	12	71	44	0.005	260	0.005	0.005	0	0	270

NOTES:

Bold denotes values elevated above the PRG

mg/kg Milligram per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

TABLE 8-12: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/l)												
1,1,1-TRICHLOROETHANE	4	0	0	--	--	--	1	1	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.06	1
1,1,2-TRICHLOROETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	5
1,1-DICHLOROETHANE	4	0	0	--	--	--	1	1	0	0	2 (CAL-modified)	5
1,1-DICHLOROETHENE	4	0	0	--	--	--	1	1	0	0	340	6
1,2,4-TRIMETHYLBENZENE	4	0	0	--	--	--	1	1	0	0	12	NA
1,2-DICHLOROETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.1	0.5
1,2-DICHLOROPROPANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	5
1,3,5-TRIMETHYLBENZENE	4	0	0	--	--	--	1	1	0	0	12	NA
BENZENE	6	1	17	**2,200**	**2,200**	**2,200**	**0.5**	**20**	1	5	0.3	1
BROMODICHLOROMETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	80
BROMOFORM	4	0	0	--	--	--	1	1	0	0	9	80
BROMOMETHANE	4	0	0	--	--	--	5	5	0	0	9	NA
CARBON TETRACHLORIDE	4	0	0	--	--	--	**1**	**1**	0	4	0.2	0.5
CHLOROBENZENE	4	0	0	--	--	--	1	1	0	0	110	70
CHLOROETHANE	4	0	0	--	--	--	**5**	**5**	0	4	5	NA
CHLOROFORM	4	0	0	--	--	--	**1**	**1**	0	4	0.5 (CAL-modified)	80
CHLOROMETHANE	4	0	0	--	--	--	**5**	**5**	0	4	2	NA
CIS-1,2-DICHLOROETHENE	4	0	0	--	--	--	1	1	0	0	61	6
CIS-1,3-DICHLOROPROPENE	4	0	0	--	--	--	**1**	**1**	0	4	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	4	0	0	--	--	--	**1**	**1**	0	4	0.1	80
ETHYLBENZENE	6	1	17	**70**	**70**	**70**	1	**20**	1	1	3	300
M,P-XYLENE	1	0	0	--	--	--	1	1	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	4	0	0	--	--	--	2	2	0	0	6 (CAL-modified)	13
METHYLENE CHLORIDE	4	0	0	--	--	--	2	**5**	0	3	4	NA
O-XYLENE	1	0	0	--	--	--	1	1	0	0	210 (xylenes)	NA
STYRENE	4	0	0	--	--	--	1	1	0	0	1,600	100
TETRACHLOROETHENE	4	0	0	--	--	--	**1**	**1**	0	4	0.7	5
TOLUENE	6	1	17	310	310	310	1	20	0	0	720	150
TRANS-1,2-DICHLOROETHENE	4	0	0	--	--	--	1	1	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	4	0	0	--	--	--	**1**	**1**	0	4	0.4 (not trans)	0.5
TRICHLOROETHENE	4	0	0	--	--	--	**1**	**1**	0	4	0.03	5
VINYL CHLORIDE	4	0	0	--	--	--	**0.5**	**0.5**	0	4	0.02 (child or adult)	0.5

TABLE 8-12: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER (Continued)

TPH Investigations

Remedial Investigation Report for CERCLA Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Detection Limit	Maximum Detection Limit	Number of Detection Over PRG	Number of Detection Limits Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (µg/l)												
XYLENE (TOTAL)	5	1	20	**640**	**640**	**640**	1	20	1	0	210	1,800

NOTES:

Bold denotes values elevated above the PRG

-- Not detected

MCL Maximum Contaminant Level

NA No criteria available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

µg/L Microgram per liter

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	55	0	0	--	--	--	5	140,000	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	55	0	0	--	--	--	5	**140,000**	0	5	410
1,1,2-TRICHLOROETHANE	55	0	0	--	--	--	5	**140,000**	0	4	730
1,1-DICHLOROETHANE	61	0	0	--	--	--	5	**140,000**	0	3	2,800 (CAL-modified)
1,1-DICHLOROETHENE	55	0	0	--	--	--	5	**140,000**	0	1	120,000
1,2-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	370,000
1,2-DICHLOROETHANE	60	2	3	11	7	14	5	**140,000**	0	6	280
1,2-DICHLOROETHENE (TOTAL)	55	0	0	--	--	--	5	**140,000**	0	1	43,000 (cis)
1,2-DICHLOROPROPANE	55	0	0	--	--	--	5	**140,000**	0	5	340
1,3-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	16,000
1,4-DICHLOROBENZENE	19	0	0	--	--	--	5	7	0	0	3,400
2-BUTANONE	55	0	0	--	--	--	10	140,000	--	--	NA
2-CHLOROETHYLVINYLETHER	18	0	0	--	--	--	10	13	--	--	NA
2-HEXANONE	55	0	0	--	--	--	10	140,000	--	--	NA
4-METHYL-2-PENTANONE	53	1	2	72,000	72,000	72,000	6	140,000	--	--	NA
ACETONE	55	1	2	690	690	690	10	170,000	0	0	1,600,000
BENZENE	55	7	13	570	6 J	**3,300**	5	**140,000**	1	4	600
BROMODICHLOROMETHANE	55	0	0	--	--	--	5	**140,000**	0	4	820
BROMOFORM	55	0	0	--	--	--	5	**140,000**	0	1	62,000
BROMOMETHANE	55	0	0	--	--	--	10	**140,000**	0	3	3,900
CARBON DISULFIDE	55	0	0	--	--	--	5	140,000	0	0	360,000
CARBON TETRACHLORIDE	55	0	0	--	--	--	5	**140,000**	0	5	250
CHLOROBENZENE	55	0	0	--	--	--	5	140,000	0	0	150,000
CHLOROETHANE	55	0	0	--	--	--	10	**140,000**	0	3	3,000
CHLOROFORM	55	0	0	--	--	--	5	**140,000**	0	4	940 (CAL-modified)
CHLOROMETHANE	55	0	0	--	--	--	10	**140,000**	0	5	1,200
CIS-1,3-DICHLOROPROPENE	55	0	0	--	--	--	5	**140,000**	0	4	780 (not cis)
DIBROMOCHLOROMETHANE	55	0	0	--	--	--	5	**140,000**	0	4	1,100
ETHYLBENZENE	55	14	25	47,000	3 J	**570,000**	5	6,600	3	0	8,900
ETHYLENE DIBROMIDE	15	0	0	--	--	--	5	72,000	--	--	NA
METHYLENE CHLORIDE	55	0	0	--	--	--	5	**140,000**	0	2	9,100

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
STYRENE	55	0	0	--	--	--	5	140,000	0	0	1,700,000
TETRACHLOROETHENE	55	0	0	--	--	--	5	**140,000**	0	4	1,500
TOLUENE	60	47	78	20,000	2 J	**840,000**	6	160	1	0	520,000
TRANS-1,3-DICHLOROPROPENE	55	0	0	--	--	--	5	**140,000**	0	4	780 (not trans)
TRICHLOROETHENE	55	3	5	5	2 J	11	5	**140,000**	0	6	53
TRICHLOROFLUOROMETHANE	18	0	0	--	--	--	5	7	0	0	390,000
VINYL ACETATE	42	0	0	--	--	--	10	14,000	0	0	430,000
VINYL CHLORIDE	55	0	0	--	--	--	10	**140,000**	0	5	79 (child or adult)
XYLENE (TOTAL)	55	17	31	170,000	2 J	**2,600,000**	5	27	1	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	79	1	1	2,000	2,000 J	2,000 J	330	14,000	0	0	650,000
1,2-DICHLOROBENZENE	79	0	0	--	--	--	330	24,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	32	0	0	--	--	--	330	**720**	0	1	610
1,3-DICHLOROBENZENE	79	0	0	--	--	--	330	**24,000**	0	1	16,000
1,4-DICHLOROBENZENE	79	0	0	--	--	--	330	**24,000**	0	2	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	16	0	0	--	--	--	340	24,000	--	--	NA
2,4,5-TRICHLOROPHENOL	79	0	0	--	--	--	820	67,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	79	0	0	--	--	--	330	**24,000**	0	2	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	79	0	0	--	--	--	330	24,000	0	0	180,000
2,4-DIMETHYLPHENOL	79	0	0	--	--	--	330	24,000	0	0	1,200,000
2,4-DINITROPHENOL	79	0	0	--	--	--	820	67,000	0	0	120,000
2,4-DINITROTOLUENE	78	0	0	--	--	--	330	24,000	0	0	120,000
2,6-DINITROTOLUENE	79	0	0	--	--	--	330	24,000	0	0	61,000
2-CHLORONAPHTHALENE	79	0	0	--	--	--	330	24,000	--	--	NA
2-CHLOROPHENOL	79	1	1	3,100	3,100 J	3,100 J	330	14,000	0	0	63,000
2-METHYLPHENOL	79	0	0	--	--	--	330	24,000	--	--	NA
2-NITROANILINE	79	0	0	--	--	--	820	**67,000**	0	53	1,700
2-NITROPHENOL	79	0	0	--	--	--	330	24,000	--	--	NA
3,3'-DICHLOROBENZIDINE	79	0	0	--	--	--	340	**28,000**	0	9	1,100
3-NITROANILINE	79	0	0	--	--	--	820	67,000	--	--	NA

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
4,6-DINITRO-2-METHYLPHENOL	79	0	0	--	--	--	820	67,000	--	--	NA
4-BROMOPHENYL-PHENYLETHER	79	0	0	--	--	--	330	24,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	79	1	1	5,700	5,700 J	5,700 J	330	14,000	--	--	NA
4-CHLOROANILINE	79	0	0	--	--	--	330	24,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	79	0	0	--	--	--	330	24,000	--	--	NA
4-METHYLPHENOL	79	0	0	--	--	--	330	24,000	0	0	310,000
4-NITROANILINE	79	0	0	--	--	--	820	67,000	--	--	NA
4-NITROPHENOL	79	0	0	--	--	--	820	67,000	--	--	NA
BENZOIC ACID	63	0	0	--	--	--	1,600	67,000	0	0	100,000,000
BENZYL ALCOHOL	63	0	0	--	--	--	330	14,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	79	0	0	--	--	--	330	24,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	79	0	0	--	--	--	**330**	**24,000**	0	79	210
BIS(2-ETHYLHEXYL)PHTHALATE	79	0	0	--	--	--	330	24,000	0	0	35,000
BUTYLBENZYLPHTHALATE	79	0	0	--	--	--	330	24,000	0	0	12,000,000
CARBAZOLE	16	2	13	21	18 J	24 J	340	24,000	0	0	24,000
DI-N-BUTYLPHTHALATE	79	1	1	6,300	6,300	6,300	330	24,000	--	--	NA
DI-N-OCTYLPHTHALATE	79	0	0	--	--	--	330	24,000	--	--	NA
DIBENZOFURAN	79	0	0	--	--	--	330	24,000	0	0	290,000
DIETHYLPHTHALATE	79	0	0	--	--	--	330	24,000	0	0	49,000,000
DIMETHYLPHTHALATE	79	0	0	--	--	--	330	24,000	0	0	100,000,000
HEXACHLOROBENZENE	79	0	0	--	--	--	**330**	**24,000**	0	79	300
HEXACHLOROBUTADIENE	79	0	0	--	--	--	330	**24,000**	0	2	6,200
HEXACHLOROCYCLOPENTADIENE	79	0	0	--	--	--	330	24,000	0	0	370,000
HEXACHLOROETHANE	79	0	0	--	--	--	330	24,000	0	0	35,000
ISOPHORONE	79	0	0	--	--	--	330	24,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	79	0	0	--	--	--	**330**	**24,000**	0	79	69
N-NITROSODIPHENYLAMINE	79	0	0	--	--	--	330	24,000	0	0	99,000
NITROBENZENE	79	0	0	--	--	--	330	**24,000**	0	1	20,000
PENTACHLOROPHENOL	79	0	0	--	--	--	820	**67,000**	0	9	3,000
PHENOL	79	2	3	200	100 J	300 J	330	24,000	0	0	37,000,000

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	88	67	76	630	0.001 J	22,000	0.005	5	--	--	NA
ACENAPHTHENE	74	31	42	6	0.001 J	49	0.02	55	0	0	3,700
ACENAPHTHYLENE	88	38	43	4	0.002 J	30	0.01	55	--	--	NA
ANTHRACENE	74	45	61	7	0.002 J	59	0.005	55	0	0	22,000
BENZ(A)ANTHRACENE	79	68	86	12	0.003 J	160	0.005	55	--	--	NA
BENZO(A)PYRENE	79	72	91	**19**	0.002 J	**510**	0.005	**6**	51	3	0.06
BENZO(B)FLUORANTHENE	82	74	90	**14**	0.002 J	**300**	0.005	**6**	39	4	0.6
BENZO(G,H,I)PERYLENE	81	71	88	17	0.003 J	440 J	0.005	55	--	--	NA
BENZO(K)FLUORANTHENE	78	67	86	**12**	0.003 J	**240**	0.005	**6**	38	5	0.4 (CAL-modified)
CHRYSENE	81	74	91	**14**	0.002 J	**220**	0.005	**6**	28	3	4 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	88	47	53	4	0.002 J	51	0.005	55	--	--	NA
FLUORANTHENE	82	74	90	28	0.002 J	460	0.005	55	0	0	2,300
FLUORENE	74	33	45	9	0.002 J	81	0.01	55	0	0	2,700
INDENO(1,2,3-CD)PYRENE	76	63	83	**16**	0.003 J	**330**	0.005	**55**	35	11	0.6
NAPHTHALENE	88	69	78	**620**	0.001 J	**25,000**	0.01	5	7	0	56
PHENANTHRENE	78	66	85	27	0.002 J	540 J	0.005	55	--	--	NA
PYRENE	83	71	86	41	0.002 J	820	0.005	6	0	0	2,300
PCBs/Pesticides (µg/kg)											
4,4'-DDD	61	2	3	6	2	9 J	2	200	0	0	2,400
4,4'-DDE	61	4	7	14	6	23 J	2	200	0	0	1,700
4,4'-DDT	61	3	5	22	3 J	53 J	2	200	0	0	1,700
ALDRIN	61	0	0	--	--	--	1	**99**	0	6	29
ALPHA-BHC	61	0	0	--	--	--	1	99	--	--	NA
ALPHA-CHLORDANE	31	2	6	14	0.9 J	27 J	82	990	0	0	1,600 (chlordane)
AROCLOR-1016	61	0	0	--	--	--	26	990	0	0	3,900
AROCLOR-1221	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1232	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1242	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1248	61	0	0	--	--	--	26	**990**	0	6	220
AROCLOR-1254	61	0	0	--	--	--	53	**2,000**	0	8	220

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
PCBs/Pesticides (ug/kg)											
AROCLOR-1260	61	0	0	--	--	--	53	**2,000**	0	8	220
BETA-BHC	61	0	0	--	--	--	1	99	--	--	NA
CHLORDANE	30	0	0	--	--	--	11	52	0	0	1,600
DELTA-BHC	61	0	0	--	--	--	1	99	--	--	NA
DIELDRIN	61	0	0	--	--	--	2	**200**	0	7	30
ENDOSULFAN I	60	0	0	--	--	--	2	99	0	0	370,000
ENDOSULFAN II	62	0	0	--	--	--	2	200	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	61	0	0	--	--	--	2	200	--	--	NA
ENDRIN	61	0	0	--	--	--	2	200	0	0	18,000
ENDRIN ALDEHYDE	30	0	0	--	--	--	2	10	--	--	NA
ENDRIN KETONE	32	0	0	--	--	--	17	200	--	--	NA
GAMMA-BHC (LINDANE)	61	0	0	--	--	--	1	99	--	--	NA
GAMMA-CHLORDANE	31	2	6	12	1 J	22 J	82	990	0	0	1,600 (chlordane)
HEPTACHLOR	61	0	0	--	--	--	1	99	0	0	110
HEPTACHLOR EPOXIDE	63	0	0	--	--	--	1	**99**	0	4	53
METHOXYCHLOR	61	2	3	16	11	20	5	990	0	0	310,000
TOXAPHENE	61	0	0	--	--	--	53	**2,000**	0	6	440
Metals (mg/kg)											
ALUMINUM	78	78	100	8,190	3,120	26,800	0.0	0.0	0	0	76,000
ANTIMONY	78	0	0	--	--	--	0.48	10.0	0	0	31.0
ARSENIC	78	40	51	**7.6**	**1.4 J**	**24.0**	**0.59**	**13.0**	40	38	0.39
BARIUM	78	78	100	66.5	0.30	200	0.0	0.0	0	0	5,400
BERYLLIUM	78	37	47	0.57	0.20	1.8	0.20	1.7	0	0	150
CADMIUM	78	35	45	0.49	0.10 J	4.3	0.080	1.7	0	0	37.0
CALCIUM	78	78	100	2,760	15.3	15,500	0.0	0.0	--	--	NA
CHROMIUM	78	78	100	37.5	11.4	71.8	0.0	0.0	0	0	210
COBALT	78	56	72	6.7	3.6	17.0	5.1	7.9	0	0	900
COPPER	78	78	100	15.2	5.6	86.2	0.0	0.0	0	0	3,100
IRON	78	78	100	12,100	760	**29,600**	0.0	0.0	1	0	23,000
LEAD	78	40	51	**264**	2.1 J	**9,890**	2.5	60.0	1	0	150 (CAL-modified)

TABLE 8-13: SITE 22 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
MAGNESIUM	78	78	100	3,310	1,510	42,400	0.0	0.0	--	--	NA
MANGANESE	78	78	100	172	72.4	734	0.0	0.0	0	0	1,800
MERCURY	16	1	6	0.46	0.46	0.46	0.15	0.19	0	0	23.0
MOLYBDENUM	78	0	0	--	--	--	1.0	8.4	0	0	390
NICKEL	78	76	97	36.1	11.6	89.0	17.1	18.7	0	0	1,600
POTASSIUM	78	75	96	929	497	2,300	530	610	--	--	NA
SELENIUM	78	6	8	1.6	0.66 J	5.7	0.54	17.0	0	0	390
SILVER	78	2	3	0.95	0.70	1.2	0.18	8.4	0	0	390
SODIUM	78	56	72	455	74.6 J	1,810	520	630	--	--	NA
THALLIUM	78	0	0	--	--	--	0.40	**17.0**	0	29	5.2
TITANIUM	62	62	100	439	183	704	0.0	0.0	--	--	NA
VANADIUM	78	78	100	25.7	13.9	62.3	0.0	0.0	0	0	550
ZINC	78	78	100	85.3	14.0	3,880	0.0	0.0	0	0	23,000

NOTES:

Bold denotes values elevated above the PRG

-- Not detected
BHC Benzene Hexachloride
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethene
DDT Dichlorodiphenyltrichloroethane
J Estimated value
mg/kg Milligrams per kilogram
NA No PRG available
PCB Polychlorinated biphenyl
PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg Micrograms per kilogram

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.4	NA
1,1,1-TRICHLOROETHANE	73	2	3	2	0.7J	3	0.5	500	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	73	0	0	--	--	--	**0.5**	**250**	0	73	0.06	1
1,1,2-TRICHLOROETHANE	73	0	0	--	--	--	**0.5**	**500**	0	73	0.2	5
1,1-DICHLOROETHANE	73	0	0	--	--	--	0.5	**130**	0	17	2 (CAL-modified)	5
1,1-DICHLOROETHENE	73	0	0	--	--	--	0.5	**500**	0	4	340	6
1,1-DICHLOROPROPENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	8	0	0	--	--	--	**0.5**	**8**	0	8	0.006	NA
1,2,4-TRICHLOROBENZENE	20	0	0	--	--	--	0.5	8	0	0	190	5
1,2,4-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	20	0	0	--	--	--	**0.5**	**8**	0	20	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	36	3	8	2	0.8J	3J	0.5	**500**	0	4	370	600
1,2-DICHLOROETHANE	73	6	8	**17**	**0.8**	**38**	**0.5**	**130**	6	67	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	53	0	0	--	--	--	1	**500**	0	6	61 (cis)	NA
1,2-DICHLOROPROPANE	73	0	0	--	--	--	**0.5**	**500**	0	73	0.2	5
1,3,5-TRIMETHYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	12	NA
1,3-DICHLOROBENZENE	36	0	0	--	--	--	0.5	**500**	0	9	6	NA
1,3-DICHLOROPROPANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
1,4-DICHLOROBENZENE	36	0	0	--	--	--	0.5	**500**	0	31	0.5	5
2,2-DICHLOROPROPANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
2-BUTANONE	32	0	0	--	--	--	2	500	--	--	NA	NA
2-CHLOROTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
2-HEXANONE	69	0	0	--	--	--	2	500	--	--	NA	NA
4-CHLOROTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
4-METHYL-2-PENTANONE	73	0	0	--	--	--	2	500	--	--	NA	NA
ACETONE	31	4	13	2,300	1J	**9,100J**	0.9	500	1	0	610	NA
BENZENE	80	35	44	**4,700**	0.3J	**34,000**	**0.5**	**5**	34	45	0.3	1
BROMOBENZENE	8	0	0	--	--	--	0.5	8	0	0	20	NA
BROMOCHLOROMETHANE	20	0	0	--	--	--	0.5	8	--	--	NA	NA
BROMODICHLOROMETHANE	73	0	0	--	--	--	**0.5**	**500**	0	73	0.2	80

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
BROMOFORM	73	0	0	--	--	--	1	**500**	0	13	9	80
BROMOMETHANE	73	1	1	0.6	0.6J	0.6J	1	**500**	0	15	9	NA
CARBON DISULFIDE	73	2	3	2,900	**1,200**	**4,600**	0.5	500	2	0	1,000	NA
CARBON TETRACHLORIDE	73	0	0	--	--	--	**0.5**	**130**	0	73	0.2	0.5
CHLOROBENZENE	73	0	0	--	--	--	0.5	**500**	0	4	110	70
CHLOROETHANE	73	0	0	--	--	--	1	**500**	0	17	5	NA
CHLOROFORM	73	1	1	**19**	**19**	**19**	0.5	**500**	1	67	0.5 (CAL-modified)	80
CHLOROMETHANE	73	1	1	0.2	0.2J	0.2J	1	**500**	0	56	2	NA
CIS-1,2-DICHLOROETHENE	20	0	0	--	--	--	0.5	8	0	0	61	6
CIS-1,3-DICHLOROPROPENE	65	0	0	--	--	--	**0.5**	**130**	0	65	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	73	0	0	--	--	--	**0.5**	**500**	0	73	0.1	80
DIBROMOMETHANE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
DICHLORODIFLUOROMETHANE	8	0	0	--	--	--	1	17	0	0	390	NA
DIISOPROPYL ETHER	8	1	13	0.3	0.3J	0.3J	0.5	8	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	8	0	0	--	--	--	0.5	8	--	--	NA	NA
ETHYLBENZENE	80	34	43	**870**	0.7J	**7,100**	0.5	**400**	31	3	3	300
ETHYLENE DIBROMIDE	30	0	0	--	--	--	0.5	17	--	--	NA	0.05
HEXACHLOROBUTADIENE	8	0	0	--	--	--	0.5	**8**	0	3	0.9	NA
ISOPROPYLBENZENE	8	4	50	110	100	120	0.5	0.5	--	--	NA	NA
M,P-XYLENE	8	3	38	4	2	8J	0.5	4	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	26	5	19	2	0.7J	5J	0.5	**1,300**	0	7	6 (CAL-modified)	13
METHYLENE CHLORIDE	73	0	0	--	--	--	0.2	**500**	0	21	4	NA
N-BUTYLBENZENE	8	4	50	20	18	21	0.5	0.5	--	--	NA	NA
N-PROPYLBENZENE	8	4	50	**270**	**260**	**280**	0.5	0.5	4	0	240	NA
NAPHTHALENE	8	4	50	**330**	**280**	**380**	2	2	4	0	6	NA
O-XYLENE	8	1	13	0.7	0.7	0.7	0.5	8	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	8	0	0	--	--	--	0.5	8	--	--	NA	NA
SEC-BUTYLBENZENE	8	4	50	14	3J	18	0.5	0.5	0	0	240	NA
STYRENE	73	0	0	--	--	--	0.5	500	0	0	1,600	100
TERT-AMYL METHYL ETHER	8	0	0	--	--	--	0.5	8	--	--	NA	NA
TERT-BUTANOL	8	3	38	150	110J	210	10	330	--	--	NA	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

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Volatile Organic Compounds (µg/L)												
TERT-BUTYLBENZENE	8	0	0	--	--	--	0.5	8	0	0	240	NA
TETRACHLOROETHENE	73	1	1	**3**	**3J**	**3J**	0.5	**500**	1	67	0.7	5
TOLUENE	80	20	25	5,200	0.3J	**34,000**	0.5	400	6	0	720	150
TRANS-1,2-DICHLOROETHENE	20	0	0	--	--	--	0.5	8	0	0	120	10
TRANS-1,3-DICHLOROPROPENE	65	0	0	--	--	--	**0.5**	**130**	0	65	0.4 (not trans)	0.5
TRICHLOROETHENE	73	2	3	**11**	**2J**	**20J**	**0.5**	**500**	2	71	0.03	5
TRICHLOROFLUOROMETHANE	8	0	0	--	--	--	1	17	--	--	NA	NA
VINYL ACETATE	5	0	0	--	--	--	5	50	0	0	410	NA
VINYL CHLORIDE	73	0	0	--	--	--	**0.5**	**130**	0	73	0.02 (child or adult)	0.5
XYLENE (TOTAL)	72	19	26	5,100	1	**36,000**	1	100	8	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	29	0	0	--	--	--	10	30	0	0	190	5
1,2-DICHLOROBENZENE	29	0	0	--	--	--	5	15	0	0	370	600
1,2-DIPHENYLHYDRAZINE	3	0	0	--	--	--	10	10	--	--	NA	NA
1,3-DICHLOROBENZENE	29	0	0	--	--	--	5	**15**	0	6	6	NA
1,4-DICHLOROBENZENE	29	0	0	--	--	--	**5**	**15**	0	29	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	24	0	0	--	--	--	10	30	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	29	0	0	--	--	--	10	75	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	29	0	0	--	--	--	**10**	**30**	0	29	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	29	0	0	--	--	--	10	30	0	0	110	NA
2,4-DIMETHYLPHENOL	29	1	3	39	39	39	10	30	0	0	730	NA
2,4-DINITROPHENOL	23	0	0	--	--	--	10	**75**	0	1	73	NA
2,4-DINITROTOLUENE	29	0	0	--	--	--	10	30	0	0	73	NA
2,6-DINITROTOLUENE	29	0	0	--	--	--	10	30	0	0	36	NA
2-CHLORONAPHTHALENE	29	0	0	--	--	--	10	30	--	--	NA	NA
2-CHLOROPHENOL	29	0	0	--	--	--	10	30	0	0	30	NA
2-METHYLNAPHTHALENE	29	7	24	17	1J	60	10	30	--	--	NA	NA
2-METHYLPHENOL	29	0	0	--	--	--	10	30	0	0	1,800	NA
2-NITROANILINE	29	0	0	--	--	--	**25**	**75**	0	29	1	NA
2-NITROPHENOL	29	0	0	--	--	--	10	30	--	--	NA	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Semivolatile Organic Compounds (ug/L)												
3,3'-DICHLOROBENZIDINE	29	0	0	--	--	--	**10**	**30**	0	29	0.2	NA
3-NITROANILINE	29	0	0	--	--	--	25	75	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	29	0	0	--	--	--	10	75	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	29	0	0	--	--	--	10	30	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	29	0	0	--	--	--	10	30	--	--	NA	NA
4-CHLOROANILINE	29	0	0	--	--	--	10	30	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	29	0	0	--	--	--	10	30	--	--	NA	NA
4-METHYLPHENOL	29	0	0	--	--	--	10	30	0	0	180	NA
4-NITROANILINE	29	0	0	--	--	--	25	75	--	--	NA	NA
4-NITROPHENOL	29	0	0	--	--	--	10	75	--	--	NA	NA
ACENAPHTHENE	29	0	0	--	--	--	10	30	0	0	370	NA
ACENAPHTHYLENE	29	0	0	--	--	--	10	30	--	--	NA	NA
ANILINE	5	0	0	--	--	--	10	10	--	--	NA	NA
ANTHRACENE	29	0	0	--	--	--	10	30	0	0	1,800	NA
BENZO(A)ANTHRACENE	29	0	0	--	--	--	**10**	**30**	0	29	0.09	0.1
BENZO(A)PYRENE	29	0	0	--	--	--	**1**	**30**	0	29	0.009	0.2
BENZO(B)FLUORANTHENE	29	0	0	--	--	--	**10**	**30**	0	29	0.09	NA
BENZO(G,H,I)PERYLENE	29	0	0	--	--	--	10	30	--	--	NA	NA
BENZO(K)FLUORANTHENE	29	0	0	--	--	--	**10**	**30**	0	29	0.06 (CAL-modified)	NA
BENZOIC ACID	5	0	0	--	--	--	50	50	0	0	150,000	NA
BENZYL ALCOHOL	5	0	0	--	--	--	10	10	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	29	0	0	--	--	--	10	30	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	29	0	0	--	--	--	**10**	**30**	0	29	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	29	0	0	--	--	--	4	**32**	0	8	5	NA
BUTYLBENZYLPHTHALATE	29	0	0	--	--	--	10	30	0	0	7,300	NA
CARBAZOLE	24	0	0	--	--	--	**10**	**30**	0	24	3	NA
CHRYSENE	29	0	0	--	--	--	**10**	**30**	0	29	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	29	0	0	--	--	--	10	30	--	--	NA	NA
DI-N-OCTYLPHTHALATE	29	0	0	--	--	--	10	30	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	29	0	0	--	--	--	**10**	**30**	0	29	0.009	NA
DIBENZOFURAN	29	0	0	--	--	--	10	**30**	0	1	24	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

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Semivolatile Organic Compounds (µg/L)												
DIETHYLPHTHALATE	29	0	0	--	--	--	10	30	0	0	29,000	NA
DIMETHYLPHTHALATE	29	0	0	--	--	--	10	30	0	0	360,000	NA
FLUORANTHENE	29	0	0	--	--	--	10	30	0	0	1,500	NA
FLUORENE	29	0	0	--	--	--	10	30	0	0	240	NA
HEXACHLOROBENZENE	29	0	0	--	--	--	**10**	**30**	0	29	0.04	1
HEXACHLOROBUTADIENE	29	0	0	--	--	--	**10**	**30**	0	29	0.9	NA
HEXACHLOROCYCLOPENTADIENE	29	0	0	--	--	--	10	30	0	0	220	NA
HEXACHLOROETHANE	29	0	0	--	--	--	**10**	**30**	0	29	5	NA
INDENO(1,2,3-CD)PYRENE	29	0	0	--	--	--	**10**	**30**	0	29	0.09	NA
ISOPHORONE	29	0	0	--	--	--	10	30	0	0	71	NA
N-NITROSO-DI-N-PROPYLAMINE	26	0	0	--	--	--	**10**	**30**	0	26	0.01	NA
N-NITROSODIMETHYLAMINE	5	0	0	--	--	--	10	10	--	--	NA	NA
N-NITROSODIPHENYLAMINE	29	0	0	--	--	--	10	**30**	0	7	14	NA
NAPHTHALENE	29	8	28	**94**	**15**	**380**	**10**	**30**	8	21	6	NA
NITROBENZENE	29	0	0	--	--	--	**10**	**30**	0	29	3	NA
PENTACHLOROPHENOL	29	1	3	**100**	**100**	**100**	**25**	**75**	1	28	0.6	1
PHENANTHRENE	29	0	0	--	--	--	10	30	--	--	NA	NA
PHENOL	29	5	17	30	4 J	54	10	30	0	0	22,000	NA
PYRENE	29	0	0	--	--	--	10	30	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	7	0	0	--	--	--	5	25	0	0	370	NA
ACENAPHTHYLENE	7	0	0	--	--	--	2	10	--	--	NA	NA
ANTHRACENE	7	0	0	--	--	--	0.2	1	0	0	1,800	NA
BENZO(A)ANTHRACENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	0.1
BENZO(A)PYRENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.009	0.2
BENZO(B)FLUORANTHENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	NA
BENZO(G,H,I)PERYLENE	7	0	0	--	--	--	0.2	1	--	--	NA	NA
BENZO(K)FLUORANTHENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.06 (CAL-modified)	NA
CHRYSENE	7	0	0	--	--	--	0.2	**1**	0	1	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	7	0	0	--	--	--	**0.5**	**3**	0	7	0.009	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Polynuclear Aromatic Hydrocarbons (µg/L)												
FLUORANTHENE	7	0	0	--	--	--	0.2	1	0	0	1,500	NA
FLUORENE	7	0	0	--	--	--	1	5	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	7	0	0	--	--	--	**0.2**	**1**	0	7	0.09	NA
NAPHTHALENE	7	1	14	**140**	**140**	**140**	5	5	1	0	6	NA
PHENANTHRENE	7	0	0	--	--	--	1	5	--	--	NA	NA
PYRENE	7	0	0	--	--	--	0.2	1	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	3	0	0	--	--	--	0.1	**1**	0	1	0.3	NA
4,4'-DDE	3	0	0	--	--	--	0.1	**1**	0	1	0.2	NA
4,4'-DDT	3	0	0	--	--	--	0.1	**1**	0	1	0.2	NA
ALDRIN	3	0	0	--	--	--	**0.05**	**0.5**	0	3	0.004	NA
ALPHA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
AROCLOR-1016	3	0	0	--	--	--	0.8	**8**	0	1	1	NA
AROCLOR-1221	3	0	0	--	--	--	**2**	**20**	0	3	0.03	NA
AROCLOR-1232	3	0	0	--	--	--	**2**	**20**	0	3	0.03	NA
AROCLOR-1242	3	0	0	--	--	--	**0.8**	**8**	0	3	0.03	NA
AROCLOR-1248	3	0	0	--	--	--	**0.5**	**5**	0	3	0.03	NA
AROCLOR-1254	3	0	0	--	--	--	**1**	**10**	0	3	0.03	NA
AROCLOR-1260	3	0	0	--	--	--	**1**	**10**	0	3	0.03	NA
BETA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
CHLORDANE	3	0	0	--	--	--	**0.2**	**2**	0	3	0.2	NA
DELTA-BHC	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA
DIELDRIN	3	0	0	--	--	--	**0.02**	**0.2**	0	3	0.004	NA
ENDOSULFAN I	3	0	0	--	--	--	0.05	0.5	0	0	220	NA
ENDOSULFAN II	5	0	0	--	--	--	0.1	1	--	--	NA	NA
ENDOSULFAN SULFATE	3	0	0	--	--	--	0.1	1	--	--	NA	NA
ENDRIN	3	0	0	--	--	--	0.06	0.6	0	0	11	2
ENDRIN ALDEHYDE	5	0	0	--	--	--	0.1	1	--	--	NA	NA
ENDRIN KETONE	5	0	0	--	--	--	0.05	0.5	--	--	NA	NA
GAMMA-BHC (LINDANE)	3	0	0	--	--	--	0.05	0.5	--	--	NA	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
PCBs/Pesticides (ug/L)												
HEPTACHLOR	3	0	0	--	--	--	**0.02**	**0.2**	0	3	0.02	0.01
HEPTACHLOR EPOXIDE	5	0	0	--	--	--	**0.05**	**0.5**	0	5	0.007	0.01
METHOXYCHLOR	5	0	0	--	--	--	0.1	1	0	0	180	30
TOXAPHENE	3	0	0	--	--	--	**1**	**10**	0	3	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	52	16	31	58,400	3.5J	**305,000**	8.4	66.6	5	0	36,000	NA
ANTIMONY	52	8	15	2.8	0.079J	7.1J	0.70	**60.0**	0	7	15.0	6.0
ARSENIC	52	37	71	**17.6**	**0.96J**	**86.0**	**0.80**	**100**	37	15	0.045	10.0
BARIUM	52	50	96	254	17.4J	1,900	9.9	14.6	0	0	2,600	1,000
BERYLLIUM	52	9	17	1.9	0.75J	7.0	0.10	5.0	0	0	73.0	4.0
CADMIUM	52	11	21	1.5	0.18J	9.0	0.11	5.0	0	0	18.0	5.0
CALCIUM	52	52	100	69,100	7,170	156,000	0.0	0.0	--	--	NA	NA
CHROMIUM	52	10	19	4,120	0.23J	39,000	0.20	10.0	--	--	NA	50.0
COBALT	52	18	35	27.7	0.34J	160	0.26	20.0	0	0	730	NA
COPPER	52	19	37	51.0	0.62J	260	0.35	21.5	0	0	1,500	1,300
IRON	52	27	52	45,400	46.0J	**376,000**	3.2	211	7	0	11,000	NA
LEAD	52	3	6	46.1	0.33J	82.0	0.25	50.0	--	--	NA	15.0
MAGNESIUM	52	52	100	52,300	4,770	132,000	0.0	0.0	--	--	NA	NA
MANGANESE	52	51	98	2,490	2.1J	**12,100**	3.9	3.9	35	0	880	NA
MERCURY	47	1	2	0.15	0.15J	0.15J	0.10	0.20	0	0	11.0	2.0
MOLYBDENUM	52	11	21	5.7	0.30J	17.4J	0.55	50.0	0	0	180	NA
NICKEL	52	22	42	165	1.3J	**1,100**	7.5	23.0	1	0	730	100
POTASSIUM	52	47	90	12,700	1,200	32,600	1,420	2,840	--	--	NA	NA
SELENIUM	49	6	12	38.3	0.38J	150	1.0	59.0	0	0	180	50.0
SILVER	51	3	6	9.7	0.21J	17.0	0.15	10.0	0	0	180	NA
SODIUM	52	52	100	161,000	8,300J	388,000	0.0	0.0	--	--	NA	NA
THALLIUM	52	5	10	**9.6**	**4.2J**	**20.3**	0.056	**100**	5	27	2.4	2.0
TITANIUM	5	5	100	4,340	2,500	7,700	0.0	0.0	--	--	NA	NA
VANADIUM	52	13	25	158	3.4J	**690**	0.43	11.9	5	0	260	NA
ZINC	52	19	37	141	4.1J	680	1.4	50.7	0	0	11,000	NA

TABLE 8-14: SITE 22 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
37	soil at IR Site 22	Section 2.3.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.4.2, Pages 3-11 through 3-12, Figure 3-7 and Table 3-6. Oneida Total Integrated Enterprises LLC 2011.

Petroleum products associated with the former gasoline station are believed to be the source of COCs in soil and groundwater.

3.2.4.2 NATURE AND EXTENT OF IMPACT

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 22:

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Basewide PAH Investigation (Bechtel 2003)

Data Gap Study in 2007/2008 (Tetra Tech EC 2009)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b) and the Data Gap Study report (Tetra Tech 2009). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels from 0 feet to 8 feet bgs are summarized in Table 3-6.

These results indicated the following:

- PCBs were not reported above their laboratory reporting limits.
- None of the reported pesticides or SVOCs in IR Site 22 soil exceeded screening criteria.
- Benzene, ethylbenzene, and xylenes were reported at maximum concentrations of 3.3 mg/kg, 570 mg/kg, and 2,600 mg/kg at a depth of 5 feet to 6 feet bgs. These locations are related to the fuel and sanitary sewer lines and are being addressed under the Petroleum Program.
- Concentrations of arsenic and lead in IR Site 22 soil were reported above screening levels.

  Two out of 64 soil samples reported arsenic at concentrations exceeding the statistically derived background value of 16.55 mg/kg (which is based on the 95th quantile of the blue background dataset documented in Appendix A of the OU-2A RI – Sul Tech 2005[b]). These reported concentrations were within the concentration ranges reported in the background dataset. The reasonable maximum EPC of the 64 soil samples analyzed for arsenic was estimated to be 3.4 mg/kg, which is less than the background value of 16.55 mg/kg. Elevated concentrations of arsenic in soil are unrelated to buildings or other site features, which suggests that these elevated concentrations of arsenic occur randomly across the site with no apparent site-related source and may be naturally occurring.

  Lead was reported at a maximum concentration of 9,890 mg/kg at one location (MW547-5) in a shallow soil sample (0.5 feet to 1-foot bgs) collected from an open area southeast of the site with clean deeper samples. However, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg (see Appendix G).

Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. .

- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a maximum reported value of 0.76 mg/kg in IR Site 22 soil. The reasonable maximum EPC of the 90 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.14 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The three exceedances of PAHs, expressed as B(a)P equivalent concentrations, are located at a depth of 4 feet to 8 feet bgs in the eastern portion of IR Site 22, which may be associated with the use of artificial fill material to construct the island. These three exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg (see Figure 3-7).

3.2.5 IR Site 23

3.2.5.1 Sources and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 23 are consistent with historical activities known to occur at the site, which included plane defueling and the former oil refinery. In addition, the petroleum plume at IR Site 13 is another likely source of impacted soil at IR Site 23. Physical features of IR Site 23, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results were evaluated. Based on the RI (Sul Tech 2005b), the likely sources of impacted soil at IR Site 23 include:

Defueling area and associated OWSs 529 and 530 and ASTs 530A, 530B, and 530C

Former oil refinery activities

Previous site activities associated with plane defueling and the operation of the former refinery were identified as a source of TPH in soil. Elevated concentrations of CERCLA chemicals were not identified in soil at IR Site 23. Currently IR Site 23 is being addressed under the Petroleum Program (Tetra Tech 2009).

3.2.5.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 23 (SulTech 2005b):

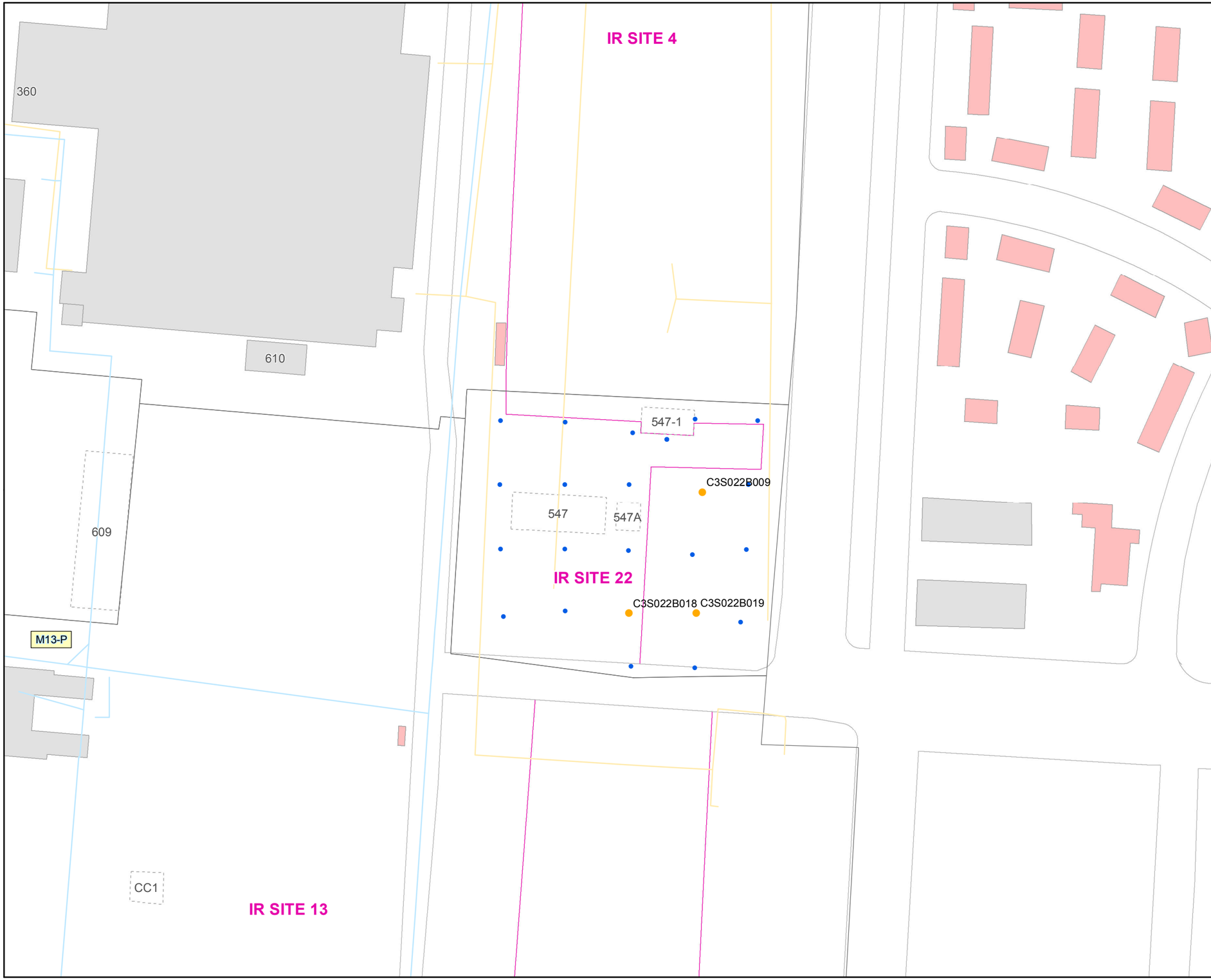
Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech EC 2002)

Basewide PAH Investigation (Bechtel 2003)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for



Legend

- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Runway
- Paved

IR Site 22, OU2A Benzo(a) Pyrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) Pyrene Equivalents (mg/kg)
C3S022B009	31-Jul-03	4-8	0.67
C3S022B018	31-Jul-03	4-8	0.64
C3S022B019	31-Jul-03	4-8	0.76
95 percent UCL of the B(a)P Equivalent			0.14 mg/kg

N

100 50 0 100 Feet

OU-2A FS Final

Nature and Extent of PAHs in Soil at IR Site 22

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-7

OTIE Oneida Total Integrated Enterprises

AECOM

Table 3-6: Summary of Chemicals in IR Site 22 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Metals (mg/kg)							
Arsenic	16.55	34/64	2	MW547-3	02-Jul-90	5.5-6	24
Lead	207	48/65	1	MW547-5	29-Jun-90	0.5-1	9,890
PAHs (mg/kg)							
B(a)P equivalents	0.62	79/90	3	C3S022B019	31-Jul-03	4-8	0.76
Volatile Organic Compounds (mg/kg)							
Benzene	1.1	3/31	1	B07C-12	17-Aug-94	5-6	3.3
Ethylbenzene	5.7	10/31	3	B07C-14	17-Aug-94	5-6	570
Xylenes (total)	600	11/31	1	B07C-14	17-Aug-94	5-6	2,600

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-7: Summary of Chemicals in IR Site 23 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	158/240	3	C3S023B016	06-Aug-03	0.5-2	3.2
Pesticides (mg/kg)							
Toxaphene	0.44	1/21	1	BOR-26	24-Jul-90	6-6.5	1.4

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
38	groundwater samples collected at IR Site 22	Section 2.3.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.4, Pages 3-20 through 3-22, Figure 2-7 and Table 3-14. Oneida Total Integrated Enterprises LLC 2011.

Data Gap Study conducted at OU-2A and OU-2B in 2008 for assessment of the lateral and vertical extent of VOCs in groundwater (Tetra Tech 2009).

Groundwater sampling at OU-2A conducted as part of basewide groundwater monitoring events conducted from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b).

Supplemental DGI (Tetra Tech 2010) at OU-2A and OU-2B (August 2009 to February 2010) to address the uncertainties following Data Gap Study.

Figure 3-9 presents the sampling locations for the Data Gap Study, Basewide groundwater sampling events, and Supplemental DGI at IR Site 19. Table 3-13 presents a summary of the constituents reported in IR Site 19 groundwater above their respective screening levels during the Data Gap Study (Tetra Tech EC 2009) and Fall 2008 Basewide groundwater sampling events (ITSI 2009a and ITSI 2009b). The screening levels for VOCs and metals are Federal or State MCLs, whichever is less.

The Data Gap Study at IR Site 19 included hydropunch sampling (S19-HP02) of shallow groundwater (5 feet to 10 feet bgs) and installation of a shallow groundwater monitoring well S19-TT-MW01 (Figure 3-9) for assessment of VOCs in groundwater. The hydropunch sample was analyzed for VOCs, SVOCs, TPH-e, TPH-p, metals, and natural attenuation parameters. The groundwater monitoring well samples were analyzed for VOCs and metals. TCE was reported at a concentration of 9.1 µg/L (exceeding its MCL of 5 µg/L) in monitoring well S19-TT-MW01 during the Data Gap Study. PCE was reported at 0.66 µg/L (estimated) (less than its MCL) in S19-TT-MW01, located 40 feet southwest of MWD13-4.

As part of Basewide groundwater sampling, two monitoring wells, MWD13-3 and MWD13-4 are routinely sampled. PCE has been consistently reported above its MCL of 5 µg/L in monitoring well MWD13-4 during Basewide groundwater monitoring from Summer 2002 to Fall 2008 (see Figure 3-9). In addition, VC has been consistently reported at concentrations ranging from 0.1 µg/L to 0.9 µg/L in monitoring well MWD13-4 during basewide groundwater monitoring from Fall 2006 to Fall 2008.

Based on these results, following additional investigations were conducted as part of Supplemental DGI (Tetra Tech 2010) to delineate the extent of TCE in groundwater.

Three hydropunch boreholes (S19-HP03, -HP04, -HP05) were advanced in the vicinity of S19-TTMW01 and groundwater samples were collected from 5 feet to 10 feet, 10 feet to 15 feet, and 20 feet to 25 feet bgs for VOC analysis to assess the horizontal and vertical extents of the VOC plume (Figure 3-9).

Groundwater samples were collected from wells M13-P and S19-TTMW01 for VOC analysis.

Figure 3-9 shows the extent of VOCs in IR Site 19 groundwater based on the Supplemental DGI and Spring/Fall 2008 basewide groundwater monitoring data. TCE was reported above the screening level at well S19-TT-MW01 during the Data Gap Study (Table 3-13). However, TCE was reported at concentrations of 0.5 J µg/L and 0.49 J µg/L in groundwater samples collected from S19-TT-MW01 during Supplemental DGI indicating that TCE concentration has decreased in the interim between Data Gap Study and Supplemental DGI to a concentration below MCL. Therefore, TCE plume depicted in the Technical Memorandum for Data Gap Investigation (Tetra Tech EC 2009), is no longer representative of site conditions.

3.3.4 IR Site 22

Table 3-14 presents summary statistics for the constituents reported in groundwater at IR Site 22 based on the investigations conducted from 2002 through 2008. The following constituents exceeded their

respective Federal and/or State MCLs at least once in groundwater samples collected from 2002 to 2008:

1,2-Dichloroethane

Benzene

Ethylbenzene

Toluene

Xylenes

Arsenic

Iron

Manganese

Thallium

The organic constituents reported above represent petroleum hydrocarbon constituents and are likely a result of releases of petroleum fuels based on the historic site activities (see Section 2.1.2.4). Impacted groundwater beneath IR Site 22 is being remediated as CAA-4C under the Petroleum Program.

The inorganic constituents including arsenic, iron, manganese, and thallium have been generally reported within their respective background ranges for OU-2A (see Table 3-14). The basewide monitoring data indicates some exceedances above background ranges; however, as explained below, these exceedances may not be indicative of current groundwater conditions or a release. As explained in Section 3.4, the locally high locally high concentrations of metals including iron and manganese generally correlate with low DO and ORP values (reducing conditions). These locally high concentrations of metals are expected to decrease as the aquifer conditions revert back to normal following completion of petroleum hydrocarbon remediation.

Arsenic concentrations exceeded its background range at one location (MW547-3) in samples collected as part of basewide groundwater monitoring in 2002 and 2003. However, arsenic was reported within its background range (less than 95th quantile value of 20.72 μg/L) in samples collected from well, MW547-3 during 2004 and 2005 basewide groundwater monitoring rounds.

Iron concentrations exceeded its background range at one location (MW547-3) in groundwater samples collected as part of basewide groundwater monitoring in 2002 and 2003. However, iron was reported within its background range (less than 95th quantile value of 6,585.5 μg/L) in a sample collected from well, MW547-3 in 2005. In addition, iron concentrations in groundwater samples collected from well, MW547-3 were reported to be less than its maximum reported concentration during background study (24,400 μg/L) in Summer 2004 through Summer 2005 basewide monitoring rounds.

Manganese exceeded its background range at one location (MW547-3) in samples collected as part of basewide groundwater monitoring from 2002 to 2005. However, basewide monitoring data shows a significant decreasing trend in manganese concentrations from 11,000 μg/L (Summer 2002) to 3,400 μg/L (Summer 2005). Additionally, manganese was reported at 2,000 μg/L (less than its maximum reported concentration during background study [2,480 μg/L]) in a sample collected in Summer 2005 from well, M07C-09, located 100 feet down/cross-gradient from MW547-3.

All reported concentrations of thallium were within its background range (less than 95th quantile value of 16.15 μg/L).

The evaluation of the recent metal results from Spring 2007 and Spring 2008 basewide groundwater sampling events from monitoring wells M07C-08 and D07C-01 (Figure 2-7) documented in the Alameda Basewide 2008 Annual Groundwater Monitoring Report (ITSI 2009a) confirm that metals in IR Site 22 groundwater are not indicative of a release. None of the metals exceeded its respective background value during these monitoring rounds.

3.3.5 IR Site 23

Table 3-15 presents summary statistics for the constituents reported in groundwater at IR Site 23 based on the investigations conducted from 2002 through 2008. The following constituents exceeded their respective Federal and/or State MCLs at least once in groundwater samples collected from 2002 to 2008:

1,2-Dibromo-3-Chloropropane

1,2-Dibromoethane

cis-1,2-Dichloroethene

Methylene chloride

Arsenic

Iron

Manganese

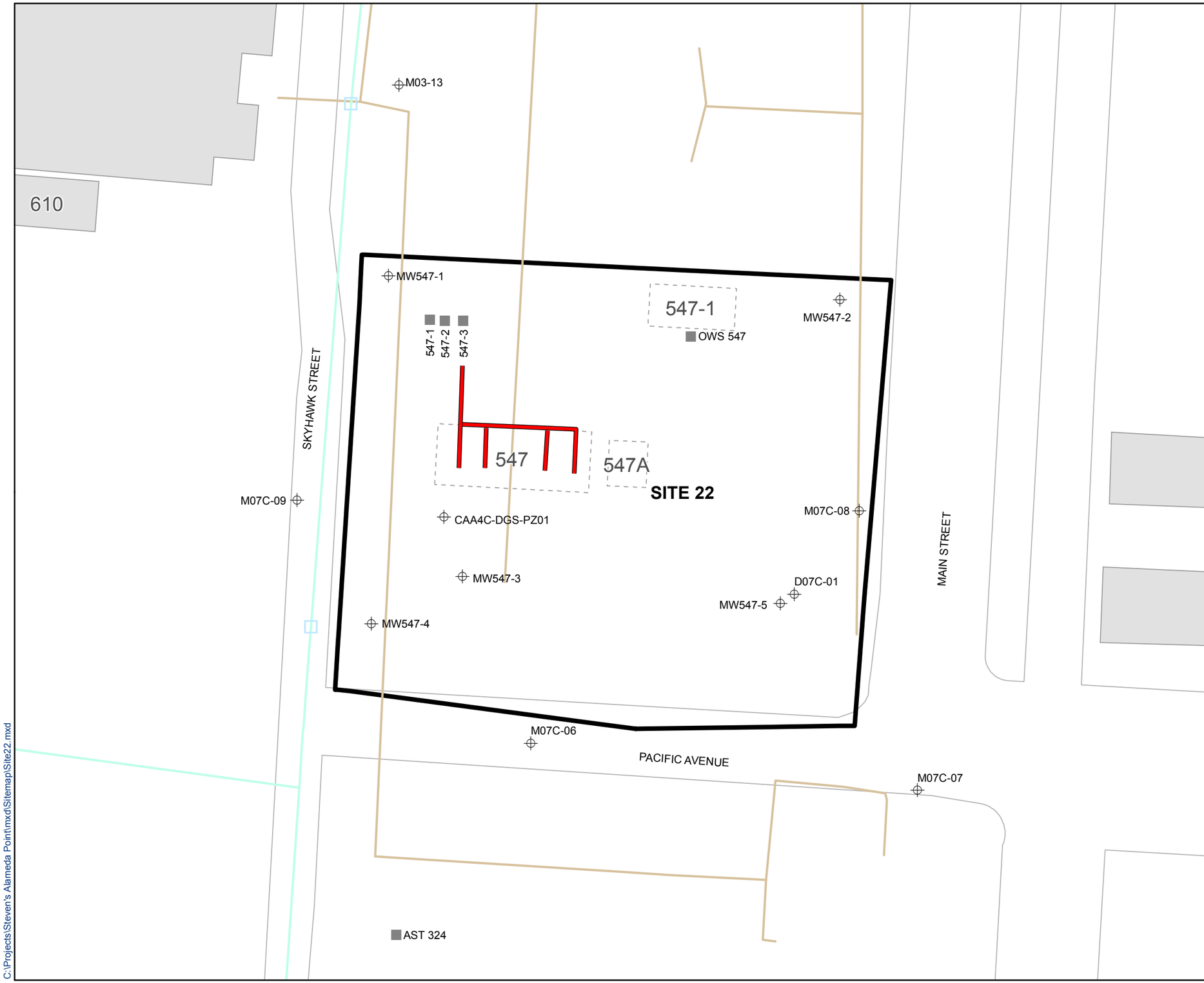
The summary statistics in Table 3-15 show sporadic/isolated detections of organic constituents in groundwater as evident from the very low detection frequencies. In addition, all reported concentrations of arsenic, iron, and manganese were within their respective background ranges (less than 95th quantile values) (see Table 3-15).

3.4 Groundwater Geochemistry and Natural Attenuation Parameters

Table 3-16 presents a summary of natural attenuation parameters for selected OU-2A wells based on the basewide groundwater monitoring results (ITSI 2009a). Groundwater parameters for OU-2A wells show a range of geochemical conditions, with median values for dissolved oxygen (DO) ranging from 0.32 mg/L to 3.57 mg/L and median oxidation reduction potential (ORP) ranging from -124 millivolts (mV) to +86 mV. ORP and DO have a relatively strong positive correlation in site groundwater, and low values of both indicate reducing chemical conditions. Groundwater at most wells is indicative of reducing, with DO below 1.0 mg/L, and ORP less than 0 mV. Locally high iron and manganese values generally correlate with low DO and ORP values, and indicate that iron and manganese reduction likely accounts for these occurrences. These reducing conditions are likely attributable to the presence of petroleum hydrocarbons and the associated biodegradation which lowers the DO. Four wells are especially low in sulfate (median values below 10 mg/L, at wells M07C-06, M13-07, MW-001, and MW547-3), and likely indicate sulfate-reducing conditions (sulfide, a product of sulfate reduction, has been typically reported at two of these wells). These same four wells have relatively high methane (greater than 1.0 mg/L) and iron (see Table 3-16), indicating that highly-reducing, methanogenic conditions are also present in or near these wells (ITSI 2009a).

3.5 Chemical Fate and Transport

This section discusses chemical fate and transport of the primary COCs identified in groundwater at OU-2A sites. The fate and transport of a contaminant depends upon its physiochemical properties



Legend

- Solid Waste Management Unit
- Groundwater Monitoring Well
- Catch Basin
- Fuel Line
- Storm Sewer Line
- Sanitary Sewer Line
- Road
- Former Building and Building Number
- 547A Building and Building Number
- 610 Site Boundary

ABBREVIATIONS AND ACRONYMS:

AST - ABOVEGROUND STORAGE TANK
FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
OWS - OIL/WATER SEPARATOR
OU - OPERABLE UNIT
UST - UNDERGROUND STORAGE TANK

SOURCE:

TETRA TECH EC 2007

N

0 15 30 60 Feet

1 inch = 61 feet

OU-2A FS | Final

Plan - IR Site 22

Alameda, CA

Date: 06-11	Project No. 106687	Figure 2-7

OTIE Oneida Total Integrated Enterprises | AECOM

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Table 3-14: Summary of Detected Groundwater Analytes at Site 22 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Volatile Organic Compounds												
1,1,1-Trichloroethane	71-55-6	67	2	3.0%	27	27	MW547-3	12/10/2003	200	--	--	--
1,1-Dichloroethane	75-34-3	67	2	3.0%	2.4	2.4	MW547-3	12/10/2003	5	--	--	--
1,1-Dichloroethene	75-35-4	67	2	3.0%	3.9	3.9	MW547-3	12/10/2003	6	--	--	--
1,2,4-Trimethylbenzene	95-63-6	60	13	21.7%	0.4	31	MW547-3	3/10/2005	--	--	--	--
1,2-Dichlorobenzene	95-50-1	67	4	6.0%	0.8	2.4	MW547-3	4/10/2003	600	--	--	--
1,2-Dichloroethane[b]	107-06-2	67	6	9.0%	0.3	38	CAA4C-DGS-DP05	4/18/2002	0.5	4	--	--
1,3,5-Trimethylbenzene	108-67-8	60	12	20.0%	0.53	14	MW547-3	3/10/2005	--	--	--	--
2-Butanone	78-93-3	67	1	1.5%	0.5	0.5	D07C-01	4/27/2006	--	--	--	--
Acetone	67-64-1	67	7	10.4%	1	16	MW547-3	3/4/2004	--	--	--	--
Benzene	71-43-2	79	41	51.9%	0.3	19000	CAA4C-DGS-DP04	4/18/2002	1	35		
Bromomethane	74-83-9	67	2	3.0%	0.6	0.6	MW547-3	12/17/2002	--	--	--	--
Carbon disulfide	75-15-0	66	2	3.0%	1200	1200	CAA4C-DGS-DP04	4/18/2002	--	--	--	--
Chloroform	67-66-3	67	3	4.5%	0.58	19	MW547-3	4/10/2003	80	--	--	--
Chloromethane	74-87-3	67	2	3.0%	0.2	0.2	M07C-08	12/17/2002	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	61	1	1.6%	0.09	0.09	D07C-01	3/28/2007	6	--	--	--
Ethylbenzene	100-41-4	79	37	46.8%	0.6	3830	CAA4C-DGS-DP06	5/8/2002	300	6		
Isopropyl Ether	108-20-3	60	5	8.3%	0.2	0.3	MW547-3	12/17/2002	--	--	--	--
Isopropyl Ether	108-20-3	60	5	8.3%	0.2	0.3	MW547-3	11/12/2004	--	--	--	--
Isopropylbenzene	98-82-8	60	23	38.3%	7.5	140	MW547-3	3/4/2004	--	--	--	--
Methyl Tert-Butyl Ether	1634-04-4	69	10	14.5%	0.2	2	CAA4C-DGS-DP05	4/18/2002	13	--	--	--
Methylene chloride	75-09-2	67	1	1.5%	0.1	0.1	M07C-08	3/28/2007	5	--	--	--
N-Butylbenzene	104-51-8	60	18	30.0%	1.5	51	MW547-3	7/3/2003	--	--	--	--
N-Propylbenzene	103-65-1	60	23	38.3%	11	280	MW547-3	6/20/2002	--	--	--	--
N-Propylbenzene	103-65-1	60	23	38.3%	11	280	MW547-3	3/4/2004	--	--	--	--
o-Xylene	95-47-6	60	15	25.0%	0.2	3.2	MW547-3	3/4/2004	1750	--	--	--
p-Isopropyltoluene	99-87-6	60	5	8.3%	0.2	0.4	MW547-3	3/10/2005	--	--	--	--
Sec-Butylbenzene	135-98-8	60	23	38.3%	2.1	30	MW547-3	9/18/2003	--	--	--	--
Tert-Butyl Alcohol	75-65-0	60	19	31.7%	43	210	MW547-3	4/10/2003	--	--	--	--
Tetrachloroethene	127-18-4	67	2	3.0%	2.6	2.6	MW547-3	4/10/2003	5	--	--	--
Toluene	108-88-3	79	28	35.4%	0.6	16000	CAA4C-DGS-DP04	4/18/2002	150	6	--	--
Trichloroethene	79-01-6	67	4	6.0%	0.3	1.9	MW547-3	4/10/2003	5	--	--	--
Xylenes (total)	1330-20-7	19	16	84.2%	20	17000	CAA4C-DGS-DP06	5/8/2002	1750	4	--	--
Xylenes, m & p	-81	60	18	30.0%	0.2	11	MW547-3	3/4/2004	1750	--	--	--
Metals												
Aluminum	7429-90-5	2	1	50.0%	7.9	7.9	M07C-08	7/24/2002	1000	--	1070	--
Antimony	7440-36-0	9	1	11.1%	0.843	0.843	S22-B10	11/7/2007	6	--	37.5	--
Arsenic	7440-38-2	3	1	33.3%	4.27	4.27	S22-B10	11/7/2007	10	--	20.72	--
Barium	7440-39-3	3	3	100.0%	74.8	190	M07C-08	7/24/2002	1000	--	569.5	--
Calcium	7440-70-2	2	2	100.0%	62200	93000	M07C-08	7/24/2002	--	--	--	--
Cobalt	7440-48-4	3	1	33.3%	1.78	1.78	S22-B10	11/7/2007	--	--	--	--
Copper	7440-50-8	3	2	66.7%	0.767	12	M07C-08	7/24/2002	1300	--	24.03	--
Iron	7439-89-6	2	1	50.0%	40	40	M07C-08	7/24/2002	300	--	6585.5	--

Table 3-14: Summary of Detected Groundwater Analytes at Site 22 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Lead	7439-92-1	11	2	18.2%	5.6	5.6	CAA4C-DGS-DP04	4/18/2002	15	--	11.45	--
Magnesium	7439-95-4	2	2	100.0%	14000	62900	D07C-01	12/9/2003	--	--	--	--
Manganese	7439-96-5	2	2	100.0%	160	472	D07C-01	12/9/2003	50	2	1741	--
Mercury	7439-97-6	34	6	17.6%	0.052	0.15	M07C-08	12/17/2002	2	--	--	--
Molybdenum	7439-98-7	3	2	66.7%	3.73	5.3	M07C-08	7/24/2002	--	--	--	--
Nickel	7440-02-0	3	2	66.7%	4.33	20	M07C-08	7/24/2002	100	--	--	--
Potassium	7440-09-7	2	1	50.0%	17000	17000	M07C-08	7/24/2002	--	--	--	--
Selenium	7782-49-2	3	1	33.3%	4	4	M07C-08	7/24/2002	50	--	8.58	--
Sodium	7440-23-5	2	2	100.0%	36000	158000	D07C-01	12/9/2003	--	--	--	--
Vanadium	7440-62-2	3	2	66.7%	1.71	4.7	M07C-08	7/24/2002	--	--	26.27	--
Zinc	7440-66-6	3	2	66.7%	7	35.4	S22-B10	11/7/2007	5000	--	36.39	--
Dissolved Metals												
Aluminum, dissolved	7429-90-5	41	22	53.7%	2.8	210	MW547-3	6/20/2002	1000	--	1070	--
Antimony, dissolved	7440-36-0	39	27	69.2%	0.079	4.8	D07C-01	11/12/2004	6	--	37.5	--
Arsenic, dissolved	7440-38-2	45	37	82.2%	0.96	41	MW547-3	6/20/2002 7/3/2003	10	13	20.72	8
Barium, dissolved	7440-39-3	41	41	100.0%	64	520	MW547-3	7/3/2003	1000	--	569.5	--
Beryllium, dissolved	7440-41-7	45	1	2.2%	0.49	0.49	D07C-01	3/28/2007	4	--	2.5	--
Cadmium, dissolved	7440-43-9	45	11	24.4%	0.094	2.2	D07C-01	11/12/2004	5	--	--	--
Calciuim, dissolved	7440-70-2	41	41	100.0%	40000	108000	MW547-3	7/3/2003		--	--	--
Chromium, dissolved	7440-47-3	45	19	42.2%	0.13	2.1	D07C-01	11/12/2004	50	--	12.45	--
Cobalt, dissolved	7440-48-4	41	29	70.7%	0.19	6.3	MW547-3	6/20/2002		--	--	--
Copper, dissolved	7440-50-8	45	33	73.3%	0.46	38	M07C-08	12/17/2002	1300	--	24.03	2
Iron, dissolved	7439-89-6	41	23	56.1%	46	29000	MW547-3	7/3/2003	300	17	6585.5	11
Lead, dissolved	7439-92-1	45	16	35.6%	0.11	1.2	D07C-01	4/27/2006	15	--	11.45	--
Magnesium, dissolved	7439-95-4	41	41	100.0%	4900	99900	MW547-3	7/3/2003	--	--	--	--
Manganese, dissolved	7439-96-5	41	41	100.0%	2.1	11000	MW547-3	6/20/2002 12/17/2002	50	34	1741	13
Mercury, dissolved	7439-97-6	12	1	8.3%	0.035	0.035	M07C-08	3/28/2007	2	--	--	--
Molybdenum, dissolved	7439-98-7	41	24	58.5%	0.42	6.7	M07C-08	7/24/2002	--	--	--	--
Nickel, dissolved	7440-02-0	45	30	66.7%	0.91	32	M07C-08	7/6/2004	100	--	--	--
Potassium, dissolved	7440-09-7	41	39	95.1%	780	45600	MW547-3	7/3/2003	--	--	--	--
Selenium, dissolved	7782-49-2	45	16	35.6%	0.22	2.2	D07C-01	7/11/2002	50	--	8.58	--
Silver, dissolved	7440-22-4	45	3	6.7%	0.091	3.3	D07C-01	4/27/2006	100	--	--	--
Sodium, dissolved	7440-23-5	41	41	100.0%	11000	240000	MW547-3	12/17/2002	--	--	--	--
Thallium, dissolved	7440-28-0	33	3	9.1%	0.3	9.8	D07C-01	4/27/2006	2	1	16.15	--
Vanadium, dissolved	7440-62-2	41	33	80.5%	0.71	24	D07C-01	11/12/2004	--	--	26.27	--
Zinc, dissolved	7440-66-6	45	31	68.9%	1.5	28	D07C-01	11/12/2004	5000	--	36.39	--
Polycylclic Aromatic Hydrocarbons												
Naphthalene	91-20-3	61	23	37.7%	9.4	460	MW547-3	12/10/2003	--	--	--	--
Semi-volatile Organic Compounds												
Styrene	100-42-5	67	1	1.5%	0.1	0.1	M07C-08	11/12/2004	100	--	--	--

Notes

[a] The lesser of Federal primary MCL and State (primary or secondary) MCL.

[b] Highlighted cells indicate analytes exceeding MCLs.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
39	removal actions have been conducted at IR Site 22	Section 2.3.4	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 8.2.5, Page 8-14, Figures 8-1 and 8-2. SulTech 2005.

8.2.5 Removal Actions

In November 1994, PWC removed USTs 547-1 through 547-3 (see Figure 8-1). At the time of removal, the condition of the USTs was not noted; however, the excavation sidewalls had visible signs of contamination at approximately 5 feet bgs. PWC collected three soil samples (547-W1 through 547-W3) and two groundwater samples (547-L1 and 547-L8) from the UST excavation at the soil/groundwater interface (approximately 9.5 feet bgs). Soil and groundwater samples were analyzed for BTEX, lead, TPH-E and TPH-P, and TRPH. Appendix E provides the complete analytical results for this removal action. Benzene, ethylbenzene, and xylene were detected in all three soil samples, and toluene was detected in two soil samples. Lead was not detected in any of the three soil samples analyzed. TPH-g and TPH-d were detected in all three soil samples, TPH-jet fuel was detected in two soil samples, and TPH-mo was detected in one soil sample. The groundwater sample exhibited concentrations of BTEX, lead, and TTPH.

In January 1995, PWC removed about 1,500 feet of fuel lines from the pump island area and collected 14 soil samples (547-1 through 547-14) from the base of the fuel line excavations, as shown on Figure 8-2. Soil samples were analyzed for BTEX, lead, and TPH-E and TPH-P. The maximum BTEX concentrations were detected at sampling locations 547-3 and 547-5. Lead was detected in all 14 samples, with the maximum concentrations detected at sampling locations 547-6 and 547-11 (located in the northeast and southern portion of the fuel pump island area, respectively). TPH-d and TPH-jet fuel were detected in all 14 soil samples; TPH-g was detected in 7 samples and TPH-mo was detected in 13 samples (see Appendix E). The maximum TPH fraction concentrations were detected at sampling locations 547-3 and 547-5 (located in the northern portion of the fuel pump island area). Sampling locations for this investigation are presented on Figure 8-2.

In July 2004, remedial action using DVE began to remove floating petroleum product and vent the vadose zone above groundwater at Site 22.

8.2.6 Treatability Studies

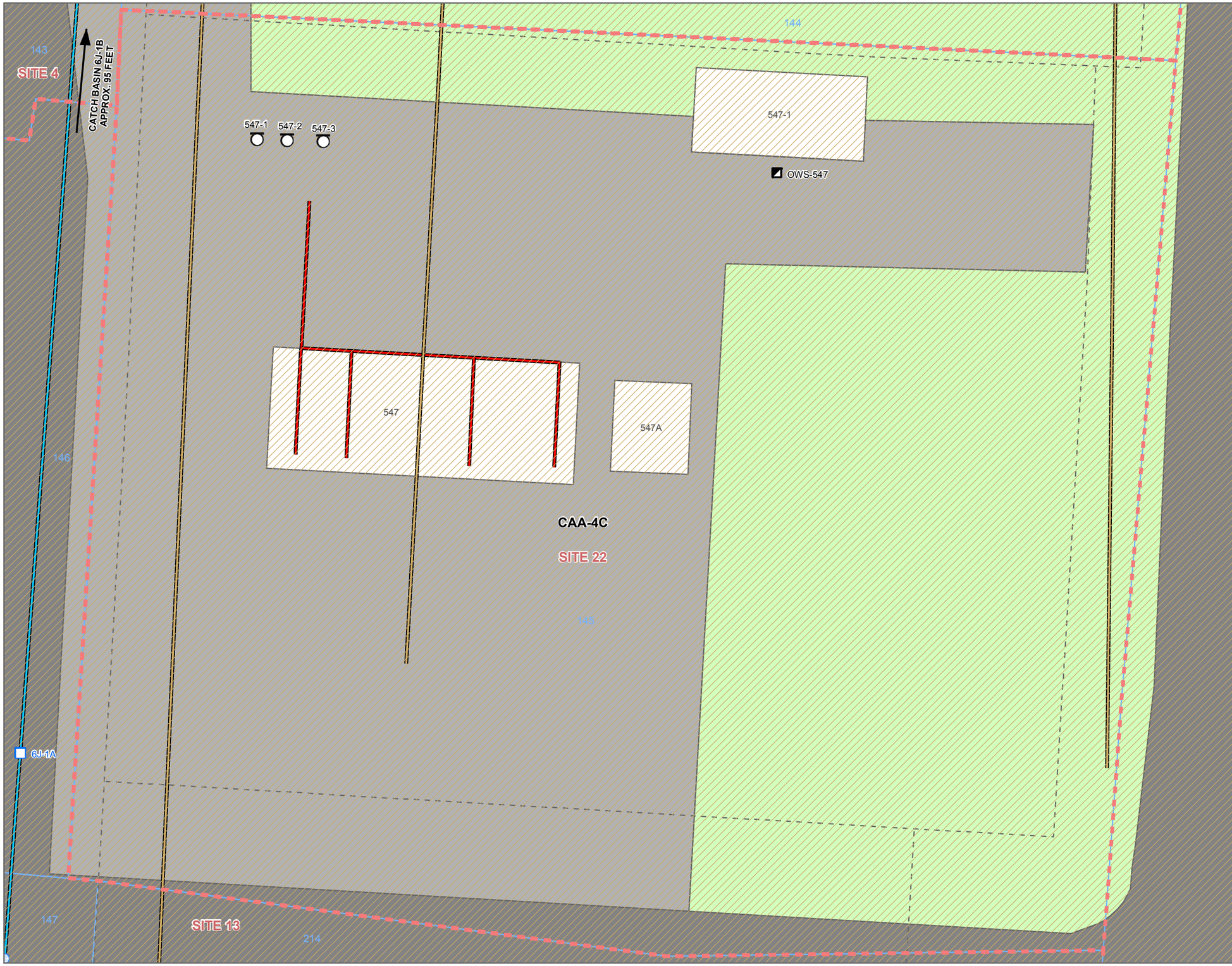
No treatability studies were conducted within Site 22.

8.3 Initial Data Evaluation

Based on the investigations described in Section 8.2, the Navy completed an initial data evaluation for Site 22. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, and (3) a background comparison. The complete background comparison is provided in Appendix A.

8.3.1 Site 22 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment,



UNDERGROUND STORAGE TANK (UST), REMOVED

CATCH BASIN

OIL-WATER SEPARATOR (OWS)

FENCE

FUEL LINE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

Unpaved

Paved

Road

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

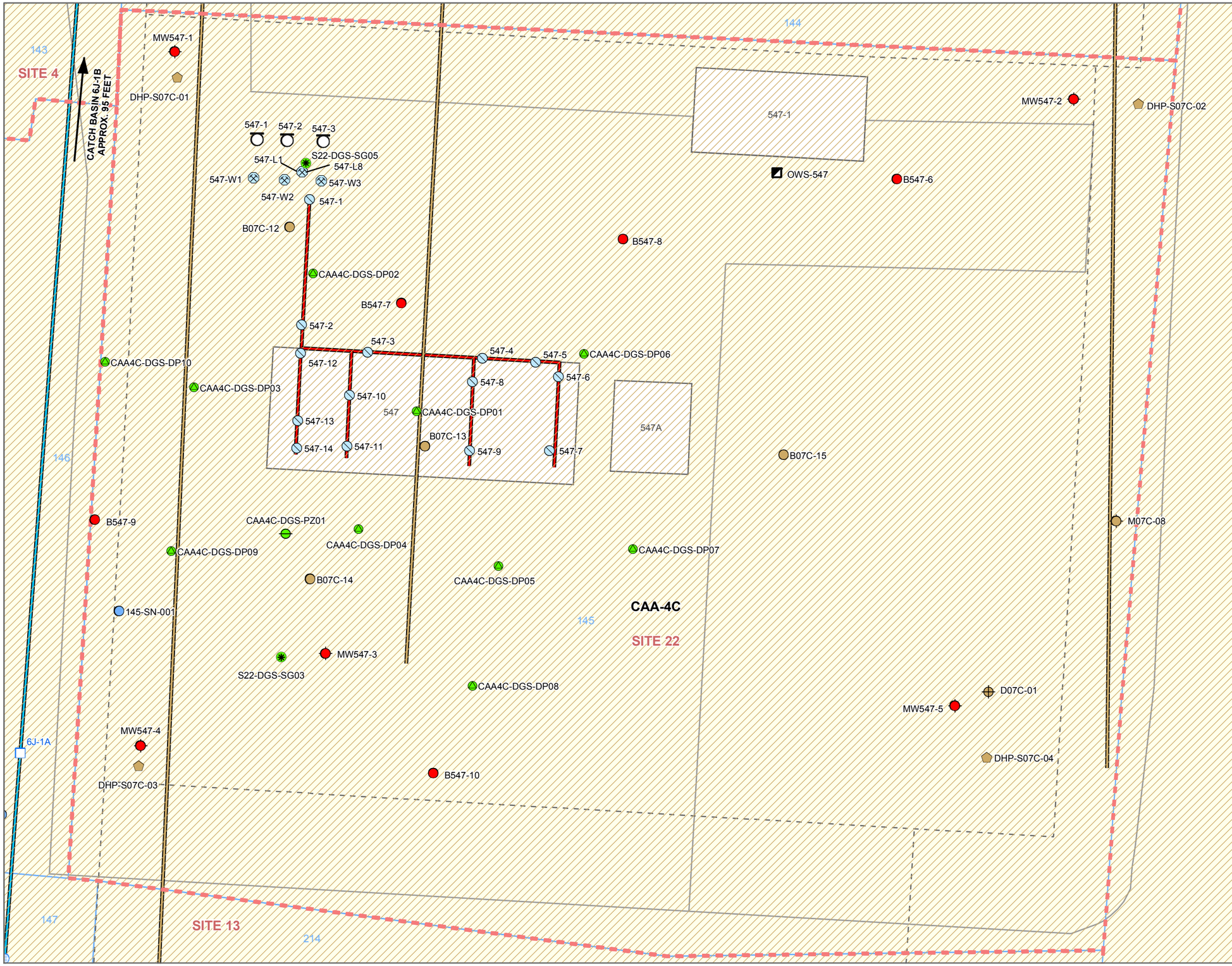
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-1
SITE 22 FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-25 U:\almda_sa\DO028\OU2A\RI\mxd\fig08-01_s22_features.mxd TtEMI-SA K. Johnson



SAMPLE LOCATION

- Direct-Push
- Excavation
- Hydropunch
- Monitoring Well
- Piezometer
- Pipe
- Soil Gas
- Soil Boring

SAMPLE INVESTIGATION

- Total Petroleum Hydrocarbon Program
- Phase 1 & 2A, 1991
- Follow-On Investigation 1994
- Data Gap Sampling 2001
- EBS Phase 2A

- UNDERGROUND STORAGE TANK (UST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

15 0 15 30 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 8-2
SITE 22 RI, TPH AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig08-02_s22_s&gw.mxd TtEMI-SA K. Johnson

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
40	RI Report for IR Site 23	Section 2.3.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 9.2 through 9-4, Pages 9-5 through 9-32, Figures 6-14, 9-2 through 9-10; Tables 9-1 and 9-2, 9-8, 9-11 and 9-12. SulTech 2005.

9.2 SITE 23 ENVIRONMENTAL INVESTIGATIONS

This section describes the environmental investigations conducted at Site 23, which include investigations conducted before the IRP, under CERCLA, under the EBS and TPH Programs, and during removal actions.

Tables 9-1 and 9-2 summarize the soil and groundwater samples collected by the environmental investigations conducted at Site 23 and the types of analyses conducted. Sampling locations are shown on Figures 9-7A through 9-9 and are categorized by investigation. Results for each of the investigations are presented in Tables 9-11 and 9-12. The tables are organized by analytical group and detail the number and percent of detections; the minimum, average, and maximum detected concentration; the minimum and maximum detection limit; the number of detections exceeding either the residential (for soil) or tap water (for groundwater) PRGs (EPA 2002a); the number of detection limits for nondetected samples exceeding the PRG; and the PRG.

The following subsections summarize investigations conducted at Site 23 prior to the IRP (Section 9.2.1), under the CERCLA (Section 9.2.2), EBS (Section 9.2.3), and TPH programs (Section 9.2.4), and as a part of removal actions (Section 9.2.5).

9.2.1 Investigations Conducted Before the IRP

No documented investigations occurred within the current Site 23 boundaries before the IRP. Site 23 boundaries previously included an area that is now within the Site 13 boundaries, and two investigations were conducted in the area that is currently Site 13. Because neither of these investigations was completed within the current Site 23 boundaries, they are not discussed in this section.

9.2.2 CERCLA Investigations

The following subsections summarize investigations conducted at Site 23 under CERCLA. These investigations include the Phase I and 2A investigation performed in 1991, the follow-on investigations conducted in 1994 and 1998, the storm sewer investigation in 2000, the supplemental RI data gaps sampling performed in 2001, the basewide groundwater monitoring conducted in 2002 and 2003, and the basewide PAH study in 2003.

Boring logs for all investigations are presented in Appendix B.

9.2.2.1 Phase 1 and 2A Investigation, 1991

At the time of this investigation, the site boundaries for Site 13 encompassed the current Site 13 and Site 23 boundaries, and Building 530 made up Site 10B (Canonie 1989). Subsequently, in October 2000, as the limits of contamination from the former oil refinery became more apparent, the boundaries for Site 13 and Site 10B were redefined. The location of the former oil refinery is

shown on Figure 9-2. Site 10B was eliminated, and the boundaries for Site 13 were redefined to the existing boundaries based on locations of groundwater plumes. The remainder of Sites 13 and 10B became the current Site 23.

The Navy contracted with Canonie to conduct an investigation at former Site 13 to determine whether contamination from the oil refinery operations leached into groundwater (Canonie 1989, 1990). Canonie also conducted an investigation at Building 530 to evaluate the soil and groundwater in the vicinity of Building 530.

Soil

The 1991 investigation included drilling 12 soil borings (BOR-20, BOR-22, BOR-23, BOR-25, BOR-26, BOR-27, MWOR-5, MW530-1, MW530-2, MW530-3, B410-6, and MW410-4) and installing 5 groundwater monitoring wells at 5 of the boring locations (MWOR-5, MW530-1, MW530-2, MW530-3, and MW410-4). To evaluate if contaminants were present in the areas investigated, 143 soil samples were collected and analyzed for VOCs, SVOCs, pesticide and PCB compounds, metals, TRPH, TOC, cations and anions, pH, cyanide, flash point, total kjeldahl nitrogen, and general chemistry parameters. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 1991 Phase 1 and 2a Investigation Soil Summary

Analytical Group	Chemicals Exceeding 2002 Residential PRG	Location of Highest Concentration
VOCs	None	Not Applicable
SVOCs	Benzo(a)pyrene	BOR-23
Pesticides and PCBs	Toxaphene	BOR-26
Metals	Arsenic	MW530-15
	Iron	BOR-22

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs or PCBs were detected in soil at concentrations exceeding their respective PRGs (EPA 2002a) at Site 23. PAHs, analyzed with the SVOC analytical group, were detected at concentrations exceeding the 2002 residential PRG in samples from location BOR-23 at a depth of 11.0 to 11.5 feet bgs.

The pesticide toxaphene was detected at concentrations exceeding the 2002 residential PRG (EPA 2002a) in samples from location BOR-26 at a depth of 10.5 at 11.0 feet bgs.

PCBs were not detected in Site 23 soils.

Arsenic was detected at concentrations exceeding the 2002 residential PRG (EPA 2002a) in samples from location MW530-1 (12.0 to 12.5 feet bgs), and iron was detected at concentrations exceeding the 2002 residential PRG in samples from location BOR-22 (11.5-12.0 feet bgs).

TRPH was identified in several samples collected at Site 23.

Groundwater

Five groundwater monitoring wells are located across Site 23. MWOR-5 is located on the eastern boundary of Site 23, and monitoring wells M09-05 and MW410-4 are located near the western boundary of the Site 23. Monitoring wells MW530-1 and MW530-2 are located on the northeast corner and the west side of Building 530, and well MW530-3 is located at the southwest corner of Building 586. One groundwater sample was collected from each monitoring well. All of the groundwater samples were analyzed for SVOCs, VOCs, dissolved metals, and general chemistry parameters. In addition, a groundwater sample collected from well MWOR-5 was analyzed for pesticides and PCBs and TRPH, and groundwater samples collected from wells MW-530-1 through MW530-3 were analyzed for TRPH and oil and grease. Monitoring well locations are presented on Figure 9-3. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 1991 Phase 1 and 2A Investigation Groundwater Summary

Analytical Group	Chemicals Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	Benzene and ethylbenzene	MW530-1
SVOC	Naphthalene	MW530-1
Pesticides and PCBs	None	Not Applicable
Metals	Aluminum, iron, manganese, nickel, and vanadium	MWOR-5
	Arsenic	MW530-3

BTEX was detected in groundwater samples from well MW530-1, and methylene chloride, believed to be a laboratory contaminant, was detected in several samples and four travel blanks. Two PAHs were detected in groundwater samples from well MW530-1. Dissolved metals were detected in all samples. No pesticides and PCBs were detected in samples from well MWOR-5, the only well at Site 23 analyzed for pesticides and PCBs. TRPH and oil and grease were detected in samples from wells MW530-1 and MW530-3.

Recommendations for future work included collecting additional soil samples to evaluate the extent of VOCs, SVOCs and petroleum hydrocarbons at Site 25. Sufficient metals data have been collected for soil. The report recommended that additional groundwater monitoring wells be installed to further characterize VOCs, SVOCs, petroleum hydrocarbons, and metals in

groundwater (PRC and JMM 1992). The collection of additional groundwater samples was also recommended to evaluate tidal influence on the shallow and deep water-bearing zone, to better characterize TDS in groundwater, and to evaluate whether groundwater beneath Site 23 was considered a potential drinking water source.

9.2.2.2 Follow-On Investigation, 1994

As stated previously, the boundaries for Site 23 have changed over time. Samples were collected at Site 23 during the 1994 investigation at Buildings 530 and 410 (west of Building 530 at Site 9).

Based on the recommendations of the 1991 investigation and discussions with the regulatory agencies, a follow-on investigation was conducted to provide additional lithologic, chemical, and hydrogeologic information to assess the nature and extent of soil and groundwater contamination for the RI/FS (PRC and JMM 1994). Analytical results from previous investigations indicated the presence of VOCs, SVOCs, petroleum hydrocarbons, and metals above background concentrations at several locations at Site 23. Activities conducted under the follow-on investigation consisted of soil sampling, nonpoint sampling (sediment in storm drain catch basins), CPT and direct-push groundwater sampling, well installation, and four quarters of groundwater monitoring (PRC and MW 1996). Sampling locations are presented on Figure 9-3.

The objective of the CPT sampling program was to evaluate the lithologic and hydrogeologic characteristics below 15 feet bgs and to identify the shallow water-bearing zone. Seven CPT points (CPT-S10B-01 through CPT-S10B-06 and CPT-S09-09) were driven across Site 23. No soil samples were collected using the CPT; however, CPT resistivity readings were used to evaluate lithology.

Soil

Soil samples were collected from two soil borings (B10B-04 and B10B-06) and two monitoring wells (M10B-01 and M09-05) to further evaluate the vertical extent and nature of contamination in soil (see Figure 9-3). Soil samples were collected at the surface, at 2.5 feet bgs, and at 5 feet bgs from each boring except M10B-01, which was sampled at 1, 2, and 3 feet bgs. Samples from borings B10B-04 and B10B-06 were analyzed for SVOCs, VOCs, and general chemistry parameters. Samples from boring M09-05 were analyzed for VOCs, metals, and general chemistry parameters. Samples from boring M10B-01 were analyzed for VOCs, SVOCs, and TPH-E, and TPH-P. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 1994 Follow-on Investigation Soil Summary		
Analytical Group	**Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
VOCs	None	Not Applicable
SVOCs	None	Not Applicable
Pesticides and PCBs	None	Not Applicable
Metals	Arsenic	M09-05

Note:

PAH data collected for soil during this investigation were not used in this RI because of high detection limits; data from additional PAH sampling conducted in 2003 were used.

No VOCs, SVOCs, or PCBs were detected in soil at concentrations exceeding their respective PRGs (EPA 2002a) at Site 23.

TPH as motor oil was detected in soil samples collected at the north end of Building 530 (B10B-07) and the northwest corner of the building (M10B-01) (PRC and MW 1995).

Groundwater

Based on soil sampling results, two soil borings were completed as shallow monitoring wells (M10B-01 and M09-05), and two deep monitoring wells (D10B-01 and D10B-02) were installed at Site 23 at locations shown on Figure 9-3. Well construction details and boring logs for these wells are included in Appendix B.

A quarterly groundwater monitoring program was conducted from October 1994 to August 1995. Groundwater samples were collected each quarter from the following monitoring wells: MW530-1, MW530-2, MW530-3, M10B-01, D10B-01, D10B-02, M09-05, and MWOR-5. Samples were analyzed for VOCs, SVOCs, pesticides and PCBs, dissolved metals, TPH-E and TPH-P, general chemistry parameters, TOC and COD, and sulfide.

Groundwater samples (DHP-S10B-01 through DHP-S10B-05 and DHP-S09-04) were collected from the SWBZ from CPT locations (CPT-S10B-01 through CPT-S10B-05 and DPH-S09-04) using a Hydropunch sampling device. In addition, two shallow groundwater samples (SHP-S10B-05 and SPH-S10B-06) were collected from CPT-S10B-05 and CPT-S10B-06, respectively, using a Hydropunch sampling device. Analyses performed for groundwater samples varied by sampling location but generally included VOCs, SVOCs, metals, TPH-E and TPH-P, general chemistry parameters, TOC, chemical oxygen demand (COD), and sulfides analyses. In addition, two shallow piezometers were installed adjacent to CPT-S10B-05 and CPT-S10B-06 to monitor groundwater elevations. Samples from boring M10B-01 were analyzed for VOCs, SVOCs, and TPH-E and TPH-P. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRGs (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 1994 Follow-on Investigation Groundwater Summary		
Analytical Group	**Chemicals Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration**
VOCs	Benzene	DHP-S10B-01
	Ethylbenzene	MW530-1
	TCE	MW410-4
SVOCs	Benzo(a)pyrene, benzo(b)fluoranthene, and chrysene	SHP-S10B-05
	Naphthalene	MW530-1
Pesticides and PCBs	None	Not Applicable
Metals	Aluminum, cadmium, cobalt, iron, manganese, and nickel	DHP-S10B-01
	Arsenic	MW530-3
	Thallium	DHP-S10B-03

VOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from DHP-S10B-01, MW530-1, and MW410-4.

SVOCs were detected in groundwater at concentrations exceeding their respective tap water PRGs in samples from location SHP-S10B-05 and well MW530-1. SVOCs also were detected at the southwest corner of Building 530 (location B10B-06).

No PCBs or pesticides were detected in groundwater at concentrations exceeding their respective tap water PRGs.

Metals were detected in a sample from monitoring well MW530-3 and in Hydropunch samples from locations DHP-S10B-01 and DHP-S10B-03.

TPH-mo was detected at locations SHP-10B-05 and SHP-S10B-06, and TPH-P was detected in a sample from monitoring well MW530-1 and in a shallow Hydropunch sample from location SHP-S10B-05. TPH-mo was detected in soil samples from the north end and the northeast corner of Building 530 (locations B10B-07 and M10B-01, respectively). TPH-E as motor oil was detected in soil samples collected location B10B-07 at the north end of Building 530 and from location M10B-01 at the northwest corner of Building 530 (PRC and MW 1995). TPH-associated compounds were detected in two groundwater samples collected from locations MW530-1 and SHP-S10B-06 at the northwest corner of Building 530. TPH-E (diesel fraction) was detected in a deep Hydropunch sample from location DHP-S10B-01. TPH-E (motor-oil fraction) was detected in deep Hydropunch samples from locations DHP-S10B-02, DHP-S10B-03, and DHP-S10B-04. TPH-P was detected in a deep Hydropunch sample from location DHP-S10B-01.

2-Butanone was detected in a groundwater sample from location SHP-S10B-05, collected west of Building 530; this chemical is a common laboratory contaminant.

Two storm drain sediment samples (NPS-S10B-01 and NPS-S10B-02) also were collected from Site 23 during this investigation. The samples were collected along the sanitary sewer line running along the northern and southern part of Site 23. The samples were analyzed for VOCs, SVOCs, metals, TPH-E, and TPH-P.

The investigation report concluded that chemicals detected in soil and groundwater are similar in nature to those found during the previous (1991) investigation (PRC and JMM 1992).

9.2.2.3 Follow-On Investigation, 1998

The 1998 follow-on investigation consisted of 1 year of basewide quarterly groundwater monitoring to assess and monitor plumes at various sites at Alameda Point (U&A 1998). Samples were collected each quarter from monitoring wells MW530-2 and D10B-02. Analyses varied from quarter to quarter and well to well but generally included VOCs, dissolved metals, TPH-E and TPH-P, TOC, and general chemistry parameters. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRGs (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 1998 Follow-on Investigation Groundwater Summary

Analytical Group	Chemicals Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOC	None	Not Applicable
Metals	Filtered arsenic	MW530-2

VOCs in groundwater were not detected at concentrations above MCLs. Dissolved metals concentrations in groundwater samples generally exceeded MCLs at Site 23. TPH-mo and TPH-d were detected at low concentrations in samples from well MW530-2.

Additionally, a tidal influence study was conducted as part of this investigation to establish tidal effects (if any) on groundwater at Alameda Point; however, no data were collected for Site 23.

9.2.2.4 Storm Sewer Investigation, 2000

The basewide storm sewer investigation evaluated the physical conditions of storm sewers, identified the places where storm sewers are submerged below groundwater, identified locations where contaminated groundwater intercepts submerged and damaged sections of storm sewers, and identified data gaps for further evaluation (Tetra Tech 2000b).

The storm sewer investigation concluded that most of the storm sewer lines at Site 23 were likely partially submerged. The investigation also evaluated the need for repairing the lines by level of priority based on whether the lines were damaged and intersected by groundwater contaminant plume(s). Site 23 contained one segment of pipe with a low priority listing for repair. The information on this line is summarized in the table below and included on Figure 9-4.

Damaged Storm Sewer Line Segments

Segment		Diameter (inches)	Length (feet)	Material	Chemical of Concern
From	To				
Low Priority					
5-JF	6-J	36	234	Reinforced Concrete	BTEX and PAHs

9.2.2.5 Supplemental Data Gaps Sampling, 2001

Based on identified data gaps, a supplemental data gap sampling effort was conducted at OU-2A to address two primary data gaps categories: (1) the status of groundwater contaminant plumes and (2) preferential flow paths associated with the storm sewer system (Tetra Tech 2002a). The sampling effort included collecting samples of groundwater and bedding material at the storm sewers. Additional sampling for secondary data gaps was conducted within Site 23. The sampling effort included collecting one soil gas sample and one soil sample for analysis of chemicals of concern; the soil sample was analyzed for total chromium and hexavalent chromium to allow for proper assessment of human health risk relative to chromium concentrations in soil.

Soil

To determine whether storm sewer bedding materials are acting as a preferential pathway for contaminant migration, two soil and one groundwater sample were collected from along storm sewer line J (see Figure 9-4), in the northern portion of Site 23. A vacuum excavation boring was advanced immediately adjacent to storm sewer lines, and an undisturbed soil sample of the bedding material was collected. For comparison purposes, samples of the native soil were collected at the approximate depth of the storm sewer, 10 feet away from the vacuum excavation locations. Soil samples were analyzed for geotechnical parameters.

One soil sample, location S23-DGS-DP01, was collected and analyzed for total chromium and hexavalent chromium. Chromium speciation results for this sample were used to assess human health risk relative to chromium concentrations in soil. Table 9-8 is a statistical summary of the soil sample collected during the 2001 data gaps sampling investigation. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 2001 Supplemental Data Gaps Sampling Investigation Soil Summary		
Analytical Group	**Chemicals Exceeding 2002 Residential PRG**	**Location of Highest Concentration**
Metals	None	Not Applicable

Analytical results indicated a small portion of the total chromium was actually hexavalent chromium; however, the hexavalent chromium results were rejected based on zero recovery in the matrix spikes. In addition, because of reducing soil conditions at Site 23, hexavalent chromium once released to soil or groundwater at Site 23 would have been reduced to less toxic and practically immobile trivalent chromium.

Groundwater

One round of groundwater samples was collected at Site 23 during the data gaps sampling to obtain more recent groundwater data. Samples were collected from monitoring wells D10B-02, M10B-01, MW410-4, MW530-2, and MW530-3. Samples were analyzed for VOCs, SVOCs, PAHs, metals, TPH-E and TPH-P, and field parameters. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRGs (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 2001 Supplemental Data Gaps Sampling Investigation Groundwater Summary		
Analytical Group	**Detected Compounds Exceeding 2002 Tap Water PRG**	**Location of Highest Concentration**
VOCs	1,2,4-trimethylbenzene, ethylbenzene, naphthalene, sec-butylbenzene, vinyl chloride, and total xylenes	S23-DGS-VE01
SVOCs	Naphthalene	S23-DGS-VE01
PAHs	Benzo(a)anthracene	MW530-1

TPH-mo was detected in the groundwater sample collected from monitoring well D10B-02. All other groundwater samples contained detectable concentrations of VOCs, mainly acetone, with one sample containing petroleum-related compounds.

Groundwater samples were collected from the vacuum extraction location and analyzed for VOCs and TPH-E and TPH-P. One sample, location S23-DGS-VE01, was collected from the storm sewer bedding. The storm sewer corridor sample contained elevated concentrations of vinyl chloride, PAHs, and TPH-related compounds. In addition, hydraulic conductivity was measured at two sampling locations, S23-DGS-VE01 (in the storm sewer corridor) and S23-DGS-DP02 (in native material just west of Building 606). The storm sewer bedding material at sampling location S23-DGS-VE01 has a lower hydraulic conductivity than the soils located approximately 10 feet from the storm sewer corridor at sampling location S23-DGS-DP02.

Soil Gas

One boring for soil gas sampling was advanced at a location selected with assistance from the BCT for use in future risk assessment. The boring was advanced near the northwest corner of Building 360 (see Figure 9-3). At the soil gas sampling location, two continuous core soil borings were completed to determine specific groundwater depths and evaluate physical soil parameters required for the risk assessment model. Samples were collected at depths of 1.5 and 4.0 feet bgs.

Chlorinated hydrocarbons and BTEX compounds were detected in the soil gas samples.

9.2.2.6 Basewide Groundwater Monitoring, 2002 and 2003

The specific objectives of the 2002 and 2003 basewide monitoring investigation were (1) to evaluate contaminant plumes in groundwater and (2) to determine the main chemicals of concern (Shaw 2003a). The monitoring scheme for OU-2A included 23 of the 46 wells located within the 5 sites of OU-2A (Sites 9, 13, 19, 22, and 23). Five monitoring wells (D10B-02, M10B-01, MW410-4, MW530-2, and MW530-3) located within Site 23 were identified for quarterly or semiannual (twice per year) monitoring. Sampling was conducted in June, September, and December 2002 and April 2003. Samples were analyzed for VOCs, dissolved metals, TPH-E and TPH-P, and general chemistry parameters. The table below summarizes the chemicals detected at concentrations exceeding the tap water PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical.

Site 23 2002 to 2003 Basewide Groundwater Monitoring Investigation

Analytical Group	Chemicals Exceeding 2002 Tap Water PRG	Location of Highest Concentration
VOCs	None	Not Applicable
Metals	Arsenic	MW530-3

No VOCs were detected in groundwater at concentrations exceeding their respective PRGs (EPA 2002a) or MCLs at Site 23.

Petroleum and petroleum-related compounds were detected in two of five monitoring wells.

9.2.2.7 Basewide PAH Study, 2003

The primary objective of the 2003 PAH study was to collect sufficient PAH data to calculate EPCs for the risk assessments at CERCLA sites (Bechtel 2003). The historical PAH data collected at each CERCLA site were used to estimate the mean and standard deviation of BaP concentrations to determine the appropriate number of PAH samples to collect at each site. The

data collected in 2003 replaced all previous PAH samples for use in the risk assessment and site characterization. At Site 23, 61 soil borings were advanced across the site using direct-push sample methods. Samples were collected from each of the following four depth intervals: 0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs. The table below summarizes the chemicals detected at concentrations exceeding the residential PRG (EPA 2002a) and the sampling location with the highest detected concentration for each chemical

Site 23 2003 Basewide PAH Investigation

Analytical Group	Detected Compounds Exceeding 2002 Residential PRG	Location of Highest Concentration
PAH	Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene	C3S023B016

In general, the concentrations of individual PAH compounds were low at Site 23. However, PAH concentrations, expressed as BaP equivalents, in three samples out of 61 exceeded the action level of 0.62 mg/kg (Navy 2001d). PAHs were detected in two samples at concentrations greater than 1 mg/kg. Sampling locations for this investigation are presented on Figure 9-5.

9.2.3 EBS

The EBS was performed to identify the environmental condition of all base property and structures to help transfer the land to the community as quickly as possible. Two phases of EBS were conducted at the Alameda Point.

Phase 1. The first phase of the EBS comprised an examination of aerial photographs and historical records as well as the performance of site inspections and interviews with current and former employees involved in operations. The Phase 1 EBS concluded that many parcels had insufficient information to classify them as transferable; therefore, recommendations for additional investigation were prepared and presented in the zone analysis plans and parcel evaluation plans (ERM-West 1995a, 1995b).

Phase 2A. As recommended by the IAS (E&E 1983), the Phase 2 investigations did not focus on areas already under evaluation. Other Navy land uses or areas that may impact transfer were the subject of the investigations. Site 23 lies within Zone 22 and comprises Parcels 148 and 211 (see Figure 9-3). Samples were collected from Parcels 148 and 211 during the EBS Phase 2A sampling effort. Three soil gas samples and three subsurface soil samples were collected from Parcel 148 in February 1995 as part of the EBS Phase 2A. Soil sampling was conducted at Parcel 211 in January, March, April and May 1995 to investigate the former plane defueling area, the former incinerator, the storm sewer corridor, the sanitary sewer corridor, and the industrial storm sewer corridor as part of the EBS Phase 2A. Tables 9-1and 9-2 list the analyses performed.

Phase 2B. EBS samples were collected from Parcel 211 during the EBS Phase 2B sampling effort. Soil and groundwater samples were collected in the plane defueling area during the EBS Phase 2B to further investigate TPH contamination in that area.

9.2.4 TPH Program

Site 23 was identified as part of CAA 13. In 2000, sampling was conducted during the data gaps investigation at Site 23 in relation to CAA 13 under the TPH program (Tetra Tech 2001e). This investigation identified 12 different data gap types. Site 23 sampling involved collection of data gap types II, III, and IV samples, as discussed below. Figure 9-3 shows the location for each sample.

Five data gaps type III samples were collected to investigate the current TTPH concentrations in groundwater near the storm drains. Two samples were collected from monitoring wells MW530-1 and M10B-01, located near the storm drain and running east and west along the northern end of Site 23. In addition, two data gap type III samples, locations CA13-07 and CA13-08, were collected in the middle of the defueling area to access TPH contamination entering the storm drain connected to Outfall J. One data gap type II sample, location CA13-09, was collected along the storm drain located in the southern portion of Site 23 to assess possible TPH contamination entering the storm drain connected to Outfall P. Because the data gap type III samples collected in association with Outfall J contained elevated concentrations of TPH and TPH-associated compounds, one data gap type II sample was collected from catch basin 5-JF. This sample also contained elevated concentrations of TPH compounds.

One Type IV groundwater sample (CA13-10) was collected to investigate OWS-530 located west of Building 530. The groundwater sample was analyzed for BTEX, MTBE, lead, and TPH-E and TPH-P. TPH-d and TPH-mo were detected in the sample.

A concurrent analysis is being completed to analyze TPH constituents as part of the TPH program and CERCLA chemicals as part of the RI program. In locations where TPH and CERCLA chemicals are commingled, the commingled area is addressed as part of the CERCLA program. Any residual TPH contamination remaining after remediation of the CERCLA chemicals will be addressed under the TPH program.

As stated in Section 9.1.3, the TPH contamination associated with the plane defueling area is not commingled and is further addressed under the TPH screening strategy in Appendix F.

9.2.5 Removal Actions

As part of a corrective action for free TPH product in groundwater located at CAA 13 (see Appendix F), 22 extraction wells of the DVE system, covering a treatment area of 40 feet by 400 feet, were installed along the western edge of Building 530. Thirty piezometers were installed within the treatment area for monitoring of the plume. A biosparging system was installed in the same area as the DVE system; however, the DVE system was determined to be more efficient in

removing petroleum at Site 23. Additional extraction wells and piezometers have been installed as needed. Since early 2004, both the DVE and biosparge systems have operated at Site 23.

As of October 31, 2004, the DVE system had removed 56,500 pounds of TPH. Periodic operations and maintenance sampling activity show that the concentrations of TPH in groundwater are steadily decreasing.

9.2.6 Treatability Studies

DVE is the only treatability study conducted at Site 23 to determine the viability of this technology for cleanup and assessment of the plane defueling area at Site 23. A DVE pilot test was conducted in 2001 to demonstrate the capability of the DVE system to recover free product from the groundwater surface and to capture hydrocarbon vapors from soil. The pilot test indicated that the DVE system was successfully removing hydrocarbon contaminants from soil; therefore, in June 2002, the pilot scale system was converted into a full-scale DVE system using equipment previously installed along the western edge of Building 530.

9.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 9.2, the Navy completed an initial data evaluation for Site 23. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, (3) and a background comparison. The complete background comparison is provided in Appendix A.

9.3.1 Site 23 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 23 and identification of remaining data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 23 is described below and presented on Figure 9-6.

Through environmental investigations and literature searches for Site 23, physical features and activities at Site 23 that might have generated hazardous waste or released chemicals to the environment were identified. The following Site 23 physical features and activities were identified as potential sources of contamination:

- Building 530 (missile rework operations): Operations included missile rework operations, overhauling aviation components, electrical maintenance, cleaning, grinding, welding, painting, paint stripping, drum storage, and parts fabrication;

chemicals used included lead-based paint, hydraulic fluid, silver solder, ethylene glycol, lead, zinc, silver, tin, chromium, nickel, mercury, TCE, and petroleum; currently leased as a repair shop for commercial flight instruments.

- NADEP GAPs 63, 63A, and 64: Located within Building 530; missile rework and paint stripping wastes and bath liquids were placed in various size drums and transferred to Yard D-13 for eventual off-site facility disposal or recycling.

- Building 529: Located at the southern end of Building 530 and supplied auxiliary power; observed nine 55-gallon drums containing petroleum products and miscellaneous chemicals and several oil-like stains during EBS; potential source of petroleum products.

- Plane defueling area and associated OWSs 529 and 530, ASTs 530A, 530B, and 530C, and former Building 460A: Located west of Building 530; ASTs had capacities of 10,000 gallons, 10,000 gallons, and 15,000 gallons and stored 1010 oil, fuel or oil, and jet fuel; potential source of petroleum products (see Appendix G); ongoing remediation of the petroleum hydrocarbons.

- Structure 561: Electrical substation 11 (transformer pad); potential source of PCBs.

- Open space: Uses include a material and equipment storage yard, a defueling facility, aircraft parking, and vehicle parking; PCB oil was used for weed control; potential source of PCBs.

- Oil refinery operations and disposal practices: Former location of the Pacific Coast Oil Works Company Refinery; used an acid-sludge process for refining fresh crude oil; potential source of crude oil, kerosene, lubricating and fuel oils, heavier-end hydrocarbons, including black TRW.

- Placement of dredged fill material used to build the island: Potential source of PAHs.

Former storage areas, Structure 586, former Buildings 606, 352, 460A, and the Navy exchange mini-storage area were not considered potential sources. The former storage areas related to the material and equipment storage yard were used only to store vehicles and large boxes. Structure 586 is a sewage lift station. Former Building 606 served as an administration building. Former Building 352 was used to store packaged explosives to support naval operations, and there are no documented spills or releases associated within the building. Building 460A was built on the east side of the plane defueling area; it housed the control equipment for the defueling facility. The Navy exchange mini-storage area is located in the far northwestern corner of Site 23 and consists of Buildings MS-11 through MS-19.

Because several oil-like stains were observed at Building 529 during the EBS, samples were collected in the vicinity of this building. Petroleum hydrocarbons were detected in soil and groundwater.

Structure 561, electrical substation 11 (transformer pad), was investigated along with other transformers in 2002 (ITSI 2002). Further action was not recommended for this transformer pad.

NADEP GAPs 63, 63A, and 64 were located within Building 530 on the concrete floor. A letter from DTSC dated November 4, 1999 recommended NFA for the GAPs (DTSC 1999a). Appendix G, the SWMU Evaluation Report, discusses the GAPs in more detail.

Of these potential sources, (1) the defueling area and associated OWSs 529 and 530 and ASTs 530A, 530B, and 530C and (2) the former oil refinery activities were identified as likely sources of contaminants in soil and groundwater at Site 23. The following exposure pathways and primary and secondary release mechanisms were identified:0

- Direct release of petroleum products from spills around OWSs 529 and 530 to soil and groundwater.
- Direct release of petroleum products from spills around ASTs 530A, 530B, and 530C to soil and groundwater from spills around ASTs 324 through 328.
- Direct release of petroleum products acids (such as sulphuric acid), PAHs, and possibly metals associated with oil refinery activities to soil.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration uptake.
- Secondary release from groundwater to air through volatilization.
- Secondary release from groundwater into domestic use through a well.

As shown in the CSM for Site 23 (see Figure 9-6), residential, commercial/industrial, and construction worker receptors were identified as potential human receptors, and exposure scenarios including ingestion of homegrown produce and ingestion, inhalation, and dermal contact with soil and groundwater are evaluated in the HHRA (see Appendix H). Exposure of potential ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ERA (see Appendix I).

Exposure of potential ecological receptors to groundwater from migration to surface water was considered an incomplete pathway. Tidal influence studies indicated that only two wells in the

FWBZ (MW530-1 and M10B-01) and one well in the SWBZ (D10B-01) at Site 23 are tidally influenced (Tetra Tech 1997a). The wells in the FWBZ are located near the storm sewer main lines and exfiltration of water could be the cause of tidal influence at these wells. Groundwater contamination has not migrated to the San Francisco Bay (including the Seaplane Lagoon), and the storm sewer system at Site 23 was not considered a preferential pathway for contaminant migration. In addition, samples collected from the storm drain bedding downstream at Site 23 did not contain VOCs at concentrations exceeding detection limits, indicating that the bedding is not serving as a migration pathway.

Site 23 is approximately 1,100 feet east of the Seaplane Lagoon, and the storm sewer lines that cross the site were identified as requiring repair in two segments. No petroleum-impacted water was detected in catch basin 5JF. The storm sewers downstream from Site 23 (in Site 9) were surveyed and found to contain VOCs at concentrations at least 2 orders of magnitude below the ecological risk values (Tetra Tech 2002a); those VOCs were not the same compounds that were detected at Site 23. Storm sewer main line (sewer line J) extends through the northern portion of Site 23. Three additional lateral lines (originating at 6J-b, 6J-C and 6J-G) flow into the main line from the eastern portion of Site 23. The line from 6J-B to the main line was replaced with new PVC piping in 1991. The line from 6J-C to the main line was cleaned in 1997, but has been identified as a high priority for repair. Additional line cleaning was conducted in 2003. The line from 6J-G to the mainline was cleaned in 1997 and was noted to be in good condition. The area where refinery waste is present intersects portions of this line. Data collected from storm drain manhole 3J (downstream on Site 9) indicate that very low concentrations of VOCs are present in storm water.

9.3.2 Site 23 Data Quality Assessment

As discussed in Section 9.2, several environmental investigations were conducted at Site 23 as a part of the CERCLA program and EBS to identify and assess the extent of contamination in soil and groundwater and to determine risk. Data were collected over a period of approximately 13 years from 1990 through 2003 using a biased and phased sampling approach. Sampling focused on the following:

- Groundwater suspected to be impacted by oil refinery operations
- Soil and groundwater in the vicinity of Buildings 530 and the plane defueling area
- SVOCs, VOCs, and metals in soil, and VOCs, SVOCs, TPH, and metals in groundwater
- Industrial, sanitary, and storm sewers
- Fill material and native sediments to assess the presence of PAHs

These data, through an iterative process, were used to construct and refine the site-specific CSM presented in Section 9.3.1 and to identify and fill data gaps until the quantity and quality of the

data at Site 23 were judged to be sufficient to complete the RI report, as determined by applying the DQOs presented in Section 3.4.

Detection limits for some of the data used to evaluate Site 23 are elevated over residential PRGs (EPA 2002a); these elevated detection limits are the consequence of one or more of the following circumstances: (1) the evolution of lower detection limits as technology improves, (2) the revision of PRGs over time (which are not always technologically feasible), (3) and matrix interference. The first two of these circumstances generally do not result in significantly elevated detection limits. However, matrix interferences sometimes cause significant elevations in the detection limits for a chemical contaminant, which leads to uncertainty as to whether that undetected compound could be present in significant concentrations at a site. Although some detection limits (SQL) were elevated above 2002 residential PRGs, detection limits for nondetected chemicals were typically sufficiently low to permit identification of potential health risks. However, because detection limits for some nondetected VOCs in groundwater were elevated, further sampling and analysis of groundwater may be needed to confirm that VOCs are not present in groundwater at Site 23. Because detection limits were elevated in both soil and groundwater for some nondetected SVOCs, further sampling and analysis of soil and groundwater for SVOCs may be needed to confirm SVOCs are not present in soil or groundwater at Site 23. Additionally, sampling and analyses of soil for PCBs is recommended to confirm PCBs are not present in soil at levels that would pose risk. PCB oil was used for weed control in the mini-storage area until 1963; however, soil samples were not collected within the vicinity of the mini-storage area and analyzed for PCBs.

Although soil and groundwater data gaps were identified, it was determined that the types and numbers of samples collected at Site 23 (see Figures 9-7A through 9-7L) and the analyses conducted (see Tables 9-11 and 9-12) were sufficient to characterize the site and to conduct risk assessments because data collection at the site focused mainly on potential sources and was conducted in phases. This phased approach afforded stakeholders opportunities to provide feedback on the suitability or adequacy of the collected data and the need to collect additional data to identify releases and complete the RI report. It is unlikely that the RI would recommend NFA if the site poses a potential significant risk to human health or the environment.

Both definitive and screening-level data were generated. Screening data were considered appropriate for use only in evaluations of nature and extent and fate and transport of chemicals. Section 3.4.2 provides further detail on the assessment of data quality and the use of definitive and screening-level data.

Data generated during the environmental investigations that were considered to be of sufficient quality for use in the RI report are presented in Appendix E and in the subsections below. Tables 9-11 and 9-12 summarize results of the CERCLA and EBS investigations for soil and groundwater. Soil gas results are presented in Appendix E. The summaries are organized according to analytical group and include the following: (1) the number and percent of detections of chemicals; (2) the average, minimum, and maximum detected concentrations; (3) minimum and maximum detection limits for nondetected samples; and (4) whether the maximum detected concentrations or detection limits exceed Region 9 residential PRGs or Cal-

modified PRGs (EPA 2002a). Cal-modified PRGs are used for some chemicals if the California EPA PRG is more protective than the federal EPA value. PRGs and MCLs are provided in the tables for comparison only

9.3.2.1 Soil

At Site 23, soil samples collected under the environmental investigations were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals as well as selected organic metals, TPH, pH, dioxins, TOC, and percent moisture (see Table 9-11). Of the samples collected and analyzed, 1 sample for dioxins, 84 samples for VOCs, 100 samples for SVOCs, 240 samples from the additional PAH sampling conducted in 2003, 50 samples for pesticides and PCBs, and 85 samples for metals were considered acceptable for use in this RI report. PAH data for soil samples collected during previous investigations were not evaluated because of the high detection limits associated with these data. Laboratory detection limits for some other chemicals exceeded residential PRGs (EPA 2002a) and are noted in Table 9-11. Detection limits for a few of the nondetected VOCs in soil were also elevated above residential PRGs (EPA 2002a); however, most of the nondetected samples had detection limits below residential PRGs. Detection limits for some of the nondetected SVOCs in soil were also elevated above residential PRGs (EPA 2002a). Samples that were nondetected for arsenic and thallium in soil were also elevated above residential PRGs (EPA 2002a). However, Site 23 was not identified as a source of arsenic or thallium and concentrations detected in soil at Site 23 are similar to concentrations detected in background soil. Detection limits for VOCs and SVOCs were sufficiently low to permit identification of potential health risks except for the SVOCs 2-nitroaniline, bis(2-chloroethyl)ether, hexachlorobenzene, and n-nitroso-di-n-propylamine, which had more than 50 percent of the detection limits above PRGs in soil.

A subset of the soil data was selected for use in the risk assessments (see table below). Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Only data collected under the IRP with the objective of characterizing CERCLA activities were used. Data were collected for screening purposes as part of the EBS, and inclusion of these data could add more uncertainty to the risk assessments. Risk from TPH was assessed separately (see Appendix F). Data for soils that are no longer present at Site 23 due to removal actions were not included because they do not reflect the current conditions at the site. Soil samples collected from petroleum-saturated soil were not included in the risk assessment; therefore the risk presented is underestimated. Petroleum-saturated soil was encountered in the area of the plane defueling area, and active remediation was ongoing during the groundwater monitoring events. Considering that active remediation of petroleum contamination is ongoing, the level of uncertainty would be much greater if the petroleum-saturated soil or free product on groundwater were included in the risk assessment. Risk from TPH was assessed separately (see Appendix F).

Soil data for each site were aggregated in depth intervals of 0 to 2, 0 to 4, and 0 to 8 feet bgs. The depth intervals evaluate potential exposures associated with site use. The 0- to 2-foot and 0- to 8-foot bgs depth intervals were used to evaluate potential human health exposures, and the 0- to 4-foot bgs depth interval was used to evaluate potential ecological exposures. The table

below summarizes the total number of samples for each analytical group included in the data set for each risk assessment and depth interval.

Number of Suitable Soil Data for Site 23 Risk Assessments

Analytical Group	(0 to 2 feet bgs)	(0 to 4 feet bgs)	(0 to 8 feet bgs)
VOCs	5	23	40
SVOCs	19	36	52
PAHs	120	180	240
Pesticides and PCBs	10	17	22
Metals	17	31	45

Dioxins in soil were not evaluated in the risk assessments because only one EBS sample was analyzed for dioxins. This EBS sample was collected for screening purposes, and the need for additional sampling for dioxins was not identified. Therefore, the lack of dioxin data was not perceived as a data gap.

The minimal data for VOCs in soil from 0 to 2 feet bgs is not perceived as a data gap because Site 23 is predominantly paved, and VOCs in surface soil would likely volatilize and no longer be present in soil at the site. Data for 2 to 8 feet bgs are sufficient to assess the nature and extent and risk from VOCs at Site 23.

9.3.2.2 Groundwater

Groundwater samples collected at Site 23 were analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, and metals (see Table 9-12) as well as physical parameters (hardness, acidity, pH, anions, specific conductance, and TDS, dissolved gases, sulphides, BOD and COD). Of the samples collected and analyzed, 107 samples for VOCs, 75 samples for SVOCs, 6 samples for pesticides and PCBs, and 76 samples for metals were considered acceptable for use in this RI report. Laboratory detection limits for some chemicals in groundwater exceeded residential PRGs (EPA 2002a) as shown in Table 9-12. Some VOCs detected in groundwater at a low frequency or nondetected had detection limits significantly elevated over tap water PRGs (EPA 2002a) and MCLs. Detection limits for some of the nondetected SVOCs and arsenic and thallium concentrations detected at a low frequency in groundwater were also elevated, and detection limits for nondetected samples were elevated in over 50 percent of the samples. Concentrations of arsenic and thallium detected in groundwater at Site 23 are similar to concentrations detected in ambient groundwater. Detection limits for some of the nondetected PAHs and pesticides and PCBs in groundwater had detection limits elevated over tap water PRGs (EPA 2002a); however, they were not significantly elevated and are due to the revision of PRGs over time and detection limits that are not always technologically feasible. Detection limits for PAHs were equivalent to MCLs.

A subset of the groundwater data was selected for use in the risk assessments, as shown in the table below. Data were considered to be appropriate for use if they (1) were validated, (2) could be used to characterize CERCLA releases, and (3) reflected current site conditions. Groundwater data were aggregated by contaminant plume rather than site. Groundwater data later replaced with more current data were not included because they do not reflect the current conditions at Site 23. Only data collected under the IRP to characterize CERCLA activities were used. Data collected as part of the EBS were not used to evaluate risk because they were collected with DQOs that differ from the CERCLA investigations. At least four quarters of groundwater data from monitoring wells were used. However, if data were lacking for an analytical group, older data were included for all analytical groups. Groundwater data included samples collected from August 1990 to April 2003. Field data and screening-level data typically were not used; however, direct-push groundwater data were used because of a lack of monitoring well data in the concentrated plume areas. Trend analyses of historic data were completed to ensure the appropriate data set accurately characterizes the plume. Groundwater samples collected from floating product areas were not included in the risk assessments. Floating product encountered in the west of Building 530 was associated with historical plane defueling activities. The table below summarizes the total number of samples for each analytical group, the data suitable for analysis in the RI report, and data used in the risk assessments.

Number of Suitable Groundwater Data for Site 23

Analytical Group	Suitable for RI Report	Used in Risk Assessment
VOCs	107	41
SVOCs	75	20
Pesticides/PCBs	6	1
Metals	76	26

Although six samples were analyzed for pesticides and PCBs, they were not included in the risk assessments because the results were nondetected. The limited PCB and pesticide data were not perceived as a data gap because pesticide and PCB use (weed control) would not be expected to impact groundwater and no other pesticide and PCB related-activities were identified at Site 23.

Most of the VOC, SVOC, and metals data were excluded from the risk assessments because they were not reflective of current site conditions.

9.3.2.3 Soil Gas

Soil gas data were collected to evaluate indoor air risk in the HHRA (see Appendix H). At Site 23, two soil gas samples were collected at depths of 1.5 and 4 feet bgs. The samples were collected from within the TPH plume, near the high concentrations of VOCs, to the northwest of Building 530. The samples were analyzed for VOCs and SVOCs. Detection limits for many of the nondetected VOCs exceeded ambient air PRGs; however, SQLs were not set to meet the PRGs.

9.3.3 Site 23 Background Comparison

A background comparison was conducted for Site 23 by comparing a background data set with analytical results for metals in samples representative of Site 23. This comparison was used to determine which metals in soil and groundwater are statistically similar to background and could be considered to be either naturally occurring (background) or potentially resulting from historical site activities. The complete approach is presented in Appendix A and summarized previously in Section 3.4.3.

Antimony, copper, and lead concentrations exceed background in soil at Site 23.

Aluminum, chromium, iron, manganese, selenium, vanadium, and zinc concentrations exceed background in groundwater at Site 23.

9.4 NATURE AND EXTENT OF CHEMICALS IN SOIL AND GROUNDWATER

The evaluation of the nature and extent comprises the following components: (1) a presentation of TPH detected at Site 23, (2) a presentation of the types and concentrations of CERCLA chemicals believed to have been used at Site 23, and (3) detailed descriptions of the CERCLA chemicals that demonstrate significant risk to human health or the environment (risk drivers). Only chemicals that pose risk to human health or the environment (see Appendices H and I) or relate to past site activity are discussed in this section. Section 9.4.2, Chemicals Believed to be Used at Site 23, provides additional information about the nature and extent of chemicals used at the site other than the risk drivers. This additional evaluation assisted the Navy in determining whether hot spots of contamination were present at Site 23. Risk drivers are defined as chemicals that pose a cancer risk above 1E-06 or an HI above 1.0. The evaluation of risk drivers primarily includes (1) site-specific figures to assess the spatial distribution and concentration patterns of the chemicals and (2) a review of the figures, data, and site hydrology to identify the boundaries of the contamination, the volume of the affected media, and, if possible, the suspected source of these chemicals.

9.4.1 TPH

Even though TPH is not a CERCLA contaminant, soil and groundwater were sampled at various locations across Site 23 for TTPH, which includes all TPH-fractions (TPH-d, -g, -jet fuel, or -mo) and TPH-associated constituents (BTEX, lead, and MTBE) (see Figures 9-8 and 9-9).

Site 23 was considered significantly impacted by TPH, and corrective action for free TPH product in soil and groundwater was conducted using DVE and biosparging. The system extracts groundwater at rate of approximately 12 gallons per minute and vapor at approximately 350 cubic feet per second. In addition, oxygen-enriched sparge air is being injected at Site 23 to enhance bioremediation. As of November 2003, approximately 55,000 pounds of TPH had been extracted by the DVE system. The mass of hydrocarbons destroyed through biosparging is

unknown. Further action is recommended for TTPH and TPH-associated constituent concentrations present in soil and groundwater at Site 23.

The following potential sources of TPH contamination were identified at Site 23:

- ASTs 530A, 530B, and 530C, which are located in the plane defueling area
- OWSs 529 and 530, which are located in the plane defueling area
- Plane defueling area
- Former Building 460A, which housed the control equipment for the defueling facility
- Building 600, where several 55-gallon drums containing lubricating oil were stored
- Building 529, which supplied auxiliary power to Building 530 and in which nine 55-gallon drums containing petroleum products were stored
- Refinery wastes from Site 13 that were likely deposited in surrounding areas, including Site 23
- Building 530, as a result of lead and petroleum usage
- NADEP GAPs 63, 63A, and 64, which are located in Building 530

A TPH plume exists at Site 23 on the west side of Building 530 in the plane defueling area (see Figure 9-10). The plume is approximately 600 feet from north to south and 200 feet east to west and is confined to the FWBZ. The plume includes floating petroleum.

Nine soil samples, ranging in depth from 1 to 5.5 feet bgs, collected from sampling locations 211-001-008, 211-SS-001, 211-SS-003, 211-SS-004, 530-1-MOJ, 530-3-MOJ, 530-15-MOJ, 530-22-MOJ, and 530-25-MOJ exhibited TTPH concentrations ranging from 14,700 to 72,000 mg/kg, which exceed the floating product screening level of 14,000 mg/kg.

Groundwater samples collected at nine sampling locations, 530-3-MOJ through 530-5-MOJ, 530-12-MOJ, 530-15-MOJ, 530-25-MOJ, 530-MJ-MW-1, 530-MJ-MW-2, and CA13-08, exhibited TTPH concentrations ranging from 23,800, which exceeds the floating product screening level of 20,000 µg/L, to pure product.

Maximum detected concentrations for benzene in groundwater ranged from 1 to 180 µg/L. Xylene was detected in groundwater designated as a potential drinking water source at location 530-MJ-MW-2 at a concentration of 11,000µg/L. Lead was detected in groundwater samples from locations DHP-S10B-03, MW410-4, MW530-1, MW530-2, and MWOR-5 at concentrations ranging from 55 to 360 µg/L. Sampling locations and the TPH plume, based on groundwater monitoring data, are depicted on Figure 9-9.

Elevated concentrations of TPH-fractions in soil indicate a potential risk to human health for residential reuse. The TTPH concentration exceeded the floating product screening level of 14,000 mg/kg in soil and 20,000 µg/L in groundwater, indicating a continuing source of groundwater contamination.

9.4.2 Chemicals Used at Site 23

This section focuses on chemicals detected in soil and groundwater that were used historically at Site 23. Chemicals that most likely were used at Site 23 and their breakdown products include petroleum products, lead-based paint, hydraulic fluid, silver solder, ethylene glycol, lead, zinc, silver, tin, chromium, nickel, mercury, TCE, and PCBs. Most of the chemicals detected across Site 23 are consistent with the historical activities known to occur at the site, which included plane defueling and storage of petroleum products and the former oil refinery. Operations in Building 530 included overhauling aviation components, electrical maintenance, cleaning, grinding, welding, painting, paint stripping, drum storage, and parts fabrication. Petroleum was handled and stored in the plane defueling area immediately to the west of Building 530. The concentrations of these chemicals and a general description of their extent are presented below by medium. Statistical summaries of all soil, groundwater, and soil gas results are presented in Tables 9-11 through 9-12.

Soil

The table below lists the chemicals that most likely were used at Site 13 (or their breakdown components), the residential PRG (EPA 2002a), the range of concentrations detected in soil at the site, and the sampling locations where the maximum concentration of each chemical was detected. It also lists chemicals not detected in soil but detected in groundwater at Site 13. Figure 9-3 shows the sampling locations.

Soil Analytical Results for Chemicals Used at Site 23

Chemical	Residential PRG (mg/kg)	Range of Concentrations (mg/kg)	Sampling Location of Maximum Concentration
Aroclor-1260	0.22	0.038	S16-70
PAHs (represented as BaP equivalent)	0.062	0.001 to 2.979	C3S023B016
TCE	0.053	Not detected	Not applicable
Benzene	0.6	0.001 to 0.59	211-SS-002
Ethylbenzene	8.9	0.036 to 16.0	211-SS-003
Toluene	520	0.001 to 16.0	530-2-MOJ
Xylene (total)	270	0.003 to 12.0	MW530-1
Lead	150*	1.3 to 120	BOR-26
Zinc	23,000	10 to 130	MW530-3
Silver	390	0.38	B410-06

Soil Analytical Results for Chemicals Used at Site 23			
Chemical	**Residential PRG (mg/kg)**	**Range of Concentrations (mg/kg)**	**Sampling Location of Maximum Concentration**
Chromium	210	7.3 to 89	BOR-22
Nickel	1,600	4.7 to 91	BOR-22
Mercury	6.1	Not detected	Not applicable
Tin (dibutyl, monobutyl, and tetrabutyl)	47,000	Not detected	Not applicable

Notes: Residential PRG is provided for reference only. Risks are quantified in Section 9.6 of this RI report.

* Denote modified California PRG

Previous site activities associated with plane defueling and the operation of the former refinery were identified as a source of TPH in soil. Elevated concentrations of CERCLA contaminants were not identified in soil at Site 23. Concentrations of chromium, lead, mercury, nickel, silver, and zinc were all detected below their respective PRGs (EPA 2002a)) and are present at concentrations considered to be background. Aroclor-1260 was detected in one soil sample (location S16-70) at a concentration below the residential PRG (EPA 2002a). Location S16-70 is near the southern border of the site (near site 16) and adjacent to a storm sewer line that runs from Site 23 to Site 16. No other PCBs were detected in soil at Site 23. TCE was not detected.

PAHs may be attributed to the presence of petroleum contamination. PAHs, expressed as BaP equivalents, for soil are above the action level of 0.62 mg/kg (Navy 2001d) in three samples. Two samples were collected at the same sampling location, C3A023B016, which is located in the plane defueling area near a TPH plume. BaP equivalent concentrations are 2.979 mg/kg for soil collected from a depth of 0.5 to 2 feet bgs and 2.553 mg/kg from a depth of 4 to 8 feet bgs. The third sample was collected from location C3A023B026 in the northeastern corner of Site 23 at a depth of 4 to 8 feet bgs and is likely associated with TRW.

TRW is present in soil in the southeastern corner of Site 13 and likely extends onto Site 23. Black material was noted in the boring log for sampling location C3A023B026 at 2 feet bgs. Data are limited, and it can not be determined whether the material is moving in soil. Based on the data collected at Site 13, TRW may move to the surface through preferential pathways, and the material moves to the surface along preferential flow paths between the original soil of the former shoreline and the fill material. Even though this flow path exists, the material has not been observed coming to the surface at Site 23.

TRW does not appear to be easily mobilized in groundwater unless unusual conditions are present such as low pH environments or the presence of jet fuel-, diesel fuel-, or gasoline-range organic compounds. Low pH environments may cause lead in TRW to dissolve in groundwater and become mobile. Commingling of TRW with jet fuel, diesel fuel, or gasoline will cause the TRW to dissolve and become mobile in groundwater. Based on data collected at Site 13 just north of where the black material was identified at Site 23, TRW at Site 23 is not commingled with free product petroleum hydrocarbons; therefore, it is not likely mobilizing in groundwater.

Groundwater

The table below lists the chemicals believed to be used at Site 23, the tap water PRGs (EPA 2002a), the range of concentrations detected in groundwater at the site, and the sampling location of the maximum concentration detected (see Figure 9-3 for sampling locations).

Groundwater Analytical Results for Chemicals used at Site 23

Chemical	Tap Water PRG (µg/L)	Range of Concentrations (µg/L)	Sampling Location of Maximum Concentration
TCE	0.028	2	MW410-4
Benzene	0.34	0.2 to 67	211-002-11
Ethylbenzene	2.9	1.6 to 79	MW530-1
Toluene	720	0.9 to 11	211-0002-11
Xylene (total)	210	4.4 to 660	530-MJ-MW-1
Sec-butylbenzene	240	0.2 to 1,000	530-MJ-MW-1
1,2,4-Trimethylbenzene	12	4.1 to 860	530-MJ-MW-1
BaP	0.0092	0.6	SHP-S10B-05
Benzo(b)fluoranthene	0.092	0.8	SHP-S10B-05
Naphthalene	6.2	21 to 1,100	530-MJ-MW-1
Lead	NA	0.029 to 360	D10B-01
Zinc	11,000	1.7 to 7,340	DHP-S10B-01
Silver	180	0.019 to 18	MW530-1
Tin	22,000	Not analyzed	Not Applicable
Chromium	55,000	0.16 to 650	MWOR-5
Nickel	730	0.42 to 11,400	DHP-S10B-01
Mercury	3.6	0.12 to 1.7	M10B-01

Notes: Residential PRG is provided for reference only. Risks are quantified in Section 9.6 of this RI report.

* Denotes modified California PRG

Plane defueling activities and Site 13 were identified as potential sources of contaminants to groundwater at Site 23 in the form of petroleum contamination and associated chemicals such as BTEX, naphthalene, trimethylbenzenes, and lead. In general, groundwater in the western portion of Site 23 is impacted with these chemicals.

The maximum concentrations of benzene, xylene, sec-butylbenzene, naphthalene, and 1,2,4-trimethylbenzene were detected in a sample from location 530-MJ-MW-1, which is within the petroleum plume associated with the plane defueling area (see Figure 9-10). Benzene was historically detected in groundwater at concentrations exceeding the PRG of 0.34 µg/L (EPA 2002a) (see Figure 9-3). Naphthalene, a petroleum hydrocarbon commonly associated with petroleum fuels such as jet fuel, was detected at a maximum concentration of 2,900 µg/L in a sample from location 530-MJ-MW-1. The compound 1,2,4-trimethylbenzene was detected in

2 of 22 groundwater samples from wells 530-MJ-MW-1 and MW530. It was detected in monitoring well 530-MJ-MW-1 at a concentrations of 860 µg/L, which exceeds the tap water PRG (EPA 2002a).

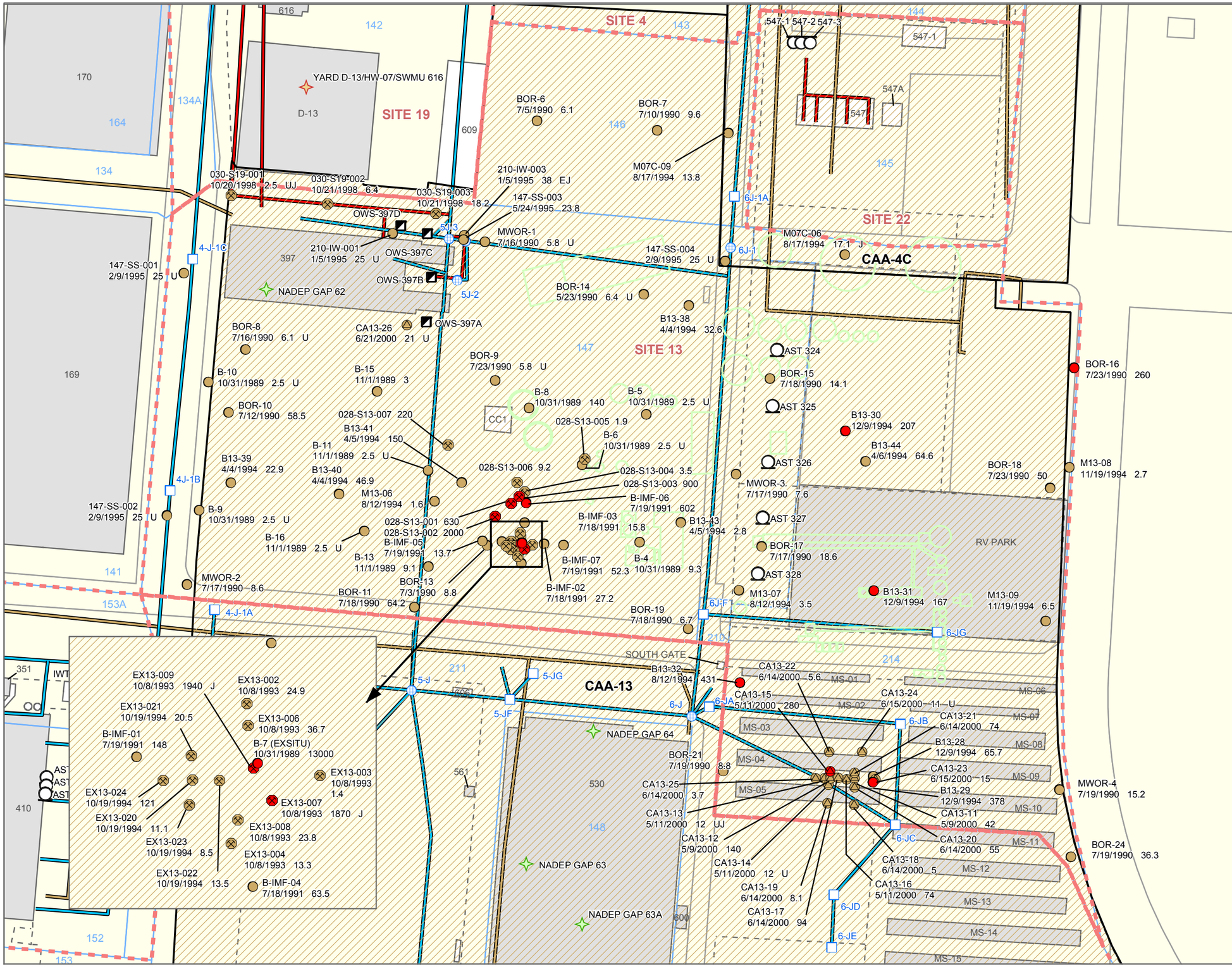
From 1990 to present, benzene, xylene, ethylbenzene, and 1,2,4-trimethylbenzene also were detected in groundwater samples from well MW530-1 (located northeast of Building 530). The compound 1,2,4-trimethylbenzene was detected at a concentration of 4.1 µg/L in a sample from monitoring well MW530-1, located northeast of Building 530. Benzene was historically detected in groundwater at concentrations exceeding the PRG of 0.34 µg/L (EPA 2002a) in samples from monitoring well MW530-1 (see Figure 9-3). The highest concentrations (79 µg/L in 1990 and 3 µg/L in 2001) of ethylbenzene was detected in samples from well MW530-1. Benzene and ethylbenzene are the only chemicals that exceeded PRGs at well MW530-1. However, the concentrations of benzene and ethylbenzene appear to be decreasing over time, meaning the compounds in the plume are degrading. Based on the decreasing concentrations of benzene and ethylbenzene in the area around well MW530-1, it is expected that benzene, ethylbenzene, and other associated petroleum products will naturally attenuate to nondetect levels.

It is likely that petroleum contamination in the northeast corner of Site 23 is associated with the petroleum plume at Site 13. Figure 6-14 in Section 6.0 shows the core of the benzene plume is approximately between Buildings MS-04 and MS-05. It is possible that the nearby storm sewer line, which is damaged (see Figure 9-4), serves as a conduit for migration of benzene and other petroleum compounds to well MW530-1. In addition, the groundwater flow direction at Site 13 in the area of the petroleum plume is west and southwest. This places well MW530-1 within the area of plume migration. Based on this information, the petroleum contamination located at MW530-1 is attributable to plume migration from Site 13. Concentrations of benzene in this well have decreased to below detection limits.

TCE was detected at Site 23 in samples from only one sampling location, and multiple subsequent sampling events documented the absence of TCE in groundwater at Site 23. In 1994, TCE was detected in one groundwater sample from well MW410-4 at 2 µg/L, which exceeds the tap water PRG (EPA 2002a). Since that time, this well has been sampled and analyzed for TCE a total of eight times, and TCE has not been detected again. Site 23 TCE analytical results are presented in Table 9-12.

9.4.3 Risk Drivers

Although numerous chemicals were detected at Site 23, most of these chemicals do not pose significant risk as defined by the risk assessments; therefore, this section further characterizes the nature and extent of CERCLA chemicals driving risk at Site 23. Selection of these chemicals was based on the background comparison for metals and results of the HHRA and ERA (see Appendices H and I, respectively). Based on the HHRA, arsenic, BaP, and dibenzo(a,h)anthracene were identified as risk drivers in soil and arsenic, 1,2,4-trimethylbenzene, BaP, ethylbenzene, naphthalene, sec-butylbenzene, and thallium were identified as risk drivers in groundwater. Cadmium in soil was determined to pose risk to



SAMPLE LOCATION
(RED = EXCEEDS CALIFORNIA MODIFIED PRELIMINARY REMEDIATION GOAL FOR LEAD IN RESIDENTIAL SOIL)

- Direct-Push
- Excavation
- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), REMOVED
- GENERATOR ACCUMULATION POINT (GAP)
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- CATCH BASIN
- MANHOLE
- FORMER OIL-WATER SEPARATOR (OWS)
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant
NADEP = Naval Aviation Depot Alameda
J = Estimated
ND = Non-detect
U = Not detected

Concentrations presented are in milligrams per kilogram and are the highest concentration detected in soil samples from a single point.

60 0 60 120 Feet

N

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 6-14
SITE 13
LEAD IN SOIL

Operable Unit 2A
Remedial Investigation Report

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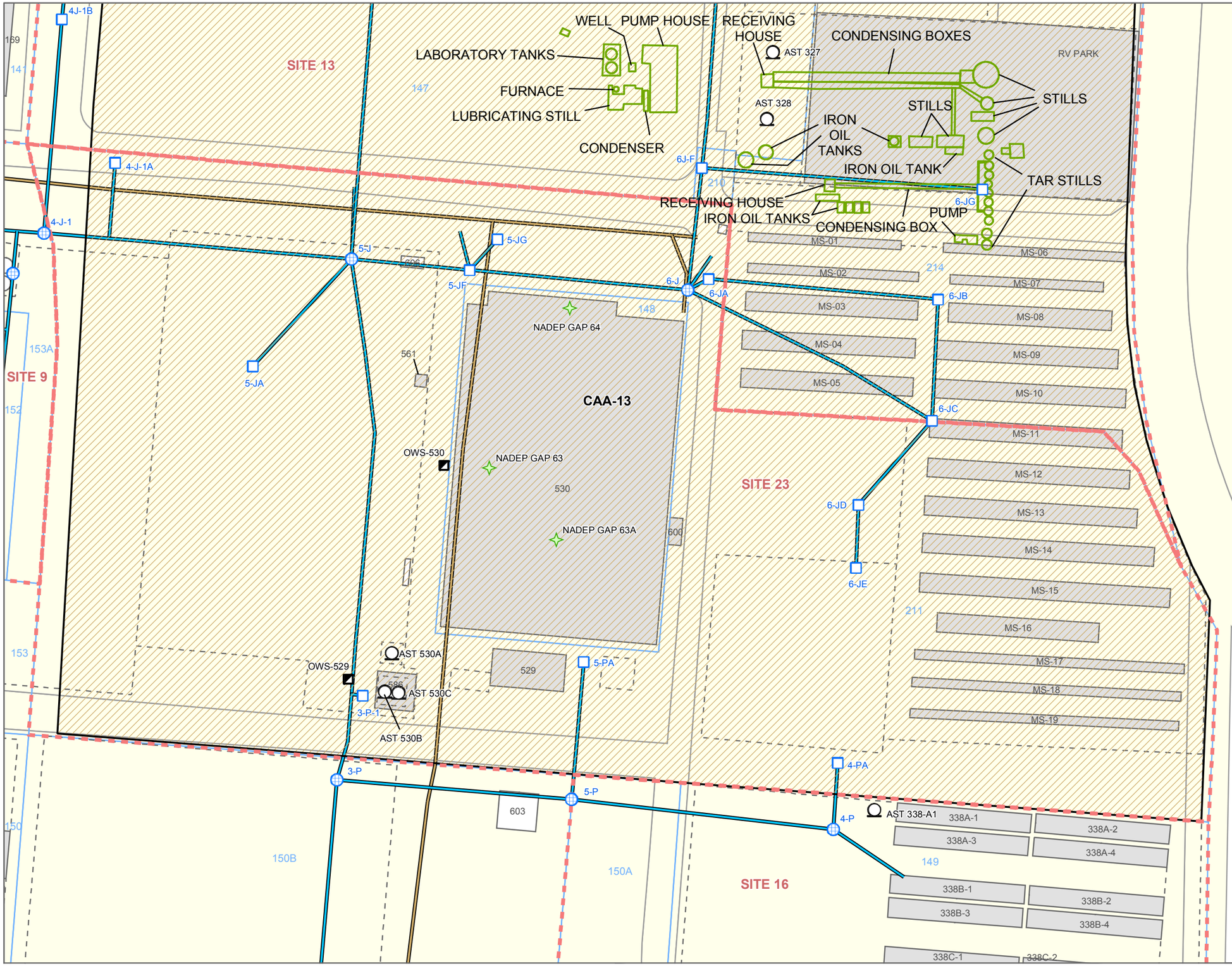


ABOVEGROUND STORAGE TANK (AST), REMOVED

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

GENERATOR ACCUMULATION POINT (GAP)

FENCE

SANITARY SEWER LINE

STORM SEWER LINE

CORRECTIVE ACTION AREA (CAA)

FORMER OIL REFINERY

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

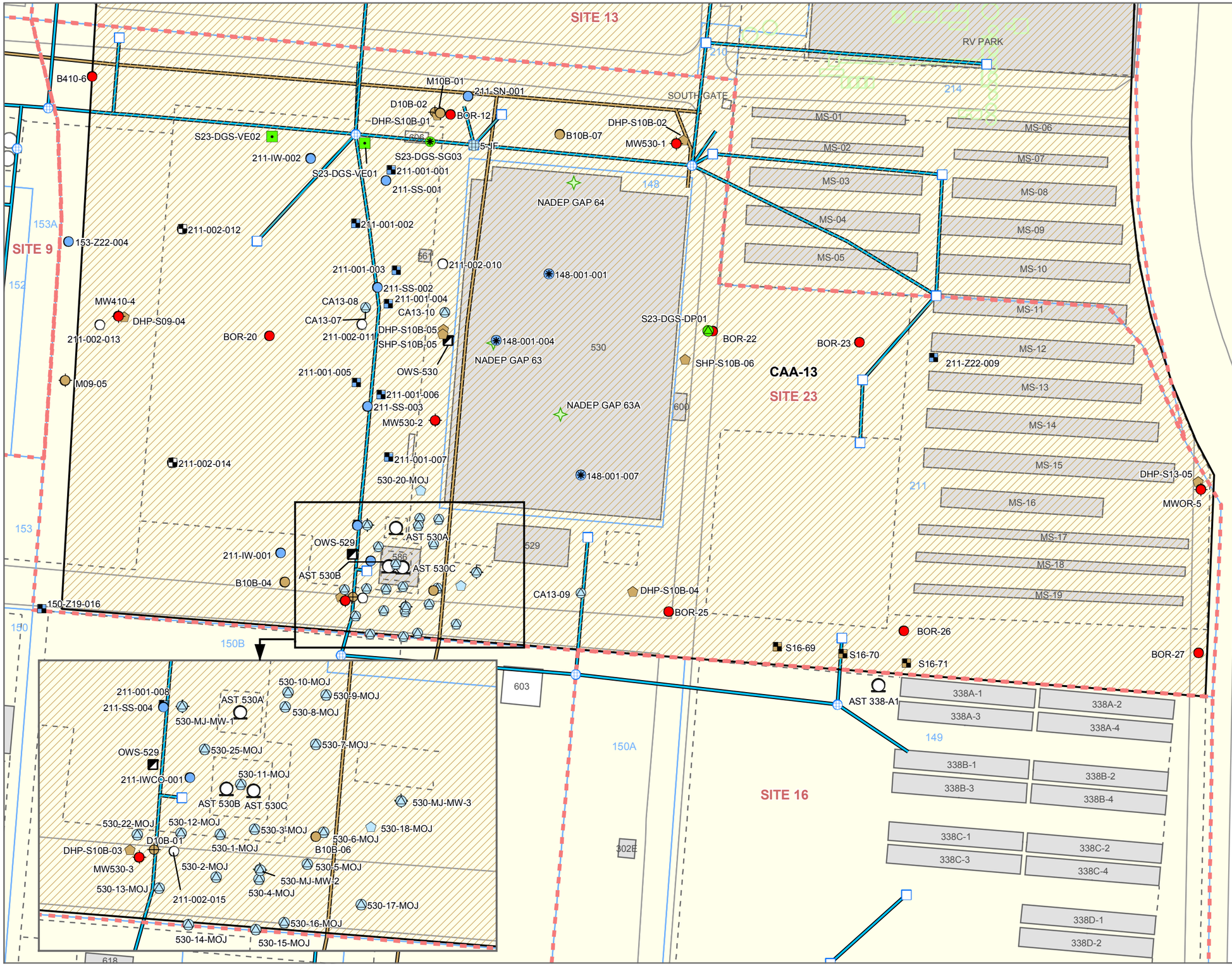
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-2
SITE 23
FORMER OIL REFINERY FEATURES

Operable Unit 2A
Remedial Investigation Report

2005-01-06 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-02_s23_refinery_features.mxd TtEMI-SA K. Johnson



SAMPLE LOCATION

- Direct-Push
- Hydropunch
- Manhole/Storm Drain
- Monitoring Well
- Soil Boring
- Soil Gas
- Surface Location
- Vacuum Extraction

SAMPLE INVESTIGATION

- Phase 1 & 2A, 1991
- Follow-On Investigation 1994
- Data Gap Sampling 2001
- Total Petroleum Hydrocarbon Program
- EBS Phase 2A
- EBS Phase 2B

- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total Petroleum Hydrocarbon

50 0 50 100 Feet

N

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FIGURE 9-3
SITE 23 RI TPH AND EBS SOIL AND GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-03_s23_ri_s&gw.mxd TtEMI-SA K. Johnson

ABOVEGROUND STORAGE TANK (AST), REMOVED

CATCH BASIN

MANHOLE

OIL-WATER SEPARATOR (OWS)

GENERATOR ACCUMULATION POINT (GAP)

FENCE

SANITARY SEWER LINE

STORM SEWER LINE

Unclassified

Damaged - high priority

Damaged - low priority

CORRECTIVE ACTION AREA (CAA)

FORMER OIL REFINERY

CERCLA SITE BOUNDARY

ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER

LAND COVER

BUILDING

Present

Removed

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

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FIGURE 9-4
SITE 23
STORM SEWER CONDITION

Operable Unit 2A
Remedial Investigation Report

2005-01-06 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-04_s23_sewer_cond.mxd TtEMI-SA K. Johnson

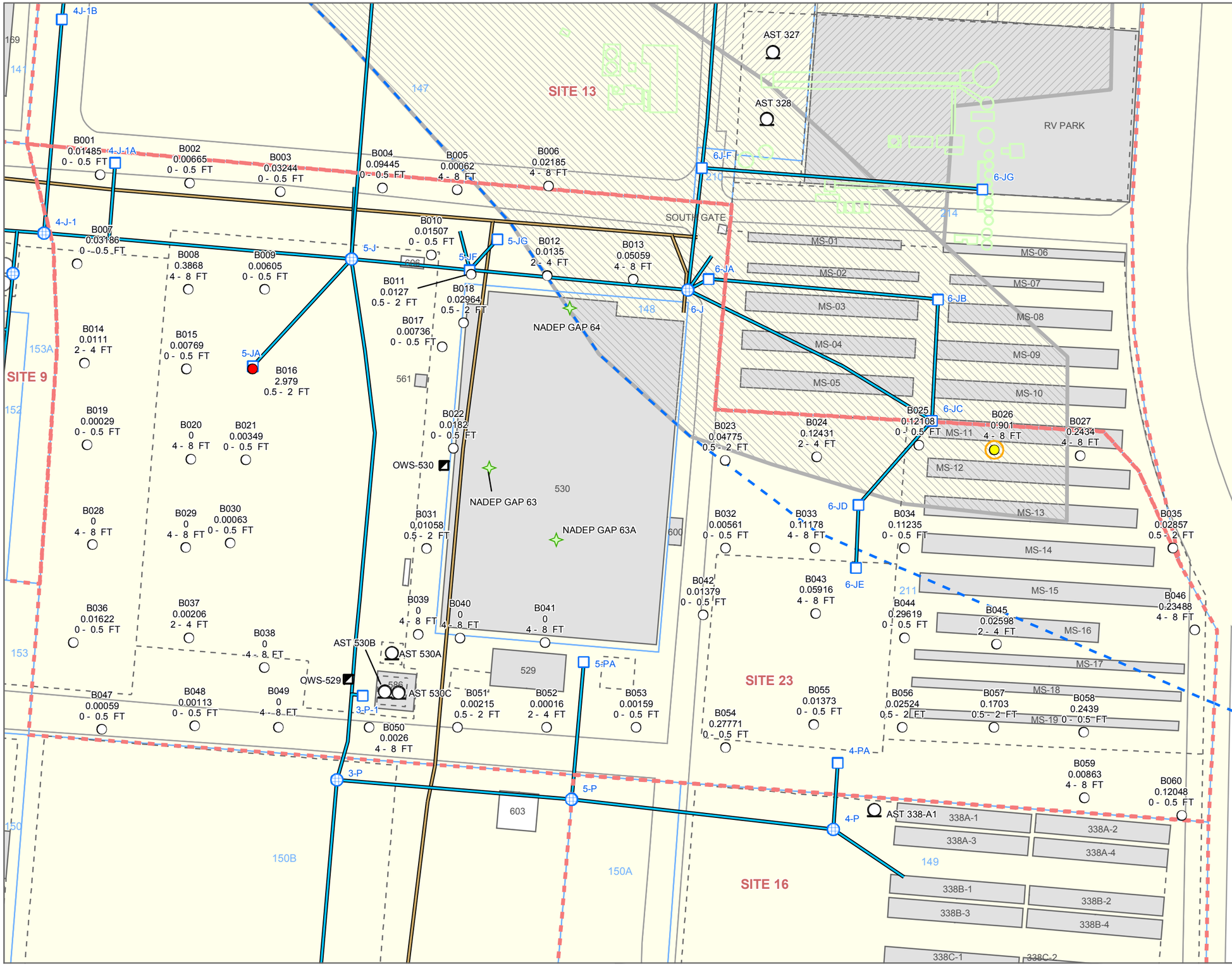

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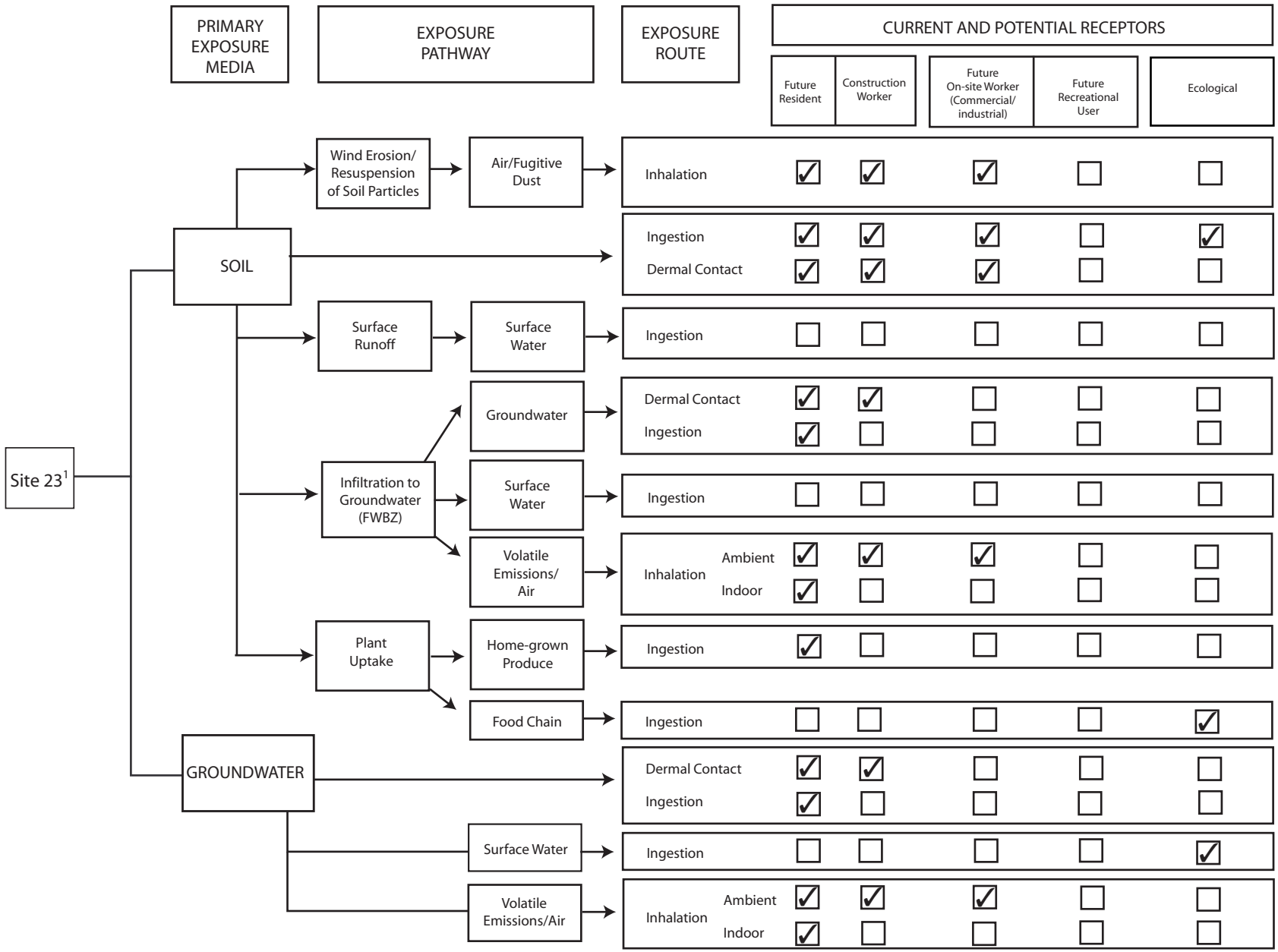
FIGURE 9-5
SITE 23 SOIL BaP EQUIVALENT VALUES AND AREA IMPACTED BY TARRY REFINERY WASTE

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-05_s23_bap.mxd TtEMI-SA K. Johnson



[1]Defueling area and associated OWSs 529 through 530, and ASTs 530A through 530C, former oil refinery activities

☑ Potentially Complete Exposure Pathway

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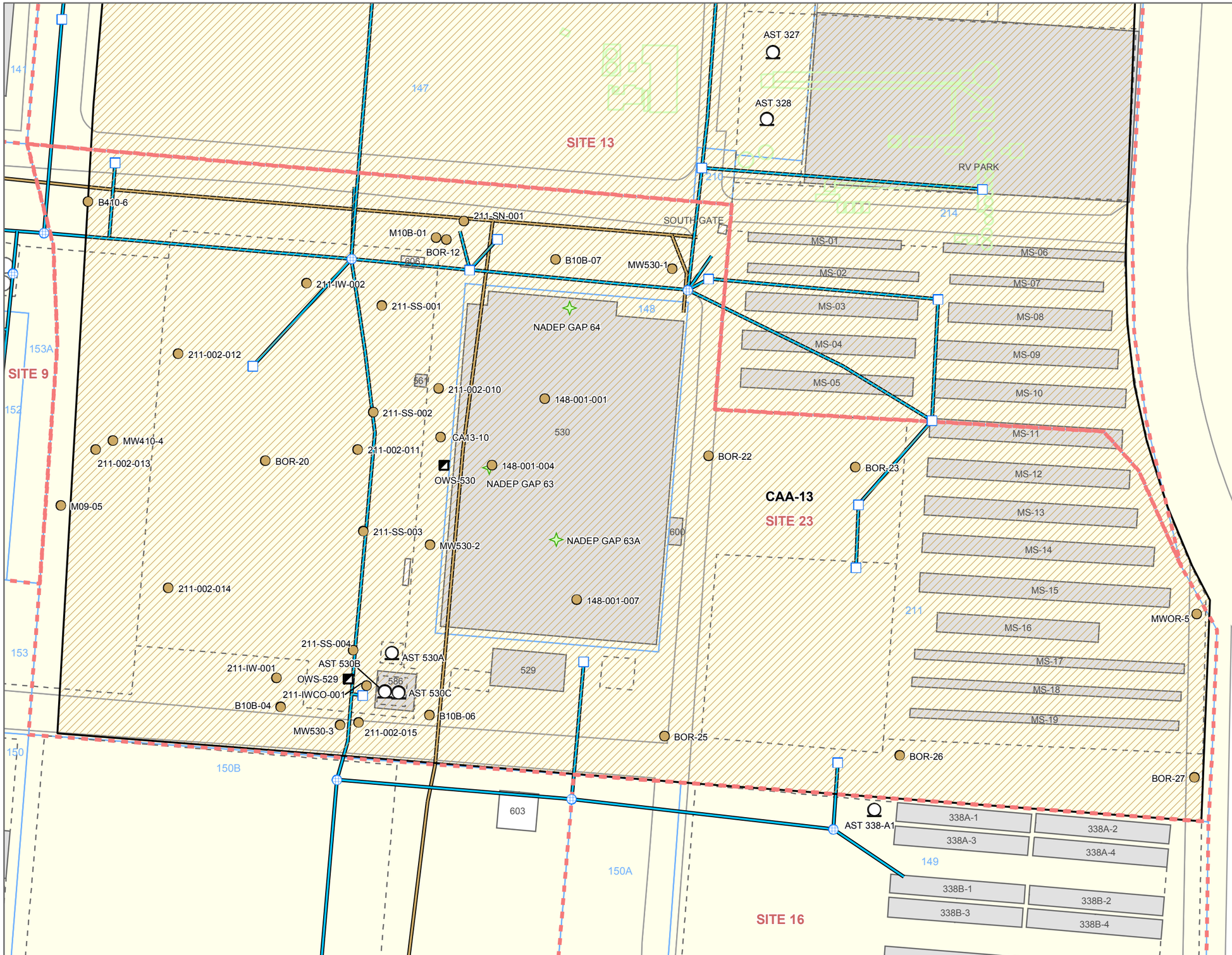
FIGURE 9-6
CONCEPTUAL SITE MODEL
Remedial Investigation Report for Sites 9, 13, 19, 22, and 23



SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

N

50 0 50 100 Feet

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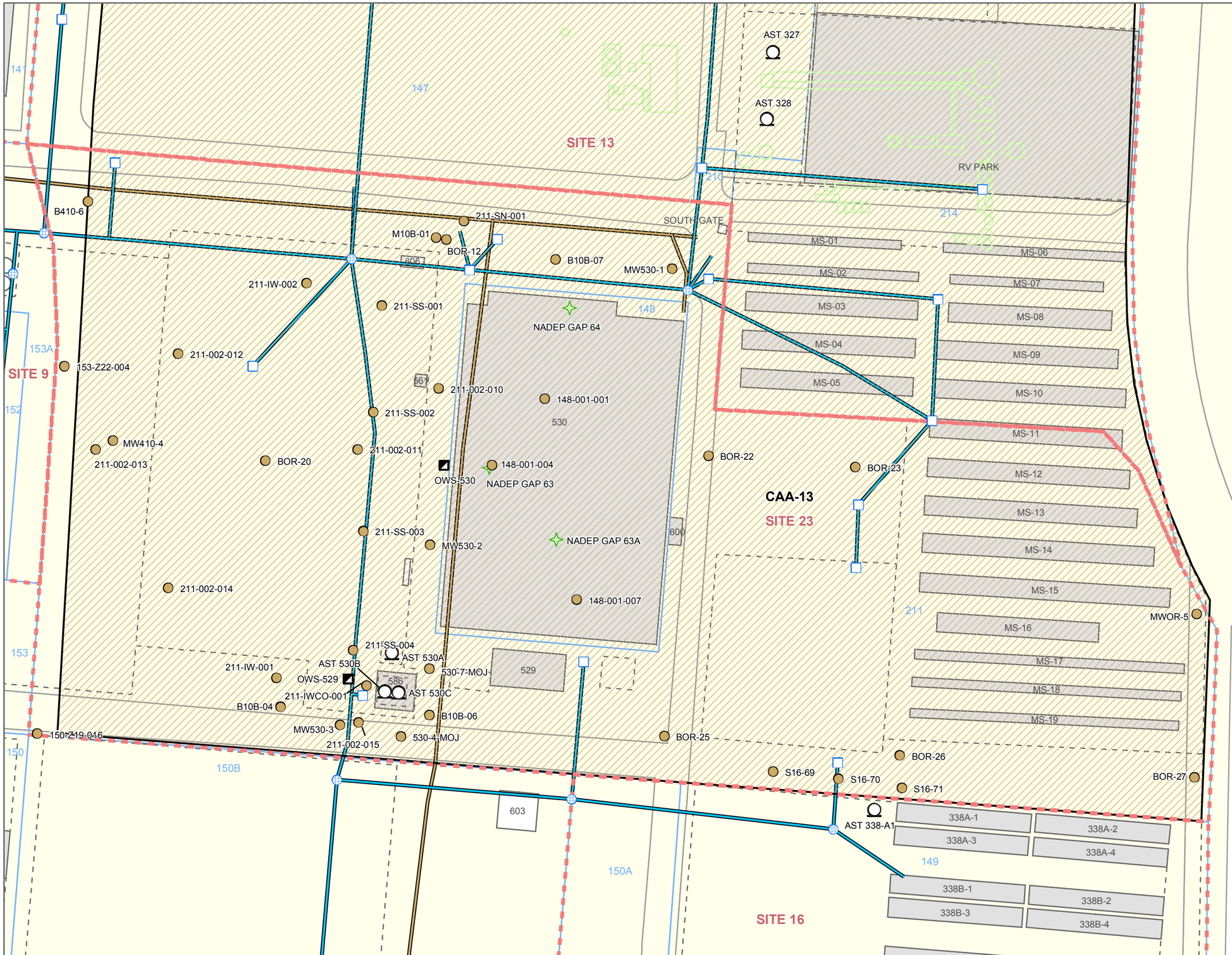
FIGURE 9-7A
SITE 23 SAMPLING LOCATIONS FOR VOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7A_s23_soil_voc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
SVOC = Semivolatile Organic Compound

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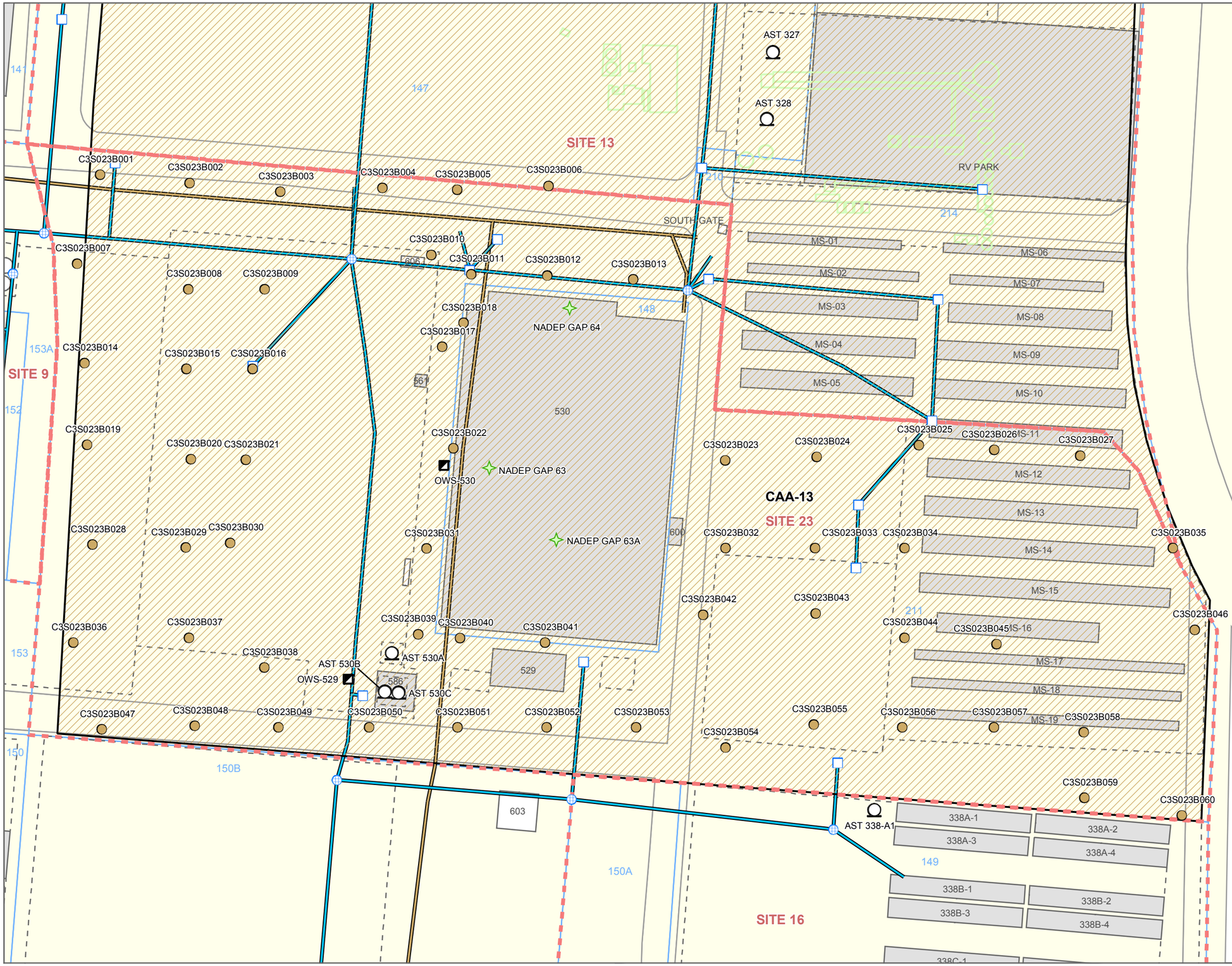
FIGURE 9-7B
SITE 23 SAMPLING LOCATIONS FOR SVOCs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7B_s23_soil_svoc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

50 0 50 100 Feet

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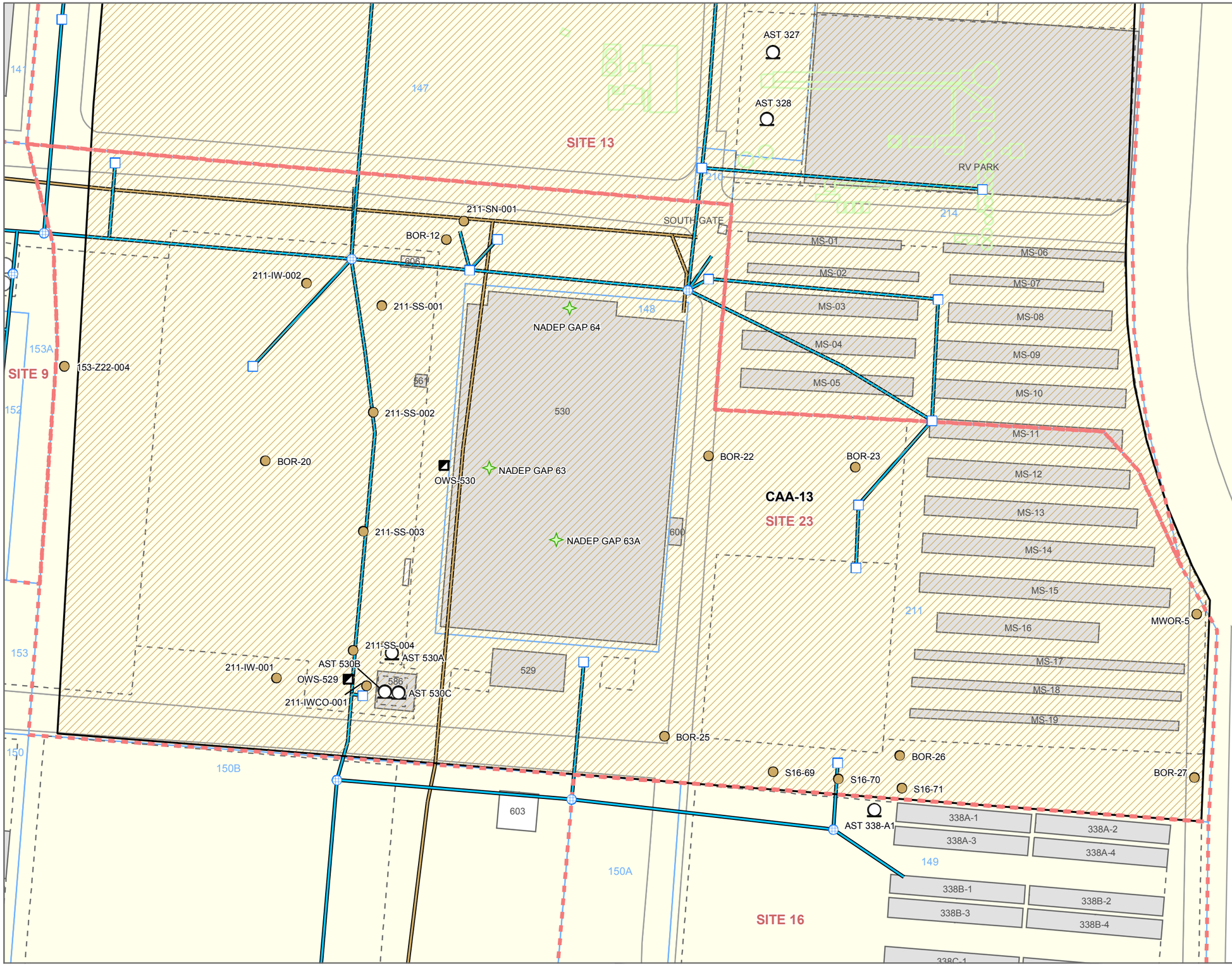
FIGURE 9-7C
SITE 23 SAMPLING LOCATIONS FOR PAH IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7C_s23_soil_PAH.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

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FIGURE 9-7D
SITE 23 SAMPLING LOCATIONS FOR PESTICIDES IN SOIL

Operable Unit 2A
Remedial Investigation Report

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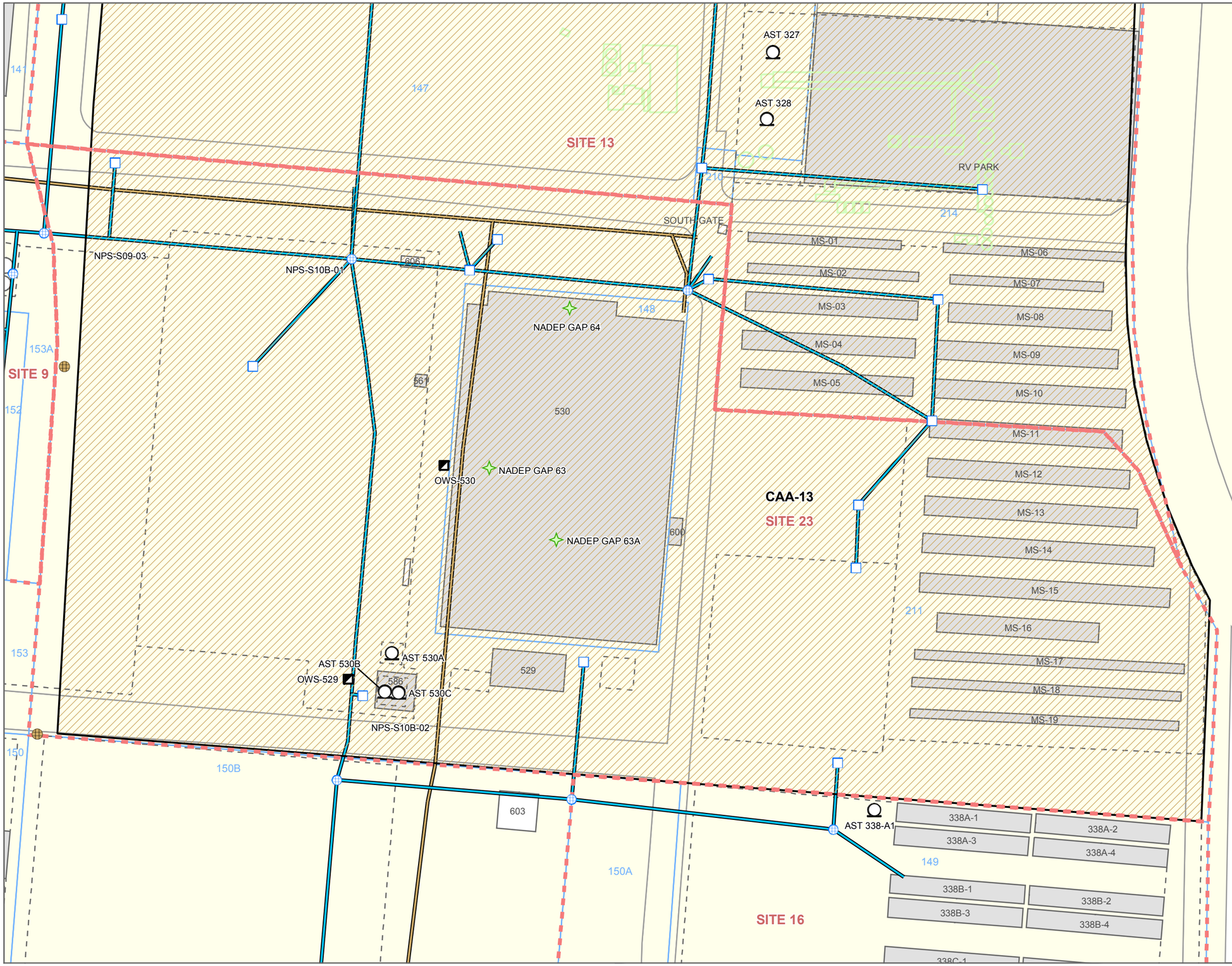

SAMPLING LOCATION

- Soil Boring
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated Biphenyl

N

50 0 50 100 Feet

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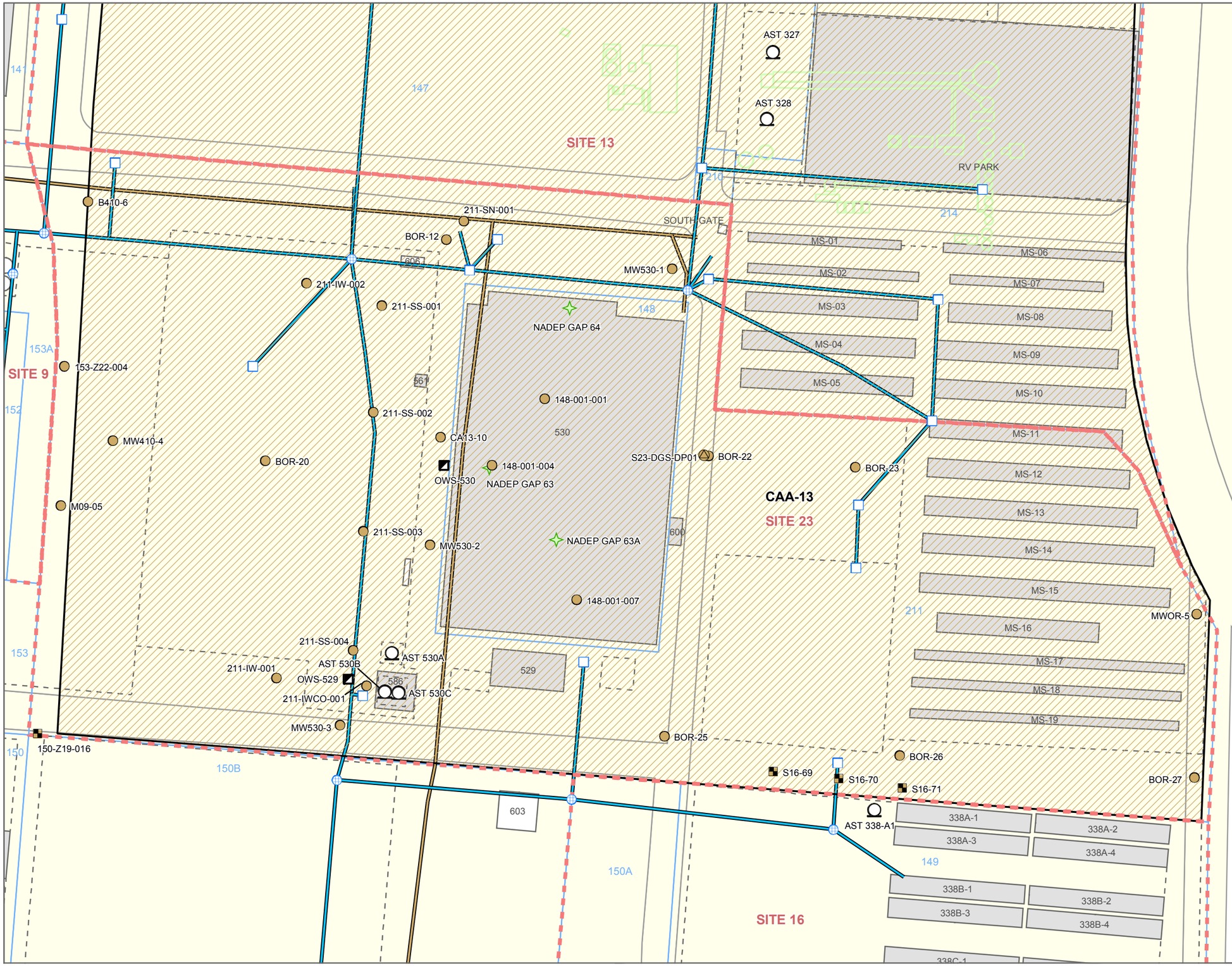
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7E
SITE 23 SAMPLING LOCATIONS FOR PCBs IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7E_s23_soil_pcb.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Soil Boring
- Surface location
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

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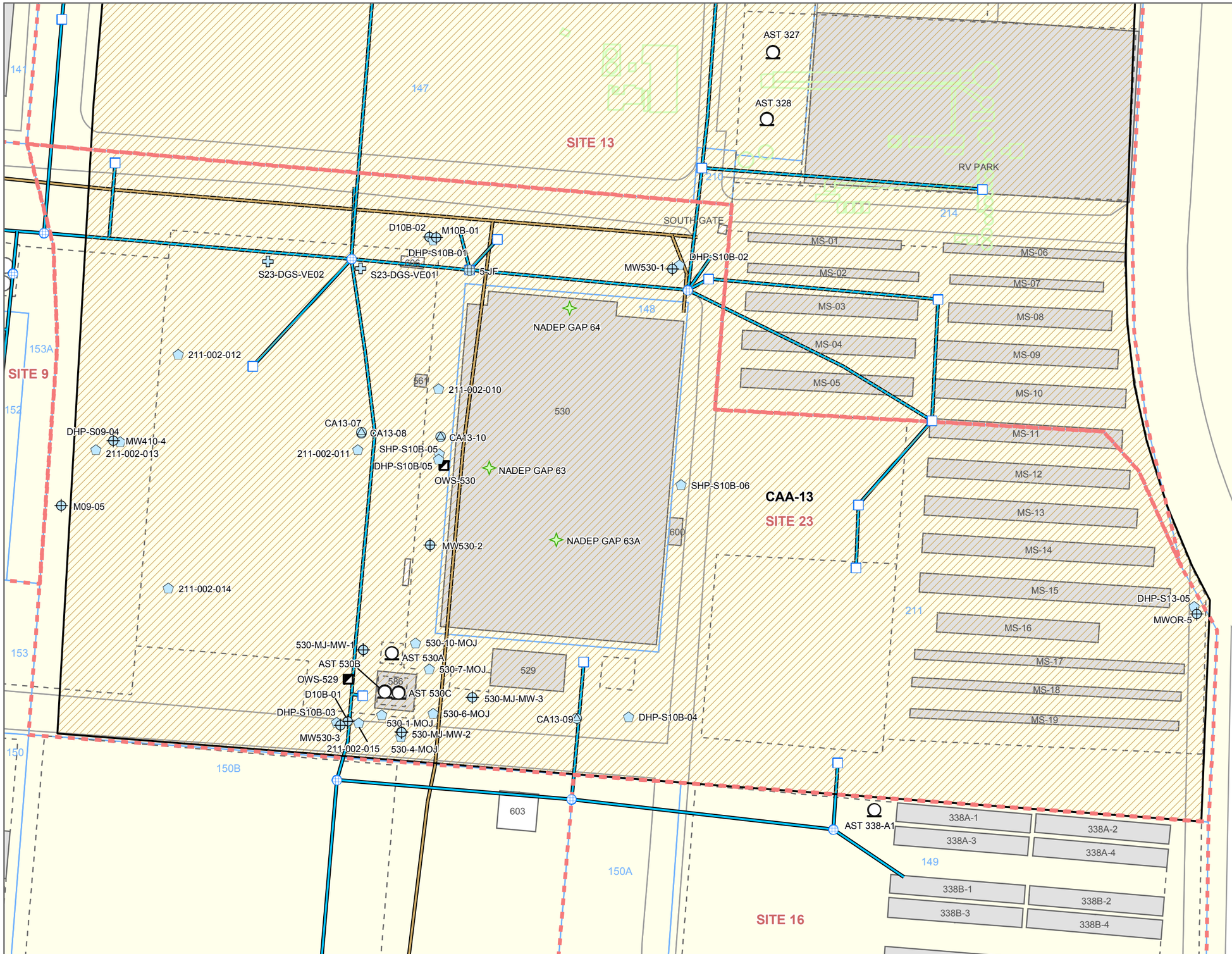
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7F
SITE 23 SAMPLING LOCATIONS FOR TOTAL METALS IN SOIL

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7FC_s23_soil_tmetal.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- Hydropunch
- Vacuum Extraction
- Direct-Push
- Manhole/Storm Drain
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
VOC = Volatile Organic Compound

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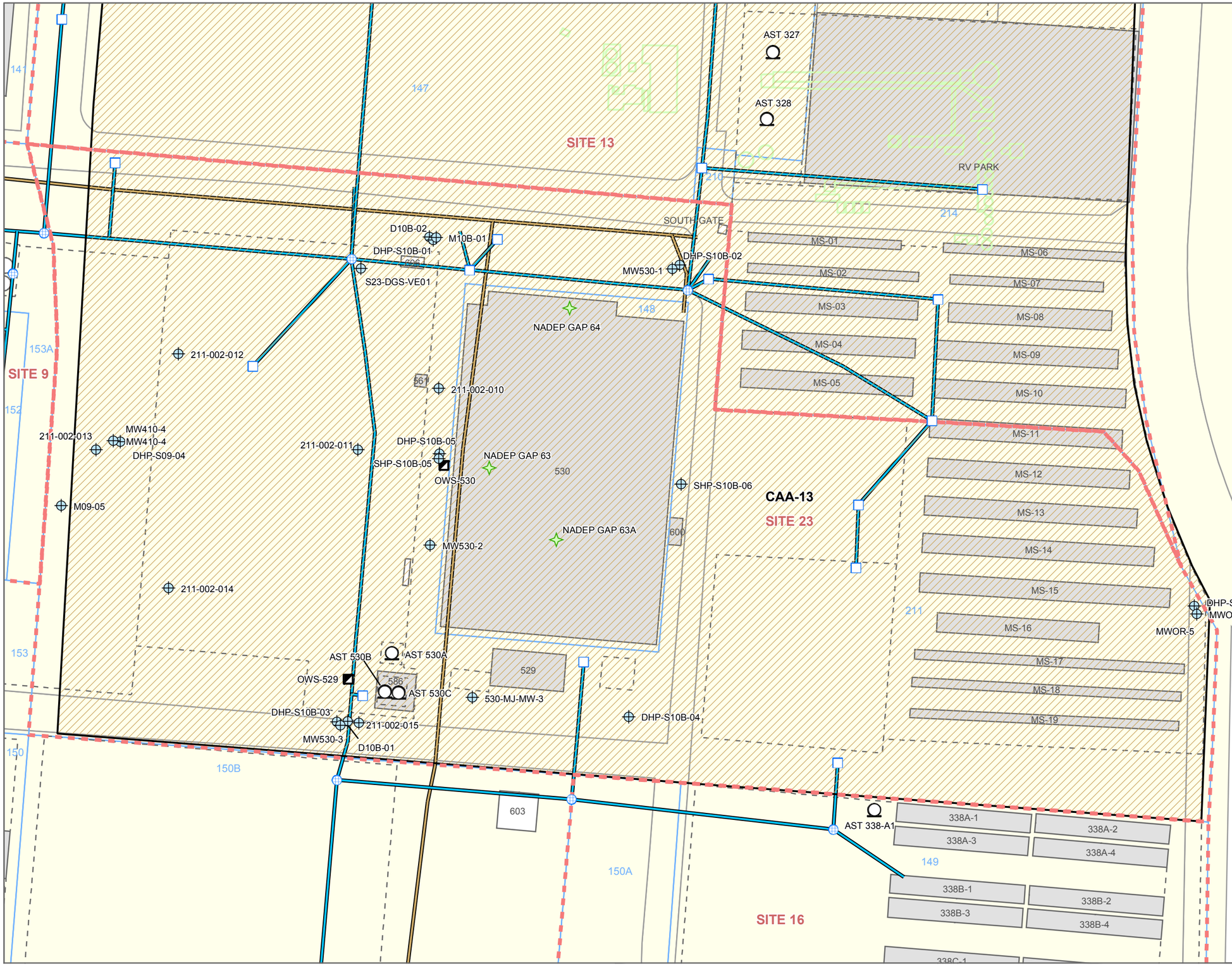
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7G
SITE 23 SAMPLING LOCATIONS FOR VOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7G_s23_gw_voc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
SVOC = Semivolatile Organic Compound

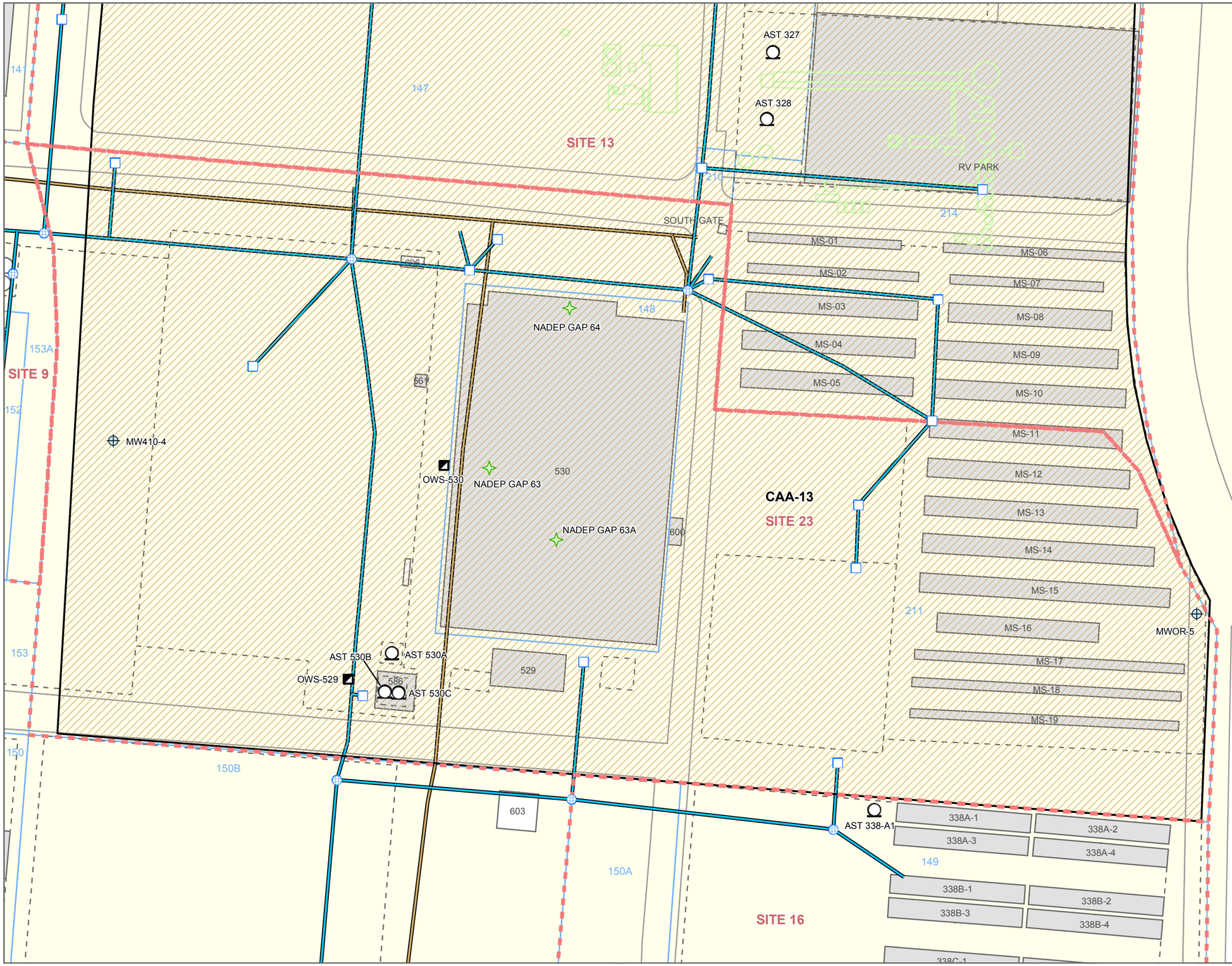
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7H
SITE 23 SAMPLING LOCATIONS FOR SVOCs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7H_s23_gw_svoc.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

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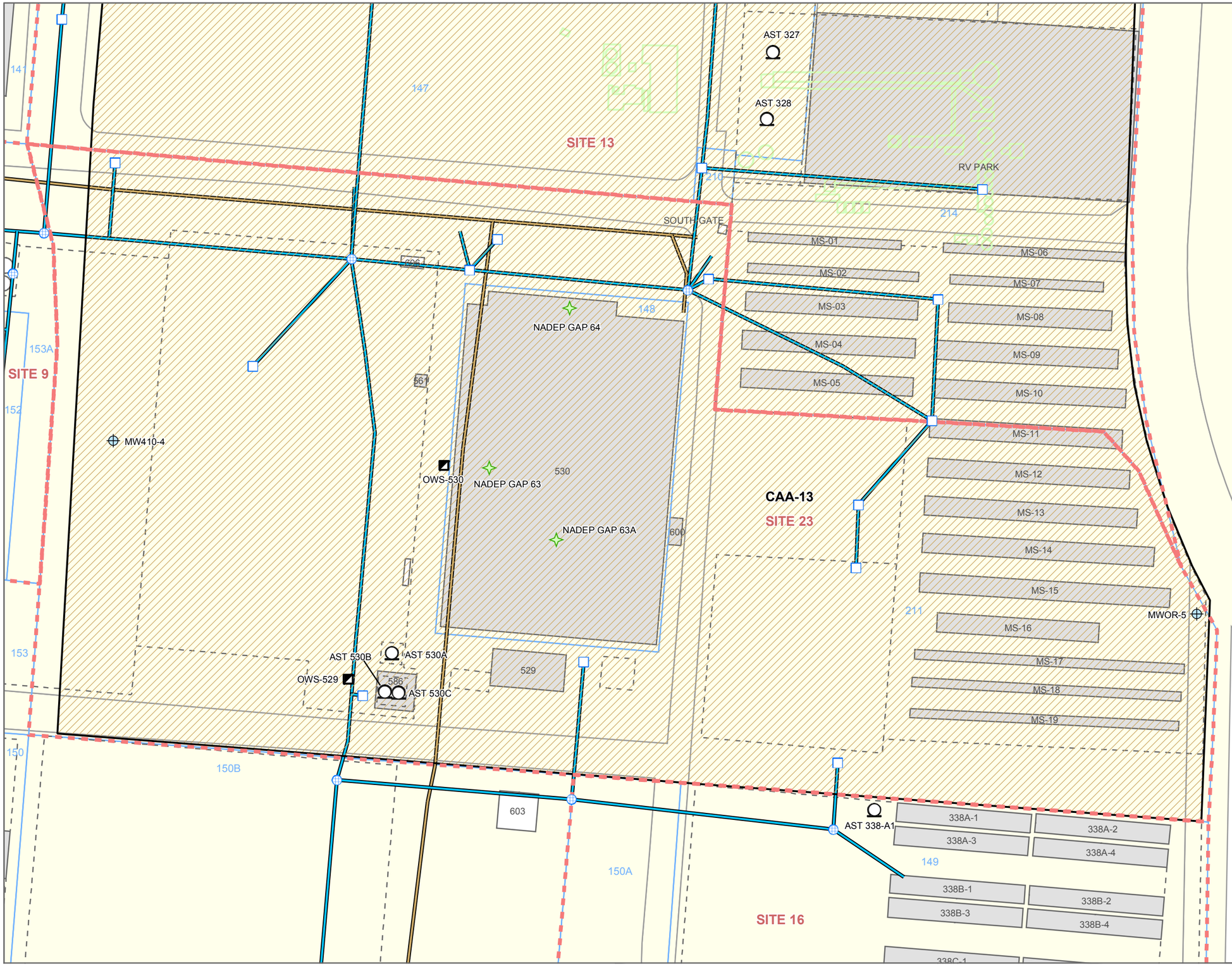
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7I
SITE 23 SAMPLING LOCATIONS FOR PESTICIDES IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7I_s23_gw_pest.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PCB = Polychlorinated biphenyl

N

50 0 50 100 Feet

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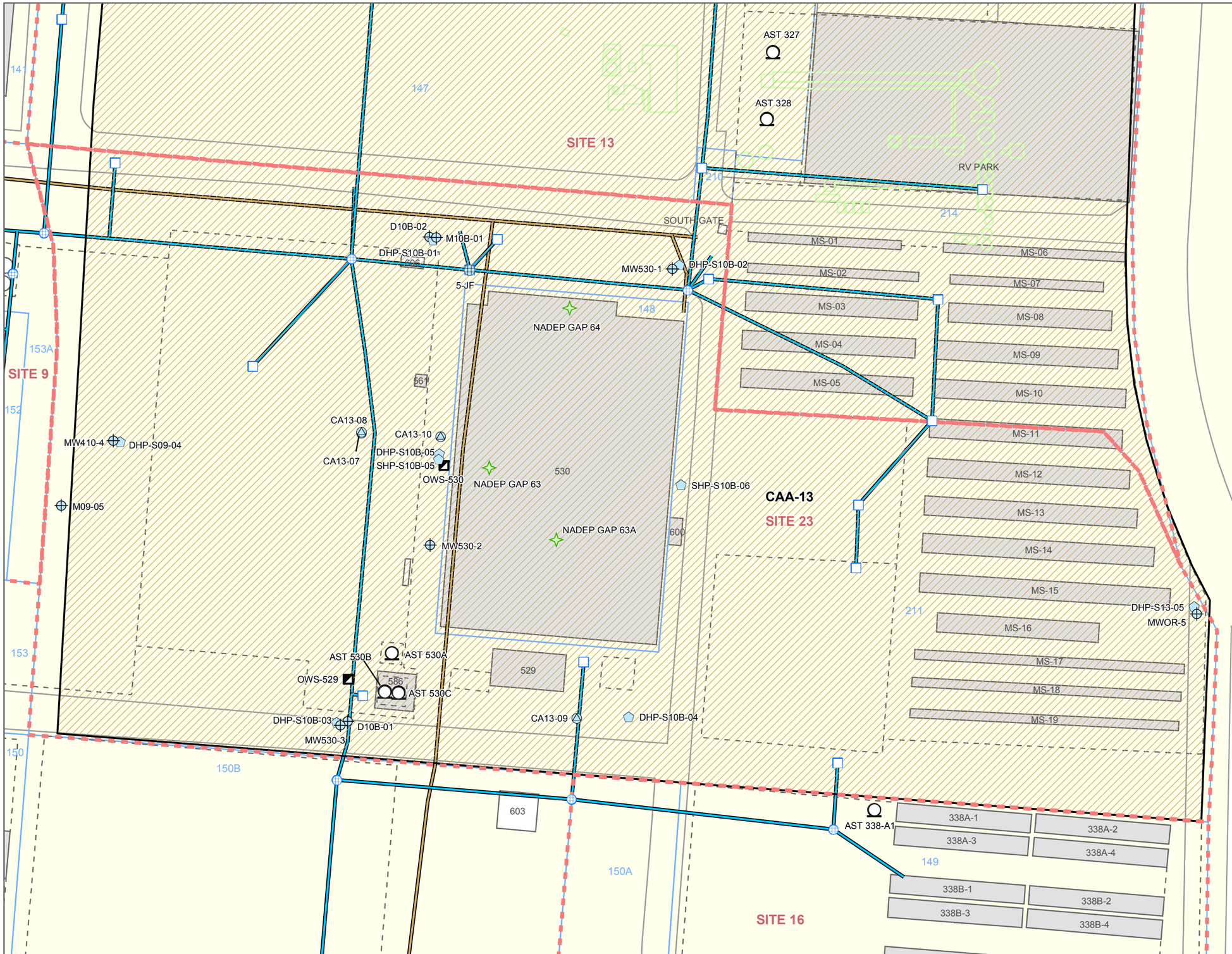
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7J
SITE 23 SAMPLING LOCATIONS FOR PCBs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7J_s23_gw_pest.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Direct-Push
- Hydropunch
- Manhole/Stormdrain
- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda

N

50 0 50 100 Feet

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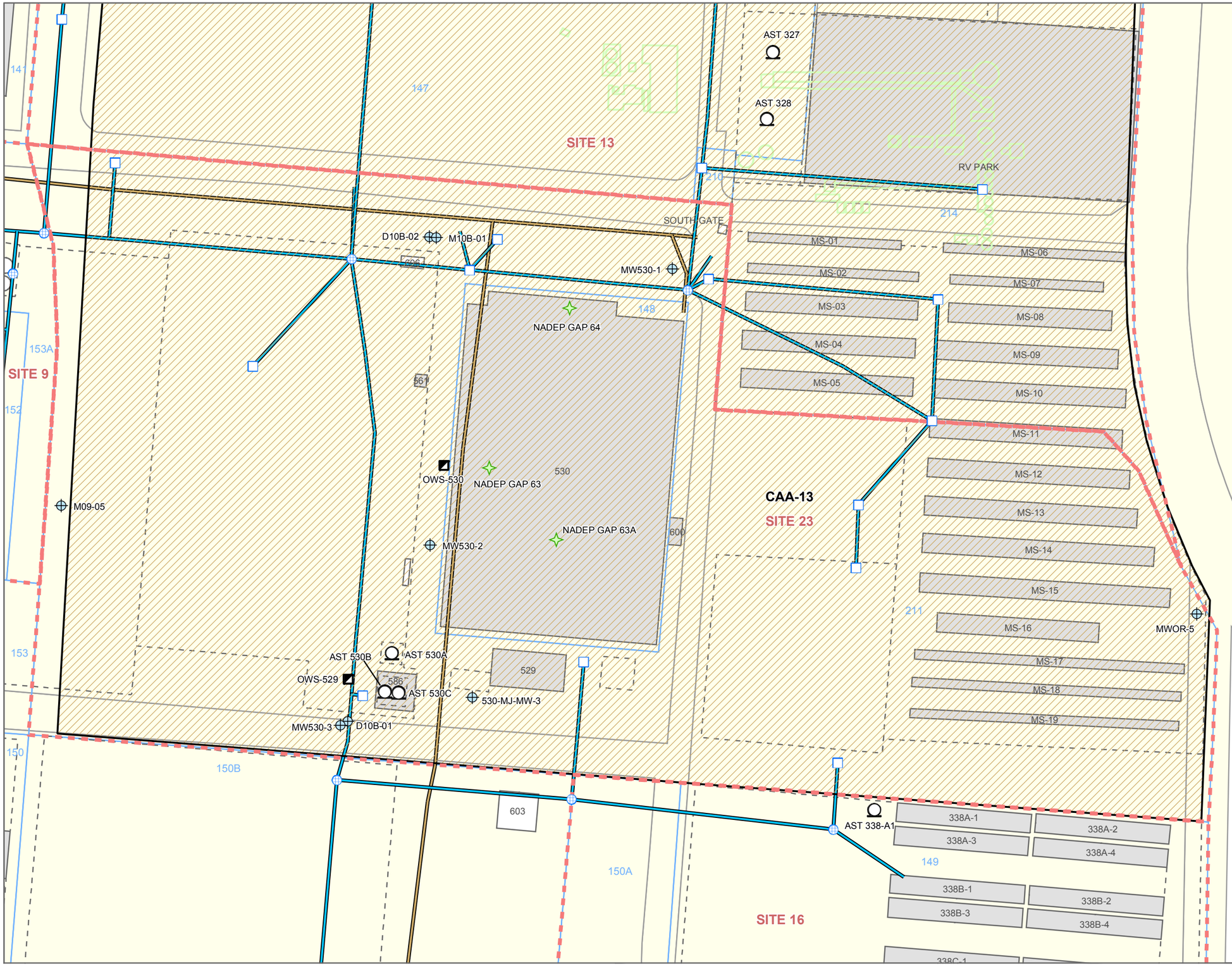
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-7K
SITE 23 SAMPLING LOCATIONS FOR METALS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7K_s23_gw_metal.mxd TtEMI-SA K. Johnson



SAMPLING LOCATION

- Monitoring Well
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
PAH = Polynuclear Aromatic Hydrocarbon

N

50 0 50 100 Feet

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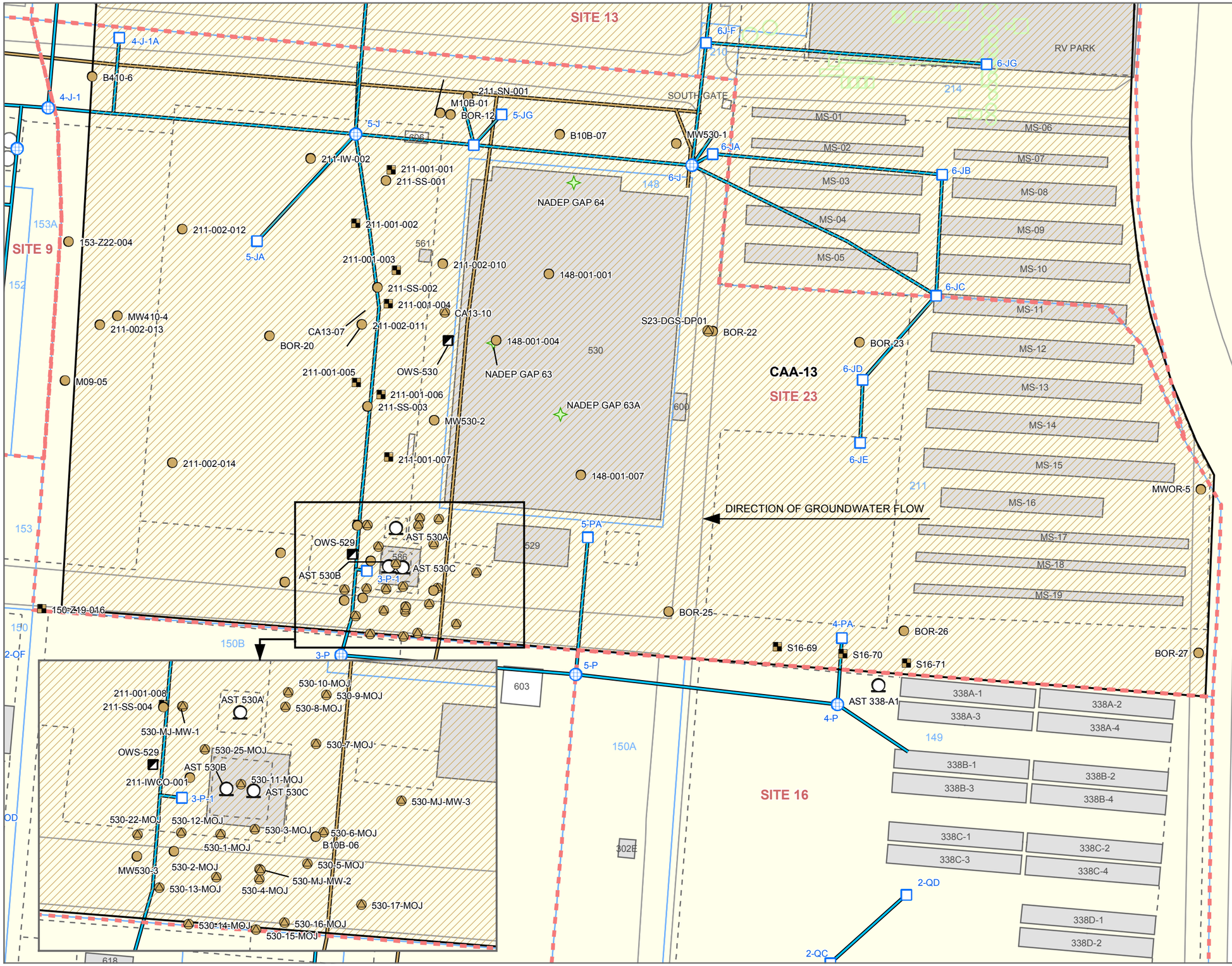
U.S. Navy Southwest Division, NAVFAC, San Diego

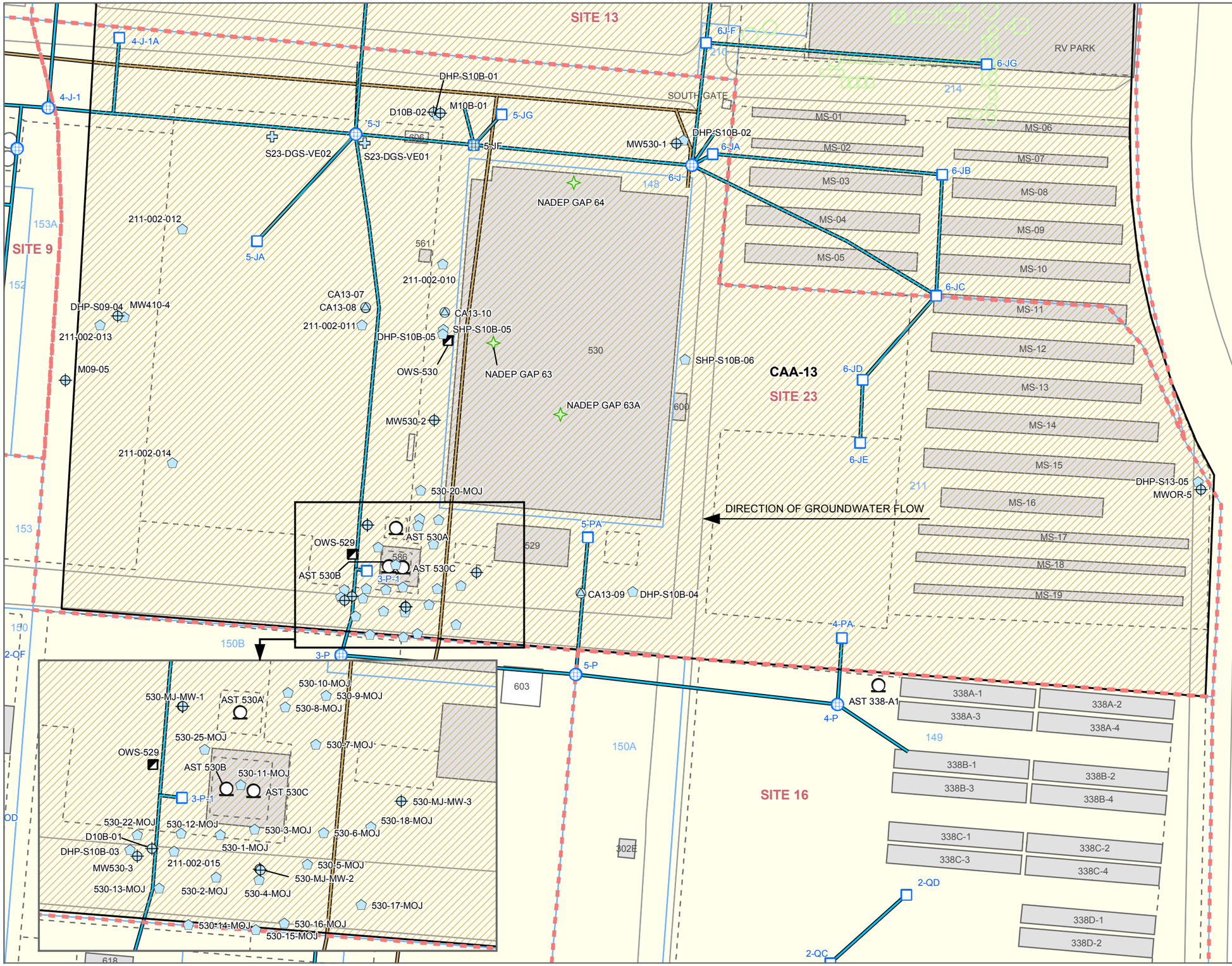
FIGURE 9-7L
SITE 23 SAMPLING LOCATIONS FOR PAHs IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\DO028\OU2A\RI\mxd\fig09-7L_s23_gw_pah.mxd TtEMI-SA K. Johnson



2005-01-13 U:\almda_sa\do028\OU2A\RI\mxd\fig09-08_s23_soil_tph.mxd TtEMI-SA K. Johnson



Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TTPH = Total total petroleum hydrocarbon
µg/L = Micrograms per liter

Groundwater data used in the RI were collected between 1990 and April 2003.
Remedial activity is on-going at this site.

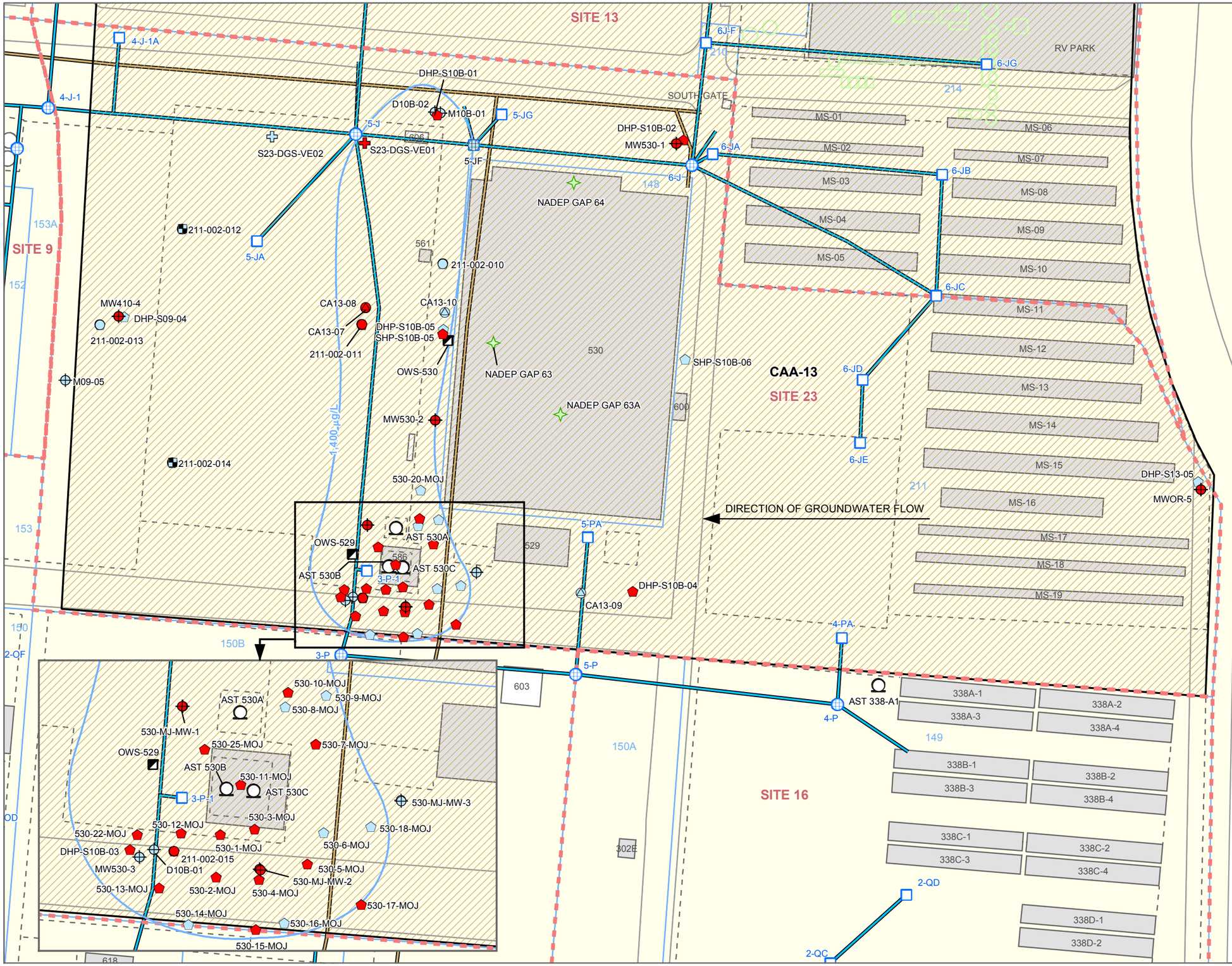
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 9-9
SITE 23
SAMPLING LOCATIONS FOR TPH IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\do028\OU2A\RI\mxd\fig09-09_s23_gw_tph.mxd TtEMI-SA K. Johnson



Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TTPH = Total total petroleum hydrocarbon
µg/L = Micrograms per liter
TPH plume delineated based on 1,400 µg/L, the action level for total TPH in groundwater to be protective of ecological receptors, if TPH were to reach the bay.
Groundwater data used in the RI were collected between 1990 and April 2003.
Remedial activity is on-going at this site.

Tetra Tech EM Inc.

Alameda Point
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FIGURE 9-10
SITE 23
TOTAL PETROLEUM HYDROCARBONS IN GROUNDWATER

Operable Unit 2A
Remedial Investigation Report

2005-01-13 U:\almda_sa\do028\OU2A\RI\mxd\fig09-10_s23_tph_gw.mxd TtEMI-SA K. Johnson

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
REMEDIAL INVESTIGATION																
Phases 1 & 2A Investigation, 1991																
B410-6	B410-6 [0.5-1.0]	07/08/1990	0.5 - 1	X	--	--	--	X	--	--	--	--	--	--	--	--
	B410-6 [1.0-1.5]	07/11/1990	1 - 1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [2.0-2.5]	07/08/1990	2 - 2.5	X	X	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [3.5-4.0]	07/11/1990	3.5 - 4	--	--	--	--	X	X	--	--	--	--	--	--	--
	B410-6 [4.0-4.5]	07/08/1990	4 - 4.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	B410-6 [5.5-6.0]	07/08/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [8.0-8.5]	07/08/1990	8 - 8.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	B410-6 [8.5-9.0]	07/08/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [10.0-10.5]	07/08/1990	10 - 10.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	B410-6 [11.0-11.5]	07/08/1990	11 - 11.5	X	X	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [11.5-12.0]	07/08/1990	11.5 - 12	X	--	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [12.5-13.0]	07/08/1990	12.5 - 13	--	--	--	--	X	--	--	--	--	--	--	--	--
	B410-6 [13.0-13.5]	07/08/1990	13 - 13.5	X	X	--	--	--	--	--	--	--	--	--	--	--
	B410-6 [14.5-15.0]	07/08/1990	14.5 - 15	--	--	--	--	X	--	--	--	--	--	--	--	--
BOR-12	BOR-12 [0.5-1.0]	07/18/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-12 [3.5-4.0]	07/18/1990	3.5 - 4	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-12 [4.0-4.5]	07/18/1990	4 - 4.5	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-12 [8.0-8.5]	07/18/1990	8 - 8.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-12 [8.5-9.0]	07/18/1990	8.5 - 9	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-12 [10.0-10.5]	07/18/1990	10 - 10.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-12 [11.0-11.5]	07/18/1990	11 - 11.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-12 [11.5-12.0]	07/18/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-12 [14.0-14.5]	07/18/1990	14 - 14.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-12 [14.5-15.0]	07/18/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-20	BOR-20 [2.5-3.0]	07/17/1990	2.5 - 3	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-20 [3.0-3.5]	07/17/1990	3 - 3.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-20 [4.5-5.0]	07/17/1990	4.5 - 5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-20 [5.0-5.5]	07/17/1990	5 - 5.5	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-20 [6.0-6.5]	07/17/1990	6 - 6.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-20 [7.0-7.5]	07/17/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-20 [10.0-10.5]	07/17/1990	10 - 10.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-20 [10.5-11.0]	07/17/1990	10.5 - 11	--	--	--	X	--	--	--	--	--	--	--	--	--
	BOR-20 [11.5-12.0]	07/17/1990	11.5 - 12	X	X	--	--	X	--	--	--	--	--	--	--	--
	BOR-20 [14.5-15.0]	07/17/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-22	BOR-22 [0.5-1.0]	07/23/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-22 [2.5-3.0]	07/23/1990	2.5 - 3	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-22 [3.5-4.0]	07/23/1990	3.5 - 4	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-22 [4.0-4.5]	07/23/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-22 [7.5-8.0]	07/23/1990	7.5 - 8	X	X	--	--	--	--	X	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)																
BOR-22	BOR-22 [8.0-8.5]	07/23/1990	8 - 8.5	--	--	--	X	X	--	--	--	--	--	--	--	--
(Continued)	BOR-22 [11.0-11.5]	07/23/1990	11 - 11.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-22 [11.5-12.0]	07/23/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-22 [14.0-14.5]	07/23/1990	14 - 14.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-22 [14.5-15.0]	07/23/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-23	BOR-23 [1.0-1.5]	07/20/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-23 [3.0-3.5]	07/20/1990	3 - 3.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-23 [3.5-4.0]	07/20/1990	3.5 - 4	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-23 [4.0-4.5]	07/23/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-23 [8.5-9.0]	07/20/1990	8.5 - 9	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-23 [9.0-9.5]	07/20/1990	9 - 9.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-23 [11.0-11.5]	07/20/1990	11 - 11.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-23 [11.5-12.0]	07/20/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-23 [14.5-15.0]	07/20/1990	14.5 - 15	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-23 [15.0-15.5]	07/20/1990	15 - 15.5	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-25	BOR-25 [0.5-1.0]	07/20/1990	0.5 - 1	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-25 [2.5-3.0]	07/20/1990	2.5 - 3	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-25 [3.5-4.0]	07/20/1990	3.5 - 4	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-25 [4.0-4.5]	07/20/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-25 [6.5-7.0]	07/20/1990	6.5 - 7	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-25 [7.0-7.5]	07/20/1990	7 - 7.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-25 [11.0-11.5]	07/20/1990	11 - 11.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-25 [11.5-12.0]	07/20/1990	11.5 - 12	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-25 [14.0-14.5]	07/20/1990	14 - 14.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-25 [14.5-15.0]	07/20/1990	14.5 - 15	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-26	BOR-26 [1.0-1.5]	07/24/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-26 [1.5-2.0]	07/24/1990	1.5 - 2	--	--	--	--	--	--	X	--	--	--	--	--	--
	BOR-26 [2.5-3.0]	07/24/1990	2.5 - 3	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-26 [4.0-4.5]	07/24/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-26 [5.5-6.0]	07/24/1990	5.5 - 6	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-26 [6.0-6.5]	07/24/1990	6 - 6.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-26 [10.0-10.5]	07/24/1990	10 - 10.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-26 [10.5-11.0]	07/24/1990	10.5 - 11	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-26 [13.0-13.5]	07/24/1990	13 - 13.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-26 [13.5-14.0]	07/24/1990	13.5 -14	--	--	--	X	X	--	--	--	--	--	--	--	--
BOR-27	BOR-27 [1.0-1.5]	07/20/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-27 [2.5-3.0]	07/20/1990	2.5 - 3	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-27 [3.0-3.5]	07/20/1990	3 - 3.5	--	--	--	X	X	X	--	--	--	--	--	--	--
	BOR-27 [4.0-4.5]	07/20/1990	4 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	BOR-27 [7.0-7.5]	07/20/1990	7 - 7.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-27 [7.5-8.0]	07/20/1990	7.5 - 8	--	--	--	X	X	--	--	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)																
'BOR-27	BOR-27 [10.0-10.5]	07/20/1990	10 - 10.5	X	X	--	--	--	--	X	--	--	--	--	--	--
(Continued)	BOR-27 [10.5-11.0]	07/20/1990	10.5 - 11	--	--	--	X	X	--	--	--	--	--	--	--	--
	BOR-27 [12.5-13.0]	07/20/1990	12.5 - 13	X	X	--	--	--	--	X	--	--	--	--	--	--
	BOR-27 [13.0-13.5]	07/20/1990	13 - 13.5	--	--	--	X	X	--	--	--	--	--	--	--	--
MW410-4	MW410-4 [1.0-1.5]	07/12/1990	1 - 1.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW410-4 [2.5-3.0]	07/12/1990	2.5 - 3	--	--	--	--	--	X	--	--	--	--	--	--	--
	MW410-4 [3.0-3.5]	07/16/1990	3 - 3.5	X	X	--	--	--	--	--	--	--	--	--	--	--
	MW410-4 [4.0-4.5]	07/12/1990	4 - 4.5	--	--	--	--	X	X	--	--	--	--	--	--	--
	MW410-4 [5.5-6.0]	07/16/1990	5.5 - 6	X	X	--	--	--	--	--	--	--	--	--	--	--
	MW410-4 [6.0-6.5]	07/12/1990	6 - 6.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	MW410-4 [8.5-9.0]	07/16/1990	8.5 - 9	X	X	--	--	--	--	--	--	--	--	--	--	--
	MW410-4 [9.0-9.5]	07/12/1990	9 - 9.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	MW410-4 [11.5-12.0]	07/16/1990	11.5 - 12	X	X	--	--	--	--	--	--	--	--	--	--	--
	MW410-4 [12.0-12.5]	07/12/1990	12 - 12.5	--	--	--	--	X	--	--	--	--	--	--	--	--
	MW410-4 [14.5-15.0]	07/16/1990	14.5 - 15	X	X	--	--	--	--	--	--	--	--	--	--	--
	MW410-4 [15.0-15.5]	07/12/1990	15 - 15.5	--	--	--	--	X	--	--	--	--	--	--	--	--
MW530-1	MW530-1 [1.0-1.5]	07/13/1990	1 - 1.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-1 [2.5-3.0]	07/13/1990	2.5 - 3	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [3.0-3.5]	07/13/1990	3 - 3.5	X	--	--	--	X	X	--	--	--	--	--	--	--
	MW530-1 [5.5-6.0]	07/13/1990	5.5 - 6	--	--	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [6.0-6.5]	07/13/1990	6 - 6.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [6.5-7.0]	07/13/1990	6.5 - 7	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-1 [7.5-8.0]	07/13/1990	7.5 - 8	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-1 [8.5-9.0]	07/13/1990	8.5 - 9	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [9.0-9.5]	07/13/1990	9 - 9.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-1 [11.5-12.0]	07/13/1990	11.5 - 12	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [12.0-12.5]	07/13/1990	12 - 12.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-1 [13.5-14.0]	07/13/1990	13.5 - 14	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-1 [14.0-14.5]	07/13/1990	14 - 14.5	X	--	--	--	X	--	--	--	--	--	--	--	--
MW530-2	MW530-2 [0.5-1.0]	07/13/1990	0.5 - 1	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-2 [2.0-2.5]	07/13/1990	2 - 2.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-2 [2.5-3.0]	07/13/1990	2.5 - 3	X	--	--	--	X	X	--	--	--	--	--	--	--
	MW530-2 [5.0-5.5]	07/13/1990	5 - 5.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-2 [5.5-6.0]	07/13/1990	5.5 - 6	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-2 [8.0-8.5]	07/13/1990	8 - 8.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-2 [8.5-9.0]	07/13/1990	8.5 - 9	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-2 [11.0-11.5]	07/13/1990	11 - 11.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-2 [11.5-12.0]	07/13/1990	11.5 - 12	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-2 [14.0-14.5]	07/13/1990	14 - 14.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-2 [14.5-15.0]	07/13/1990	14.5 - 15	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-2R [6.0-6.5]	07/13/1990	6 - 6.5	X	--	--	--	X	--	--	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Phases 1 & 2A Investigation, 1991 (Continued)																
MW530-3	MW530-3 [0.5-1.0]	07/13/1990	0.5 - 1	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-3 [2.0-2.5]	07/13/1990	2 - 2.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-3 [2.5-3.0]	07/13/1990	2.5 - 3	X	--	--	--	X	X	--	--	--	--	--	--	--
	MW530-3 [4.0-4.5]	07/13/1990	4 - 4.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-3 [5.0-5.5]	07/13/1990	5 - 5.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-3 [7.0-7.5]	07/13/1990	7 - 7.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-3 [8.0-8.5]	07/13/1990	8 - 8.5	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-3 [10.0-10.5]	07/13/1990	10 - 10.5	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-3 [10.5-11.0]	07/13/1990	10.5 - 11	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-3 [11.5-12.0]	07/13/1990	11.5 - 12	--	X	--	--	--	--	X	--	--	--	--	--	--
	MW530-3 [12.5-13.0]	07/13/1990	12.5 - 13	X	--	--	--	X	--	--	--	--	--	--	--	--
	MW530-3R [8.5-9.0]	07/13/1990	8.5 - 9	X	--	--	--	X	--	--	--	--	--	--	--	--
MWOR-5	MWOR-5 [1.0-1.5]	07/19/1990	1 - 1.5	X	--	--	X	X	--	--	--	--	--	--	--	--
	MWOR-5 [1.5-2.0]	07/19/1990	1.5 - 2	--	--	--	--	--	X	--	--	--	--	--	--	--
	MWOR-5 [7.0-7.5]	07/18/1990	7 - 7.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	MWOR-5 [8.5-9.0]	07/19/1990	8.5 - 9	--	--	--	X	X	X	--	--	--	--	--	--	--
	MWOR-5 [10.0-10.5]	07/18/1990	10 - 10.5	X	X	--	--	--	--	X	--	--	--	--	--	--
	MWOR-5 [10.5-11.0]	07/19/1990	10.5 - 11	--	--	--	X	X	--	--	--	--	--	--	--	--
	MWOR-5 [12.5-13.0]	07/18/1990	12.5 - 13	X	X	--	--	--	--	X	--	--	--	--	--	--
	MWOR-5 [13.0-13.5]	07/19/1990	13 - 13.5	--	--	--	X	X	--	--	--	--	--	--	--	--
	MWOR-5 [14.5-15.0]	07/18/1990	14.5 - 15	X	X	--	--	--	--	X	--	--	--	--	--	--
	MWOR-5 [15.0-15.5]	07/19/1990	15 - 15.5	--	--	--	X	X	--	--	--	--	--	--	--	--
Follow-on Investigation, 1994																
B10B-04	280-S10B-001	08/19/1994	0.5 - 1.5	X	X	--	--	--	X	--	--	--	--	--	--	--
	280-S10B-002	08/19/1994	2 - 3	X	X	--	--	--	X	--	--	--	--	--	--	--
	280-S10B-003	08/19/1994	5 - 6	X	X	--	--	--	X	--	--	--	--	--	--	--
B10B-06	280-S10B-008	08/19/1994	0.5 - 1.5	X	X	--	--	--	X	--	--	--	--	--	--	--
	280-S10B-009	08/19/1994	2.5 - 3.5	X	X	--	--	--	X	--	--	--	--	--	--	--
	280-S10B-010	08/19/1994	5 - 6	X	X	--	--	--	X	--	--	--	--	--	--	--
B10B-07	280-S10B-011	08/19/1994	0.5 - 1.5	X	X	--	--	--	X	X	--	--	--	--	--	--
	280-S10B-012	08/19/1994	2.5 - 3.5	X	X	--	--	--	X	X	--	--	--	--	--	--
	280-S10B-013	08/19/1994	5 - 6	X	X	--	--	--	X	X	--	--	--	--	--	--
M09-05	280-S09-001	11/05/1994	1.5 - 2.5	--	X	--	--	X	X	--	--	--	--	--	--	--
	280-S09-002	11/05/1994	3 - 4	--	X	--	--	X	X	--	--	--	--	--	--	--
	280-S09-003	11/05/1994	5 - 6	--	X	--	--	X	X	--	--	--	--	--	--	--
M10B-01	280-S10B-134	11/05/1994	1 - 2	X	X	--	--	--	X	X	--	--	--	--	--	--
	280-S10B-135	11/05/1994	2 - 3	X	X	--	--	--	X	X	--	--	--	--	--	--
	280-S10B-136	11/05/1994	3 - 4	X	X	--	--	--	X	X	--	--	--	--	--	--
NPS-S09-03	280-S09-025	08/24/1994	0	X	X	--	--	X	X	X	--	--	--	--	--	--
NPS-S10B-01	280-S10B-094	07/20/1994		X	X	--	--	X	X	X	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Follow-on Investigation, 1994 (Continued)																
NPS-S10B-02	280-S10B-096	07/20/1994		X	X	--	--	X	X	X	--	--	--	--	--	--
S16-69	280-S16-015	07/15/1994	0 - 0	X	--	--	X	X	X	--	X	--	--	--	--	--
S16-70	280-S16-016	07/15/1994	0 - 0	X	--	--	X	X	X	--	X	--	--	--	--	--
S16-71	280-S16-017	07/14/1994	0 - 0	X	--	--	X	X	X	--	X	--	--	--	--	--
Supplemental Remedial Investigation Data Gap Sampling, 2001																
S23-DGS-DP01	385-S23-001	08/01/2001	1 - 1.5	--	--	--	--	X	X	--	--	--	--	--	--	--
PAH Study, 2003																
C3S023B001	C0591103	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591104	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591105	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591106	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B002	C0591107	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591108	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591109	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591110	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B003	C0591111	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591113	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591114	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591115	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B004	C0591116	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591117	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591118	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591119	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B005	C0591120	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591121	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591123	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591124	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B006	C0591125	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591126	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591127	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591128	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B007	C0590551	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0590552	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0590553	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0590555	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B008	C0591134	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591135	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591136	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591137	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003, continued																
C3S023B009	C0591138	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591139	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591140	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591141	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B010	C0591143	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591144	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591145	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591146	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B011	C0591147	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591148	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591149	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591150	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B012	C0591151	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591153	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591154	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591155	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B013	C0591156	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591157	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591158	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591159	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B014	C0591160	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591161	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591163	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591164	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B015	C0591165	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591166	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591167	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591168	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B016	C0591169	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591170	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591171	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591173	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B017	C0591174	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591175	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591176	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591177	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B018	C0591178	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591179	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591180	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591181	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

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Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

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PAH Study, 2003 (Continued)																
C3S023B019	C0591183	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591184	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591185	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591186	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B020	C0591187	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591188	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591189	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591190	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B021	C0591191	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591193	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591194	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591195	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B022	C0591196	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591197	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591198	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591199	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B023	C0591200	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591201	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591203	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591204	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B024	C0591205	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591206	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591207	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591208	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B025	C0591209	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591210	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591211	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591213	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B026	C0591214	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591215	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591216	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591217	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B027	C0591218	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591219	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591220	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591221	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B028	C0591223	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591224	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591225	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591226	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

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SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																
C3S023B029	C0591227	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591228	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591229	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591230	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B030	C0591231	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591233	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591234	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591235	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B031	C0591236	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591237	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591238	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591239	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B032	C0591240	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591241	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591243	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591244	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B033	C0591245	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591246	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591247	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591248	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B034	C0591249	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591250	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591251	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591253	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B035	C0591254	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591255	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591256	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591257	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B036	C0591258	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591259	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591260	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591261	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B037	C0591263	8/6/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591264	8/6/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591265	8/6/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591266	8/6/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B038	C0591267	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591268	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591269	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591270	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																
C3S023B039	C0591271	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591273	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591274	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591275	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B040	C0591276	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591277	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591278	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591279	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B041	C0591280	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591281	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591283	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591284	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B042	C0591285	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591286	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591287	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591288	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B043	C0591289	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591290	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591291	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591293	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B044	C0591294	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591295	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591296	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591297	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B045	C0591298	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591299	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591300	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591301	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B046	C0591303	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591304	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591305	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591306	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B047	C0591307	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591308	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591309	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591310	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B048	C0591311	8/7/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591313	8/7/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591314	8/7/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591315	8/7/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

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Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
PAH Study, 2003 (Continued)																
C3S023B049	C0591316	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591317	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591318	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591319	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B050	C0591320	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591321	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591323	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591324	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B051	C0591325	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591326	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591327	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591328	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B052	C0591329	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591330	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591331	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591333	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B053	C0591334	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591335	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591336	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591337	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B054	C0591338	8/5/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591339	8/5/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591340	8/5/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591341	8/5/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B055	C0591343	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591344	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591345	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591346	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B056	C0591347	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591348	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591349	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591350	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B057	C0591351	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591353	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591354	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591355	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B058	C0591356	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591357	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591358	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591359	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--

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PAH Study, 2003 (Continued)																
C3S023B059	C0591360	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591361	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591363	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591364	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
C3S023B060	C0591365	8/1/2003	0 - 0.5	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591366	8/1/2003	0.5 - 2	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591367	8/1/2003	2 - 4	--	--	X	--	--	--	--	--	--	--	--	--	--
	C0591368	8/1/2003	4 - 8	--	--	X	--	--	--	--	--	--	--	--	--	--
ENVIRONMENTAL BASELINE SURVEY				--	--	--	--	--	--	--	--	--	--	--	--	--
Phase IIA Environmental Baseline Survey				--	--	--	--	--	--	--	--	--	--	--	--	--
148-001-001	148-0002M	02/07/1995	3.5 - 4	--	X	--	--	X	--	X	--	--	--	--	--	--
	148-0003	02/07/1995	3.5 - 4	X	X	--	--	X	X	X	--	--	--	--	--	--
148-001-004	148-0005M	02/07/1995	3.5 - 4	--	X	--	--	X	--	X	--	--	--	--	--	--
	148-0006	02/07/1995	3.5 - 4	X	--	--	--	--	X	--	--	--	--	--	--	--
148-001-007	148-0008M	02/07/1995	4 - 4.5	--	X	--	--	X	--	X	--	--	--	--	--	--
	148-0009	02/07/1995	4 - 4.5	X	--	--	--	--	X	--	--	--	--	--	--	--
150-Z19-016	150-0016M	06/21/1995	0.5 - 1	X	--	--	X	X	--	X	--	--	--	--	--	--
153-Z22-004	153-0004	04/10/1995	2.5 - 3	X	--	--	X	X	X	X	--	--	--	--	--	--
	153-0004M	04/10/1995	2.5 - 3	--	--	--	X	X	--	X	--	--	--	--	--	--
211-001-001	211-0001M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-002	211-0002M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-003	211-0003M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-004	211-0004M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-005	211-0005	03/31/1995	0 - 0.5	--	--	--	--	--	X	X	--	--	--	--	--	--
	211-0005M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-006	211-0006M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-007	211-0007M	03/31/1995	0.5 - 1	--	--	--	--	--	--	X	--	--	--	--	--	--
211-001-008	211-0008	03/31/1995	0 - 0.5	--	--	--	--	--	X	X	--	--	--	--	--	--
	211-0008M	03/31/1995	0 - 0.5	--	--	--	--	--	--	X	--	--	--	--	--	--
211-IW-001	211I-001	01/19/1995	5.5 - 6.5	X	X	--	X	X	X	X	--	X	X	X	X	--
	211I-001M	01/19/1995	5.5 - 6.5	--	X	--	--	X	--	--	--	--	--	--	--	--
211-IW-002	211I-002	01/20/1995	7 - 7.5	X	X	--	X	X	X	X	--	X	X	X	X	--
	211I-002M	01/20/1995	7 - 7.5	--	X	--	--	X	--	--	--	--	--	--	--	--
211-IWCO-001	211C-001	01/20/1995	1 - 2	X	X	--	X	X	X	X	--	X	X	X	--	--
	211C-001M	01/20/1995	1 - 2	--	X	--	--	X	--	--	--	--	--	--	--	--
211-SN-001	211S-001	01/17/1995	4 - 4.5	X	--	--	X	--	X	--	--	--	--	--	--	--
	211S-001M	01/17/1995	4 - 4.5	--	X	--	--	X	--	X	--	--	--	--	--	--
211-SS-001	211M-001	03/01/1995	2.5 - 3	X	X	--	X	X	X	X	--	--	X	X	--	--
	211M-001M	03/01/1995	2.5 - 3	--	X	--	--	X	--	X	--	--	--	--	--	--
211-SS-002	211M-002	03/01/1995	2 - 2.5	X	--	--	X	--	X	--	--	--	X	X	--	--
	211M-002M	03/01/1995	2 - 2.5	--	X	--	--	X	--	X	--	--	--	--	--	--

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Phase IIA Environmental Baseline Survey (Continued)																
211-SS-003	211M-003	03/01/1995	2.5 - 3	X	--	--	X	--	X	--	--	--	X	X	--	--
	211M-003M	03/01/1995	2.5 - 3	--	X	--	--	X	--	X	--	--	--	--	--	--
211-SS-004	211M-004	03/01/1995	3.5 - 4	X	X	--	--	X	X	X	--	--	X	X	--	--
	211M-004M	03/01/1995	3.5 - 4	--	X	--	--	X	--	X	--	--	--	--	--	--
211-Z22-009	211-0009	04/11/1995	0.5 - 1	--	--	--	--	--	--	--	--	--	--	--	--	X
Phase IIB Environmental Baseline Survey																
211-002-010	211-0012	10/17/1995	1.5 - 2.5	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0013	10/17/1995	5.5 - 6.5	X	X	--	--	--	X	X	--	--	--	--	--	--
211-002-011	211-0015	10/17/1995	1 - 2	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0016	10/17/1995	5.5 - 6.5	X	X	--	--	--	X	X	--	--	--	--	--	--
211-002-012	211-0018	10/17/1995	0.5 - 1	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0019	10/17/1995	5 - 5.5	X	X	--	--	--	X	X	--	--	--	--	--	--
211-002-013	211-0021	10/18/1995	1 - 2	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0022	10/18/1995	4.5 - 6.5	X	X	--	--	--	X	X	--	--	--	--	--	--
211-002-014	211-0024	10/17/1995	0.5 - 1	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0025	10/17/1995	4.5 - 5.5	X	X	--	--	--	X	X	--	--	--	--	--	--
211-002-015	211-0027	10/17/1995	1 - 2	--	X	--	--	--	X	X	--	--	--	--	--	--
	211-0028	10/17/1995	5 - 6	X	X	--	--	--	X	X	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS																
Fuel Line and Underground Storage Tank Investigations																
530-1-MOJ	530-P1-5.5	8/20/1997	5.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-2-MOJ	530-P2-5.5	8/20/1997	5.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-3-MOJ	530-P3-5.5	8/20/1997	5.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-4-MOJ	530-P4-5.5	8/20/1997	5.5	X	--	--	--	--	--	X	--	--	--	--	--	--
530-5-MOJ	530-P5-5.5	8/20/1997	5.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-6-MOJ	530-P6-6.0	8/21/1997	6	--	--	--	--	--	--	X	--	--	--	--	--	--
530-7-MOJ	530-P7-6.0	8/21/1997	6	X	--	--	--	--	--	X	--	--	--	--	--	--
530-8-MOJ	530-P8-5.5	8/21/1997	5.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-9-MOJ	530-P9-6.0	8/21/1997	6	--	--	--	--	--	--	X	--	--	--	--	--	--
530-10-MOJ	530-P10-6.0	8/21/1997	6	--	--	--	--	--	--	X	--	--	--	--	--	--
530-11-MOJ	530-P11-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-12-MOJ	530-P12-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-13-MOJ	530-P13-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-14-MOJ	530-P14-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-15-MOJ	530-P15-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-16-MOJ	530-P16-4.5	9/17/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-17-MOJ	530-P17	9/17/1997		--	--	--	--	--	--	X	--	--	--	--	--	--
530-22-MOJ	530-P22-5.0	10/6/1997	5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-25-MOJ	530-P25-5.0	11/11/1997	5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-MJ-MW-1	530MW1-3.5	11/4/1997	3.5	--	--	--	--	--	--	X	--	--	--	--	--	--

TABLE 9-1: SITE 23 SOIL SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED												
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	PAH	Pesticides/ PCB	Total Metals	General Chemistry	TPH	Cyanide	Herbicides	Oil & Grease	Tin	Organic Lead	Dioxins
Fuel Line and Underground Storage Tank Investigations (Continued)																
530-MJ-MW-2	530MW2-3.5	11/4/1997	3.5	--	--	--	--	--	--	X	--	--	--	--	--	--
530-MJ-MW-3	530MW3-4.5	12/4/1997	4.5	--	--	--	--	--	--	X	--	--	--	--	--	--
CA13-10	030-CAP-202	6/15/2000	4 - 4.5	--	X	--	--	X	X	X	--	--	--	--	--	--
	030-CAP-203	6/15/2000	6.5 - 7	--	X	--	--	X	X	X	--	--	--	--	--	--

Notes:

--	These analyses were not performed.
ft bgs	Feet below ground surface
General chemistry	Flashpoint, major anions, percent moisture, pH, reactivity, TKN, and/or TOC
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic compound
TKN	Total Kjelkahl nitrogen
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
VOC	Volatile organic compound
X	These analyses were performed.

TABLE 9-2: SITE 23 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	ANALYSES PERFORMED								
				SVOC	VOC	Landfill Gases	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	PAH
REMEDIAL INVESTIGATION												
Phases 1 & 2A Investigation, 1991												
MW410-4	MW410-4 [08/22/90]	08/22/1990		X	X	--	X	--	--	X	--	--
MW530-1	MW530-1 [08/23/90]	08/23/1990		X	X	--	X	--	--	X	X	--
MW530-2	MW530-2 [08/23/90]	08/23/1990		X	X	--	X	--	--	X	X	--
MW530-3	MW530-3 [08/24/90]	08/24/1990		X	X	--	X	--	--	X	X	--
MWOR-5	MWOR-5 [08/28/90]	08/28/1990		X	X	--	X	--	X	X	X	--
Follow-on Investigation, 1994												
D10B-01	280-S10B-138	12/15/1994		X	X	--	X	--	--	X	X	--
	280-S10B-141	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-142	06/23/1995		X	X	--	X	--	--	X	X	--
	280-S10B-143	09/14/1995		X	X	--	X	--	--	X	X	--
D10B-02	280-S10B-139	12/15/1994		X	X	--	X	--	--	X	X	--
	280-S10B-144	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-145	06/23/1995		X	X	--	X	--	--	X	X	--
	280-S10B-146	09/14/1995		X	X	--	X	--	--	X	X	--
DHP-S09-04	280-S09-056	08/26/1994	22	X	X	--	X	--	--	X	--	--
DHP-S10B-01	280-S10B-110	07/15/1994	40	X	X	--	X	--	--	X	X	--
DHP-S10B-02	280-S10B-111	07/15/1994	33	X	X	--	X	--	--	X	X	--
DHP-S10B-03	280-S10B-112	07/18/1994	24	X	X	--	X	--	--	--	X	--
DHP-S10B-04	280-S10B-114	07/15/1994	24.5	X	X	--	X	--	--	X	X	--
DHP-S10B-05	280-S10B-115	07/15/1994	21	X	X	--	X	--	--	--	X	--
DHP-S13-05	280-S13-076	08/29/1994	13.5 - 17	X	X	--	X	--	--	X	X	--
M09-05	280-S09-044	11/30/1994		X	X	--	X	--	--	X	X	--
	280-S09-046	02/21/1995		X	X	--	X	--	--	X	X	--
	280-S09-047	06/21/1995		X	X	--	X	--	--	X	X	--
	280-S09-048	08/07/1995		X	X	--	X	--	--	X	X	--
M10B-01	280-S10B-140	12/01/1994		X	X	--	X	--	--	X	X	--
	280-S10B-147	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-148	06/23/1995		X	X	--	X	--	--	X	X	--
	280-S10B-149	08/09/1995		X	X	--	X	--	--	X	X	--
MW410-4	280-S09-040	10/19/1994		X	X	--	X	--	--	X	X	--
	280-S09-041	02/21/1995		X	X	--	X	--	--	X	X	--
	280-S09-042	06/23/1995		X	X	--	X	--	X	X	X	--
	280-S09-043	08/07/1995		X	X	--	X	--	--	X	X	--

TABLE 9-2: SITE 23 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED								
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	Landfill Gases	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	PAH
Follow-on Investigation, 1994 (Continued)												
MW530-1	280-S10B-017	10/19/1994		X	X	--	X	--	--	X	X	--
	280-S10B-018	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-020	06/26/1995		X	X	--	X	--	--	X	X	--
	280-S10B-021	08/09/1995		X	X	--	X	--	--	X	X	--
MW530-2	280-S10B-022	10/19/1994		X	X	--	X	--	--	X	X	--
	280-S10B-023	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-024	06/26/1995		X	X	--	X	--	--	X	X	--
	280-S10B-025	08/08/1995		X	X	--	X	--	--	X	X	--
MW530-3	280-S10B-026	10/19/1994		X	X	--	X	--	--	X	X	--
	280-S10B-027	02/22/1995		X	X	--	X	--	--	X	X	--
	280-S10B-028	06/26/1995		X	X	--	X	--	--	X	X	--
	280-S10B-029	08/09/1995		X	X	--	X	--	--	X	X	--
MWOR-5	280-S13-050	10/21/1994		X	X	--	X	--	X	X	X	--
	280-S13-051	02/23/1995		X	X	--	X	--	X	X	X	--
	280-S13-052	06/28/1995		X	X	--	X	--	X	X	X	--
	280-S13-053	08/11/1995		X	X	--	X	--	X	X	X	--
SHP-S10B-05	280-S10B-127	08/22/1994	5 - 8.5	X	X	--	X	--	--	--	X	--
SHP-S10B-06	280-S10B-128	08/22/1994	4.5 - 8	X	X	--	X	--	--	--	X	--
Follow-on Investigation, 1998												
D10B-02	108-S23-001	11/13/1997		--	X	--	X	--	--	X	--	--
	108-S23-003	02/12/1998		--	X	--	X	--	--	X	--	--
	108-S23-005	05/13/1998		--	X	--	X	--	--	X	--	--
	108-S23-007	08/07/1998		--	X	--	--	X	--	X	--	--
MW530-2	108-S23-002	11/06/1997		--	X	--	X	--	--	X	X	--
	108-S23-004	02/06/1998		--	X	--	X	--	--	X	X	--
	108-S23-006	05/13/1998		--	X	--	X	--	--	X	X	--
	108-S23-008	08/10/1998		--	X	--	--	X	--	X	X	--
MWOR-5	108-S13-003	11/07/1997		--	X	--	X	--	--	X	X	--
	108-S13-007	02/10/1998		--	X	--	X	--	--	X	X	--
	108-S13-011	05/13/1998		--	X	--	X	--	--	X	X	--
	108-S13-015	08/07/1998		--	X	--	--	X	--	X	X	--
Supplemental Remedial Investigation Data Gap Sampling, 2001												
530-MJ-MW-1	385-S23-008	07/09/2001		--	X	--	--	--	--	--	X	--
530-MJ-MW-2	385-S23-009	07/09/2001		--	X	--	--	--	--	--	X	--
530-MJ-MW-3	385-S23-010	07/06/2001		X	X	--	--	--	--	--	X	X

TABLE 9-2: SITE 23 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED								
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	Landfill Gases	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	PAH
Supplemental Remedial Investigation Data Gap Sampling, 2001 (Continued)												
D10B-01	385-S23-006	07/09/2001		X	X	--	--	--	--	--	X	X
D10B-02	385-S23-007	07/09/2001		X	X	--	--	--	--	--	X	X
M09-05	385-S09-029	06/25/2001		X	X	--	--	--	--	--	X	X
M10B-01	385-S23-005	07/06/2001		X	X	--	--	--	--	--	X	X
MW530-1	385-S23-002	07/06/2001		X	X	--	--	--	--	--	X	X
MW530-2	385-S23-003	07/06/2001		X	X	--	--	--	--	--	X	X
MW530-3	385-S23-004	07/06/2001		X	X	--	--	--	--	--	X	X
MWOR-5	385-S13-005	06/29/2001		X	X	--	--	--	--	--	X	X
S23-DGS-SG03	385-S23-019	07/27/2001	1.5	X	--	X	--	--	--	--	--	--
S23-DGS-SG03	385-S23-955	07/27/2001	4	X	--	X	--	--	--	--	--	--
S23-DGS-VE01	385-S23-015	08/08/2001	8 - 10	--	X	--	--	--	--	--	X	--
	385-S23-015A	08/08/2001	8 - 10	X	--	--	--	--	--	--	X	--
S23-DGS-VE02	385-S23-023	08/21/2001	7	--	X	--	--	--	--	--	--	--
Basewide Groundwater Monitoring, 2002												
D10B-02	D10B-02-A1137	06/28/2002		--	X	X	X	--	--	X	X	--
	D10B-02-A1638	12/16/2002		--	X	X	X	--	--	X	X	--
M10B-01	M10B-01-A1143	06/18/2002		--	X	X	X	--	--	X	X	--
	M10B-01-A1342	09/05/2002		--	X	--	--	--	--	--	X	--
	M10B-01-A1644	12/16/2002		--	X	X	X	--	--	X	X	--
	M10B-01-A1995	04/10/2003		--	X	--	--	--	--	--	X	--
MW410-4	MW410-4-A1152	06/18/2002		--	X	X	X	--	--	X	X	--
	MW410-4-A1346	09/04/2002		--	X	--	--	--	--	--	X	--
	MW410-4-A1653	12/16/2002		--	X	X	X	--	--	X	X	--
	MW410-4-A1999	04/09/2003		--	X	--	--	--	--	--	X	--
MW530-2	MW530-2-A1154	06/18/2002		--	X	X	X	--	--	X	X	--
	MW530-2-A1655	12/16/2002		--	X	X	X	--	--	X	X	--
MW530-3	MW530-3-A1155	06/18/2002		--	X	X	X	--	--	X	X	--
	MW530-3-A1656	12/16/2002		--	X	X	X	--	--	X	X	--
ENVIRONMENTAL BASELINE SURVEY												
Phase IIA Environmental Baseline Survey												
148-001-001	148-0001M	02/07/1995	5 - 5	--	X	--	--	--	--	--	--	--
148-001-004	148-0004M	02/07/1995	3.5 - 4	--	X	--	--	--	--	--	--	--
148-001-007	148-0007M	02/07/1995	3 - 3.5	--	X	--	--	--	--	--	--	--

TABLE 9-2: SITE 23 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED								
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	Landfill Gases	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	PAH
Phase IIB Environmental Baseline Survey												
211-002-010	211-0011	10/17/1995	9 - 9	X	--	--	--	--	--	--	X	--
	211-0011RS	11/29/1995	9 - 9	--	X	--	--	--	--	--	--	--
211-002-011	211-0014	10/17/1995	9 - 9	X	--	--	--	--	--	--	X	--
	211-0014RS	11/29/1995	8 - 9	--	X	--	--	--	--	--	--	--
211-002-012	211-0017	10/17/1995	9 - 9	X	--	--	--	--	--	--	X	--
	211-0017RS	11/29/1995	8 - 9	--	X	--	--	--	--	--	--	--
211-002-013	211-0020	10/18/1995	7.5 - 8.5	X	--	--	--	--	--	--	X	--
	211-0020RS	11/29/1995	8 - 8.5	--	X	--	--	--	--	--	--	--
	211-0029RS	11/29/1995	8 - 9	--	X	--	--	--	--	--	--	--
211-002-014	211-0023	10/17/1995	9 - 9	X	--	--	--	--	--	--	X	--
	211-0023RS	11/29/1995	8 - 9	--	X	--	--	--	--	--	--	--
211-002-015	211-0026	10/17/1995	9 - 9	X	--	--	--	--	--	--	X	--
	211-0026RS	11/29/1995	9 - 10	--	X	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBON INVESTIGATIONS												
Fuel Line and Underground Storage Tank Investigations												
530-1-MOJ	530-P1W	08/20/1997		--	X	--	--	--	--	--	X	--
530-2-MOJ	530-P2W	08/20/1997		--	--	--	--	--	--	--	X	--
530-3-MOJ	530-P3W	08/20/1997		--	--	--	--	--	--	--	X	--
530-4-MOJ	530-P4W	08/20/1997		--	X	--	--	--	--	--	X	--
530-5-MOJ	530-P5W	08/20/1997		--	--	--	--	--	--	--	X	--
530-6-MOJ	530-P6W	08/21/1997		--	X	--	--	--	--	--	X	--
530-7-MOJ	530-P7W	08/21/1997		--	X	--	--	--	--	--	X	--
530-8-MOJ	530-P8W	08/21/1997		--	--	--	--	--	--	--	X	--
530-9-MOJ	530-P9W	08/21/1997		--	--	--	--	--	--	--	X	--
530-10-MOJ	530-P10W	08/21/1997		--	X	--	--	--	--	--	X	--
530-11-MOJ	530-P11W	09/17/1997		--	--	--	--	--	--	--	X	--
530-12-MOJ	530-P12W	09/17/1997		--	--	--	--	--	--	--	X	--
530-13-MOJ	530-P13W	09/17/1997		--	--	--	--	--	--	--	X	--
530-14-MOJ	530-P14W	09/17/1997		--	--	--	--	--	--	--	X	--
530-15-MOJ	530-P15W	09/17/1997		--	--	--	--	--	--	--	X	--
530-16-MOJ	530-P16W	09/17/1997		--	--	--	--	--	--	--	X	--
530-17-MOJ	530-P17W	09/17/1997		--	--	--	--	--	--	--	X	--
530-18-MOJ	530-P18W	09/18/1997		--	--	--	--	--	--	--	X	--
530-20-MOJ	530-P20W	09/18/1997		--	--	--	--	--	--	--	X	--
530-22-MOJ	530-P22W	10/06/1997		--	--	--	--	--	--	--	X	--

TABLE 9-2: SITE 23 GROUNDWATER SAMPLING SUMMARY

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

				ANALYSES PERFORMED								
SAMPLE LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	DEPTH (ft bgs)	SVOC	VOC	Landfill Gases	Dissolved Metals	Total Metals	Pesticides/ PCBs	General Chemistry	TPH	PAH
Fuel Line and Underground Storage Tank Investigations (Continued)												
530-25-MOJ	530-P25W	11/11/1997		--	--	--	--	--	--	--	X	--
530-MJ-MW-1	530-MJ-MW-1	12/15/1997		--	--	--	--	--	--	--	X	--
	530-MJ-MW-1	03/16/1998		--	--	--	--	--	--	--	X	--
	530-MJ-MW-1	09/29/1998		--	--	--	--	--	--	--	X	--
	530-MJ-MW-1	04/07/1999		--	--	--	--	--	--	--	X	--
530-MJ-MW-2	530-MJ-MW-2	12/15/1997		--	--	--	--	--	--	--	X	--
	530-MJ-MW-2	03/16/1998		--	--	--	--	--	--	--	X	--
	530-MJ-MW-2	09/29/1998		--	--	--	--	--	--	--	X	--
530-MJ-MW-3	530-MJ-MW-2	04/07/1999		--	--	--	--	--	--	--	X	--
	530-MJ-MW-3	12/15/1997		--	--	--	--	--	--	--	X	--
	530-MJ-MW-3	03/16/1998		--	--	--	--	--	--	--	X	--
	530-MJ-MW-3	09/29/1998		--	--	--	--	--	--	--	X	--
	530-MJ-MW-3	04/07/1999		--	--	--	--	--	--	--	X	--
5-JF	030-CAP-191	05/03/2000		--	X	--	X	--	--	--	X	--
CA13-07	030-CAP-200	04/26/2000	3 - 8	--	X	--	X	--	--	--	X	--
CA13-08	030-CAP-200A	05/02/2000	3 - 8	--	X	--	X	--	--	--	X	--
CA13-09	030-CAP-201	04/26/2000	3 - 8	--	X	--	X	--	--	--	X	--
CA13-10	030-CAP-204	06/15/2000	3 - 8	--	X	--	X	--	--	--	X	--
M10B-01	030-CAP-198	04/25/2000		--	X	--	X	--	--	--	X	--
MW530-1	030-CAP-197	04/26/2000		--	X	--	X	--	--	--	X	--

Notes:

--	These analyses were not performed.
ft bgs	Feet below ground surface
General chemistry	Acidity, alkalinity, conductivity, hardness, major anions, MBAS, oxydation, pH, sulfide, TDS, and/or TOC
MBAS	Methylene blue active substances (surfactants)
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyls
SVOC	Semivolatile organic compounds
TDS	Total dissolved solids
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compounds
X	These analyses were performed.

TABLE 9-8: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES

Supplemental Remedial Investigation Data Gap Sampling, 2001

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
CHROMIUM	1	1	100	76.9	76.9	76.9	0.0	0.0	0	0	210
LEAD	1	1	100	12.5	12.5	12.5	0.0	0.0	0	0	150 (CAL-modified)

NOTES:

Bold denotes values elevated above the PRG

mg/kg Milligrams per kilogram

NA No PRG available

PRG Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
1,1,1-TRICHLOROETHANE	82	0	0	--	--	--	5	1,400	0	0	1,200,000
1,1,2,2-TETRACHLOROETHANE	81	1	1	**930**	**930 J**	**930 J**	5	**1,400**	1	1	410
1,1,2-TRICHLOROETHANE	81	0	0	--	--	--	5	**1,400**	0	2	730
1,1-DICHLOROETHANE	81	0	0	--	--	--	5	1,400	0	0	2,800 (CAL-modified)
1,1-DICHLOROETHENE	82	0	0	--	--	--	5	1,400	0	0	120,000
1,2-DICHLOROBENZENE	37	0	0	--	--	--	5	840	0	0	370,000
1,2-DICHLOROETHANE	82	0	0	--	--	--	5	**1,400**	0	2	280
1,2-DICHLOROETHENE (TOTAL)	81	1	1	5	5 J	5 J	5	1,400	0	0	43,000 (cis)
1,2-DICHLOROPROPANE	81	0	0	--	--	--	5	**1,400**	0	2	340
1,3-DICHLOROBENZENE	37	0	0	--	--	--	5	840	0	0	16,000
1,4-DICHLOROBENZENE	37	0	0	--	--	--	5	840	0	0	3,400
2-BUTANONE	82	0	0	--	--	--	5	1,400	--	--	NA
2-CHLOROETHYLVINYLETHER	37	0	0	--	--	--	10	19	--	--	NA
2-HEXANONE	81	1	1	2	2 J	2 J	10	1,400	--	--	NA
4-METHYL-2-PENTANONE	81	0	0	--	--	--	6	1,400	--	--	NA
ACETONE	83	2	2	1,100	18	2,100 J	10	1,500	0	0	1,600,000
BENZENE	82	1	1	1	1 J	1 J	5	**1,400**	0	2	600
BROMODICHLOROMETHANE	81	0	0	--	--	--	5	**1,400**	0	2	820
BROMOFORM	81	0	0	--	--	--	5	1,400	0	0	62,000
BROMOMETHANE	81	0	0	--	--	--	10	1,400	0	0	3,900
CARBON DISULFIDE	81	0	0	--	--	--	5	1,400	0	0	360,000
CARBON TETRACHLORIDE	81	0	0	--	--	--	5	**1,400**	0	2	250
CHLOROBENZENE	81	0	0	--	--	--	5	1,400	0	0	150,000
CHLOROETHANE	81	0	0	--	--	--	10	1,400	0	0	3,000
CHLOROFORM	81	0	0	--	--	--	5	**1,400**	0	2	940 (CAL-modified)
CHLOROMETHANE	81	0	0	--	--	--	10	**1,400**	0	2	1,200
CIS-1,2-DICHLOROETHENE	1	0	0	--	--	--	10	10	0	0	43,000
CIS-1,3-DICHLOROPROPENE	81	0	0	--	--	--	5	**1,400**	0	2	780 (not cis)
DIBROMOCHLOROMETHANE	81	0	0	--	--	--	5	**1,400**	0	2	1,100
ETHYLBENZENE	84	3	4	3,600	36	6,200	5	1,400	0	0	8,900
HEXANE	1	0	0	--	--	--	20	20	0	0	110,000 (n-hexane)

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Volatile Organic Compounds (µg/kg)											
M,P-XYLENE	1	0	0	--	--	--	20	20	0	0	270,000 (xylenes)
METHYLENE CHLORIDE	84	3	4	660	7	1,800	5	1,400	0	0	9,100
O-XYLENE	1	0	0	--	--	--	10	10	0	0	270,000 (xylenes)
STYRENE	81	0	0	--	--	--	5	1,400	0	0	1,700,000
TETRACHLOROETHENE	82	0	0	--	--	--	5	1,400	0	0	1,500
TOLUENE	84	50	60	54	1 J	1,100	5	1,400	0	0	520,000
TRANS-1,2-DICHLOROETHENE	1	0	0	--	--	--	10	10	0	0	69,000
TRANS-1,3-DICHLOROPROPENE	81	0	0	--	--	--	5	**1,400**	0	2	780 (not trans)
TRICHLOROETHENE	82	0	0	--	--	--	5	**1,400**	0	2	53
TRICHLOROFLUOROMETHANE	37	0	0	--	--	--	5	9	0	0	390,000
VINYL ACETATE	54	0	0	--	--	--	10	61	0	0	430,000
VINYL CHLORIDE	82	0	0	--	--	--	10	**1,400**	0	2	79 (child or adult)
XYLENE (TOTAL)	83	5	6	3,000	3 J	12,000	5	1,400	0	0	270,000
Semivolatile Organic Compounds (µg/kg)											
1,2,4-TRICHLOROBENZENE	100	0	0	--	--	--	340	110,000	0	0	650,000
1,2-DICHLOROBENZENE	100	0	0	--	--	--	340	110,000	0	0	370,000
1,2-DIPHENYLHYDRAZINE	49	0	0	--	--	--	340	**1,200**	0	6	610
1,3-DICHLOROBENZENE	100	0	0	--	--	--	340	**110,000**	0	3	16,000
1,4-DICHLOROBENZENE	100	0	0	--	--	--	340	**110,000**	0	11	3,400
2,2'-OXYBIS(1-CHLOROPROPANE)	27	0	0	--	--	--	340	110,000	--	--	NA
2,4,5-TRICHLOROPHENOL	100	0	0	--	--	--	830	280,000	0	0	6,100,000
2,4,6-TRICHLOROPHENOL	100	0	0	--	--	--	340	**110,000**	0	7	6,900 (CAL-modified)
2,4-DICHLOROPHENOL	100	0	0	--	--	--	340	110,000	0	0	180,000
2,4-DIMETHYLPHENOL	100	1	1	52	52 J	52 J	340	110,000	0	0	1,200,000
2,4-DINITROPHENOL	100	0	0	--	--	--	830	**280,000**	0	1	120,000
2,4-DINITROTOLUENE	100	0	0	--	--	--	340	110,000	0	0	120,000
2,6-DINITROTOLUENE	100	0	0	--	--	--	340	**110,000**	0	1	61,000
2-CHLORONAPHTHALENE	100	0	0	--	--	--	340	110,000	--	--	NA
2-CHLOROPHENOL	100	0	0	--	--	--	340	**110,000**	0	1	63,000
2-METHYLPHENOL	100	1	1	21	21 J	21 J	340	110,000	--	--	NA

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (ug/kg)											
2-NITROANILINE	100	0	0	--	--	--	830	**280,000**	0	64	1,700
2-NITROPHENOL	100	0	0	--	--	--	340	110,000	--	--	NA
3,3'-DICHLOROBENZIDINE	100	0	0	--	--	--	340	**110,000**	0	32	1,100
3-NITROANILINE	100	0	0	--	--	--	830	280,000	--	--	NA
4,6-DINITRO-2-METHYLPHENOL	100	0	0	--	--	--	830	280,000	--	--	NA
4-BROMOPHENYL-PHENYLETHER	100	0	0	--	--	--	340	110,000	--	--	NA
4-CHLORO-3-METHYLPHENOL	100	0	0	--	--	--	340	110,000	--	--	NA
4-CHLOROANILINE	100	1	1	1,100	1,100 J	1,100 J	340	110,000	0	0	240,000
4-CHLOROPHENYL-PHENYLETHER	100	0	0	--	--	--	340	110,000	--	--	NA
4-METHYLPHENOL	100	1	1	48	48 J	48 J	340	110,000	0	0	310,000
4-NITROANILINE	100	1	1	760	760 J	760 J	830	280,000	--	--	NA
4-NITROPHENOL	100	0	0	--	--	--	830	280,000	--	--	NA
ANILINE	14	0	0	--	--	--	350	1,200	0	0	85,000
AZOBENZENE	1	0	0	--	--	--	350	350	0	0	4,400
BENZIDINE	1	0	0	--	--	--	**350**	**350**	0	1	2
BENZOIC ACID	73	0	0	--	--	--	1,600	75,000	0	0	100,000,000
BENZYL ALCOHOL	74	0	0	--	--	--	340	16,000	0	0	18,000,000
BIS(2-CHLOROETHOXY)METHANE	100	0	0	--	--	--	340	110,000	--	--	NA
BIS(2-CHLOROETHYL)ETHER	100	0	0	--	--	--	**340**	**110,000**	0	100	210
BIS(2-ETHYLHEXYL)PHTHALATE	100	2	2	720	560 J	880	340	**110,000**	0	1	35,000
BUTYLBENZYLPHTHALATE	100	2	2	370	32 J	700 J	340	110,000	0	0	12,000,000
CARBAZOLE	26	0	0	--	--	--	340	**110,000**	0	3	24,000
DI-N-BUTYLPHTHALATE	100	1	1	12,000	12,000	12,000	340	110,000	--	--	NA
DI-N-OCTYLPHTHALATE	100	0	0	--	--	--	340	110,000	--	--	NA
DIBENZOFURAN	100	0	0	--	--	--	340	110,000	0	0	290,000
DIETHYLPHTHALATE	100	0	0	--	--	--	340	110,000	0	0	49,000,000
DIMETHYLPHTHALATE	100	0	0	--	--	--	340	110,000	0	0	100,000,000
HEXACHLOROBENZENE	100	0	0	--	--	--	**340**	**110,000**	0	100	300
HEXACHLOROBUTADIENE	100	0	0	--	--	--	340	**110,000**	0	7	6,200
HEXACHLOROCYCLOPENTADIENE	100	0	0	--	--	--	340	110,000	0	0	370,000
HEXACHLOROETHANE	100	0	0	--	--	--	340	**110,000**	0	1	35,000

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Semivolatile Organic Compounds (µg/kg)											
ISOPHORONE	100	2	2	12,000	10,000	13,000	340	110,000	0	0	510,000
N-NITROSO-DI-N-PROPYLAMINE	100	0	0	--	--	--	**340**	**110,000**	0	100	69
N-NITROSODIMETHYLAMINE	14	0	0	--	--	--	**350**	**1,200**	0	14	10
N-NITROSODIPHENYLAMINE	100	12	12	97	46 J	220 J	340	**110,000**	0	1	99,000
NITROBENZENE	100	0	0	--	--	--	340	**110,000**	0	3	20,000
PENTACHLOROPHENOL	99	1	1	930	930 J	930 J	830	**280,000**	0	28	3,000
PHENOL	100	0	0	--	--	--	340	110,000	0	0	37,000,000
Polynuclear Aromatic Hydrocarbons (µg/kg)											
2-METHYLNAPHTHALENE	240	69	29	160	0.001 J	11,000	0.005	130	--	--	NA
ACENAPHTHENE	240	22	9	11	0.002 J	93 J	0.005	130	0	0	3,700,000
ACENAPHTHYLENE	240	48	20	3	0.002 J	66 J	0.005	130	--	--	NA
ANTHRACENE	240	60	25	16	0.001 J	430	0.005	280	0	0	22,000,000
BENZ(A)ANTHRACENE	240	133	55	37	0.002 J	2,100	0.005	130	--	--	NA
BENZO(A)PYRENE	240	128	53	45	0.002 J	**2,000**	0.005	**130**	13	1	62
BENZO(B)FLUORANTHENE	240	130	54	45	0.002 J	**2,000**	0.005	130	2	0	620
BENZO(G,H,I)PERYLENE	240	148	62	34	0.002 J	1,300	0.005	52	--	--	NA
BENZO(K)FLUORANTHENE	240	103	43	44	0.002 J	**1,600**	0.005	130	2	0	380 (CAL-modified)
CHRYSENE	240	140	58	45	0.002	2,300	0.005	52	0	0	3,800 (CAL-modified)
DIBENZ(A,H)ANTHRACENE	238	98	41	12	0.002 J	390	0.005	280	--	--	NA
FLUORANTHENE	240	132	55	68	0.002 J	3,400	0.005	130	0	0	2,300,000
FLUORENE	240	36	15	12	0.003 J	290	0.005	130	0	0	2,700,000
INDENO(1,2,3-CD)PYRENE	240	120	50	34	0.003 J	**1,400**	0.005	130	2	0	620
NAPHTHALENE	240	86	36	140	0.001 J	12,000	0.005	130	0	0	56,000
PHENANTHRENE	237	122	51	36	0.002 J	1,500	0.005	100	--	--	NA
PYRENE	240	141	59	58	0.002 J	2,700	0.005	130	0	0	2,300,000
PCBs/Pesticides (µg/kg)											
4,4'-DDD	46	1	2	14	14	14	2	94	0	0	2,400
4,4'-DDE	46	1	2	7	7	7	2	94	0	0	1,700
4,4'-DDT	46	3	7	27	3	72	2	94	0	0	1,700

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
PCBs/Pesticides (ug/kg)											
ALDRIN	46	0	0	--	--	--	1	**47**	0	1	29
ALPHA-BHC	46	0	0	--	--	--	1	47	--	--	NA
ALPHA-CHLORDANE	32	0	0	--	--	--	2	470	0	0	1,600 (chlordane)
AROCLOR-1016	49	0	0	--	--	--	21	470	0	0	3,900
AROCLOR-1221	49	0	0	--	--	--	21	**850**	0	4	220
AROCLOR-1232	49	0	0	--	--	--	21	**850**	0	4	220
AROCLOR-1242	49	0	0	--	--	--	21	**470**	0	4	220
AROCLOR-1248	49	0	0	--	--	--	17	**470**	0	2	220
AROCLOR-1254	49	0	0	--	--	--	17	**940**	0	4	220
AROCLOR-1260	49	1	2	38	38 J	38 J	17	**940**	0	4	220
BETA-BHC	46	1	2	4	4 J	4 J	1	47	--	--	NA
CHLORDANE	14	0	0	--	--	--	11	120	0	0	1,600
DELTA-BHC	46	0	0	--	--	--	1	47	--	--	NA
DIELDRIN	46	0	0	--	--	--	1	**94**	0	1	30
ENDOSULFAN I	46	0	0	--	--	--	2	47	0	0	370,000
ENDOSULFAN II	47	0	0	--	--	--	2	94	0	0	370,000 (endosulfan)
ENDOSULFAN SULFATE	46	0	0	--	--	--	2	94	--	--	NA
ENDRIN	43	0	0	--	--	--	2	94	0	0	18,000
ENDRIN ALDEHYDE	22	0	0	--	--	--	2	24	--	--	NA
ENDRIN KETONE	32	0	0	--	--	--	3	94	--	--	NA
GAMMA-BHC (LINDANE)	46	0	0	--	--	--	1	47	--	--	NA
GAMMA-CHLORDANE	32	0	0	--	--	--	2	470	0	0	1,600 (chlordane)
HEPTACHLOR	42	0	0	--	--	--	1	47	0	0	110
HEPTACHLOR EPOXIDE	45	0	0	--	--	--	1	47	0	0	53
METHOXYCHLOR	46	0	0	--	--	--	5	470	0	0	310,000
TOXAPHENE	46	3	7	1,400	400	**2,500**	53	**940**	2	3	440
Metals (mg/kg)											
ALUMINUM	80	80	100	6,080	370	28,800	0.0	0.0	0	0	76,000
ANTIMONY	81	19	23	4.0	0.89 J	7.4	0.52	25.0	0	0	31.0
ARSENIC	80	24	30	**4.7**	**0.84 J**	**12.0**	**0.71**	**17.0**	24	56	0.39

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES (Continued)

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Residential PRG
Metals (mg/kg)											
BARIUM	75	68	91	52.6	15.2	300	21.0	25.0	0	0	5,400
BERYLLIUM	81	15	19	0.26	0.10	0.50	0.20	25.0	0	0	150
CADMIUM	81	33	41	0.81	0.18J	10.0	0.060	25.0	0	0	37.0
CALCIUM	80	79	99	4,380	710	28,800	10.0	10.0	--	--	NA
CHROMIUM	82	80	98	33.5	7.3	89.0	6.2	25.0	0	0	210
COBALT	80	51	64	5.9	2.8	15.0	3.7	6.6	0	0	900
COPPER	81	76	94	20.2	4.5	113	5.3	25.0	0	0	3,100
CYANIDE	3	0	0	--	--	--	0.50	0.60	--	--	NA
IRON	80	80	100	10,300	1,500	**37,000**	0.0	0.0	5	0	23,000
LEAD	85	38	45	18.1	1.3	120	3.5	25.0	0	0	150 (CAL-modified)
MAGNESIUM	80	78	98	2,880	26.6	10,000	620	640	--	--	NA
MANGANESE	80	79	99	137	13.0	759	6.2	6.2	0	0	1,800
MERCURY	7	0	0	--	--	--	0.16	**25.0**	0	1	23.0
MOLYBDENUM	80	0	0	--	--	--	0.31	8.5	0	0	390
NICKEL	81	79	98	29.5	4.7	91.0	6.2	6.4	0	0	1,600
POTASSIUM	80	71	89	1,010	390	3,700	425	620	--	--	NA
SELENIUM	80	1	1	26.0	26.0	26.0	0.55	14.0	0	0	390
SILVER	81	1	1	0.38	0.38	0.38	0.18	25.0	0	0	390
SODIUM	80	59	74	825	130	3,400	69.0	660	--	--	NA
THALLIUM	80	2	3	3.1	2.9	3.3	0.40	**17.0**	0	31	5.2
TITANIUM	74	74	100	422	229	2,540	0.0	0.0	--	--	NA
VANADIUM	80	79	99	21.8	12.0	82.0	6.2	6.2	0	0	550
ZINC	81	79	98	35.4	10.0	130	16.6	25.0	0	0	23,000

TABLE 9-11: SITE 23 STATISTICAL SUMMARY OF SOIL ANALYSES

All Soil Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
mg/kg	Milligrams per kilogram
NA	No PRG available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/kg	Micrograms per kilogram

TABLE 9-12: SITE 23 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
Volatile Organic Compounds (ug/L)												
1,1,1,2-TETRACHLOROETHANE	18	0	0	--	--	--	**0.5**	**1,300**	0	18	0.4	NA
1,1,1-TRICHLOROETHANE	96	3	3	8	2	16	0.5	1,300	0	0	3,200	200
1,1,2,2-TETRACHLOROETHANE	96	0	0	--	--	--	**0.5**	**1,300**	0	96	0.06	1
1,1,2-TRICHLOROETHANE	96	0	0	--	--	--	**0.5**	**1,300**	0	96	0.2	5
1,1-DICHLOROETHANE	96	2	2	2	1	2	0.5	**1,300**	0	8	2 (CAL-modified)	5
1,1-DICHLOROETHENE	96	1	1	4	4 J	4 J	0.5	**1,300**	0	1	340	6
1,1-DICHLOROPROPENE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
1,2,3-TRICHLOROBENZENE	16	1	6	1	1	1	0.5	1,300	--	--	NA	NA
1,2,3-TRICHLOROPROPANE	16	0	0	--	--	--	**0.5**	**1,300**	0	16	0.006	NA
1,2,4-TRICHLOROBENZENE	28	0	0	--	--	--	0.5	**1,300**	0	1	190	5
1,2,4-TRIMETHYLBENZENE	16	1	6	**860**	**860 J**	**860J**	0.5	**100**	1	1	12	NA
1,2-DIBROMO-3-CHLOROPROPANE	28	0	0	--	--	--	**0.5**	**1,300**	0	28	0.002 (CAL-modified)	0.2
1,2-DICHLOROBENZENE	39	1	3	0.1	0.1 J	0.1 J	0.5	**1,300**	0	1	370	600
1,2-DICHLOROETHANE	96	0	0	--	--	--	**0.5**	**1,300**	0	96	0.1	0.5
1,2-DICHLOROETHENE (TOTAL)	66	2	3	1	1	1	1	**200**	0	1	61 (cis)	NA
1,2-DICHLOROPROPANE	94	0	0	--	--	--	**0.5**	**1,300**	0	94	0.2	5
1,3,5-TRIMETHYLBENZENE	16	0	0	--	--	--	0.5	**1,300**	0	2	12	NA
1,3-DICHLOROBENZENE	39	0	0	--	--	--	0.5	**1,300**	0	2	6	NA
1,3-DICHLOROPROPANE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
1,4-DICHLOROBENZENE	39	0	0	--	--	--	0.5	**1,300**	0	25	0.5	5
2,2-DICHLOROPROPANE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
2-BUTANONE	40	1	3	4,200	4,200 J	4,200 J	2	15	--	--	NA	NA
2-CHLOROTOLUENE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
2-HEXANONE	85	1	1	2	2 J	2 J	2	200	--	--	NA	NA
4-CHLOROTOLUENE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
4-METHYL-2-PENTANONE	94	1	1	2	2 J	2 J	2	13,000	--	--	NA	NA
ACETONE	40	5	13	1	0.4 J	2 J	0.5	33	0	0	610	NA
BENZENE	96	8	8	**15**	0.2 J	**67**	**0.5**	**1,300**	7	88	0.3	1
BROMOBENZENE	16	0	0	--	--	--	0.5	**1,300**	0	2	20	NA
BROMOCHLOROMETHANE	28	0	0	--	--	--	0.5	1,300	--	--	NA	NA
BROMODICHLOROMETHANE	94	0	0	--	--	--	**0.5**	**1,300**	0	94	0.2	80

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Volatile Organic Compounds (ug/L)												
BROMOFORM	94	1	1	0.2	0.2J	0.2J	1	**1,300**	0	3	9	80
BROMOMETHANE	94	0	0	--	--	--	0.6	**1,300**	0	8	9	NA
CARBON DISULFIDE	94	2	2	85	0.3J	170J	0.5	**1,300**	0	1	1,000	NA
CARBON TETRACHLORIDE	94	0	0	--	--	--	**0.5**	**1,300**	0	94	0.2	0.5
CHLOROBENZENE	96	0	0	--	--	--	0.5	**1,300**	0	2	110	70
CHLOROETHANE	96	0	0	--	--	--	1	**1,300**	0	8	5	NA
CHLOROFORM	94	1	1	**3**	**3**	**3**	0.2	**1,300**	1	79	0.5 (CAL-modified)	80
CHLOROMETHANE	96	0	0	--	--	--	1	**1,300**	0	68	2	NA
CIS-1,2-DICHLOROETHENE	30	1	3	1	1	1	0.5	**1,300**	0	2	61	6
CIS-1,3-DICHLOROPROPENE	80	0	0	--	--	--	**0.5**	**1,300**	0	80	0.4 (not cis)	0.5
DIBROMOCHLOROMETHANE	94	0	0	--	--	--	**0.5**	**1,300**	0	94	0.1	80
DIBROMOMETHANE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
DICHLORODIFLUOROMETHANE	16	0	0	--	--	--	1	**1,300**	0	1	390	NA
DIISOPROPYL ETHER	14	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYL TERT-BUTYL ETHER	14	0	0	--	--	--	0.5	0.5	--	--	NA	NA
ETHYLBENZENE	96	8	8	**19**	2	**79**	0.5	**1,300**	7	7	3	300
ETHYLENE DIBROMIDE	33	0	0	--	--	--	0.5	1,300	--	--	NA	0.05
HEXACHLOROBUTADIENE	16	0	0	--	--	--	0.5	**1,300**	0	2	0.9	NA
ISOPROPYLBENZENE	16	1	6	1,000	1,000J	1,000J	0.5	100	--	--	NA	NA
M,P-XYLENE	16	1	6	1	1	1	0.5	1	0	0	210 (xylenes)	NA
METHYL-T-BUTYL ETHER	27	0	0	--	--	--	0.2	**2,500**	0	3	6 (CAL-modified)	13
METHYLENE CHLORIDE	96	0	0	--	--	--	0.2	**1,300**	0	20	4	NA
N-BUTYLBENZENE	16	0	0	--	--	--	0.3	1,300	--	--	NA	NA
N-PROPYLBENZENE	16	0	0	--	--	--	0.5	**1,300**	0	1	240	NA
NAPHTHALENE	18	2	11	**560**	**21**	**1,100J**	1	**100**	2	1	6	NA
O-XYLENE	16	0	0	--	--	--	0.5	1	0	0	210 (xylenes)	NA
P-ISOPROPYLTOLUENE	16	0	0	--	--	--	0.5	1,300	--	--	NA	NA
SEC-BUTYLBENZENE	16	2	13	**500**	0.2J	**1,000J**	0.5	100	1	0	240	NA
STYRENE	94	0	0	--	--	--	0.5	1,300	0	0	1,600	100
TERT-AMYL METHYL ETHER	14	0	0	--	--	--	0.5	0.5	--	--	NA	NA
TERT-BUTANOL	14	0	0	--	--	--	10	20	--	--	NA	NA

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Volatile Organic Compounds (µg/L)												
TERT-BUTYLBENZENE	16	0	0	--	--	--	0.5	**1,300**	0	1	240	NA
TETRACHLOROETHENE	96	0	0	--	--	--	0.5	**1,300**	0	82	0.7	5
TOLUENE	96	7	7	5	0.9J	11	0.5	**1,300**	0	1	720	150
TRANS-1,2-DICHLOROETHENE	30	0	0	--	--	--	0.5	**1,300**	0	1	120	10
TRANS-1,3-DICHLOROPROPENE	80	0	0	--	--	--	**0.5**	**1,300**	0	80	0.4 (not trans)	0.5
TRICHLOROETHENE	96	1	1	**2**	**2**	**2**	**0.5**	**1,300**	1	95	0.03	5
TRICHLOROFLUOROMETHANE	16	0	0	--	--	--	1	1,300	--	--	NA	NA
VINYL ACETATE	5	0	0	--	--	--	5	5	0	0	410	NA
VINYL CHLORIDE	96	1	1	**8**	**8**	**8**	**0.5**	**1,300**	1	95	0.02 (child or adult)	0.5
XYLENE (TOTAL)	80	9	11	130	7	**660J**	1	200	1	0	210	1,800
Semivolatile Organic Compounds (µg/L)												
1,2,4-TRICHLOROBENZENE	66	0	0	--	--	--	10	100	0	0	190	5
1,2-DICHLOROBENZENE	66	0	0	--	--	--	5	100	0	0	370	600
1,3-DICHLOROBENZENE	66	0	0	--	--	--	5	**100**	0	12	6	NA
1,4-DICHLOROBENZENE	66	0	0	--	--	--	**5**	**100**	0	66	0.5	5
2,2'-OXYBIS(1-CHLOROPROPANE)	61	0	0	--	--	--	10	30	--	--	NA	NA
2,4,5-TRICHLOROPHENOL	66	0	0	--	--	--	25	500	0	0	3,600	50
2,4,6-TRICHLOROPHENOL	66	0	0	--	--	--	**10**	**100**	0	66	1 (CAL-modified)	NA
2,4-DICHLOROPHENOL	66	1	2	0.5	0.5J	0.5J	10	100	0	0	110	NA
2,4-DIMETHYLPHENOL	66	1	2	9	9J	9J	10	100	0	0	730	NA
2,4-DINITROPHENOL	58	0	0	--	--	--	25	**500**	0	2	73	NA
2,4-DINITROTOLUENE	66	0	0	--	--	--	10	**100**	0	1	73	NA
2,6-DINITROTOLUENE	66	1	2	6	6J	6J	10	**100**	0	1	36	NA
2-CHLORONAPHTHALENE	66	0	0	--	--	--	10	100	--	--	NA	NA
2-CHLOROPHENOL	66	0	0	--	--	--	10	**100**	0	1	30	NA
2-METHYLNAPHTHALENE	66	9	14	69	0.8J	390	10	20	--	--	NA	NA
2-METHYLPHENOL	66	0	0	--	--	--	10	100	0	0	1,800	NA
2-NITROANILINE	66	0	0	--	--	--	**25**	**500**	0	66	1	NA
2-NITROPHENOL	66	0	0	--	--	--	10	100	--	--	NA	NA
3,3'-DICHLOROBENZIDINE	66	0	0	--	--	--	**10**	**200**	0	66	0.2	NA

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Semivolatile Organic Compounds (ug/L)												
3-NITROANILINE	66	0	0	--	--	--	25	500	--	--	NA	NA
4,6-DINITRO-2-METHYLPHENOL	66	1	2	25	25 J	25 J	25	500	--	--	NA	NA
4-BROMOPHENYL-PHENYLETHER	66	0	0	--	--	--	10	100	--	--	NA	NA
4-CHLORO-3-METHYLPHENOL	66	0	0	--	--	--	10	100	--	--	NA	NA
4-CHLOROANILINE	66	0	0	--	--	--	10	100	0	0	150	NA
4-CHLOROPHENYL-PHENYLETHER	66	0	0	--	--	--	10	100	--	--	NA	NA
4-METHYLPHENOL	66	1	2	3	3 J	3 J	10	100	0	0	180	NA
4-NITROANILINE	66	0	0	--	--	--	25	500	--	--	NA	NA
4-NITROPHENOL	66	0	0	--	--	--	25	500	--	--	NA	NA
ACENAPHTHENE	66	2	3	0.9	0.8 J	1 J	10	100	0	0	370	NA
ACENAPHTHYLENE	66	0	0	--	--	--	10	100	--	--	NA	NA
ANTHRACENE	66	0	0	--	--	--	10	100	0	0	1,800	NA
BENZO(A)ANTHRACENE	66	0	0	--	--	--	**10**	**100**	0	66	0.09	0.1
BENZO(A)PYRENE	66	1	2	**0.6**	**0.6 J**	**0.6J**	**0.2**	**100**	1	65	0.009	0.2
BENZO(B)FLUORANTHENE	66	1	2	**0.8**	**0.8 J**	**0.8J**	**10**	**100**	1	65	0.09	NA
BENZO(G,H,I)PERYLENE	66	0	0	--	--	--	10	100	--	--	NA	NA
BENZO(K)FLUORANTHENE	66	0	0	--	--	--	**10**	**100**	0	66	0.06 (CAL-modified)	NA
BENZOIC ACID	5	0	0	--	--	--	50	500	0	0	150,000	NA
BENZYL ALCOHOL	5	0	0	--	--	--	10	100	0	0	11,000	NA
BIS(2-CHLOROETHOXY)METHANE	66	0	0	--	--	--	10	100	--	--	NA	NA
BIS(2-CHLOROETHYL)ETHER	66	0	0	--	--	--	**10**	**100**	0	66	0.01	NA
BIS(2-ETHYLHEXYL)PHTHALATE	66	1	2	**22**	**22**	**22**	4	**100**	1	17	5	NA
BUTYLBENZYLPHTHALATE	66	1	2	1	1 J	1 J	10	100	0	0	7,300	NA
CARBAZOLE	61	0	0	--	--	--	**10**	**30**	0	61	3	NA
CHRYSENE	66	1	2	**0.9**	**0.9 J**	**0.9J**	**10**	**100**	1	65	0.6 (CAL-modified)	NA
DI-N-BUTYLPHTHALATE	66	0	0	--	--	--	10	100	--	--	NA	NA
DI-N-OCTYLPHTHALATE	66	1	2	17	17	17	10	100	--	--	NA	NA
DIBENZO(A,H)ANTHRACENE	66	0	0	--	--	--	**10**	**100**	0	66	0.009	NA
DIBENZOFURAN	66	0	0	--	--	--	10	**100**	0	2	24	NA
DIETHYLPHTHALATE	66	1	2	19	19	19	10	100	0	0	29,000	NA
DIMETHYLPHTHALATE	66	0	0	--	--	--	10	100	0	0	360,000	NA

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Semivolatile Organic Compounds (µg/L)												
FLUORANTHENE	66	2	3	1	1J	1J	10	100	0	0	1,500	NA
FLUORENE	66	4	6	4	3J	5J	10	100	0	0	240	NA
HEXACHLOROBENZENE	66	0	0	--	--	--	**10**	**100**	0	66	0.04	1
HEXACHLOROBUTADIENE	66	0	0	--	--	--	**10**	**100**	0	66	0.9	NA
HEXACHLOROCYCLOPENTADIENE	66	0	0	--	--	--	10	100	0	0	220	NA
HEXACHLOROETHANE	66	0	0	--	--	--	**10**	**100**	0	66	5	NA
INDENO(1,2,3-CD)PYRENE	66	0	0	--	--	--	**10**	**100**	0	66	0.09	NA
ISOPHORONE	66	3	5	4	2J	7J	10	**100**	0	1	71	NA
N-NITROSO-DI-N-PROPYLAMINE	66	0	0	--	--	--	**10**	**100**	0	66	0.01	NA
N-NITROSODIPHENYLAMINE	66	0	0	--	--	--	10	**100**	0	4	14	NA
NAPHTHALENE	66	7	11	**91**	4J	**280J**	**10**	**20**	6	59	6	NA
NITROBENZENE	66	0	0	--	--	--	**10**	**100**	0	66	3	NA
PENTACHLOROPHENOL	66	0	0	--	--	--	**25**	**500**	0	66	0.6	1
PHENANTHRENE	66	5	8	2	0.6J	5J	10	100	--	--	NA	NA
PHENOL	66	3	5	2	0.5J	5J	10	100	0	0	22,000	NA
PYRENE	66	3	5	0.8	0.5J	1J	10	100	0	0	180	NA
Polynuclear Aromatic Hydrocarbons (µg/L)												
ACENAPHTHENE	9	0	0	--	--	--	5	5	0	0	370	NA
ACENAPHTHYLENE	9	0	0	--	--	--	2	2	--	--	NA	NA
ANTHRACENE	9	0	0	--	--	--	0.2	0.2	0	0	1,800	NA
BENZO(A)ANTHRACENE	9	1	11	**0.1**	**0.1J**	**0.1J**	**0.2**	**0.2**	1	8	0.09	0.1
BENZO(A)PYRENE	9	0	0	--	--	--	**0.2**	**0.2**	0	9	0.009	0.2
BENZO(B)FLUORANTHENE	9	0	0	--	--	--	**0.2**	**0.2**	0	9	0.09	NA
BENZO(G,H,I)PERYLENE	9	0	0	--	--	--	0.2	0.2	--	--	NA	NA
BENZO(K)FLUORANTHENE	9	0	0	--	--	--	**0.2**	**0.2**	0	9	0.06 (CAL-modified)	NA
CHRYSENE	9	0	0	--	--	--	0.2	0.2	0	0	0.6 (CAL-modified)	NA
DIBENZO(A,H)ANTHRACENE	9	0	0	--	--	--	**0.5**	**0.5**	0	9	0.009	NA
FLUORANTHENE	9	0	0	--	--	--	0.2	0.2	0	0	1,500	NA
FLUORENE	9	0	0	--	--	--	1	1	0	0	240	NA
INDENO(1,2,3-CD)PYRENE	9	0	0	--	--	--	**0.2**	**0.2**	0	9	0.09	NA

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Polynuclear Aromatic Hydrocarbons (ug/L)												
NAPHTHALENE	9	0	0	--	--	--	5	5	0	0	6	NA
PHENANTHRENE	9	0	0	--	--	--	1	1	--	--	NA	NA
PYRENE	9	1	11	0.2	0.2	0.2	0.2	0.2	0	0	180	NA
PCBs/Pesticides (µg/L)												
4,4'-DDD	6	0	0	--	--	--	0.02	0.1	0	0	0.3	NA
4,4'-DDE	6	0	0	--	--	--	0.02	0.1	0	0	0.2	NA
4,4'-DDT	6	0	0	--	--	--	0.02	0.1	0	0	0.2	NA
ALDRIN	6	0	0	--	--	--	**0.02**	**0.05**	0	6	0.004	NA
ALPHA-BHC	6	0	0	--	--	--	0.02	0.05	--	--	NA	NA
ALPHA-CHLORDANE	5	0	0	--	--	--	0.05	0.05	0	0	0.2 (chlordane)	NA
AROCLOR-1016	6	0	0	--	--	--	0.3	0.5	0	0	1	NA
AROCLOR-1221	6	0	0	--	--	--	**0.3**	**0.5**	0	6	0.03	NA
AROCLOR-1232	6	0	0	--	--	--	**0.3**	**0.5**	0	6	0.03	NA
AROCLOR-1242	6	0	0	--	--	--	**0.3**	**0.5**	0	6	0.03	NA
AROCLOR-1248	6	0	0	--	--	--	**0.3**	**0.5**	0	6	0.03	NA
AROCLOR-1254	6	0	0	--	--	--	**0.5**	**0.5**	0	6	0.03	NA
AROCLOR-1260	6	0	0	--	--	--	**0.5**	**0.5**	0	6	0.03	NA
BETA-BHC	6	0	0	--	--	--	0.02	0.05	--	--	NA	NA
CHLORDANE	1	0	0	--	--	--	**0.3**	**0.3**	0	1	0.2	NA
DELTA-BHC	6	0	0	--	--	--	0.02	0.05	--	--	NA	NA
DIELDRIN	6	0	0	--	--	--	**0.02**	**0.1**	0	6	0.004	NA
ENDOSULFAN I	6	0	0	--	--	--	0.02	0.05	0	0	220	NA
ENDOSULFAN II	6	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDOSULFAN SULFATE	6	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDRIN	6	0	0	--	--	--	0.02	0.1	0	0	11	2
ENDRIN ALDEHYDE	6	0	0	--	--	--	0.02	0.1	--	--	NA	NA
ENDRIN KETONE	5	0	0	--	--	--	0.1	0.1	--	--	NA	NA
GAMMA-BHC (LINDANE)	6	0	0	--	--	--	0.02	0.05	--	--	NA	NA
GAMMA-CHLORDANE	5	0	0	--	--	--	0.05	0.05	0	0	0.2 (chlordane)	NA
HEPTACHLOR	6	0	0	--	--	--	**0.02**	**0.05**	0	6	0.02	0.01

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Analyte	Number of Samples Analyzed	Number of Detections	Percent of Detections	Average of Detected Concentration	Minimum Detected Concentration	Maximum Detected Concentration	Minimum Non-detected Concentration	Maximum Non-detected Concentration	Number of Detections Over PRG	Number of Non-detects Over PRG	Tap Water PRG	MCL
PCBs/Pesticides (µg/L)												
HEPTACHLOR EPOXIDE	6	0	0	--	--	--	**0.01**	**0.02**	0	6	0.007	0.01
METHOXYCHLOR	6	0	0	--	--	--	0.05	0.5	0	0	180	30
TOXAPHENE	6	0	0	--	--	--	**1**	**3**	0	6	0.06	3
Metals (µg/L)												
Filtered												
ALUMINUM	69	16	23	42,200	25.2 J	**223,000**	4.9	236	6	0	36,000	NA
ANTIMONY	69	5	7	4.1	0.10 J	14.3 J	0.063	**60.0**	0	10	15.0	6.0
ARSENIC	69	28	41	**15.3**	**2.1 J**	**110**	**0.80**	**100**	28	41	0.045	10.0
BARIUM	69	58	84	175	13.7 J	2,400	4.3	62.9	0	0	2,600	1,000
BERYLLIUM	69	13	19	5.3	1.0 J	39.5	0.10	5.0	0	0	73.0	4.0
CADMIUM	69	12	17	4.0	0.066 J	**20.2**	0.15	8.0	1	0	18.0	5.0
CALCIUM	69	69	100	149,000	6,800	1,110,000	0.0	0.0	--	--	NA	NA
CHROMIUM	69	22	32	104	0.16 J	650	0.20	32.0	--	--	NA	50.0
COBALT	69	20	29	199	0.033 J	**3,560**	0.30	50.0	1	0	730	NA
COPPER	69	19	28	57.1	0.31 J	250	0.35	90.7	0	0	1,500	1,300
IRON	69	28	41	45,400	54.0 J	**296,000**	3.2	154	10	0	11,000	NA
LEAD	69	9	13	72.4	0.029 J	360	0.029	200	--	--	NA	15.0
MAGNESIUM	69	69	100	151,000	2,740 J	1,370,000	0.0	0.0	--	--	NA	NA
MANGANESE	69	63	91	2,920	6.6 J	**93,900**	0.90	10.0	13	0	880	NA
MERCURY	64	3	5	0.72	0.12 J	1.7	0.10	0.20	0	0	11.0	2.0
MOLYBDENUM	69	10	14	2.3	0.62 J	4.4 J	0.64	50.0	0	0	180	NA
NICKEL	69	21	30	666	0.42 J	**11,400**	1.5	84.7	2	0	730	100
POTASSIUM	69	69	100	19,100	3,140 J	111,000	0.0	0.0	--	--	NA	NA
SELENIUM	66	9	14	29.0	0.49 J	120	0.80	100	0	0	180	50.0
SILVER	66	2	3	9.0	0.019 J	18.0	0.15	10.0	0	0	180	NA
SODIUM	69	69	100	876,000	12,700	5,310,000	0.0	0.0	--	--	NA	NA
THALLIUM	69	4	6	**31.3**	**3.7 J**	**52.7**	0.18	**76.0**	4	37	2.4	2.0
TITANIUM	5	5	100	5,180	2,400	12,000	0.0	0.0	--	--	NA	NA
VANADIUM	69	19	28	103	0.93 J	**510**	0.21	34.4	4	0	260	NA
ZINC	69	24	35	503	1.7 J	7,340	2.7	29.1	0	0	11,000	NA

TABLE 9-12: SITE 23 STATISTICAL SUMMARY OF GROUNDWATER ANALYSES

All Groundwater Investigations

Remedial Investigation Report for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

NOTES:

Bold denotes values elevated above the PRG

--	Not detected
BHC	Benzene Hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
J	Estimated value
MCL	Maximum Contaminant Level
NA	No criteria available
PCB	Polychlorinated biphenyl
PRG	Preliminary Remediation Goal, U.S. Environmental Protection Agency, Region 9 or CAL-modified
µg/L	Micrograms per liter

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
41	remove free product	Section 2.3.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Section 9.2.5, Pages 9-16 through 9-17. SulTech 2005.

Phase 2B. EBS samples were collected from Parcel 211 during the EBS Phase 2B sampling effort. Soil and groundwater samples were collected in the plane defueling area during the EBS Phase 2B to further investigate TPH contamination in that area.

9.2.4 TPH Program

Site 23 was identified as part of CAA 13. In 2000, sampling was conducted during the data gaps investigation at Site 23 in relation to CAA 13 under the TPH program (Tetra Tech 2001e). This investigation identified 12 different data gap types. Site 23 sampling involved collection of data gap types II, III, and IV samples, as discussed below. Figure 9-3 shows the location for each sample.

Five data gaps type III samples were collected to investigate the current TTPH concentrations in groundwater near the storm drains. Two samples were collected from monitoring wells MW530-1 and M10B-01, located near the storm drain and running east and west along the northern end of Site 23. In addition, two data gap type III samples, locations CA13-07 and CA13-08, were collected in the middle of the defueling area to access TPH contamination entering the storm drain connected to Outfall J. One data gap type II sample, location CA13-09, was collected along the storm drain located in the southern portion of Site 23 to assess possible TPH contamination entering the storm drain connected to Outfall P. Because the data gap type III samples collected in association with Outfall J contained elevated concentrations of TPH and TPH-associated compounds, one data gap type II sample was collected from catch basin 5-JF. This sample also contained elevated concentrations of TPH compounds.

One Type IV groundwater sample (CA13-10) was collected to investigate OWS-530 located west of Building 530. The groundwater sample was analyzed for BTEX, MTBE, lead, and TPH-E and TPH-P. TPH-d and TPH-mo were detected in the sample.

A concurrent analysis is being completed to analyze TPH constituents as part of the TPH program and CERCLA chemicals as part of the RI program. In locations where TPH and CERCLA chemicals are commingled, the commingled area is addressed as part of the CERCLA program. Any residual TPH contamination remaining after remediation of the CERCLA chemicals will be addressed under the TPH program.

As stated in Section 9.1.3, the TPH contamination associated with the plane defueling area is not commingled and is further addressed under the TPH screening strategy in Appendix F.

9.2.5 Removal Actions

As part of a corrective action for free TPH product in groundwater located at CAA 13 (see Appendix F), 22 extraction wells of the DVE system, covering a treatment area of 40 feet by 400 feet, were installed along the western edge of Building 530. Thirty piezometers were installed within the treatment area for monitoring of the plume. A biosparging system was installed in the same area as the DVE system; however, the DVE system was determined to be more efficient in

removing petroleum at Site 23. Additional extraction wells and piezometers have been installed as needed. Since early 2004, both the DVE and biosparge systems have operated at Site 23.

As of October 31, 2004, the DVE system had removed 56,500 pounds of TPH. Periodic operations and maintenance sampling activity show that the concentrations of TPH in groundwater are steadily decreasing.

9.2.6 Treatability Studies

DVE is the only treatability study conducted at Site 23 to determine the viability of this technology for cleanup and assessment of the plane defueling area at Site 23. A DVE pilot test was conducted in 2001 to demonstrate the capability of the DVE system to recover free product from the groundwater surface and to capture hydrocarbon vapors from soil. The pilot test indicated that the DVE system was successfully removing hydrocarbon contaminants from soil; therefore, in June 2002, the pilot scale system was converted into a full-scale DVE system using equipment previously installed along the western edge of Building 530.

9.3 INITIAL DATA EVALUATION

Based on the investigations described in Section 9.2, the Navy completed an initial data evaluation for Site 23. This evaluation included (1) a site-specific CSM, (2) a data quality assessment, (3) and a background comparison. The complete background comparison is provided in Appendix A.

9.3.1 Site 23 Conceptual Site Model

The initial CSM was refined in an iterative process that involved conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This iterative process resulted in a CSM specific to Site 23 and identification of remaining data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors. The CSM for Site 23 is described below and presented on Figure 9-6.

Through environmental investigations and literature searches for Site 23, physical features and activities at Site 23 that might have generated hazardous waste or released chemicals to the environment were identified. The following Site 23 physical features and activities were identified as potential sources of contamination:

- Building 530 (missile rework operations): Operations included missile rework operations, overhauling aviation components, electrical maintenance, cleaning, grinding, welding, painting, paint stripping, drum storage, and parts fabrication;

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
42	IR Site 23 soil	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.2.3.2, Pages 3-12 through 3-13, Figure 3-8; Table 3-7. Oneida Total Integrated Enterprises LLC 2011.

Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. .

- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a maximum reported value of 0.76 mg/kg in IR Site 22 soil. The reasonable maximum EPC of the 90 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.14 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The three exceedances of PAHs, expressed as B(a)P equivalent concentrations, are located at a depth of 4 feet to 8 feet bgs in the eastern portion of IR Site 22, which may be associated with the use of artificial fill material to construct the island. These three exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg (see Figure 3-7).

3.2.5 IR Site 23

3.2.5.1 Sources and Release Mechanisms

The nature and extent evaluation presented in the RI report (Sul Tech 2005b) concluded that most of the chemicals reported across IR Site 23 are consistent with historical activities known to occur at the site, which included plane defueling and the former oil refinery. In addition, the petroleum plume at IR Site 13 is another likely source of impacted soil at IR Site 23. Physical features of IR Site 23, along with specific details on the hazardous waste generated and past disposal and storage practices associated with these wastes, were used to identify potential sources of CERCLA chemicals. Environmental investigations were conducted in these areas to identify and assess the extent of CERCLA chemicals in soil and groundwater, and the analytical results were evaluated. Based on the RI (Sul Tech 2005b), the likely sources of impacted soil at IR Site 23 include:

Defueling area and associated OWSs 529 and 530 and ASTs 530A, 530B, and 530C

Former oil refinery activities

Previous site activities associated with plane defueling and the operation of the former refinery were identified as a source of TPH in soil. Elevated concentrations of CERCLA chemicals were not identified in soil at IR Site 23. Currently IR Site 23 is being addressed under the Petroleum Program (Tetra Tech 2009).

3.2.5.2 Nature and Extent of Impact

The following CERCLA investigations have been conducted to evaluate the nature and extent of impacted soil at IR Site 23 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech EC 2002)

Basewide PAH Investigation (Bechtel 2003)

These investigations included collection of soil samples from borehole locations and analyses for VOCs, SVOCs, pesticides, PCBs, metals, PAHs, and TPH. A detailed summary of the results of these investigations is provided in the RI report (SulTech 2005b). Concentrations of chemicals reported in soil were compared to screening levels, which consisted of residential 2009 USEPA RSLs or the DTSC Lead Spreadsheet based value for lead of 207 mg/kg or the Alameda Point background value for

arsenic, and 0.62 mg/kg for PAHs (expressed as B[a]P equivalent concentrations), which was established under agreements between the Navy and agencies (DON 2001a). Chemicals in soil exceeding these screening levels from 0 feet to 8 feet bgs are summarized in Table 3-7.

These results indicated the following:

- None of the reported concentrations of VOCs, SVOCs, PCBs, and metals in IR Site 23 soil exceeded screening levels.
- Toxaphene was reported above the laboratory reporting limit in one of the 21 samples analyzed at a concentration of 1.4 mg/kg in soil sample (6 feet to 6.5 feet bgs) collected at location BOR-26, southeast of IR Site 23. Toxaphene concentration at this location was greater than its screening level. The shallow soil samples collected at this location at 1 foot to 1.5 feet bgs and 2.5 feet to 3 feet bgs were non-detect.
- PAHs, expressed as B(a)P equivalent concentrations, ranged from non-detect to a reported value of 3.2 mg/kg in IR Site 23 soil. The reasonable maximum EPC of the 240 soil samples computed for B(a)P equivalent concentrations was estimated to be 0.17 mg/kg, which is less than the Alameda Point screening level of 0.62 mg/kg. The exceedances of PAHs, expressed as B(a)P equivalent concentrations, are localized in two regions, west of Building 530 within the plane defueling area near a TPH plume and east of Building 530 (see Figure 3-8). These exceedances mainly occur at depths greater than 4 feet which may be associated with the use of artificial fill material to construct the island. These exceedances have cleaner shallow soil samples and adjacent samples with B(a)P equivalent concentrations less than the screening level of 0.62 mg/kg.

3.3 Nature and Extent of Impacted Groundwater

3.3.1 IR Site 9

3.3.1.1 Sources and Release Mechanisms

The RI report (SulTech 2005b) presents a detailed analysis of potential sources of impacted soil and groundwater at IR Site 9 based on past investigations. In addition, the Data Gap Study included an assessment whether OWS 410A and OWS 410B, and the Wash Rack Area (WRA) south of Building 410 (see Figure 2-4) constitute potential sources of impacted soil and groundwater (see Section 3.3.1.2 for details). Based on the RI (Sul Tech 2005b) and results of the Data Gap Study (Tetra Tech EC 2009), the likely sources of impacted groundwater at IR Site 9 include:

Paint stripping within Building 410, and

Releases of petroleum fuel from storage and defueling activities near Building 410

3.3.1.2 Nature and Extent of Impact

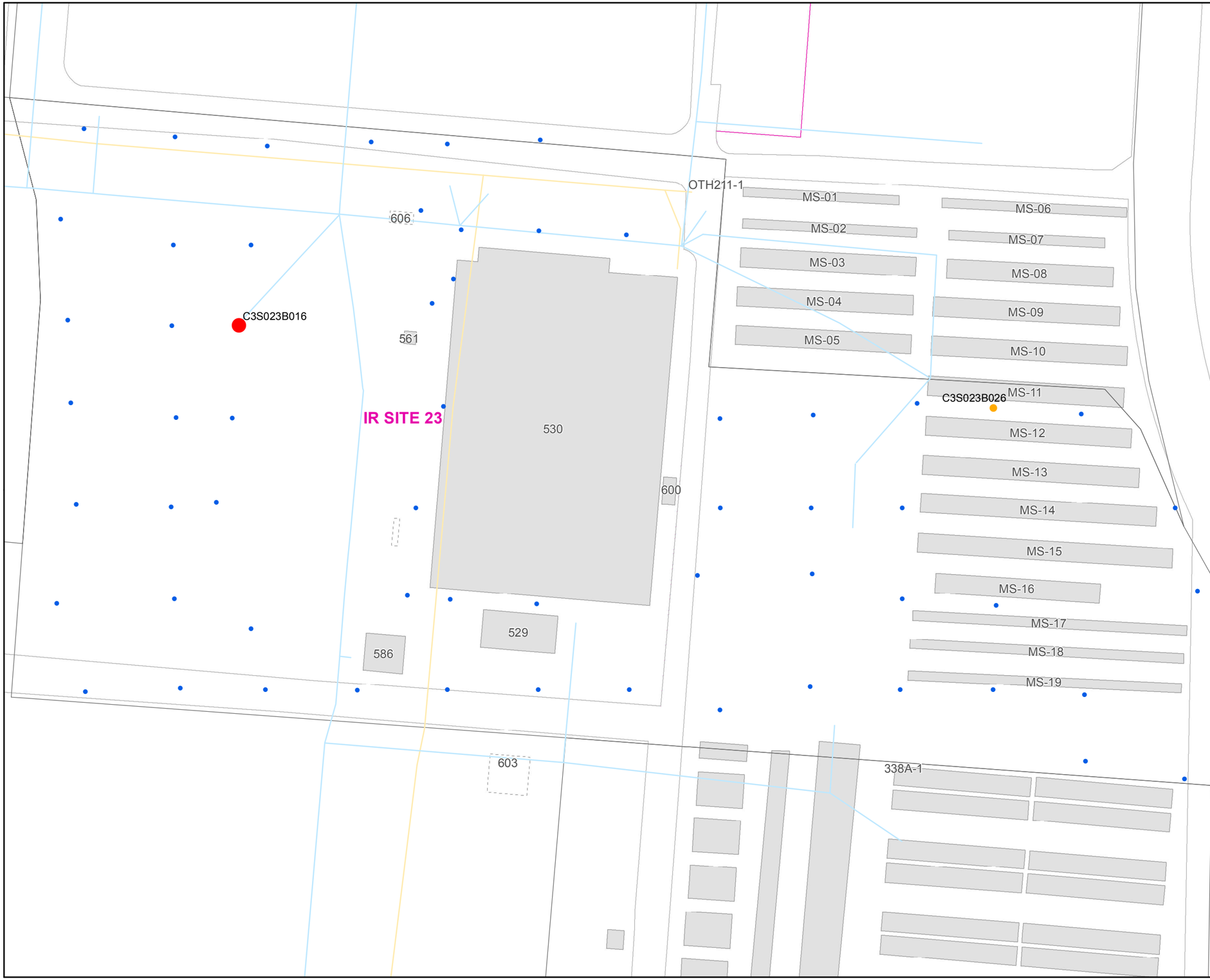
The following investigations have been conducted to evaluate the nature and extent of impacted groundwater at IR Site 9 (SulTech 2005b):

Phases 1 and 2A Investigation in 1991 (PRC and JMM 1992)

Follow-on Investigation in 1994 (PRC and JMM 1995)

Follow-on Investigation in 1998 (Tetra Tech and Uribe and Associates, Inc. [U&A] 1998)

Supplementation Remedial Investigation Data Gap Sampling in 2001 (Tetra Tech 2002)



Legend

- Total Benzo(a) Pyrene Equivalents > 1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents between 0.62-1.0 mg/kg
- Total Benzo(a) Pyrene Equivalents < 0.62 mg/kg
- Storm Sewer
- Sanitary Sewer

Building Status

- Former
- Removed
- Present
- Undetermined
- Road
- Paved

IR Site 23, OU2A Benzo(a)P yrene Equivalent Concentrations Greater than 0.62mg/kg

Location	Sample Date	Sample Depth Range (feet bgs)	Total Benzo(a) P yrene Equivalents (mg/kg)
C3S023B016	06 -Aug -03	0.5 -2	3.2
C3S023B016	06 -Aug -03	4-8	2.7
C3S023B026	01 -Aug -03	4-8	0.93

FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
PAH - POLYCYCLIC AROMATIC HYDROCARBON

N

100 50 0 100 Feet

OU-2A FS — Final

Nature and Extent of PAHs in Soil at IR Site 23

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-8

OTIE Oneida Total Integrated Enterprises

AECOM

Table 3-6: Summary of Chemicals in IR Site 22 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
Metals (mg/kg)							
Arsenic	16.55	34/64	2	MW547-3	02-Jul-90	5.5-6	24
Lead	207	48/65	1	MW547-5	29-Jun-90	0.5-1	9,890
PAHs (mg/kg)							
B(a)P equivalents	0.62	79/90	3	C3S022B019	31-Jul-03	4-8	0.76
Volatile Organic Compounds (mg/kg)							
Benzene	1.1	3/31	1	B07C-12	17-Aug-94	5-6	3.3
Ethylbenzene	5.7	10/31	3	B07C-14	17-Aug-94	5-6	570
Xylenes (total)	600	11/31	1	B07C-14	17-Aug-94	5-6	2,600

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

Table 3-7: Summary of Chemicals in IR Site 23 Exceeding the Screening Levels (0-8 feet bgs)

Analyte	Screening Level (mg/kg)	Number of Detections/Total Analyzed	Number of Detections Exceeding Screening Levels	Location of Maximum Detected Concentration	Sample Date	Depth of Maximum Reported Concentration (feet bgs)	Maximum Detected Concentration (mg/kg)
PAHs (mg/kg)							
B(a)P equivalents	0.62	158/240	3	C3S023B016	06-Aug-03	0.5-2	3.2
Pesticides (mg/kg)							
Toxaphene	0.44	1/21	1	BOR-26	24-Jul-90	6-6.5	1.4

Notes:
B(a)P = Benzo(a)Pyrene
bgs = below ground surface
mg/kg = milligrams per kilogram

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
43	groundwater for IR Site 23	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3.3.5, Page 3-22; Table 3-15. Oneida Total Integrated Enterprises LLC 2011.

All reported concentrations of thallium were within its background range (less than 95th quantile value of 16.15 µg/L).

The evaluation of the recent metal results from Spring 2007 and Spring 2008 basewide groundwater sampling events from monitoring wells M07C-08 and D07C-01 (Figure 2-7) documented in the Alameda Basewide 2008 Annual Groundwater Monitoring Report (ITSI 2009a) confirm that metals in IR Site 22 groundwater are not indicative of a release. None of the metals exceeded its respective background value during these monitoring rounds.

3.3.5 IR Site 23

Table 3-15 presents summary statistics for the constituents reported in groundwater at IR Site 23 based on the investigations conducted from 2002 through 2008. The following constituents exceeded their respective Federal and/or State MCLs at least once in groundwater samples collected from 2002 to 2008:

1,2-Dibromo-3-Chloropropane

1,2-Dibromoethane

cis-1,2-Dichloroethene

Methylene chloride

Arsenic

Iron

Manganese

The summary statistics in Table 3-15 show sporadic/isolated detections of organic constituents in groundwater as evident from the very low detection frequencies. In addition, all reported concentrations of arsenic, iron, and manganese were within their respective background ranges (less than 95th quantile values) (see Table 3-15).

3.4 Groundwater Geochemistry and Natural Attenuation Parameters

Table 3-16 presents a summary of natural attenuation parameters for selected OU-2A wells based on the basewide groundwater monitoring results (ITSI 2009a). Groundwater parameters for OU-2A wells show a range of geochemical conditions, with median values for dissolved oxygen (DO) ranging from 0.32 mg/L to 3.57 mg/L and median oxidation reduction potential (ORP) ranging from -124 millivolts (mV) to +86 mV. ORP and DO have a relatively strong positive correlation in site groundwater, and low values of both indicate reducing chemical conditions. Groundwater at most wells is indicative of reducing, with DO below 1.0 mg/L, and ORP less than 0 mV. Locally high iron and manganese values generally correlate with low DO and ORP values, and indicate that iron and manganese reduction likely accounts for these occurrences. These reducing conditions are likely attributable to the presence of petroleum hydrocarbons and the associated biodegradation which lowers the DO. Four wells are especially low in sulfate (median values below 10 mg/L, at wells M07C-06, M13-07, MW-001, and MW547-3), and likely indicate sulfate-reducing conditions (sulfide, a product of sulfate reduction, has been typically reported at two of these wells). These same four wells have relatively high methane (greater than 1.0 mg/L) and iron (see Table 3-16), indicating that highly-reducing, methanogenic conditions are also present in or near these wells (ITSI 2009a).

3.5 Chemical Fate and Transport

This section discusses chemical fate and transport of the primary COCs identified in groundwater at OU-2A sites. The fate and transport of a contaminant depends upon its physiochemical properties

Table 3-15: Summary of Detected Groundwater Analytes at Site 23 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Volatile Organic Compounds												
1,1,1,2-Tetrachloroethane	630-20-6	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,1,1-Trichloroethane	71-55-6	106	3	2.8%	0.21	0.5	MW530-2	8/1/2006	200	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	1	--	--	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	3	1	33.3%	5	5	MW530-2	8/1/2006	--	--	--	--
1,1,2-Trichloroethane	79-00-5	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
1,1-Dichloroethane	75-34-3	106	7	6.6%	0.1	0.5	MW530-2	8/1/2006	5	--	--	--
1,1-Dichloroethene	75-35-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	6	--	--	--
1,1-Dichloropropene	563-58-6	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,2,3-Trichlorobenzene	87-61-6	104	3	2.9%	0.5	1.1	MW530-3	12/16/2002	--	--	--	--
1,2,3-Trichloropropane	96-18-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
1,2,4-Trimethylbenzene	95-63-6	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,2-Dibromo-3-Chloropropane[b]	96-12-8	106	1	0.9%	2	2	MW530-2	8/1/2006	0.2	1	--	--
1,2-Dibromoethane	106-93-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	0.05	1	--	--
1,2-Dichlorobenzene	95-50-1	106	4	3.8%	0.1	0.7	530MJ-MW1	11/11/2004	600	--	--	--
1,2-Dichloroethane	107-06-2	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	0.5	--	--	--
1,2-Dichloropropane	78-87-5	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
1,3,5-Trimethylbenzene	108-67-8	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,3-Dichlorobenzene	541-73-1	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,3-Dichloropropane	142-28-9	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
1,4-Dichlorobenzene	106-46-7	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
2,2-Dichloropropane	594-20-7	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
2-Butanone	78-93-3	106	6	5.7%	1.2	610	530MJ-MW1	3/10/2005	--	--	--	--
2-Chlorotoluene	95-49-8	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
2-Hexanone	591-78-6	106	3	2.8%	0.5	10	MW530-2	8/1/2006	--	--	--	--
4-Chlorotoluene	106-43-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
4-Methyl-2-pentanone	108-10-1	106	4	3.8%	0.9	10	MW530-2	8/1/2006	--	--	--	--
Acetone	67-64-1	105	31	29.5%	0.4	36	530MJ-MW1	3/10/2005	--	--	--	--
Benzene	71-43-2	106	6	5.7%	0.1	0.5	MW530-2	8/1/2006	1	--	--	--
Bromobenzene	108-86-1	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Bromochloromethane	74-97-5	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Bromodichloromethane	75-27-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	80	--	--	--
Bromoform	75-25-2	106	5	4.7%	0.1	1	MW530-2	8/1/2006	80	--	--	--
Carbon disulfide	75-15-0	103	10	9.7%	0.1	0.75	530MJ-MW1	9/19/2003	--	--	--	--
Carbon tetrachloride	56-23-5	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	0.5	--	--	--
Chlorobenzene	108-90-7	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	70	--	--	--
Chloroethane	75-00-3	106	1	0.9%	1	1	MW530-2	8/1/2006	--	--	--	--
Chloroform	67-66-3	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	80	--	--	--
Chloromethane	74-87-3	106	1	0.9%	1	1	MW530-2	8/1/2006	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	106	8	7.5%	0.7	6.9	MW530-2	7/7/2004	6	2	--	--
cis-1,3-Dichloropropene	10061-01-5	1	1	100.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Dibromochloromethane	124-48-1	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	80	--	--	--
Dibromomethane	74-95-3	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Dichlorodifluoromethane	75-71-8	106	1	0.9%	1	1	MW530-2	8/1/2006	--	--	--	--

Table 3-15: Summary of Detected Groundwater Analytes at Site 23 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Ethylbenzene	100-41-4	106	2	1.9%	0.1	0.5	MW530-2	8/1/2006	300	--	--	--
Hexachlorobutadiene	87-68-3	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Isopropyl Ether	108-20-3	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Isopropylbenzene	98-82-8	105	2	1.9%	0.32	0.5	MW530-2	8/1/2006	--	--	--	--
Methyl Tert-Butyl Ether	1634-04-4	106	3	2.8%	0.23	0.5	MW530-2	8/1/2006	13	--	--	--
Methylene chloride	75-09-2	106	2	1.9%	0.7	10	MW530-2	8/1/2006	5	1	--	--
N-Butylbenzene	104-51-8	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
N-Propylbenzene	103-65-1	105	2	1.9%	0.41	0.5	MW530-2	8/1/2006	--	--	--	--
o-Xylene	95-47-6	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	1750	--	--	--
p-Isopropyltoluene	99-87-6	104	1	1.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Sec-Butylbenzene	135-98-8	105	6	5.7%	0.2	1.2	530MJ-MW1	9/19/2003	--	--	--	--
T-Butylbenzene	98-06-6	106	3	2.8%	0.28	0.5	MW530-2	8/1/2006	--	--	--	--
Tert-Amyl Methyl Ether	994-05-8	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Tert-Butyl Alcohol	75-65-0	106	11	10.4%	1.5	28	530MJ-MW1	3/10/2005	--	--	--	--
Tert-Butyl Ethyl Ether	637-92-3	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Tetrachloroethene	127-18-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
Toluene	108-88-3	106	6	5.7%	0.2	0.5	MW530-2	8/1/2006	150	--	--	--
trans-1,2-Dichloroethene	156-60-5	106	3	2.8%	0.1	0.5	MW530-2	8/1/2006	10	--	--	--
trans-1,3-Dichloropropene	10061-02-6	1	1	100.0%	0.5	0.5	MW530-2	8/1/2006	--	--	--	--
Trichloroethene	79-01-6	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	5	--	--	--
Trichlorofluoromethane	75-69-4	106	2	1.9%	0.59	1	MW530-2	8/1/2006	150	--	--	--
Vinyl acetate	108-05-4	1	1	100.0%	10	10	MW530-2	8/1/2006	--	--	--	--
Vinyl chloride	75-01-4	106	1	0.9%	0.5	0.5	MW530-2	8/1/2006	0.5	--	--	--
Xylenes (total)	1330-20-7	3	1	33.3%	0.5	0.5	MW530-2	8/1/2006	1750	--	--	--
Metals												
Aluminum	7429-90-5	5	1	20.0%	7.5	7.5	MW410-4	6/18/2002	1000	--	1070	--
Antimony	7440-36-0	13	1	7.7%	0.13	0.13	MW410-4	6/18/2002	6	--	37.5	--
Arsenic	7440-38-2	5	4	80.0%	2.5	9.74	M10B-01	7/2/2003	10	--	20.72	--
Barium	7440-39-3	5	5	100.0%	14.9	61	MW410-4	6/18/2002	1000	--	569.5	--
Cadmium	7440-43-9	5	1	20.0%	0.07	0.07	MW410-4	12/16/2002	5	--	--	--
Calcium	7440-70-2	5	5	100.0%	13200	44800	M10B-01	7/2/2003	--	--	--	--
Chromium, Hexavalent	18540-29-9	2	1	50.0%	20	20	MW410-4	6/9/2006	--	--	--	--
Chromium, Total	7440-47-3	5	1	20.0%	3.3	3.3	MW410-4	12/16/2002	50	--	12.45	--
Cobalt	7440-48-4	5	2	40.0%	0.035	0.041	MW410-4	6/18/2002	--	--	--	--
Copper	7440-50-8	5	4	80.0%	0.83	6.2	MW530-3	12/11/2003	1300	--	24.03	--
Iron	7439-89-6	5	3	60.0%	60	3380	M10B-01	7/2/2003	300	1	6585.5	--
Lead	7439-92-1	5	1	20.0%	0.12	0.12	MW410-4	6/18/2002	15	--	11.45	--
Magnesium	7439-95-4	5	5	100.0%	1230	48300	M10B-01	7/2/2003	--	--	--	--
Manganese	7439-96-5	5	4	80.0%	0.23	499	M10B-01	7/2/2003	50	2	1741	--
Mercury	7439-97-6	45	6	13.3%	0.048	1.7	M10B-01	6/18/2002	2	--	--	--
Molybdenum	7439-98-7	5	2	40.0%	0.82	7.84	MW530-2	7/1/2003	--	--	--	--
Nickel	7440-02-0	5	3	60.0%	0.48	16.1	MW530-2	7/1/2003	100	--	--	--
Potassium	7440-09-7	5	4	80.0%	12000	26900	M10B-01	7/2/2003	--	--	--	--
Selenium	7782-49-2	5	1	20.0%	0.59	0.59	MW410-4	6/18/2002	50	--	8.58	--
Sodium	7440-23-5	5	4	80.0%	65000	646000	M10B-01	7/2/2003	--	--	--	--

Table 3-15: Summary of Detected Groundwater Analytes at Site 23 (2002 to 2008)

Analyte	CAS #	Number of Samples	Number of Detections	Frequency of Detection	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Location of Maximum Detection	Date of Detection of Maximum Concentration	MCL[a] (µg/L)	Number of Detected Concentrations Exceeding MCL value	Background Value (µg/L)	Number of Detected Concentrations Exceeding Background value
Vanadium	7440-62-2	5	5	100.0%	2.96	13.7	M10B-01	7/2/2003	--	--	26.27	--
Zinc	7440-66-6	5	3	60.0%	2.4	12	MW410-4	6/18/2002	5000	--	36.39	--
Dissolved Metals												
Aluminum, dissolved	7429-90-5	56	11	19.6%	2.9	63	M10B-01	12/16/2002	1000	--	1070	--
Antimony, dissolved	7440-36-0	52	26	50.0%	0.067	1.3	M10B-01	11/11/2004	6	--	37.5	--
Arsenic, dissolved	7440-38-2	60	53	88.3%	2.4	18	MW530-3	6/18/2002	10	18	20.72	--
Barium, dissolved	7440-39-3	56	56	100.0%	15.7	190	MW530-2	11/11/2004	1000	--	569.5	--
Beryllium, dissolved	7440-41-7	60	1	1.7%	0.33	0.33	MW410-4	3/27/2008	4	--	2.5	--
Cadmium, dissolved	7440-43-9	60	8	13.3%	0.066	0.46	MW410-4	3/27/2008	5	--	--	--
Calciuim, dissolved	7440-70-2	56	56	100.0%	13200	90000	MW530-3	11/12/2004	--	--	--	--
Chromium, dissolved	7440-47-3	60	38	63.3%	0.39	8.3	MW410-4	3/29/2007	50	--	12.45	--
Cobalt, dissolved	7440-48-4	56	30	53.6%	0.033	3.2	MW530-2	7/7/2004	--	--	--	--
Copper, dissolved	7440-50-8	60	39	65.0%	0.31	300	MW410-4	3/27/2008	1300	--	24.03	1
Iron, dissolved	7439-89-6	56	36	64.3%	45	3670	M10B-01	7/2/2003	300	21	6585.5	--
Lead, dissolved	7439-92-1	60	19	31.7%	0.029	0.5	MW530-2	7/7/2004	15	--	11.45	--
Magnesium, dissolved	7439-95-4	56	56	100.0%	1280	100000	MW530-2	11/11/2004	--	--	--	--
Manganese, dissolved	7439-96-5	56	41	73.2%	0.34	1100	MW530-2	11/11/2004	50	33	1741	--
Molybdenum, dissolved	7439-98-7	56	26	46.4%	0.77	11	MW530-2	7/7/2004 9/8/2005	--	--	--	--
Nickel, dissolved	7440-02-0	60	29	48.3%	0.42	28.5	MW530-2	12/10/2003	100	--	--	--
Potassium, dissolved	7440-09-7	56	54	96.4%	5280	55000	MW530-2	11/11/2004	--	--	--	--
Selenium, dissolved	7782-49-2	60	24	40.0%	0.49	6.9	MW530-2	9/8/2005	50	--	8.58	--
Silver, dissolved	7440-22-4	60	4	6.7%	0.019	0.3	MW410-4	3/27/2008	100	--	--	--
Sodium, dissolved	7440-23-5	56	54	96.4%	20000	1700000	MW530-2	11/11/2004	--	--	--	--
Thallium, dissolved	7440-28-0	44	4	9.1%	0.095	0.49	M10B-01	9/7/2005	2	--	16.15	--
Vanadium, dissolved	7440-62-2	56	50	89.3%	0.93	30	M10B-01	12/16/2002	--	--	26.27	2
Zinc, dissolved	7440-66-6	60	38	63.3%	1.5	40	M10B-01	7/6/2004	5000	--	36.39	2
Polycylclic Aromatic Hydrocarbons												
Naphthalene	91-20-3	105	9	8.6%	1.1	6.6	530MJ-MW1	9/19/2003	--	--	--	--
Semi-volatile Organic Compounds												
Styrene	100-42-5	106	3	2.8%	0.1	0.5	MW530-2	8/1/2006	100	--	--	--

Notes

[a] The lesser of Federal primary MCL and State (primary or secondary) MCL.

[b] Highlighted cells indicate analytes exceeding MCLs.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
44	corrective action	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 2.4.3, Pages 2-8 through 2-9; Figures 2-2 and 2-8. Oneida Total Integrated Enterprises LLC 2011.

For the intermediate zone, some wells showed decrease in 1,1-DCA concentrations (primary contaminant) while some showed an increase. Surfacing of reagent was observed during injection into the intermediate zone; therefore, it was concluded that an insufficient quantity of ISOTEC reagents appeared to have been introduced into the subsurface. Based on this, additional pilot testing was recommended 25 feet to 35 feet away from the previous injection well.

2.4.2 IR Site 9 Removal Action

Removal actions were performed using an ISCO process to treat VOCs (primarily cis-1,2-dichloroethene [cis-1,2-DCE] and VC) in the shallow groundwater zone (between 8 feet and 15 feet bgs) east of Building 410 (Shaw 2006a), and VOCs (primarily 1,1-DCA and VC) in the intermediate zone between 20 feet and 40 feet bgs primarily northwest, west, and southwest of Building 410 (Shaw 2006b). The primary objective of the removal actions was to achieve mass reduction of contaminants within the saturated zone to reduce the dissolved-phase contaminant concentrations to below their respective maximum contaminant levels or to levels that are technically or economically feasible.

Three oxidant injection events were conducted between January and May 2006 for the first water-bearing zone (FWBZ). Three injection events were conducted between May and December 2005 for the second water-bearing zone (SWBZ). After three injection events, the number of shallow zone monitoring wells with concentrations of cis-1,2-DCE and VC above maximum contaminant levels (MCLs) was reduced; however, concentrations above MCLs were still reported. In intermediate zone wells, 1,1-DCA concentrations increased and decreased in various wells. VC concentrations generally decreased. However, both 1,1-DCA and VC were reported at concentrations above MCLs.

No additional injection of oxidant was conducted following third injection event and performance monitoring as part of removal actions for the FWBZ and SWBZ at IR Site 9. It was recommended that several quarters of groundwater monitoring be conducted to assess if elevated contaminant concentrations following third round of injection decrease with time. It was further recommended that the decision on the need for additional ISCO treatment be made following at least three quarters of additional groundwater sampling.

2.4.3 Pilot Studies/Corrective Actions – CAA-13

Corrective action in the form of DVE and biosparging was implemented at CAA-13 west of Building 530 between February 2002 and August 2006 as part of Petroleum Program (see Figures 2-2 and Figure 2-8). Both DVE and biosparge remediation systems were implemented to address separate-phase and dissolved-phase hydrocarbons in groundwater and the vadose zone. A pilot-scale DVE system was installed and began operations in October 2002. The pilot-scale DVE system operated until May 30, 2003. The full-scale DVE system began operations in June 2003 on 31 wells, with an additional eight wells being added to the system over the period of full-scale operations.

A biosparging pilot test began in October 2002, and was terminated in November 2002 when separate-phase hydrocarbon was observed in the test area. A second biosparging pilot test area was selected at the southern end of the site and began operations in November 2003. The biosparge pilot test system was expanded to full-scale with the addition of 27 wells in February 2004.

DVE and biosparging activities ceased in September 2004 when the DVE system mass extraction rate remained at less than 10 pounds per day, and the monthly groundwater monitoring samples for August 2004 showed only one well exceeding 20 mg/L, the preliminary remediation criteria (PRC) in the *Preliminary Remediation Criteria and Closure Strategy for Petroleum-Contaminated Sites at Alameda Point* (TPH Strategy) (DON 2001b) taken to be indicative of free product. Approximately 55,800 pounds of hydrocarbons were removed during pilot-scale and full-scale operations of the DVE, of which nearly 40,000 pounds were recovered as separate-phase. Hydrocarbon mass reduction resulting from the

biosparging operations was not quantified due to concurrent operation of the DVE system. Based on the data collected during biosparging as part of pre-pilot test, an injection well spacing of approximately 40-foot centers was suggested.

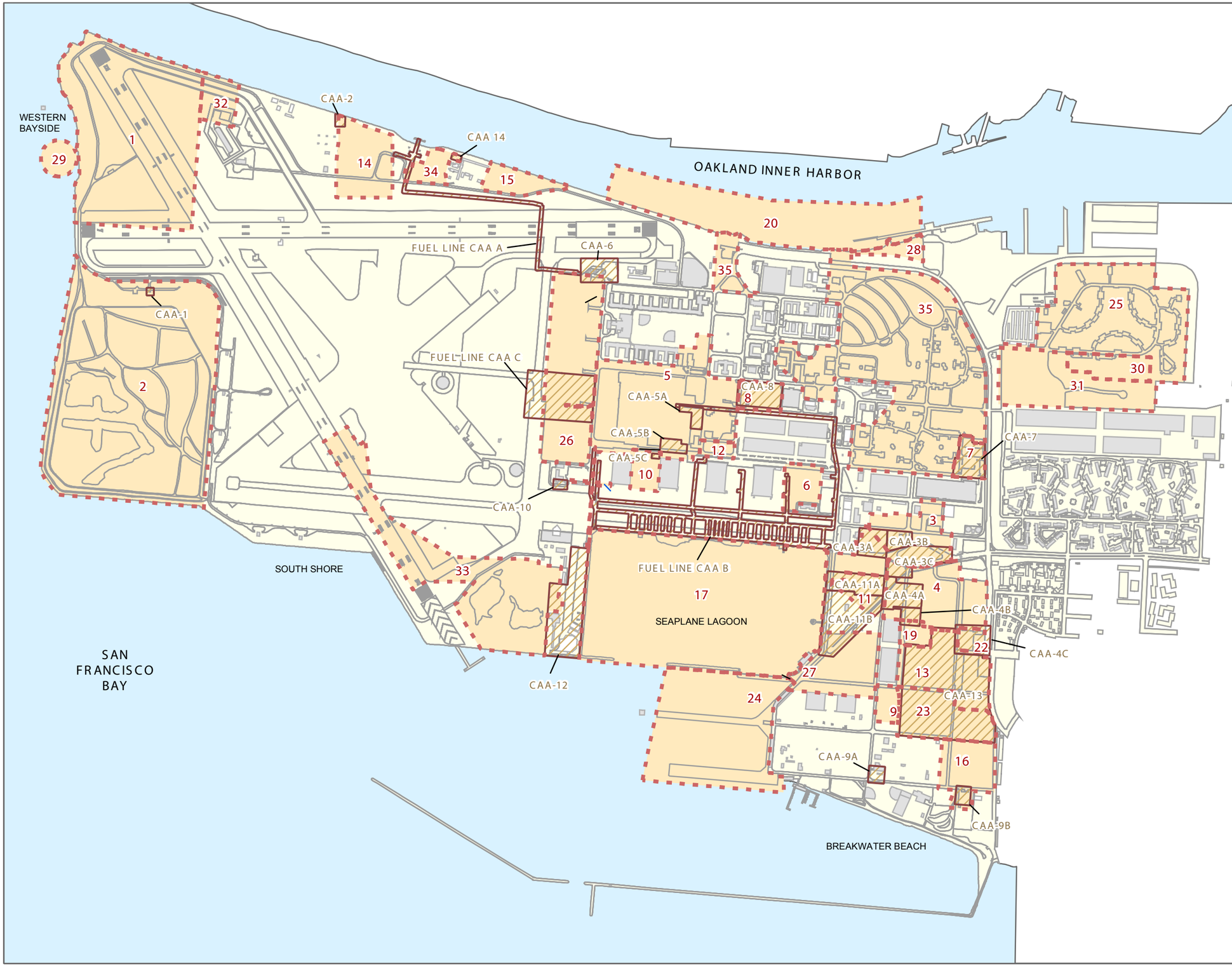
Groundwater sampling, in October 2004, of 27 wells situated throughout the defueling area found no measurable product, and analyses of groundwater samples found no dissolved TTPH above the free product screening level of 20 mg/L. Subsequent groundwater sampling found free product in some wells and groundwater exceeded the free product screening level in others. This rebound in hydrocarbons prompted the resumption of limited DVE operations on select wells in October 2005, and a similar resumption of limited biosparge operations on select wells in January 2006. Both systems were again shut down in February 2006 and post-remediation groundwater sampling continued through August of 2006.

Results of the analyses of groundwater samples collected during the last three months of post-remediation monitoring (June, July, and August of 2006) showed two small areas of about 4,000 square feet total in the central and northern portions of the site contained dissolved hydrocarbons levels that exceeded 20 mg/L. Benzene was not detected above 0.5 µg/L. Ten soil and soil gas samples were collected from throughout the site in August 2006 to evaluate residual hydrocarbons in the vadose zone. Results of analyses of soil samples, which were considered estimated, found no petroleum fraction or fuel-related compounds exceeded the PRCs established by the TPH Strategy.

2.4.4 Intrinsic Bioremediation Study at IR Site 13

A study was conducted in 1998 to evaluate intrinsic bioremediation of hydrocarbons at IR Site 13 and to estimate the rate of bioremediation (Berkley Environmental Restoration Center 1998). Samples were collected in the field southeast of Building 397, and field and laboratory analyses were performed to accomplish the following objectives: (1) characterize the microbial populations present at each site (microcosms, microbial enrichment, and direct epifluorescent microscopy); (2) characterize the geochemical conditions at each site and identify the occurrence of metabolic substrates and products (field physical/chemical assays, soil gas, and isotopic assays); (3) evaluate the mechanisms responsible for degradation (soil gas and isotopic assays).

Analytical data indicated that although biodegradation of the hydrocarbons is occurring, the mode of degradation is dominated by a coupled process of methanogenesis and methane oxidation rather than by direct aerobic activity on the parent hydrocarbons. The contaminant degradation activity varies significantly over time and is much more pronounced following periods of high rainfall. Modeling results and field observations suggested that oxygen transport is hindered in the unsaturated soils above the hydrocarbons at IR Site 13, resulting in slow bioremediation rates. Results of this study indicated that to significantly accelerate the in situ bioremediation rate at the site, the permeability within the unsaturated subsurface above the zone of contamination must be increased to facilitate soil gas exchange.



CERCLA SITE BOUNDARY AND NUMBER

CORRECTIVE ACTION AREA (CAA) AND NUMBER

BUILDING

Present

Removed

LAND COVER

OPEN WATER

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CAA = Corrective Action Area

600 0 600 1200 Feet

OU-2A FS

Final

CORRECTIVE ACTION AREAS AND CERCLA SITES

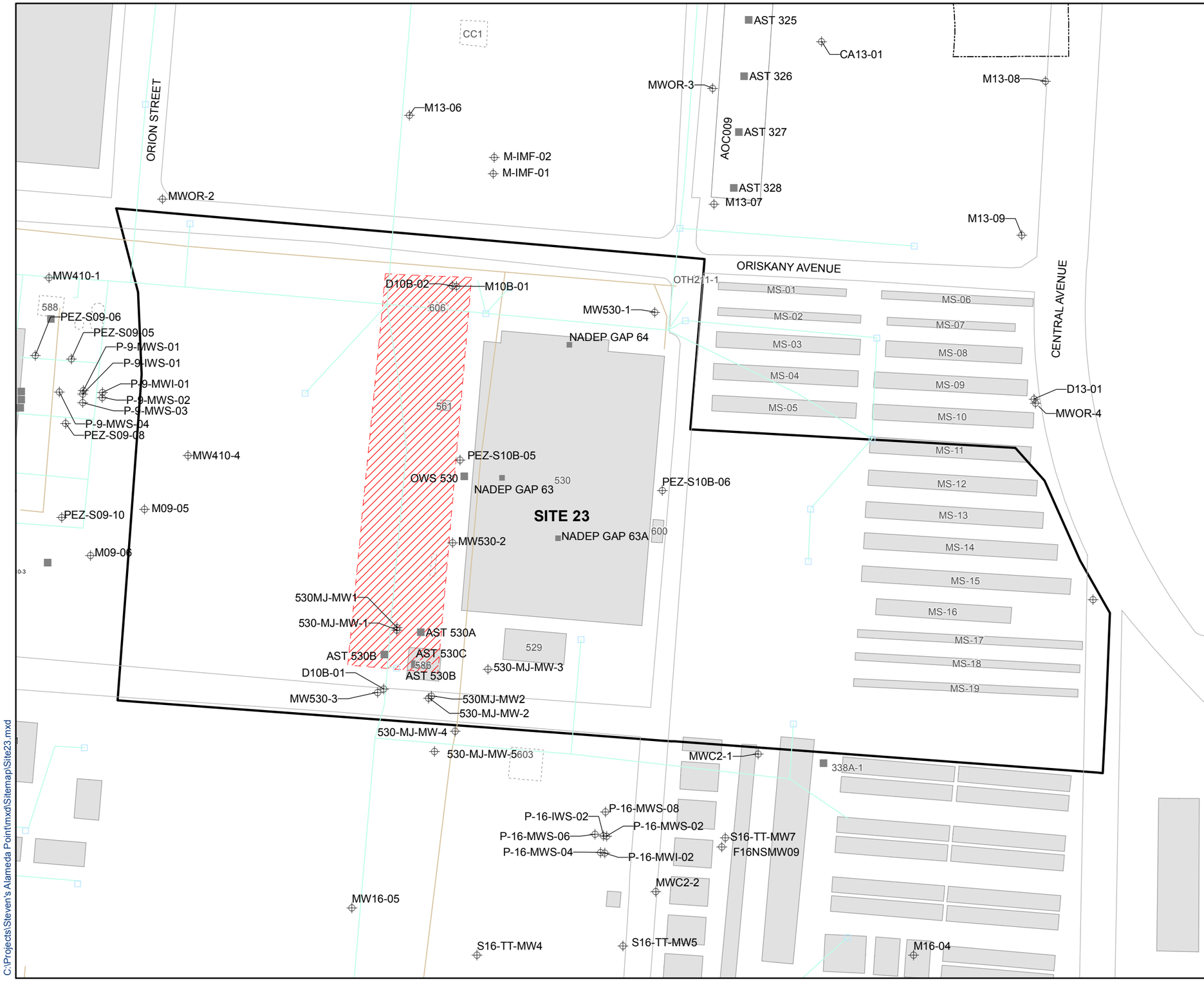
Alameda, CA

Date: 06-11	Project No. 106687	Figure 2-2

OTIE Oneida Total Integrated Enterprises

AECOM

2005-07-22 U:\almda_sa\do028\ou2a\fs\mxd\fig02-01_caa_cercla.mxd TtEMI-SA K. Johnson



Legend

- Solid Waste Management Unit
- Groundwater Monitoring Well
- Catch Basin
- Storm Sewer Line
- Sanitary Sewer Line
- Road
- Site Boundary
- 603 Former Building and Building Number
- Building and Building Number
- Approximate location of DVE and biosparging (Petroleum corrective action at CAA-13)

ABBREVIATIONS AND ACRONYMS:

AOC - AREA OF CONCERN
AST - ABOVEGROUND STORAGE TANK
CAA - CORRECTIVE ACTION AREA
DVE - DUAL VACUUM EXTRACTION
FS - FEASIBILITY STUDY
IR - INSTALLATION RESTORATION
NADEP GAP - NAVAL GENERATOR ACCUMULATION POINT
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR

SOURCE:

TETRA TECH EC 2007

N

0 30 60 120 Feet

1 inch = 122 feet

OU-2A FS | Final

Plan - IR Site 23

Alameda, CA

Date: 06-11	Project No. 106687	Figure 2-8

OTIE Oneida Total Integrated Enterprises

AECOM

C:\Projects\Steven's Alameda Point\mxd\Sitemap\Site23.mxd

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
45	future land use	Section 2.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Sections 3.1.2 and 3.1.3, Page 6. Oneida Total Integrated Enterprises LLC 2011.

The most conservative of these potential hypothetical uses (residential whole-house use, including residential ingestion) was retained for evaluation in this HHRA. In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

3.1.2 Current Land Use

Although the installation has been closed, some security, administrative, and maintenance personnel remain. Occasional recreational activities at the base may consist of jogging, walking, and picnicking, but these do not occur at CERCLA sites. Although not associated with IR Sites 9, 13, 19, 22, and 23, residential housing is located in the northeastern corner of the base. Some buildings on Alameda Point are leased for commercial or industrial use, but not on OU-2A.

These general exposure scenarios cover the range of current exposure scenarios at Alameda Point. Because the future exposure scenarios associated with Alameda Point involve a greater extent and duration of exposure than current exposures, only future exposure parameters were used to evaluate risks associated with these scenarios (that is, only future scenarios were evaluated).

3.1.3 Future Land Use

OU-2A is planned for commercial mixed use and other commercial uses including: office, research and development (R&D), warehousing, light industrial, maritime industrial, manufacturing, service-commercial, retail, and where appropriate residential uses (ARRA 2006).

Commercial/industrial exposures are the most reasonable exposure scenarios for future land use at IR Sites 9, 13, 19, 22, and 23. Construction worker exposures are also possible.

However, although the five sites are likely to be developed for mixed land uses, residential land use was evaluated for soil and groundwater for these sites. In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario have also been evaluated.

Even though there are no planned parks in the inner harbor area (with the exception of the southern shoreline area, which does not include OU-2A), recreational receptor has also been identified for OU-2A but will not be evaluated in this HHRA. This determination was based, in part, on the fact that no primarily recreational areas are located on OU-2A as well as the fact that the residential assessment is more conservative (as compared to commercial, construction or recreational reuse), given its increased exposure frequencies and durations relative to a recreational scenario.

3.1.4 Potential Receptors

For IR Sites 9, 13, 19, 22, and 23, the residential, commercial/industrial, and construction worker exposure scenarios are considered potentially complete based on reuse plans developed for Alameda Point. Exposures to chemicals in soil, and groundwater were evaluated for each potential receptor on a site-specific basis.

The current and future receptors at OU-2A, IR Sites 9, 13, 19, 22, and 23 are resident (child and adult), construction worker, onsite worker (commercial/industrial), and recreational user (potentially complete pathways but negligible). However, in order to conduct these risk assessments, the following simplifications were made to USEPA's baseline risk assessment process.

- Baseline risks were evaluated for residential receptors for soil and groundwater and for commercial receptors for groundwater.
- Baseline risks were evaluated for reasonable maximum exposure (RME).

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
46	Ecological Risk Assessment	Section 2.5	Final Remedial Investigation Report, Sites 9, 13, 19, 22 and 23, Operable Unit 2A (OU-2A), Appendix I. SulTech 2005.

I.1 INTRODUCTION

This ecological risk assessment (ERA) is part of a remedial investigation (RI) being conducted by the U.S. Department of the Navy (Navy) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at CERCLA Sites 9, 13, 19, 22, and 23 at Alameda Point (formerly Naval Air Station Alameda) in Alameda County, California. These sites make up the Light Industrial Operable Unit (OU), referred to as "OU-2A." All of the sites are industrial areas with limited habitat for ecological receptors, and planned reuse is to remain industrial and commercial. The purpose of this ERA was to evaluate residual chemicals at the OU-2A sites to determine their potential risks to ecological receptors.

A screening-level ERA was prepared for the OU-2 sites in 1999 (Tetra Tech EM Inc. [Tetra Tech] 1999). The screening-level ERA for the OU-2 sites indicated that risk to ecological receptors was possible at the sites based on the conservative assumptions used; however, significant data gaps identified required additional investigation. These additional data gap investigations resulted in the collection of soil and groundwater samples for analysis from the sites.

To reduce the level of uncertainty in the screening-level ERA, a baseline ERA, including the new data from the data gap sampling, was deemed to be necessary. The urban nature of the sites, however, precluded the collection of site-specific tissue samples that could be used to reduce the uncertainty in the baseline ERA. Because limited habitat at the sites does not support site-specific ecological sampling needed for baseline ERAs, a typical baseline ERA is not feasible. A modified ERA was conducted for OU-2A. This modified ERA is intended to be a conservative estimate that uses more realistic exposure parameters for the ecological endpoints defined than would be used typically for a screening-level ERA. In addition, because habitat is limited at the sites and future land use would not result in additional habitat, it is unlikely that ecological receptors would use the sites in any significant manner. The methodology used to conduct the assessments and the results of the ERA are presented in this appendix. This ERA methodology follows U.S. Environmental Protection Agency (EPA) guidance for screening-level and baseline ERAs, as well as Navy ERA guidance (EPA 1997a; Navy 1999).

This ERA is organized into the following sections:

- Section I.1 presents the scope and process used to conduct the modified screening-level ERA at Sites 9, 13, 19, 22, and 23.
- Section I.2 presents the site-specific screening-level ERA results and conclusions for Sites 9, 13, 19, 22, and 23.
- Section 1.3 presents the references used to prepare this appendix.
- Attachment I1 presents the ecotoxicological profiles for ecological chemicals of potential concern (COPC) at Alameda Point.

Figures and tables used to prepare this appendix are provided after Section I.3, References.

I.1.1 SCOPE

A modified ERA was conducted for Sites 9, 13, 19, 22, and 23. Figure I-1 identifies these sites in relation to the entire Alameda Point facility.

The following section identifies the ERA process used to evaluate potential risks to ecological receptors associated with ecological COPCs at Sites 9, 13, 19, 22, and 23. This ERA is composed of two major steps: (1) problem formulation and (2) exposure estimates and risk calculations. The problem formulation step results in development of an ecological conceptual site model (CSM) for exposure at the site and selection of assessment and measurement endpoints. The exposure estimate and risk calculation parameters used in the assessment were generally based on average values instead of the most conservative values. These modifications resulted in a more realistic estimate of potential risk to selected assessment endpoints; however, these estimates are still relatively conservative.

This ERA incorporates conservative assumptions to represent site-specific information in a manner that minimizes the probability of underestimating ecological risks. Because of the conservative nature of the assessment, potential risks identified in the ERA should not be interpreted to imply that a risk actually exists.

I.1.2 DESCRIPTION OF THE ECOLOGICAL RISK ASSESSMENT PROCESS

The following sections present a description of the process used in conducting the modified screening-level ERA for Sites 9, 13, 19, 22, and 23.

I.1.2.1 Screening for Ecological Chemicals of Potential Concern

Existing soil data collected during the RI, environmental baseline survey, and data gap sampling were deemed to be of adequate quality to support an ERA. Soil data from 0 to 6 feet below ground surface, which represent the maximum burrowing depth of the California ground squirrel, were used. Groundwater at the five OU-2A sites was not assessed in this ERA for two reasons: (1) Groundwater was determined not to express to the surface, and (2) groundwater occurs at depths such that exposure to burrowing animals is expected to be minimal.

The soil data were used as follows to develop ecological COPCs for the OU-2A sites. Ecological COPCs are site-related chemicals that have the potential for causing adverse effects to ecological receptors. The 95th percentile upper confidence limit on the arithmetic mean (UCL95) and standard deviation values were calculated for each detected constituent. For chemicals with less than 15 percent of samples detected, one-half the reporting limit is substituted for each nondetect measurement in all calculations. The exposure point concentration (EPC) for each site was the lower of the UCL95 or maximum detected value and was used to identify ecological COPCs. The distribution of each chemical (that is, normal,

lognormal, or unknown) was taken into account when calculating the UCL95. When the constituent was detected in less than three of the total samples collected, a UCL95 was not calculated, and the maximum detected value was used as the EPC.

EPCs were calculated as discussed in Section I.1.2.1. Constituents detected in the soils were subjected to a screening process to focus the ERA on chemicals that are site-specific and that pose the greatest potential risk to ecological receptors. The screening was a sequential process that considered factors such as frequency of detection, spatial distribution of detected chemicals, statistical comparison to background concentrations for inorganic chemicals, and chemical properties such as bioaccumulation and toxicity. The following are the steps involved in the chemical screening process; a detailed flow chart is presented in Figure I-2.

Step 1: Certain inorganic chemicals are essential nutrients that may be eliminated as ecological COPCs, according to guidance documents issued by EPA and the California Department of Toxic Substances Control (DTSC). These chemicals are calcium, iron, magnesium, potassium, and sodium. The first step in the ecological COPC screening process was to exclude these essential nutrients as ecological COPCs. If the chemical was not an essential nutrient, then it was further screened by the criteria in Step 2.

Step 2: The second step in the ecological COPC screening process was to calculate the frequency of detection for all detected chemicals. Chemicals with a frequency of detection of greater than 5 percent were further screened in Step 4. Chemicals with a frequency of detection of 5 percent or less were further screened in Step 3.

Step 3: Chemicals that did not have a 5 percent frequency of detection were then screened based on their bioaccumulation potential and toxicity. Octanol-water partition coefficient (K_{ow}) values for a chemical are correlated with the bioaccumulation potential because K_{ow} values provide a measure of the tendency of a chemical to partition into lipids (fat tissues). Constituents detected in the soils, with K_{ow} values greater than 3.0, were considered to have significant bioaccumulation potential. Chemical toxicity was evaluated by literature review. If the chemical was associated with significant bioaccumulation or high toxicity (to a specific receptor), it was retained as an ecological COPC.

Step 4: If the frequency of detection was greater than 5 percent and the chemical was inorganic, but not an essential nutrient, the concentration was statistically compared to background levels established for Alameda Point, consistent with the methodology identified in the document "Procedural Guidance for Statistically Analyzing Environmental Background Data" (Navy 1998a). Any inorganic chemical that was detected at levels that were determined to be statistically similar to or less than background was removed from consideration as an ecological COPC. This comparison was not conducted for organic chemicals, because organic chemicals are not naturally occurring and do not have a natural background level by which to compare.

I.1.2.2 Problem Formulation

Problem formulation represents the stage of the ERA process where the goals, breadth, and focus of the assessment are determined. The major goal of the problem formulation step was to develop an ecological CSM that addressed the following five issues:

1. Environmental setting and chemicals known or suspected to exist at the site
2. Chemical fate and transport mechanisms that might exist at the site
3. Mechanisms of ecotoxicity associated with chemicals and likely categories of receptors that could be affected
4. Complete exposure pathways that might exist at the site (a complete exposure pathway is one in which the chemical can be traced or expected to travel from the source to a receptor)
5. Selection of assessment and measurement endpoints to screen for ecological risk

The following sections summarize specific issues associated with problem formulation for OU-2A sites.

I.1.2.2.1 Evaluation of Environmental Setting and Chemicals

To begin the screening-level problem formulation stage, information on the environmental setting and a list of chemicals known to exist at the site was obtained. For these chemicals, physical and chemical characteristics were obtained. The first step to compiling environmental setting information was to obtain information about site (1) history, (2) habitats, and (3) animal and plant species, including special status species. In addition, a literature search of site reports, review of maps and aerial photographs, communication with regulatory agencies, and site visits were used to gather information on valuable ecological resources at the facility. Valuable ecological resources include those that are critical to ecosystem function, provide critical resources, or are perceived by humans as being valuable.

Habitat and animal and plant species were identified by: (1) reviewing site-specific literature and data, (2) conducting site reconnaissance in June 1995 and June 1997, and (3) conducting a site visit in October 1998. The U.S. Fish and Wildlife Service (FWS) identified special status species that occur or are expected to occur at Alameda Point (1993). Special status species are defined as (1) plants and animals officially listed or proposed for listing under state or federal Endangered Species Acts, (2) state or federal candidate species for possible listing, (3) California Department of Fish and Game (CDFG) "Species of Special Concern," and (4) species designated as "sensitive" by federal land managers. In addition, "special species" listed by CDFG were identified. They are not state or federally designated threatened or endangered but those species that fall into one or more of the following categories: (1) species that are biologically rare, very restricted in distribution, declining throughout their range, or reside in California during a critical

stage in their life cycle; (2) populations in California that may be peripheral to the major population of a species range, but are threatened with extirpation in California; and (3) species closely associated with habitats that are declining in California such as wetland, riparian, and primary forest habitats. Based on literature reviews, four rare plants, four rare fishes, one special status species reptile, 29 special status species birds and associated sensitive habitat, and seven special status species mammals could potentially occur at Alameda Point (Tables I-1 and I-2).

Site reconnaissances of Alameda Point were conducted in 1995 and 1997 to assess habitats and species at Alameda Point and to augment literature sources. These reconnaissances were conducted following protocol developed by the EPA Region 9 reconnaissance work plan (PRC Environmental Management, Inc. 1995). Terrestrial habitats were delineated, and the dominant vegetation was identified. Additionally, these reconnaissances were important in providing information on the physical layout of the site; identifying existing habitat types and distributions, potential migration pathways, and exposure pathways; and identifying the potential for nonchemical stressors at the site. Table I-3 identifies the dominant vegetation and fauna present at OU-2A sites, and Figure I-3 depicts the habitat at Sites 9, 13, 19, 22, and 23.

I.1.2.2.2 Evaluation of Chemical Fate and Transport

The physical and chemical properties of ecological COPCs at each site were evaluated because these properties govern chemical and biological transformation processes, bioaccumulation potential, and transport properties. Based on this evaluation, the fate and transport potential of each ecological COPC was assessed. The fate and transport potential assessment was used to evaluate potential exposure pathways.

The movement of chemicals in the environment depends on several factors such as vapor pressure, solubility, and adsorption. These factors govern the distribution of chemicals among various phases (gas, liquid, or solid) and a chemical's mobility and persistence in the environment. Chemical and structural properties of organic chemicals determine resistance to biological and chemical degradation, and therefore govern persistence of the chemical in the environment. Physical properties are more important when developing the ecological CSM because current chemical concentrations and their potential transport mechanisms are being assumed. Literature data on the following physical properties were evaluated to assist in development of the ecological CSM.

Water Solubility

Water solubility is a critical property affecting the fate of chemicals in the environment. Highly soluble chemicals can be leached rapidly from wastes and soils into groundwater, where they are transported by groundwater. The mobility of chemicals in soil is proportional to their water solubility. Solubilities can range from less than 1 milligram per liter (mg/L) to totally miscible, with most common organic chemicals exhibiting solubilities greater than 1 mg/L (Lyman and others 1982). Water solubility is influenced by several factors such as pH, temperature, salinity, dissolved organic carbon, and the presence of cosolvents. Chemicals with solubilities greater than 1,000 mg/L are expected to be mobile in soil. The pesticides and polychlorinated biphenyls

(PCB) detected in the soils at OU-2A sites have a water solubility of less than 1 mg/L, while most of the semivolatile organic compounds (SVOC) and volatile organic compounds (VOC) have water solubilities of greater than 1,000 mg/L.

Vapor Pressure

Volatilization is the transformation of a compound from a liquid or solid to a gas. As a gas, a compound's mobility is generally higher because of advection (flow) of air and diffusion. Volatilization of a compound depends on its vapor pressure, water solubility, and air diffusion coefficient. Highly water-soluble chemicals generally have lower volatilization rates from water unless they also have high vapor pressures. Vapor pressure (a relative measure of the volatility of a chemical in its pure state) ranges from roughly 0.001 to 760 millimeters of mercury for liquids. Henry's Law constant, which is a function of vapor pressure and solubility, is more appropriate than vapor pressure alone for estimating releases from water to air. Chemicals with Henry's Law constants greater than 1×10^{-3} atmosphere per cubic meters per mole can be expected to volatilize readily from water; those with values ranging from 1×10^{-3} to 1×10^{-5} are associated with moderate volatilization; chemicals with values less than 1×10^{-5} will volatilize from water only to a limited extent (Lyman and others 1982). Chemicals with high vapor pressure will preferentially partition from soils and surface water to the air.

Octanol-water Partition Coefficient

The K_{ow} indicates the tendency of dissolved organic chemicals to partition from water into the lipids of an organism or into organic matter found in soil or sediment. High K_{ow} values are strongly correlated with a chemical's propensity to bioaccumulate. K_{ow} is the ratio of the solute concentration in octanol to the solute concentration in water at equilibrium and is calculated by dissolving a given mass of the chemical of interest in a container holding octanol and water. K_{ow} can be measured accurately up to values in the range of 106 (Mackay and others 1992). In the event that measured K_{ow} values are not available, Lyman and others (1982) have summarized estimation methods for predicting K_{ow} values for a chemical based on substituent groups or fragment constants.

Bioconcentration, Bioaccumulation, and Biomagnification

Bioconcentration is the process resulting in a net accumulation of a chemical in an organism (such as fish) from direct exposure to a medium such as water (EPA 1997b).

Bioaccumulation is the process by which chemicals are taken up by an organism, either directly from a contaminated medium or by consumption of contaminated foods (EPA 1997b). In the dose assessment of an ERA, it is sometimes necessary to assess chemical exposure from multiple routes if each route contributes significantly to the total dose. It is often possible in most ERAs, however, to assume that one route of exposure is dominant and others are negligible (Suter 1993).

The processes of bioaccumulation and biotransfer, by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain, cause biomagnification (EPA 1997b). The term implies an efficient transfer of chemical from food to consumer so that residue concentrations increase systematically from one trophic level to the next.

Fate and Transport Assumptions

To develop the ecological CSM, site conditions and the physical and chemical properties of the ecological COPCs were evaluated. Physical fate processes of concern include transport to groundwater, volatilization to air, transfer to surface water, and movement of contaminated soil particles through windblown dust or as suspended soil particles in surface water. The following assumptions were used to evaluate various transport mechanisms.

All ecological COPCs in soils were assumed to be leaching to groundwater. Groundwater was assumed to be inaccessible to ecological receptors unless evidence of groundwater discharge was present in the immediate area of the site. If evidence of groundwater discharge occurred in the immediate area of the site, groundwater was assumed to be surface water that could be consumed by ecological receptors. Groundwater was not a complete exposure pathway for Sites 9, 13, 19, 22, and 23.

The air exposure pathway was considered to be complete for inhalation of contaminated dust or vapors if the site had significant areas of exposed soils or volatile ecological COPCs. Limited areas of exposed soils exist at the OU-2A sites. VOCs only occur in relatively low concentrations; therefore, exposure to airborne vapors and dust was not considered a significant exposure pathway for evaluation purposes.

The site was evaluated to determine whether rainfall runoff went into the storm sewer system or collected in low spots on the site. Exposure to surface water did not occur in association with the OU-2A sites.

Direct contact and ingestion pathways for contaminated soils were assumed to be complete at OU-2A sites.

Food chain exposure to chemicals was assumed to occur at the sites with complete exposure pathways. The food chain exposure evaluation was based on the food web presented in Figure I-4.

I.1.2.2.3 Ecotoxicity Evaluation

Ecological COPCs associated with OU-2A sites of Alameda Point include metals, pesticides, PCBs, SVOCs, and VOCs. A literature review was conducted to identify potential toxic effects of ecological COPCs on ecological receptors. These ecological COPCs induce a variety of effects that depend on species and trophic level. A summary of literature information collected

on potential ecotoxicological effects is presented in Attachment I1 of this appendix. This information was used to assist in selection of assessment and measurement endpoints.

I.1.2.2.4 Development of Toxicity Reference Values for Soil

Toxicity reference values (TRV) or ecological reference values (ERV) were used to assess the toxicity of ecological COPCs in the soil. A TRV or ERV is a concentration or daily dose at which a particular biological effect may occur in an organism, based on laboratory toxicological investigations. The Navy, the EPA Region 9 Biological Technical Advisory Group (BTAG), and Tetra Tech (Navy 1998b) developed TRVs as a result of an ecological effect evaluation for mammalian and avian receptors. This evaluation resulted in development of high and low TRVs for a number of ecological COPCs commonly detected at Navy facilities in California (Navy 1998b). The low TRV is a conservative screening value consistent with a chronic no effects level; the high TRV is a less conservative value consistent with an effect level, at which a specific biological effect was observed in a laboratory test organism. The high TRV, therefore, is a value at which the potential for adverse effects exists. If a Navy TRV was not available for an ecological COPC or endpoint, ERVs previously developed for other Navy facilities in California were used, if available. If no ERVs for Navy facilities were available, other sources of conservative ERVs and TRVs, such as Toxicological Benchmarks for Wildlife (Sample and others 1996) or the EcoSSLs, were used. For most of the chemicals in the Sample (1996) document, benchmarks are provided as NOAELs, which were used as the low TRV, and LOAELs, which were used as the high TRV. For the EcoSSLs a geometric mean NOAEL and LOAEL were calculated from several studies that were deemed adequate for TRV development.

The Navy established a low, mammalian TRV for lead of 0.0015 milligram per kilogram per day (mg/kg-day) in 1997, which was based on a study by Krasovskii and others (1979). This study evaluated reproductive, hematological, and neurological effects of lead in rats; however, this TRV was revised by BTAG in November 2002 based on a request by the U.S. Department of the Army (2001), which stated that the Krasovskii and others (1979) study was inadequate for the purpose of TRV development. The new low mammalian TRV of 1 mg/kg-day was developed based primarily on a study by Fowler and others (1980). This study evaluated renal effects in rats. The justification and rationale for the establishment of the new low mammalian TRV is presented in the DTSC Human and Ecological Risk Division (HERD), HERD Ecological Risk Assessment Note, No. 5 (2002).

Following protocol established in Navy (1998), if the species representing the measurement endpoint was different from the species used to develop the ERV, dietary concentrations were converted to dose (that is, milligram of ecological COPC per kilogram of body weight per day) for comparison with estimated ecological COPC ingestion rates in receptor species. All TRVs and ERVs were adjusted to account for the difference in body weights between the study organism and the measurement endpoint receptor, based on the allometric equations recommended by Sample and others (1998a). The allometric conversion equations developed by Sample and others (1998a) were used to extrapolate doses according to methods described by Opresko and others (1993) and Sample and Arenal (1999). The following allometric conversion equations were used for this food chain analysis:

$$\text{Birds: } TRV_{receptor} = TRV_{test\ organism} (BW_{test\ organism} / BW_{receptor})^{1 - 1.2}$$
$$\text{Mammals: } TRV_{receptor} = TRV_{test\ organism} (BW_{test\ organism} / BW_{receptor})^{1 - 0.94}$$

Toxicity was evaluated by one of the following methods for ecological COPCs and endpoints not covered by the Navy TRV list:

1. Available literature was evaluated to determine whether published studies could be used to develop a conservative ERV. If appropriate studies were found, the relevant, most sensitive ecological effect was used to develop the ERV. ERVs were developed in accordance with EPA guidance (EPA 1997a). This was relevant when a high TRV was not published for a chemical that had a low TRV. In these instances, the low TRV was multiplied by 10 to develop a high TRV.

2. The existing literature was evaluated to determine whether the ERV for a similar chemical could be used as a surrogate when insufficient information existed to develop a specific ERV for the ecological COPC and endpoint. If the literature indicated similar effects and mechanisms of actions for the chemicals, surrogate ERVs were used for the preliminary ecological effects evaluation conducted in the screening-level ERA.

3. The ecological COPC and endpoint were evaluated on a qualitative basis if an ERV or surrogate ERV could not be developed. Available literature information, ecological COPC concentrations and distribution, and other information were used to arrive at a conclusion on potential ecological effects.

High and low ERVs and TRVs used in risk calculations for each receptor endpoint are presented in Tables I-4 through I-11.

I.1.2.2.5 Exposure Pathway Evaluation

Complete exposure pathways were evaluated for OU-2A sites, based on fate and transport properties of each ecological COPC, including food chain transfer in the food web postulated to exist at the site. Complete exposure pathways were identified before a quantitative evaluation of toxicity to allow the assessment to focus on only the contaminants that can reach ecological receptors. For an exposure pathway to be considered complete, an ecological COPC must be able to travel from the source to ecological receptors and to be taken up by the receptors through one or more exposure routes. As requested by EPA and DTSC, the ERA assumes that all existing buildings and pavement are removed and that the underlying soil immediately provides suitable habitat for higher-trophic-level receptors.

The ecological CSM for the OU-2A sites is based on site media, potential food chain transport pathways, assessment endpoints, and measurement endpoints associated with each assessment endpoint. The ecological CSM supports selection of completed exposure pathways that present the greatest potential risk of adverse effects. A generic ecological CSM for OU-2A sites is presented in Figure I-5. The CSM depicts the guilds chosen as assessment endpoints as well as

those species representing those endpoints. Additionally, other guilds, not chosen as assessment endpoints are also presented in the CSM because they represent a food source for the assessment endpoints.

I.1.2.2.6 Selection of Assessment and Measurement Endpoints

EPA defines an assessment endpoint as an "explicit expression of an environmental value to be protected" (EPA 1997a). Ecological resources may be considered valuable when (1) their absence would significantly impair ecosystem function; (2) they provide critical resources, such as habitat or fisheries; and (3) they are perceived by humans as being valuable such as endangered species. An assessment endpoint should define both the valuable ecological entity at the site and a characteristic of the entity to protect, such as reproductive success or production per unit area.

Unlike human health risk assessment, which evaluates only one species, the ERA involves multiple species with different degrees of exposure and toxicological responses. For the purpose of a CERCLA ERA, investigations should focus on endpoints most likely to be affected given the fate and transport mechanisms of the chemicals involved, ecotoxicological properties of the chemicals, habitats at the site (and future use), and potential ecological receptors (EPA 1997a).

OU-2A sites consist of developed and paved areas within Alameda Point, and suitable wildlife habitats are limited; however, this screening-level ERA assumes that all pavement and buildings are removed and that soil is fully exposed. Based on EPA guidance, three generic assessment endpoints were selected for OU-2A to evaluate potential ecological risk at the sites. The following paragraphs summarize the assessment endpoints selected and the rationale for selection. Plants and invertebrate populations were not selected as assessment endpoints because of the urban habitat at the sites. The habitat available for such species is expected to remain minimal.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, mutagenic, teratogenic, and other effects on mammals (Peterle 1991; EPA 1975). Small mammals, such as the California ground squirrel and various voles, are secondary consumers that provide a major food source for upper-trophic-level consumers such as raptors. Adverse effects on the small mammal community of Alameda Point could result in a reduction in the amount of food available to and corresponding reductions in populations of predators. The small mammal community was, therefore, considered to be an ecological value to be protected.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, teratogenic, and other effects on passerine species (Beyer and others 1996; Peterle 1991; EPA 1995; Hoffman and others 1996). Passerines, such as the

Alameda song sparrow and the American robin, are secondary consumers that provide a food source for upper trophic level predators. In addition, some small birds, such as songbirds, are considered to be important and worthy of protection for aesthetic or other functional reasons. Adverse effects on the passerine community at Alameda Point could result in a reduction of food available to and corresponding reductions in populations of predators; therefore, the passerine community was considered to be an ecological value to be protected.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, teratogenic, and other effects on birds (Beyer and others 1996; Peterle 1991; EPA 1995; Hoffman and others 1996). The facility has a strong presence of raptors such as red-tailed hawks, Swainson's hawk, and other species. At least one of these, the northern harrier, is a species of special concern. Raptors are the major tertiary consumers at the site and are strongly susceptible to effects of bioaccumulating chemicals. A decrease in the raptor population at Alameda Point would be undesirable because of the effects of the loss of predation on prey; therefore, the raptor population was considered to be an ecological value to be protected.

Assessment endpoints are usually not amenable to direct measurement. Instead, measurement endpoints that are measurable and related to assessment endpoints must be developed. EPA defines a measurement endpoint as "a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint and is a measure of biological effects (e.g., mortality, reproduction, growth)" (EPA 1997a). Measurement endpoints can include measures of exposure or measures of effect. They are frequently numerical expressions of observations that can be compared statistically to a control or reference site or scientific study to detect adverse responses to an ecological COPC. Each measurement endpoint correlates directly with one of the defined assessment endpoints and was based on available literature mechanisms of toxicity.

The following generic measurement endpoints for Alameda Point were selected based on ecotoxicity data for ecological COPCs found at the site and each measurement endpoint corresponds to an assessment endpoint. Each generic measurement endpoint (1) is based on populations or communities present or potentially present at the site, (2) is amenable to evaluation based on literature research, and (3) can be used to infer information about the related assessment endpoint. The following measurement endpoints were used to evaluate potential ecological impacts to assessment endpoints. Even though Special Status Species may be present at OU-2A sites, as indicated in Table I-1, these species were not selected as measurement endpoints because the sites are located in an urban/industrial area and are not expected to revert to a natural ecological state. The organisms identified as measurement endpoints were, therefore, selected based on their ability to represent more ecologically relevant endpoints that would be exposed at the sites.

Reproductive or Physiological Impacts to the California Ground Squirrel. The California ground squirrel (*Citellus beecheyi*) was used as a surrogate to represent the small mammal

population associated with the site. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section I.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information on the California ground squirrel (Linsdale 1946). A hazard quotient (HQ) was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Reproductive or Physiological Impacts to the Alameda Song Sparrow and the American Robin. The Alameda song sparrow (*Melospiza melodia pusillula*) and the American robin (*Turdus migratorius*) were used as surrogates to represent the passerine population associated with the site. Both species were assessed because the Alameda song sparrow resides in a more estuarine habitat, while the American robin resides in a more terrestrial or upland habitat. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section I.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information on the Alameda song sparrow or the American robin (EPA 1993). An HQ was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Reproductive or Physiological Impacts to the Red-tailed Hawk. The red-tailed hawk (*Buteo jamaicensis*) was used as a surrogate to represent the raptor population associated with the site. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section I.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information on the red-tailed hawk (EPA 1993). An HQ was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Table I-12 presents generic assessment and associated measurement endpoints.

I.1.2.3 Exposure Estimates and Risk Evaluation

The exposure estimate and risk calculation step results in a conservative estimate of potential risk to the selected measurement endpoints. For each measurement endpoint and ecological COPC, a conservative estimate of the dose to an organism was developed using soil EPCs and either site-specific or literature-derived exposure parameters. Using risk calculations, doses were then compared to TRVs or ERVs to evaluate potential risks to each ecological receptor. The following sections describe the development of exposure estimates and risk calculations.

I.1.2.3.1 Development of Exposure Estimates

It is important to be conservative when estimating risk with a screening-level ERA to ensure that the assessment does not indicate insignificant risk when a significant risk exists. The screening-level ERA for the OU-2A sites indicated that risk to ecological receptors was possible at the sites based on the conservative assumptions that were used. The urban nature of the sites, however, precluded the collection of site-specific tissue samples that could be used to reduce the uncertainty in the baseline ERA. In the absence of site- or species-specific tissue data, a modified ERA based on the use of more average exposure parameters was deemed appropriate for the OU-2A sites. These average exposure parameters were used to provide a more realistic estimate of potential risk to ecological receptors. The following assumptions were used for the exposure assessment to calculate a conservative dose to each receptor.

Site Use Factors (SUF). All species considered in the ERA were assumed to live and feed within the site at all times.

Bioavailability. All ecological COPCs were assumed to be 100 percent bioavailable for all trophic levels and species.

Body Weight and Food Ingestion. The average body weight indicated in the literature was used in conjunction with the average ingestion rate.

Bioconcentration and Bioaccumulation Factors. Soil-to-plant and soil-to-soil invertebrate bioconcentration factors (BCF) were obtained from EPA protocol (1999) (Appendix C) or calculated using the following formulas, also presented by EPA (1999):

$$\log BCF_{soil\text{-}to\text{-}invert} = (0.819)(\log K_{ow}) - 1.146 \quad \text{(I-1)}$$

$$\log BCF_{soil\text{-}to\text{-}plant} = 1.588 - (0.578)(\log K_{ow}) \quad \text{(I-2)}$$

where

$BCF_{soil\text{-}to\text{-}invert}$	=	Bioconcentration factor for uptake of constituent from ingestion of soil and into invertebrate tissue
$BCF_{soil\text{-}to\text{-}plant}$	=	Bioconcentration factor for uptake of constituent from ingestion of soil and into plant tissue
log	=	Logarithm

Table I-13 presents the plant and soil invertebrate BCFs.

BCFs for intake of food items to mammal tissues also were based upon EPA protocol (EPA 1999) (Appendix D). The ecological COPC-specific biotransfer factor for mammals

(Ba_{mammal}) was based upon studies of beef cattle ingesting food items. The Ba_{mammal} for inorganic compounds are presented by EPA (1998), while the Ba_{mammal} for organic compounds were calculated using the Travis and Arms (1988) correlation equation, as presented by EPA (1999):

$$\log Ba_{mammal} = -7.6 + \log K_{ow} \quad \text{(I-3)}$$

The $BCF_{soil\text{-}to\text{-}mammal}$ and the $BCF_{food\ item\text{-}to\text{-}mammal}$ was then calculated from the following equations (EPA 1999):

$$BCF_{soil\text{-}to\text{-}mammal} = (Ba_{mammal})\ (IR_{soil}) \quad \text{(I-4)}$$

$$BCF_{food\ item\text{-}to\text{-}mammal} = (Ba_{mammal})\ (IR_{food\ item}) \quad \text{(I-5)}$$

where

$BCF_{soil\text{-}to\text{-}mammal}$ = Bioconcentration factor for uptake of constituent from ingestion of soil and into mammal tissue

$BCF_{food\ item\text{-}to\text{-}mammal}$ = Bioconcentration factor for uptake of constituent from ingestion of food item and into mammal tissue

Table I-14 presents the Ba_{mammal} values and the calculated mammal BCFs used in exposure estimate calculations, as discussed in the following text.

Dietary Composition. The diet of each of the receptors was based on the percentages of dietary items, as reported in the literature.

Ecological COPC Concentration. The EPC used in the evaluation was the lower of the maximum detected concentration or the UCL95 concentration.

Exposure was assessed in the context of the following linear food chains:

Soil→Invertebrates and Plants→California ground squirrel→Red-tailed hawk

Soil→Invertebrates and Plants→Alameda song sparrow or American robin

These food chains were used in this modified ERA to evaluate potential ecological effects on small mammals, passerines, and raptors. The postulated food web for Alameda Point is presented in Figure I-4.

The model presented in the following equations is adequate to estimate daily doses to various receptors in a modified ERA.

Ground squirrel dose (milligrams per kilogram per day [mg/kg-day]) =

$$(SUF)\ \frac{[(C_{soil})(IR_{soil}) + (C_{invert})(IR_{invert}) + (C_{plant})(IR_{plant})]}{BW} \quad \text{(I-6)}$$

Alameda song sparrow dose (mg/kg-day) =

$$(SUF)\ \frac{[(C_{soil})(IR_{soil}) + (C_{invert})(IR_{invert}) + (C_{plant})(IR_{plant})]}{BW} \quad \text{(I-7)}$$

American robin dose (mg/kg-day) =

$$(SUF)\ \frac{[(C_{soil})(IR_{soil}) + (C_{invert})(IR_{invert}) + (C_{plant})(IR_{plant})]}{BW} \quad \text{(I-7)}$$

Red-tailed hawk dose (mg/kg-day) =

$$(SUF)\ \frac{[(C_{ground\ squirrel})(IR_{ground\ squirrel}) + (C_{soil})(IR_{soil})]}{BW} \quad \text{(I-8)}$$

where

BW	=	Body weight
C_{soil}	=	EPC of chemical in soil (milligrams per kilogram [mg/kg])
C_{invert}	=	$(C_{soil})(BCF_{soil\text{-}to\text{-}invert})$ (mg/kg-Fresh Weight [FW]) (EPA 1999)
C_{plant}	=	$(C_{soil})(BCF_{soil\text{-}to\text{-}plant})$ (0.12) (mg/kg-FW) (EPA 1999)

(0.12 is a default value to convert the plant concentration from dry weight to fresh weight and is presented in Appendix B of EPA 1999. This value is an average based on 80 to 95 percent water content in herbaceous plants and non-woody plant parts.)

$BCF_{soil\text{-}to\text{-}invert}$	=	Bioconcentration factor for uptake of constituent from soil to invertebrate tissue
$BCF_{soil\text{-}to\text{-}plant}$	=	Bioconcentration factor for uptake of constituent from soil to plant tissue
$C_{ground\ squirrel}$	=	$[(C_{invert})(FCM^3/FCM^2)(F_i) + (C_{plant})(BCF_{plant\text{-}to\text{-}mammals})(F_p)(0.12) + (C_{soil})(BCF_{soil\text{-}to\text{-}mammal})](mg/kg)]$ (EPA 1999)
$BCF_{soil\text{-}to\ mammal}$	=	Bioconcentration factor for uptake of constituent from soil to mammal tissue (based on mg/kg Dry Weight [DW] soil to mg/kg FW mammal tissue (unitless) (EPA 1999)

$BCF_{plant\text{-}to\text{-}mammals}$	=	Bioconcentration factor for uptake of constituent from plant tissues to mammal tissues (based on mg/kg DW soil to mg/kg DW plant tissue (unitless)
FCM^3/FCM^2	=	Food chain multiplier (FCM), which models a COPC concentration in a predator item (FCM^3), such as the California ground squirrel, from the ingestion of a prey item (FCM^2), such as a soil invertebrate (unitless).
Fi	=	The fraction of the ground squirrel diet that consists of invertebrates
F_p	=	The fraction of the ground squirrel diet that consists of plants
IR	=	Ingestion rate (the amount of prey items, IR_{soil}, IR_{invert}, IR_{plant}, and soil ingested per day) (mg/kg-day)
SUF	=	Site use factor

Table I-15 presents the FCMs as presented in EPA 1999.

Values for the exposure factors for each vertebrate receptor are presented in Table I-16. The following overall procedures and assumptions are associated with the exposure estimates for each receptor.

Small Mammal and Passerine Endpoints

- Small mammal and passerine receptors were assumed to have a diet consisting of a mixture of plants and invertebrates. For small mammals, diet consisted of 80 percent vegetation and 20 percent invertebrates; while for passerines, diet consisted of 50 percent vegetation and 50 percent invertebrates. The primary source of the dietary information was collected from the California Environmental Protection Agency (2000).

- The EPC is the ecological COPC soil concentration used in risk calculations. Multiplying the EPC by the appropriate plant and invertebrate BCF and natural history information on ingestion rates and body weights for the receptors derived the dose for each ecological COPC. The dose was calculated in mg/kg-day for each ecological COPC.

- For 4,4'-dichlorodiphenyltrichloroethane (DDT); 4,4'-dichlorodiphenyldichloroethane (DDD); and 4,4-dichlorodiphenyldichloroethene (DDE), the EPCs were summed and evaluated as total DDT (DDTt). The DDTt value was used in calculations as the soil concentration.

- All polynuclear aromatic hydrocarbon (PAH) compounds were segregated into low-molecular weight (LMW) and high-molecular weight (HMW) PAH categories. LMW PAHs are defined as measured PAHs with a molecular weight below 200 atomic mass units (amu) and include acenaphthene, anthracene, fluorene, naphthalene, 2-methylnaphthalene, and phenanthrene. HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 amu and include benzo(a)fluorene, benzo(b)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. The EPC for each category was calculated by summing the individual compound concentrations detected in each medium and area. Total LMW and HMW PAH concentrations were used in the calculations as the soil concentration.

- For PCB compounds, the EPCs of detected Aroclors were summed to develop a total PCB concentration, which was used in the calculations as the soil concentration.

Raptor Endpoints

- Raptors at the site were assumed to have a diet consisting exclusively of the California ground squirrel, which is considered to be the most conservative diet for the raptor. This diet was selected based on the screening-level ERA, which estimated that the concentrations of chemicals in small mammals were higher than passerines.

- The EPC is the ecological COPC soil concentration used in risk calculations. The red-tailed hawk dose for each ecological COPC was derived by (1) calculating the California ground squirrel concentration, as discussed previously in Section I.1.2.3.1 and (2) multiplying the EPC and the California ground squirrel concentration by the appropriate natural history information on ingestion rates and body weight for the receptor.. The dose was calculated in mg/kg-day for each ecological COPC.

- The EPCs for DDT, DDD, and DDE were summed and evaluated as DDTt. The DDTt value was used in calculations as the soil concentration.

- PAH compounds were segregated into LMW and HMW PAH categories defined previously. The soil concentration for each category was calculated by summing the individual EPCs in each medium and area. Total LMW and HMW PAH concentrations were used in the calculations as the soil EPC.

- For PCB compounds, the EPCs of each detected Aroclor were summed to develop a total PCB concentration, which was used in the calculations as the soil concentration.

Depending on ecological COPCs identified at each site, additional site-specific considerations were used, where appropriate.

I.1.2.3.2 Risk Calculations

Risk calculations were prepared for each receptor based on exposure assumptions for the individual receptor. Risk calculations consist of dividing the calculated dose by the appropriate ERV or TRV for each receptor and ecological COPC, deriving an HQ. HQs greater than 1.0 indicate potential risk to the assessment endpoint that was being evaluated. Depending on the ecological COPCs present at a site, risk calculations were based on the following assumptions.

Small Mammal Endpoint

- The calculations for total PCBs were based on the TRV for Aroclor 1254. No TRV was identified or developed for Aroclor 1260.
- No specific TRVs or ERVs were identified for the individual PAHs. The TRV for naphthalene was used as a surrogate for the LMW PAHs, and the benzo(a)pyrene TRV was used as a surrogate for the HMW PAHs. These surrogates were based on Navy guidance (Navy 1998b).
- No specific TRVs or ERVs were identified for the SVOCs n-nitroso-diphenylamine, and carbazole; therefore, a qualitative evaluation (QE) was performed for these chemicals.
- No specific TRVs or ERVs were identified for the VOCs 1,3-dichlorobenzene, ethylbenzene, and carbon disulfide. A QE was performed for these chemicals.

Passerine and Raptor Endpoints

- No avian TRV or ERV was identified for alpha-chlordane, gamma-chlordane, and heptachlor epoxide. Literature data were inadequate to develop a TRV for avian species. To support the modified ERA, the TRV for DDT was used to evaluate the potential effects of these pesticides. The basis for using the TRV for DDT as a surrogate is based on the fact that these constituents are chlorinated pesticides and as a group, have many of the same effects (Agency for Toxic Substance Disease Registry [ATSDR] 1992a).
- The calculations for total PCBs were based on the TRV for Aroclor 1254. No TRV was identified or developed for Aroclor 1260.
- No specific TRVs or ERVs were identified for the LMW and HMW PAH ecological COPCs. A QE was performed for the chemicals.
- No specific TRVs or ERVs were identified for the SVOCs pentachlorophenol, n-nitroso-diphenylamine, and carbazole. A QE was performed for these chemicals.
- No specific TRVs or ERVs were identified for the VOCs 1,2-dichloroethene (DCE), 1,3-dichlorobenzene, 4-methyl-2-pentanone, acetone, benzene, carbon disulfide, ethylbenzene, methylene chloride, tetrachloroethene (PCE), toluene, trichloroethene (TCE), and xylene. A QE was performed for these chemicals.

I.1.2.4 Evaluation of Assessment Results

Using the high and low TRVs to evaluate ecological endpoints bounds the estimate of risk to each endpoint. The high TRV is the lowest reported dose in the literature at which adverse effects are known to occur and represents an upper bounding limit. The low TRV is the highest reported dose in the literature at which adverse effects are known not to occur and represents the lower bounding limit. Based on this, HQ results using the high and low TRV were evaluated. Generally, concentrations of ecological COPCs with calculated HQs less than 1.0 based on the low TRV would not be considered to pose an appreciable risk to ecological receptors, while HQs greater than 1.0 based on the high TRVs may pose an unacceptable level of risk and require evaluation of the need for remedial actions at a site.

Following calculation of the low and high HQs, further assessment of the potential risk was conducted using a weight-of-evidence approach. This evaluation was conducted as follows:

1. If both HQ values for a constituent were below 1.0, then no potential risk to the ecological endpoint was anticipated.
2. If one or both bounding-limit HQs exceeded 1.0, then the constituent was further compared to calculated background or ambient HQs.
3. Additional factors such as frequency of detection, distribution, concentration, and absorption potential of the chemical were used to evaluate risk.

I.1.2.5 Uncertainties

The ERA process involves a large number of uncertainties and extrapolations to evaluate potential risk to ecological receptors. Uncertainties and extrapolations associated with the evaluation of each site were identified and explained so that risk managers can make risk management decisions with an understanding of how the HQs were developed. Many of the assumptions in the screening-level ERA process are conservative and result in overestimates of site-specific parameters. The following uncertainties apply to all sites for the modified ERA.

SUFs. The risk calculations assumed that all receptors lived and fed in the area of the site at all times. This will not be true for the upper-trophic-level receptors that have large foraging ranges. Sites 9, 13, 19, 22, and 23 are 3, 17.5, 2.3, 2.1, and 14 acres in size, respectively. Based on the assumption of 100 percent site use, the exposure is overestimated for receptors, such as the red-tailed hawk, that feed over a range of about 200 acres (EPA 1993). The actual ingestion of ecological COPCs from the site will, therefore, be much less than the value used in the risk calculations.

Dietary Composition. The percent composition and type of prey ingested by the endpoint receptors were based on literature studies that were not site-specific. Additionally, the models were simplified to assume a limited diet, such as the raptor diet, consisting of 100 percent

California ground squirrels. Receptors at the facility may use different food sources or have different percentages of available food sources.

Bioavailability. All ecological COPCs were assumed to be 100 percent bioavailable to all receptors. Depending on the ecological COPCs and receptor, bioavailability may be significantly less than 100 percent.

Development of TRVs. TRVs and ERVs used in risk calculations were derived from literature studies. These studies were not conducted on the receptors used in this assessment. TRVs and ERVs were extrapolated using uncertainty factors to account for differences between species. The effect of this uncertainty cannot be estimated.

QEs of Ecological COPCs. Studies were not available to develop TRVs for a number of the measurement endpoints. The potential effects of these ecological COPCs were evaluated on a qualitative basis, relying heavily on professional judgment. The potential exists that these QEs may not have adequately judged the potential effects of these ecological COPCs.

Surrogate TRVs. The use of surrogate TRVs for some compounds, such as the DDT TRV for other chlorinated pesticides, increases the uncertainty associated with the evaluation. While every effort was made to select conservative TRVs, the effect of this uncertainty cannot be estimated.

Bioconcentration Factors. The use of the logKow to calculate the $Ba_{mammals}$ and the BCFs for receptors and food items can overestimate the uptake of organic compounds into the tissues of organisms and plants.

Background Concentrations. Another consideration is risk associated with background levels of metals and ambient concentrations of pesticides that are not specific to the various sites but are ubiquitous across Alameda Point. Documentation of background soil is presented in Appendix A of the RI. To place site-specific risks in the proper context, the risks associated with background and ambient concentrations of chemicals were considered. Background samples collected for Alameda underwent statistical analysis, the results of which are presented in Table I-17. These background concentration risks, based on the screening-level ERA exposure assumptions, are presented in Table I-17 for each receptor.

I.2 SITE-SPECIFIC SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENTS

This section describes the results of the modified ERA for sites 9, 13, 19, 22, and 23, including site-specific considerations, factors, and uncertainties in the assessment. These sites are very similar in environmental setting and the ERA conducted for each used the same parameters. The following sections describe the ERA process for the sites.

I.2.1 PROBLEM FORMULATION

The environmental setting for each of the OU-2A sites is described in the following text.

I.2.1.1 Environmental Setting and Contaminants

Site 9

Site 9 is located in the southeast portion of Alameda Point, approximately 1,100 feet east of the Seaplane Lagoon (Figure I-1). Site 9 is approximately 3 acres in size, relatively flat, mostly paved, and primarily comprises open space surrounding Building 410. Before the construction of Building 410 in 1958, the site was used for aircraft storage. Building 410, located in the western portion of Site 9, is the primary structure on the property. The building housed the aircraft cleaning and paint stripping facility for the installation. Paint stripping and aircraft cleaning activities included the use of phenol, methylene chloride, TCE, chromium, detergents, wipe down solvents, and parts cleaners (Ecology and Environment, Inc. 1983). Other site features include Buildings 351, an office and break room for staff. Former Building 588, which housed parts of former industrial waste treatment plant, and 11 former aboveground storage tanks have been removed (Navy 1998a). Storm and industrial wastewater sewer lines run from Building 410 to the area previously occupied by Building 588 and extend to the Seaplane Lagoon. No underground storage tanks (UST) or underground fuel lines were identified at Site 9.

Anecdotal evidence suggests that numerous undocumented releases of aircraft fuel have occurred inside of Building 410 (International Technology Corporation [IT] 2001). Floor drains within Building 410 drained to storm sewer laterals extending from Building 410 toward the east and north to a sewer main line located parallel to the northern edge of Site 9. This sewer main line flows from east to west and empties at Outfall "J" in the Seaplane lagoon. Industrial wastes were discharged into these lines from 1958 until 1973. A catch basin (6-9A) for a second storm sewer line is located south of the southwest corner of Building 410. This second storm sewer line is oriented north-south and runs south to Outfall "O" and the San Francisco Bay.

Approximately 70 percent of Site 9 consists of open space, which is extensively covered with asphalt and concrete. These areas were primarily used for aircraft storage, roadways, vehicle and equipment parking, materials storage, and as maintenance, gear, and equipment wash-down areas. There are minor landscaped areas at the site.

Site 13

Site 13 is situated approximately 1,000 feet east of the Seaplane Lagoon and lies at the center of OU-2A (Figure I-1). The site is approximately 17.5 acres in size, relatively flat, partially paved and is composed of primarily open space with several structures. Past uses included aircraft, fuel, and material storage, and vehicle parking. Site 13 includes Building 397, which is located in the northwest portion of Site 13, and serves as an aircraft overhaul plant services facility. This

building contains Generator Accumulation Point 62 (a Resource Conservation Recovery Act [RCRA]-regulated, but not permitted, temporary storage area for hazardous waste) and oil water separators (OWS)-397 A, B, and C. Materials stored at Building 397 included petroleum products, halogenated and nonhalogenated solvents, and aircraft fuel (IT 2001). Other structures at Site 13 include Buildings MS-01 through MS-10 (the Navy Exchange Mini-Storage area); a recreational vehicle park; Corrective Action Area-13; RCRA Area of Concern (AOC) 397 and AOC 009; and several storm sewer lines.

All buildings, with the exception of Building 397, were demolished before 1981, and approximately 90 percent of Site 13 now consists of open space. The open space area is half exposed soil and half paved with asphalt or concrete. No significant vegetation growth has been allowed because the current uses of the site include vehicle parking, storage, and a bicycle path (IT 2001).

Site 19

Site 19 is located in the northwest corner of OU-2A, approximately 1,000 feet east of the Seaplane Lagoon (Figure I-1). Site 19 is approximately 2.3 acres in size. The main structure at the site is Yard D-13, a hazardous waste storage yard. Empty 55-gallon drums and drums containing wastes such as corrosives, halogenated and nonhalogenated organics, paints, metals, asbestos, PCBs, petroleum products, and various types of fuel were stored at Yard D-13. Drums containing wastes were organized by chemical type and stored in separate bermed areas in the open-sided building. The wastes were removed from the storage area in 1996. Several releases have been documented in Yard D-13, including nitric acid, PD-680, poly paint, zyglow penetrant, and mixed oil and fuel (IT 2001). Other structures at Site 19 include Building 616, former Building 609, an underground fuel line, and Navy-installed underground storage tanks.

Approximately 50 percent of Site 19 consists of open space. Eighty percent of the open space is paved. The unpaved areas are covered with grass. Reported activities conducted within the paved open space include vehicle parking and equipment storage.

Site 22

Site 22 is located in the northeast corner of OU-2A and is approximately 2.1 acres in size. Site 22 consists of the area around Buildings 547, 547A (a former gasoline service station), and 547-1. The gas station was built in 1974. In 1982, leaking fuel lines were dug up and replaced. Other structures at Site 22 include an OWS-547, four USTs, and fuel lines. All site features have been partially or completely removed.

All storm sewer lines at Site 22 are in sound condition (Tetra Tech 2000). One storm sewer line runs southward from the center of Site 22. This storm sewer line flows into the San Francisco Bay at Outfall Q. Another storm sewer line runs west and out of Site 22 from the northern portion. This storm sewer line empties into the Bay at Outfall P. Six catch basins (1-QA, 2-QA, 2-QB, 2-QC, 2-QD, and 2-QE) are located within Site 16.

Open space covers roughly 95 percent of Site 22. Approximately 70 percent of the open space is paved with asphalt, while the remaining area is exposed soil. PCB oil was used for weed control in the storage yard until 1963.

Site 23

Site 23 is located along the southern side of OU-2A and is approximately 14 acres in size. Site 23 consists primarily of Building 530, a missile rework facility, built in 1973. Hazardous materials known to have been used in the building include lead-based paint, hydraulic fluid, silver solder, ethylene glycol, lead, zinc, silver, tin, chromium, nickel, mercury, TCE, and petroleum. Other structures at Site 23 include Structures 529, 561, and 586; Buildings 600 and MS-11 through MS-19; and former Buildings 352, 460A, and 606.

Storm sewer lines at Site 23 are generally in sound condition with some limited segments having observed or potential infiltration (Tetra Tech 2000). Two main storm sewer line branches run along the northern and southern boundaries of Site 23 with the northern branch flowing to Outfall J and the southern branch flowing to Outfall P. Shorter segments from within Site 23 (some from buildings) connect to these main branches.

Open space covers roughly 80 percent of Site 23. Nearly all the open space is paved with asphalt. Areas not paved generally consist of exposed soil. PCB oil was used for weed control in the storage yard until 1963.

I.2.1.2 Selection of Chemicals of Potential Ecological Concern

The screening of chemicals for soils were conducted as described in Section I.1 and presented in Figure I-2 of this appendix. The data concerning the statistical comparison to background concentrations for inorganic constituents are presented in Appendix A of the RI.

Data concerning all detected chemicals for sites 9, 13, 19, 22, and 23 and the results of the screening process are presented in Tables I-19 through I-23 for soils. Based on the screening of ecological COPCs in surface soils at each of the sites, the following chemicals were retained for further evaluation:

Site 9: The metals barium, beryllium, chromium, and lead; the SVOCs 2-methylnaphthalene, pentachlorophenol, and n-nitroso-diphenylamine; and the VOCs 1,2-DCE, ethylbenzene, PCE, toluene, and xylene (Table I-19).

Site 13: The metals antimony, arsenic, lead, mercury, selenium, and zinc; the pesticides DDE, DDT, and heptachlor epoxide; the SVOCs 2-methylnaphthalene, carbazole, di-n-butylphthalate, pentachlorophenol, and n-nitroso-diphenylamine; and the VOCs acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene (Table I-20).

Site 19: The metals barium, copper, lead, and zinc; the SVOCs 4-chloro-3-methylphenol, bis(2-ethylhexyl)phthalate, diethylphthalate, di-n-butylphthalate, pentachlorophenol, and n-nitroso-diphenylamine; and the VOCs 1,3-dichlorobenzene, acetone, methylene chloride, PCE, toluene, TCE, and xylene (Table I-21).

Site 22: The metals barium, copper, lead, selenium, and zinc; the pesticides DDD, DDE, DDT, alpha-chlordane, and gamma-chlordane; the SVOCs 2-methylnaphthalene and carbazole; and the VOCs 4-methyl-2-pentanone, benzene, ethylbenzene, toluene, and xylene (Table I-22).

Site 23: The metals antimony, barium, cadmium, and lead; the pesticides DDT and Aroclor 1260; the SVOC n-nitroso-diphenylamine; and the VOC toluene (Table I-23).

I.2.1.3 Fate and Transport of Ecological Chemicals of Potential Concern

Physical properties of all of the ecological COPCs, with the exception of VOCs, indicate that they will bind preferentially to the soil and are relatively insoluble in water. Major ecological COPC movement will be through erosion processes, such as wind and surface water runoff, and infiltration to subsurface soils and groundwater.

I.2.1.4 Ecotoxicity Assessment

Ecological COPCs associated with the OU-2A sites include metals, pesticides, PCBs, SVOCs, and VOCs. A literature review was conducted to identify the potential toxic effects of the ecological COPCs on ecological receptors. These ecological COPCs have a variety of effects dependent on species and trophic level. Known effects of these chemicals are described in Attachment I1 of this appendix.

The ecological effects evaluation was conducted as described in Section I.1 of this appendix. Tables I-4 through I-11 provide detailed information on the derivation of the TRVs and ERVs used to evaluate each measurement endpoint and ecological COPC for the OU-2A sites.

I.2.1.5 Potential Receptors

Table I-3 provides a summary of species observed or potentially present at the OU-2A sites.

I.2.1.6 Exposure Pathways

Both existing and potential exposure pathways were identified for terrestrial receptors. Potential terrestrial exposure pathways to contaminated soil include direct contact, incidental ingestion, volatilization, windblown dust, and food chain effects. As requested by EPA and DTSC, the ERA assumes that all existing buildings and pavement at the OU-2A sites are removed and that the underlying soil immediately provides suitable habitat for higher-trophic-level receptors.

The depth of groundwater at the OU-2A sites is greater than 6 feet, and groundwater is not expected to reach the Seaplane Lagoon or the San Francisco Bay because of the distance from these shorelines (Tetra Tech 2000). Storm sewers within OU-2A are in good condition wherever groundwater plumes exist. Some VOCs have been measured near storm sewers within OU-2A. However, it has been determined VOCs from up gradient in OU-2B have migrated along the sewer bedding material. This source is addressed in the OU-2B RI Report. Exposure to groundwater is, therefore, not a complete exposure pathway at OU-2A.

Complete exposure pathways were assessed for Site 9, 13, 19, 22, and 23, as discussed in Section I.1.2.2.5. The following discussion summarizes each potential exposure pathway under this scenario.

Direct Exposure to Soil. Animals in contact with the soil at the OU-2A sites can be directly exposed to metals, SVOCs, and VOCs through ingestion and dermal exposure. Direct exposure is expected to involve all trophic levels; therefore, direct exposure to soil at the OU-2A sites is a complete exposure pathway under the fully exposed soil scenario. In addition to the potential direct effects to receptors, contaminated soil at the sites is a probable source of ecological COPCs migrating to the underlying groundwater.

Direct Exposure to Surface Water. Precipitation and runoff infiltrates soil and moves to groundwater; therefore, the surface water pathway is considered to be a complete pathway for the sites. The only surface water available at the sites is ponded water that exists for a short period of time after rainfall events. Even thought this exposure pathway is complete, it is not significant and was not evaluated.

Direct Exposure to Air. Many of the ecological COPCs associated with the OU-2A sites have extremely low volatilization rates. Ecological COPCs with low volatilization rates include metals (except mercury) and SVOCs. The exceptions are VOCs, which generally were detected at low concentrations in soil. Minimal volatilization from ecological COPCs from soil to the air is expected. Windblown dust could represent a complete exposure pathway because exposed soil exists at least on a portion of each of the OU-2A sites; therefore, the air exposure pathway is considered to be a complete exposure pathway, primarily resulting from airborne dust ingestion at Site 9 under the fully exposed soil scenario. Although this exposure pathway is complete, it is postulated to be insignificant compared to direct soil exposure.

Food Chain Exposure. A number of higher-trophic-level receptors could be exposed to ecological COPCs through diet. Of the ecological COPCs associated with OU-2A sites, alpha-chlordane, Aroclor 1260, DDD, DDE, DDT, gamma-chlordane, heptachlor epoxide, 2-methylnaphthalene, 4-chloro-3-methylphenol, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, n-nitroso-diphenylamine, pentachlorophenol, ethylbenzene, PCE, and xylene have a K_{ow} greater than 3.0, which could indicate significant tendencies for these chemicals to bioaccumulate and biomagnify in food chains. Food chain exposure is, therefore, a complete exposure pathway under the fully exposed soil scenario.

I.2.1.7 Assessment and Measurement Endpoints

Habitat associated with the OU-2A sites is of low ecological value because of current limited habitat existing at the sites. The sites are expected to have long-term reuse potential including research and development, light industrial, supporting retail, office, commercial, and residential uses. Community oriented institutions, such as places of worship and nonprofit organizations, are also considered allowable and desirable uses. Based on the anticipated future uses of the sites, the value of the habitat is not expected to increase.

Ecological COPCs present at the OU-2A sites have different effects on different trophic levels; therefore, the assessment endpoints and associated measurement endpoints presented in Section I.1.2.2.6 of this appendix are necessary to adequately evaluate the risk to environmental receptors associated with the ecological COPCs.

I.2.2 EXPOSURE ESTIMATES AND RISK EVALUATION

For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed using life history information, site chemical concentrations, and other data. This exposure information was then compared with TRVs or ERVs to develop a quantitative evaluation of risk to ecological receptors.

Exposure estimates for each receptor were developed using the assumptions described in Section I.1.2.3.1 of this appendix. General exposure factors used for the California ground squirrel, Alameda song sparrow, American robin, and red-tailed hawk are presented in Table I-16. Risk calculations were conducted using the procedures described in Section I.1.2.3.2.

I.2.3 RESULTS OF THE ECOLOGICAL RISK ASSESSMENT FOR TERRESTRIAL RECEPTORS

HQs calculated for each site using high and low TRVs for each measurement endpoint are presented in Tables I-24 through I-28. HQs were evaluated based on the discussion presented in Section I.1.2.4. The following sections relate calculated HQs to assessment endpoints for each site and discuss these results. Uncertainties that exist in this ERA for the OU-2A sites are presented in Section I.1.2.5.

I.2.3.1 Ecological Risk Assessment Results for Site 9

The following sections relay the results of the ERA for Site 9 for each of the assessment endpoints evaluated. HQ values for Site 9 are presented on Table I-24.

I.2.3.1.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Pentachlorophenol was the only ecological COPC with an HQ above 1.0 using either the high or low TRV (Table I-24). Literature data were not adequate to develop ERVs for n-nitroso-diphenylamine and ethylbenzene for small mammals. All other ecological COPCs presented in Table I-19 pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Pentachlorophenol: The HQ value using the high TRV was 6.69, and the low TRV HQ value was 66.9. Pentachlorophenol was detected in only 1 of 13 samples at a concentration of 0.43 mg/kg, which was below the maximum laboratory-reporting limit of 3.5 mg/kg. The relatively high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,034 (EPA 1999). This value was calculated based on the K_{ow} value of 5.12 and the fact that pentachlorophenol is rapidly absorbed by ecological receptors. In mammals, however, the degree of accumulation into the tissues is small because pentachlorophenol is efficiently and rapidly excreted (EPA 1999). Based on these factors, the ecological risk of pentachlorophenol to small mammals cannot be discounted; however, it is expected to be low.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOC n-nitroso-diphenylamine. N-nitroso-diphenylamine was detected in 4 of 13 samples. The maximum detected value was 0.054 mg/kg, which is below the maximum laboratory-reporting limit of 0.73 mg/kg. Impacts on wildlife from n-nitroso-diphenylamine are not well documented; however, based on the low frequency of detection and low concentration, the potential impacts to small mammals are postulated to be low.

VOCs: The literature data were not adequate to develop an ERV for small mammals for the VOC ethylbenzene. Ethylbenzene was detected in only 1 of 21 samples at a concentration of 0.2 mg/kg, which is slightly above the maximum laboratory-reporting limit of 0.12 mg/kg. In general, VOCs only have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on the general low toxicity of VOCs to ecological receptors, the low frequency of detection, and relatively low concentrations, the impact to small mammals from the residual levels of ethylbenzene at Site 9 is postulated to be low.

I.2.3.1.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Chromium and lead were the only ecological COPCs with HQs above 1.0 using the low TRV for the passerine endpoints, the Alameda song sparrow and the American robin (Table I-24). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, pentachlorophenol, n-nitroso-diphenylamine, 1,2-DCE, ethylbenzene, PCE, toluene, and xylene. All other ecological COPCs presented in Table I-19 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Chromium: HQs for the Alameda song sparrow and the American robin using the high TRV for chromium were below 1.0. The low TRV HQs for chromium were 2.84 and 1.36, respectively. The low HQs for the Alameda song sparrow and the American robin exceeded the background low HQs of 0.851 and 0.385, respectively, which was three times above background (Table I-18). Chromium was detected in all 26 samples collected within the Site 9 at concentrations ranging from 22 mg/kg to 178 mg/kg. Background concentrations of chromium range from 11.4 mg/kg to 81.7 mg/kg. Very limited information is available in the literature pertaining to toxic effects of chromium to birds. Based on the range of HQs calculated for the song sparrow and robin (not greatly above 1.0), the potential risk to passerines from chromium is expected to be low.

Lead: HQs for the Alameda song sparrow and the American robin using the high TRV for lead were below 1.0. The low TRV HQs for lead were 18.7 and 8.79, respectively. The HQ for the Alameda song sparrow and the American robin did not exceed the background low HQs of 27.1 and 12.7, respectively. Additionally, these HQ values may be driven by an overly conservative low TRV of 0.014 mg/kg-day. This TRV was originally developed by the Navy and the EPA Region 9 BTAG and is based on a study by Edens and others (1976) that found physiological effects on birds that were measurable at a dose of 0.014 mg/kg-day, but the effects are not believed to be ecologically significant. When the HQ was calculated using an alternative TRV of 3.85 mg/kg-day, developed by Oak Ridge National Laboratory for the U.S. Department of Energy, the lead HQ value was reduced significantly. This TRV was established based on a study by Pattee (1984) during which inorganic lead was administered to an avian receptor. Using an allometrically converted TRV of 2.65 mg/kg-day for song sparrows and 3.50 mg/kg-day for robins, reevaluation of the lead HQ at Site 9 was calculated as 0.0712 for the song sparrow with a background HQ of 0.103 and as 0.0334 for the robin with a background HQ of 0.0484. Based on this information, lead at Site 9 does not appear to pose a significant potential for risk to passerines.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 9 at frequencies ranging from 13 to 82 percent out of a total of 39 samples collected. Calculated EPCs ranged from 0.003 to 0.22 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the passerine community from residual levels of HMW and LMW PAHs associated with Site 9 cannot be discounted.

SVOC: The literature data were not adequate to develop a passerine ERV for pentachlorophenol and n-nitroso-diphenylamine. Pentachlorophenol was detected in only 1 of 13 samples, at a concentration below the maximum laboratory-reporting of 3.5 mg/kg. N-nitroso-diphenylamine was detected in 4 of 13 samples with a maximum concentration of 0.054 mg/kg, which was not above the maximum reporting limit 0f 0.73 mg/kg. Impacts on wildlife from these SVOCs are not well documented; however, based on the low frequency of detection and low concentration, the potential impacts from these SVOCs are postulated to be low.

VOCs: The literature data were not adequate to develop avian ERVs for 1,2-DCE, ethylbenzene, PCE, toluene, TCE, and xylene. VOCs were detected in up to 9 of 21 samples collected at Site 9, with maximum concentrations ranging from 0.001 to 0.43 mg/kg. Although the risk posed to passerines from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.1.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

There were no ecological COPCs with an HQ above 1.0 using the high and low TRV for the raptor endpoint (Table I-24). Literature data were not adequate to develop avian ERVs for LMW PAHs, pentachlorophenol, n-nitroso-diphenylamine, 1,2-DCE, ethylbenzene, PCE, toluene, TCE, and xylene. All other ecological COPCs presented in Table I-19 had low and high HQ values of less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 9 at frequencies ranging from 13 to 82 percent out of a total of 39 samples collected. Calculated EPCs ranged from 0.003 to 0.22 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the raptor community from residual levels of HMW and LMW PAHs associated with Site 9 cannot be discounted.

SVOCs: The literature data were not adequate to develop a raptor ERV for pentachlorophenol and n-nitroso-diphenylamine. Pentachlorophenol was detected in only 1 of 13 samples, at a concentration below the maximum laboratory-reporting of 3.5 mg/kg. N-nitroso-diphenylamine was detected in 4 of 13 samples with a maximum concentration of 0.054 mg/kg, which was not above the maximum reporting limit 0f 0.73 mg/kg. Impacts on wildlife from these SVOCs are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop raptor ERVs for 1,2-DCE, ethylbenzene, PCE, toluene, TCE, and xylene. VOCs were detected in up to 9 of 21 samples collected at Site 9, with maximum concentrations ranging from 0.001 to 0.43 mg/kg. Although the risk posed to raptors from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.1.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 9

The results of the HQ calculations and QEs indicate that the residual chemicals at Site 9 have very limited potential to impact terrestrial ecological receptors. Based on the HQ calculations and QEs and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

I.2.3.2 Ecological Risk Assessment Results for Site 13

The following sections relay the results of the ERA for Site 13 for each of the assessment endpoints evaluated. HQ values for Site 13 are presented on Table I-25.

I.2.3.2.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Pentachlorophenol was the only ecological COPCs with an HQ above 1.0 using either the high or low TRV for mammals (Table I-25). Literature data were not adequate to develop ERVs for carbazole, n-nitroso-diphenylamine, carbon disulfide, and ethylbenzene for small mammals. All other ecological COPCs presented in Table I-20 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Pentachlorophenol: The HQ value using the high TRV was 15.6, and the low TRV HQ value was 156. Pentachlorophenol was detected in only 3 of 54 samples at concentrations ranging from 0.27 to 1 mg/kg, which was below the maximum laboratory-reporting limit of 170 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,034 (EPA 1999). This value was calculated based upon the K_{ow} value of 5.12 and the fact that pentachlorophenol is rapidly absorbed by ecological receptors. In mammals, however, the degree of accumulation into the tissues is small because pentachlorophenol is efficiently and rapidly excreted (EPA 1999). Based on these factors, the ecological risk of pentachlorophenol to small mammals cannot be discounted; however, it is expected to be low.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOCs carbazole and n-nitroso-diphenylamine. Carbazole was detected in only 2 of 14 samples at concentrations ranging from 0.13 to 0.27 mg/kg, which was below the maximum reporting limit of 3.6 mg/kg. N-nitroso-diphenylamine was detected in 12 of 53 samples, which is only 23 percent of the total samples collected. The maximum detected value was 1.2 mg/kg, which is below the maximum reporting limit of 34 mg/kg. Impacts on wildlife from these SVOCs are not well documented; however, based on the low frequency of detection and low concentration, impacts from SVOCs to small mammals at Site 13 are postulated to be low.

VOCs: The literature data were not adequate to develop an ERV for small mammals for the VOCs carbon disulfide and ethylbenzene. Carbon disulfide was detected in 3 of 43 samples at concentrations ranging from 0.001 to 0.002 mg/kg, which are below the maximum reporting limit of 0.63 mg/kg. Ethylbenzene was detected in only 12 of 48 samples at concentrations ranging from 0.00069 to 0.56 mg/kg. In general, VOCs only have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on the relatively low toxicity of VOCs to mammals, the low frequency of detection, and relatively low concentrations, the impact to small mammals from the residual levels of VOCs at Site 13 is postulated to be low.

I.2.3.2.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Ecological COPCs with HQs above 1.0 calculated using either the high or low TRV for the passerine endpoints included lead, mercury, selenium, zinc, DDTt, and di-n-butylphthalate (Table I-25). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, carbazole, n-nitroso-diphenylamine, pentachlorophenol, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table I-20 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Lead: HQs for the Alameda song sparrow and the American robin using the high TRV for lead were below 1.0. The low HQs for these receptors were 300 and 141, which exceeded the background HQs of 27.1 and 12.7, respectively. This HQ value may, however, be driven by the overly conservative low TRV, as described in Section I.2.3.1.2. Using the allometrically converted TRVs for the passerines, reevaluation of the low TRV lead HQ at Site 13 was calculated as 1.14 for the song sparrow with a background HQ of 0.103 and as 0.537 for the robin with a background HQ of 0.0484. Based on this information, lead at Site 13 poses no significant potential for risk to the passerine endpoints.

Mercury: HQs for the Alameda song sparrow and the American robin using the high TRV for mercury were below 1.0. The low HQs for these receptors were 3.06 and 1.34, respectively. Mercury was not detected in background samples collected. Mercury was detected in 8 of 37 samples collected within the Site 13 at concentrations ranging from 0.01 mg/kg to 0.4 mg/kg. There can be reproductive and other physiological effects of mercury to birds; however, based on the low HQ values (not significantly above 1.0) and low frequency of detection, the risk to passerines from mercury at Site 13 is expected to be low.

Selenium: HQs for the Alameda song sparrow and the American robin using the high TRV for selenium were below 1.0. The low HQs for these receptors were 3.38 and 1.51, which were not above the background low HQs of 4.83 and 2.16, respectively. Selenium was detected in 14 of 75 samples collected within the Site 13 at concentrations ranging from 0.14 mg/kg to 12 mg/kg, while selenium was detected in only one background sample at a concentration of 5.7 mg/kg. Based on the low HQ values (not significantly above 1.0) and low frequency of detection, the risk to passerines from selenium at Site 13 is expected to be low.

Zinc: HQs for the Alameda song sparrow and the American robin using the high TRV for zinc were below 1.0. The low HQs for these receptors were 8.86 and 3.90, which exceeded the background low HQs of 0.912 and 0.401, respectively, by a factor of 10. Zinc was detected in all 75 samples collected within the Site 13 at concentrations ranging from 7 mg/kg to 7,120 mg/kg, while the EPC used in risk calculations was 300.45 mg/kg. Zinc was detected in all 88 background samples at concentrations ranging from 14 mg/kg to 84 mg/kg. Zinc can have varying toxicities to different species of birds. Based on the HQ values, the risk to birds from zinc at Site 13 cannot be discounted; however, based on the future reuse of the site, this risk is expected to be low.

DDTt: HQs for the Alameda song sparrow and the American robin using the high TRV for DDTt were below 1.0. The low HQs for these receptors were 7.46 and 3.26. 4,4-DDE was detected in two of 38 samples collected within the Site 13 at concentrations of 0.0037 mg/kg and 0.0.031, while 4,4-DDT was detected in three of 38 samples at concentrations ranging from 0.0021 mg/kg to 0.16 mg/kg Based on the low frequency of detection of these compounds in soils at Site 13, the risk to passerines is expected to be low.

Di-n-butylphthalate: The HQ value using the high TRV for the Alameda song sparrow was 11.8, and 5.12 for the American robin. The low TRV HQs were 118 and 51.2, respectively. Di-n-butylphthalate was detected in only 1 of 54 samples at a concentration of 0.031 mg/kg, which was below the maximum laboratory-reporting limit of 34 mg/kg. The relatively high HQ values were directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 736.4, which is based upon the K_{ow} value of 4.9. Based on this and the low frequency of detection, the risk of di-n-butylphthalate to passerines is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 13 at frequencies ranging from 17 to 60 percent out of a total of 243 samples collected. Calculated EPCs ranged from 0.036 to 1.03 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the passerine community from residual levels of HMW and LMW PAHs associated with Site 13 cannot be discounted.

SVOCs: The literature data were not adequate to develop avian ERVs for carbazole, n-nitroso-diphenylamine, and pentachlorophenol. Carbazole was detected in 2 of 14 samples at a maximum concentration of 0.27 mg/kg, which was not above the maximum reporting limit of 3.6 mg/kg. N-nitroso-diphenylamine was detected in 12 of 53 samples with concentrations ranging from 0.042 to 1.2 mg/kg, which was not above the maximum reporting limit of 34 mg/kg. Pentachlorophenol was detected in only 1 of 54 samples, at a concentration below the maximum reporting limit of 34 mg/kg. Impacts of these SVOCs on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop avian ERVs for acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. VOCs were detected in up to 26 of 48 samples collected at Site 13, with maximum concentrations ranging from 0.001 to 0.15 mg/kg. Although the risk posed to passerines from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.2.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Ecological COPCs with HQs above 1.0 calculated using either the high or low TRV for the raptor endpoints included lead, DDTt, and di-n-butylphthalate (Table I-25). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, carbazole, n-nitroso-

diphenylamine, pentachlorophenol, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table I-20 had HQ values of less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Lead: The high HQ value for lead was less than 1.0. The low HQ value was 8.48, which was more than 10 times above the background HQ value of 0.765. As discussed in Section I.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 5.93, the HQ for lead at Site 13 was 0.0323, with a background HQ of 0.00292. Based on this information, lead at Site 13 poses no significant risk to the raptor community.

DDTt: The high HQ value for DDTt for the raptor was less than 1.0. The low HQ value was 6.83. Based on the low frequency of detection of DDT and its metabolite, DDE, in soils at Site 13 (as discussed in Section I.2.3.2.2), the risk to raptors is expected to be low. Additionally, this HQ was conservatively calculated assuming that 100 percent of the organism's diet came from Site 13, which is only 17.5 acres. Raptors, such as the red-tailed hawk, can have extensive foraging ranges, up to 200 acres.

Di-n-butylphthalate: The HQ value using the high TRV for the raptor was 2.26, while the low TRV HQ was 22.6. Di-n-butylphthalate was detected in only 1 of 54 samples at a concentration of 0.031 mg/kg, which was below the maximum laboratory-reporting limit of 34 mg/kg. The relatively high HQ values were directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 736.4, which is based upon the K_{ow} value of 4.9. Based on this and the low frequency of detection, the ecological risk of di-n-butylphthalate to raptors is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 13 at frequencies ranging from 17 to 60 percent out of a total of 243 samples collected. Calculated EPCs ranged from 0.036 to 1.03 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the raptor community from residual levels of HMW and LMW PAHs associated with Site 13 cannot be discounted.

SVOCs: The literature data were not adequate to develop a raptor ERV for carbazole, n-nitroso-diphenylamine, and pentachlorophenol. Carbazole was detected in 2 of 14 samples at a maximum concentration of 0.27 mg/kg, which was not above the maximum reporting limit of 3.6 mg/kg. N-nitroso-diphenylamine was detected in 12 of 53 samples with concentrations ranging from 0.042 to 1.2 mg/kg, which were not above the maximum reporting limit of 34 mg/kg. Pentachlorophenol was detected in only 1 of 54 samples, at a concentration below the maximum reporting limit of 34 mg/kg. Impacts of these SVOCs on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop raptor ERVs for acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. VOCs were detected in up to 26 of 48 samples collected at Site 13, with maximum concentrations ranging from 0.001 to 0.15 mg/kg. Although the risk posed to raptors from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.2.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 13

The results of the HQ calculations and QEs indicate potential risk to passerines from zinc. No significant risk to small mammals and raptors occurs from exposure to Site 13 soils. Based on the lack of habitat at Site 13 and the planned future use of the site, however, any risk associated with exposure to these contaminants will be low.

I.2.3.3 Ecological Risk Assessment Results for Site 19

The following sections relay the results of the ERA for Site 19 for each of the assessment endpoints evaluated. HQ values for Site 19 are presented on Table I-26.

I.2.3.3.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV for mammals included bis(2-ethylhexyl)phthalate and pentachlorophenol (Table I-26). Literature data were not adequate to develop ERVs for 4-chloro-3-methylphenol, n-nitroso-diphenylamine, and 1,3-dichlorobenzene for small mammals. All other ecological COPCs presented in Table I-21 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Bis(2-ethylhexyl)phthalate: The HQ value for bis(2-ethylhexyl)phthalate using the high TRV was less than 1.0, and the low TRV HQ value was 2.67. Bis(2-ethylhexyl)phthalate was detected in only 2 of 28 samples at concentrations of 0.11 and 0.89 mg/kg, which are below the maximum reporting limit of 11 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,309. This value is based upon the high K_{ow} value of 7.6. Based on this and the low frequency of detection, the risk of bis(2-ethylhexyl)phthalate to small mammals is expected to be low.

Pentachlorophenol: The HQ value using the high TRV was 24.9, and the low TRV HQ value was 249. Pentachlorophenol was detected in only 3 of 28 samples at concentrations ranging from 0.41 to 1.6 mg/kg, which was below the maximum laboratory-reporting limit of 33 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,034 (EPA 1999). This value was calculated based upon the high K_{ow} value of 5.12 and the fact that pentachlorophenol is rapidly absorbed by ecological receptors. In mammals, however, the degree of accumulation into the tissues is small because pentachlorophenol is efficiently and

rapidly excreted (EPA 1999). Based on these factors and the low frequency of detection, the risk of pentachlorophenol to small mammals is expected to be low.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOCs 4-chloro-3-methylphenol and n-nitroso-diphenylamine. 4-Chloro-3-methylphenol was detected in only 1 of 28 samples at a concentration below the maximum reporting limit of 11 mg/kg. N-nitroso-diphenylamine was detected in 7 of 28 samples, which is only 25 percent of the total samples collected. The maximum detected value was 0.9 mg/kg, which is below the maximum reporting limit of 11 mg/kg. Impacts on wildlife from 4-chloro-3-methylphenol and n-nitroso-diphenylamine are not well documented; however, based on the low frequency of detection and low concentration, the impacts of SVOCs at Site 19 to the small mammal population are postulated to be low.

VOCs: The literature data were not adequate to develop an ERV for small mammals for the VOC 1,3-dichlorobenzene. 1,3-Dichlorobenzene was detected in one of nine samples at a concentration slightly above the maximum reporting limit of 0.52 mg/kg. In general, VOCs only will have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on the relatively low toxicity, the low frequency of detection, and relatively low concentrations, the impact to small mammals from the residual levels of VOCs at Site 19 is postulated to be low.

I.2.3.3.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using the high or low TRV for the passerine receptors included copper, lead, zinc, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate (Table I-26). Literature data were not adequate to develop ERVs for 4-chloro-3-methylphenol, HMW PAHs, LMW PAHs, n-nitroso-diphenylamine, pentachlorophenol, 1,3-dichlorobenzene, acetone, methylene chloride, PCE, toluene, TCE, and xylene. All other ecological COPCs presented in Table I-21 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Copper: HQs for the Alameda song sparrow and the American robin using the high TRV for copper were below 1.0. The low HQs for these receptors were 2.52 and 1.15, which exceeded the background HQs of 0.743 and 0.341, respectively, by a factor of three times. Copper was detected in 21 of 24 samples collected within the Site 19 at concentrations ranging from 5.9 mg/kg to 138 mg/kg, while in background samples copper was detected in 83 of 88 samples at concentrations ranging from 4.2 mg/kg to 89.4 mg/kg. Based on the low HQ values (not significantly above 1.0), the risk from copper at Site 19 to passerines is expected to be low.

Lead: HQs for the Alameda song sparrow and the American robin using the high TRV for lead were below 1.0. The low HQs for these receptors were 148 and 69.6, which exceeded the background HQs of 27.2 and 12.7, respectively. These HQs may, however, be driven by the overly conservative low TRV, as described in Section I.2.3.1.2. Using the alternative allometrically converted TRVs, reevaluation of the lead HQ at Site 19 was calculated as 0.564

for the song sparrow with a background HQ of 0.103 and as 0.265 for the robin with a background HQ of 0.0484. Based on this information, lead at Site 19 poses no significant potential for risk to passerines.

Zinc: High and low HQs for the American robin were below 1.0. The high HQ for the song sparrow was less than 1.0, also. The low HQ for this receptor was 1.91, which exceeded the background HQ of 0.912, by a factor of two. Zinc was detected in all 24 samples collected within the Site 19 at concentrations ranging from 14 mg/kg to 292 mg/kg, while in background samples zinc was detected in all 88 samples at concentrations ranging from 14 mg/kg to 84 mg/kg. Based on the low HQ value (not significantly above 1.0), the risk from zinc at Site 19 to passerines is expected to be low

Bis(2-ethylhexyl)phthalate: The high TRV HQ value for bis(2-ethylhexylphthalate was 60.1 and 26.1, respectively for the Alameda song sparrow and the American robin. The low TRV HQ values were 601 and 261, respectively. Bis(2-ethylhexyl)phthalate was detected in only 2 of 28 samples at concentrations of 0.11 and 0.89 mg/kg, which are below the maximum reporting limit of 11 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,309. This value is calculated based upon the high K_{ow} value of 7.6. Based on this and the low frequency of detection, the risk of bis(2-ethylhexyl)phthalate to small mammals is expected to be low.

Di-n-butylphthalate: The high TRV HQ value for di-n-butylphthalate was 729 and 317, respectively, for the Alameda song sparrow and the American robin. The low TRV HQ values were 7,290 and 3,170, respectively. Di-n-butylphthalate was detected in only 1 of 28 samples at a concentration of 7.3 mg/kg, which was below the maximum laboratory-reporting limit of 11 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 736.4, which is calculated based upon the K_{ow} value of 4.9. Based on this and the low frequency of detection, the risk of di-n-butylphthalate to passerines is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 19 at frequencies ranging from 18 to 95 percent out of a total of 39 samples collected. Calculated EPCs ranged from 0.0018 to 0.072 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the passerine community from residual levels of HMW and LMW PAHs associated with Site 19 cannot be discounted.

SVOC: The literature data were not adequate to develop a passerine ERV for 4-chloro-3-methylphenol, n-nitroso-diphenylamine, and pentachlorophenol. 4-Chloro-3-methylphenol was detected in only 1 of 28 samples at a concentration below the maximum reporting limit of 11 mg/kg. N-nitroso-diphenylamine was detected in 7 of 28 samples, which is only 25 percent of the total samples collected. The maximum detected value was 0.9 mg/kg, which is below the maximum reporting limit of 11 mg/kg. Pentachlorophenol was detected in only 3 of 28 samples, at concentrations below the maximum reporting limit of 33 mg/kg. Impacts of these SVOCs on

wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop passerine ERVs for 1,3-dichlorobenzene, acetone, methylene chloride, PCE, toluene, TCE, and xylene. VOCs were detected in up to 15 of 20 samples collected at Site 19, with maximum concentrations ranging from 0.004 to 0.59 mg/kg. Although the risk posed to passerines from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.3.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV for raptors included lead, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate (Table I-26). Literature data were not adequate to develop ERVs for 4-chloro-3-methylphenol, HMW PAHs, LMW PAHs, n-nitroso-diphenylamine, pentachlorophenol, 1,3-dichlorobenzene, acetone, methylene chloride, PCE, toluene, TCE, and xylene. All other ecological COPCs presented in Table I-21 had HQ values of less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Lead: The high HQ value for lead was less than 1.0. The low HQ value was 16.8, which was more than 20 times the background HQ value of 0.765. As discussed in Section I.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 5.93, the HQ for lead at Site 19 was 0.0642, with a background HQ of 0.00292. Based on this information, lead at Site 19 poses no significant potential for risk to raptors.

Bis(2-ethylhexyl)phthalate: The high TRV HQ value for bis(2-ethylhexylphthalate was 20.6, while the low TRV HQ was 206 for the raptor receptor. Bis(2-ethylhexyl)phthalate was detected in only 2 of 28 samples at concentrations of 0.11 and 0.89 mg/kg, which are below the maximum reporting limit of 11 mg/kg. The high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,309 and the high FCM of 12. These values are based upon the high K_{ow} value of 7.6. Based on this and the low frequency of detection, the risk of bis(2-ethylhexyl)phthalate to raptors is expected to be low.

Di-n-butylphthalate: The high TRV HQ value for di-n-butylphthalate was 249, while the low TRV HQ was 2,490 for the raptor receptor. Di-n-butylphthalate was detected in only 1 of 28 samples at a concentration of 0.73 mg/kg, which was below the maximum laboratory reporting limit of 11 mg/kg. The relatively high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 736.4, which is calculated based upon the K_{ow} value of 4.9. Based on this and the low frequency of detection, the risk of di-n-butylphthalate to passerines is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 19 at frequencies ranging from 18 to 95 percent out of a total of 39 samples collected. Calculated EPCs ranged from 0.0018 to 0.072 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the raptor community from residual levels of HMW and LMW PAHs associated with Site 19 cannot be discounted.

SVOC: The literature data were not adequate to develop avian ERVs for 4-chloro-3-methylphenol, n-nitroso-diphenylamine, and pentachlorophenol. 4-Chloro-3-methylphenol was detected in only 1 of 28 samples at a concentration below the maximum reporting limit of 11 mg/kg. N-nitroso-diphenylamine was detected in 7 of 28 samples, which is only 25 percent of the total samples collected. The maximum detected value was 0.9 mg/kg, which is below the maximum reporting limit of 11 mg/kg. Pentachlorophenol was detected in only 3 of 28 samples, at concentrations below the maximum reporting limit of 33 mg/kg. Impacts of these SVOCs on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop avian ERVs for 1,3-dichlorobenzene, acetone, methylene chloride, PCE, toluene, TCE, and xylene. VOCs were detected in up to 15 of 20 samples collected at Site 19, with maximum concentrations ranging from 0.004 to 0.59 mg/kg. Although the risk posed to raptors from residual VOC compounds in soils at Site 19 is not fully known, it is expected to be low.

I.2.3.3.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 19

The results of the HQ calculations and QEs indicated no significant risk to small mammals, passerines, or raptors occur from exposure to Site 19 soils. Based on the magnitude of the calculated low HQs, lack of habitat at Site 19, and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

I.2.3.4 Ecological Risk Assessment Results for Site 22

The following sections relay the results of the ERA for Site 22 for each of the assessment endpoints evaluated. HQ values for Site 22 are presented on Table I-27.

I.2.3.4.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV for mammals included lead and xylene (Table I-27). Literature data were not adequate to develop ERVs for carbazole and ethylbenzene for small mammals. All other ecological COPCs presented in Table I-22 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Lead: The high TRV HQ value for lead was less than 1.0. The low TRV HQ value was 10.1, which was more than 200 times above the background low TRV HQ of 0.0428. Lead was detected at Site 22 in 22 of 30 samples with an EPC of 1,780.33 mg/kg, which exceeded the UCL95 calculated for the background samples of 7.54 mg/kg. The extent and rate of GI absorption of lead are influenced by the age of the organism; presence of essential nutrients, such as calcium and iron, in the diet; physiological state of the organism, such as pregnancy; and form of lead ingested (ATSDR 1999a). The absorption of lead in contaminated soil is lower than that of easily dissolvable forms, such as lead acetate. Absorption studies in rats determined that the bioavailability of ingested lead acetate was about 15 percent. Using this estimate, the "absolute" bioavailability of lead in soils from this study was 2.7 percent (ATSDR 1999a). Also, bioavailability of lead in soil decreased with increasing soil-lead concentration. Based on this information, lead at Site 22 poses a potential risk to small mammals.

Xylene: The high HQ value for xylene was 2.27, while the low HQ value was 2.81. Xylene was detected in 6 of 15 samples collected from Site 22 with concentrations ranging from 0.07 to 22 mg/kg. Large amounts of xylene can cause changes in the liver and harmful effects in the kidneys, heart, lungs, and nervous system (ATSDR 1993). Long-term exposures of animals to low doses of xylene have not been well studied (ATSDR 1993). The HQ values are directly attributable to the relatively conservative $BCF_{soil\text{-}to\text{-}invert}$ of 29.84, which was calculated using the K_{ow} of 3.2. Plants and animals take up only a small portion of xylene. Based on these factors, the ecological risk of xylene to small mammals cannot be discounted; however, it is expected to be low.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOC carbazole. Carbazole was detected in only 1 of 11 samples at a concentration below the maximum reporting limit of 0.39 mg/kg. Impacts on wildlife from carbazole are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop an ERV for small mammals for the VOC ethylbenzene. Ethylbenzene was detected in 7 of 15 samples at concentrations ranging from 0.012 to 52 mg/kg. The maximum reporting limit for ethylbenzene was 7.2 mg/kg. In general, VOCs only will have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on this and the relatively low concentrations, the impact to small mammals from the residual levels of VOCs at Site 22 is postulated to be low.

I.2.3.4.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using the low or high TRV for the song sparrow and the robin include copper, lead, selenium, zinc, alpha-chlordane, gamma-chlordane, and DDTt (Table I-27). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, carbazole, 4-methyl-2-pentanone, benzene, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table I-22 had HQ values less than 1.0 and pose no significant

risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Copper: The high and low lead HQ values for the robin were below 1.0. The high HQ value for the song sparrow also was less than 1.0. The low HQ value for the sparrow was 1.13, which exceeded the background HQs of 0.743 by less than two times. Copper was detected in all 30 samples collected within Site 22 at concentrations ranging from 5.6 mg/kg to 86.2 mg/kg; while in background soils, copper was detected in 83 of 88 samples at concentrations ranging from 4.2 mg/kg to 89.4 mg/kg. Copper at Site 22 poses no significant potential for risk to passerines, based on background concentrations and the low HQ values (less than 1.0 or not significantly above 1.0).

Lead: The high lead HQ values for the sparrow and the robin were 15.5 and 7.24, respectively. The low HQ values for these receptors were 6,400 and 3,010, which exceeded the background HQs of 27.1 and 12.7, respectively. These HQs may, however, be driven by the overly conservative low TRV, as described in Section I.2.3.1.2. Using the allometrically converted TRVs, reevaluation of the lead HQ at Site 22 was calculated as 24.4 for the song sparrow with a background HQ of 0.103 and as 11.4 for the robin with a background HQ of 0.0484. Based on this information, lead at Site 22 poses a potential for risk to passerines.

Zinc: The high and low lead HQ values for the robin were below 1.0. The high HQ value for the song sparrow also was less than 1.0. The low HQ value for the sparrow was 1.63, which exceeded the background HQs of 0.912 by less than two times. Zinc was detected in all 30 samples collected within Site 22 at concentrations ranging from 16.6 mg/kg to 151 mg/kg; while in background soils, zinc was detected in all 88 samples at concentrations ranging from 14 mg/kg to 84 mg/kg. Zinc at Site 22 poses no significant potential for risk to passerines, based on background concentrations and the low HQ values (less than 1.0 or not significantly above 1.0).

Chlordane: The high and low HQ values for alpha-chlordane for the sparrow were 17.8 and 3,820, respectively; while for the robin the HQ values were 7.76 and 1,660. The high and low HQs for gamma-chlordane for the sparrow were 14.5 and 3,080, respectively, while for the robin the HQ values were 6.32 and 1,350. These compounds were once widely used as a broad-spectrum insecticide and known to bioconcentration and biomagnify in food chains. Physiologic and reproductive effects can be seen in wild birds. Both alpha- and gamma-chlordane were detected in only 2 of 10 samples at maximum concentrations of 0.027 mg/kg and 0.022 mg/kg, respectively, which were below the compounds' maximum laboratory-reporting limit of 0.87. Additionally, the high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,202.4. This value was calculated based upon the K_{ow} value of 5.16. Based on this and the low frequency of detection, the potential risk to passerines from residual chlordane concentrations at Site 22 is postulated to be low.

DDTt: The high HQ values for DDTt for the passerine receptors were below 1.0. The low HQ value for the sparrow and the robin were 12 and 5.3, respectively. 4,4-DDD was detected in 2 of 19 samples at a maximum concentration of 0.009 mg/kg, 4,4-DDE was detected in 4 of

19 samples at a maximum concentration of 0.023 mg/kg, and 4,4-DDT was detected in 3 of 19 samples at a maximum concentration of 0.053 mg/kg. Based on the low frequency of detection and low concentrations, the potential risk to passerines from residual DDT compounds at Site 22 is postulated to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 22 at frequencies ranging from 41 to 92 percent out of a total of 66 samples collected. Calculated EPCs ranged from 0.016 to 0.612 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the passerine community from residual levels of HMW and LMW PAHs associated with Site 22 cannot be discounted.

SVOC: The literature data were not adequate to develop an avian ERV for the SVOC carbazole. Carbazole was detected in only 1 of 11 samples at a concentration below the maximum reporting limit of 0.39 mg/kg. Impacts of carbazole on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop avian ERVs for 4-methyl-2-pentanone, benzene, ethylbenzene, toluene, and xylene. VOCs were detected in up to 10 of 18 samples collected at Site 22, with maximum concentrations ranging from 0.003 to 72 mg/kg. In general, VOCs only will have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Although the risk posed to passerines from residual VOC compounds in soils at Site 22 is not fully known, it is postulated to be low because mammals and birds quickly metabolize VOCs (ATSDR 1992b, 1996a, 1996b).

I.2.3.4.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Lead was the only ecological COPC with an HQ above 1.0 using the low TRV for raptors (Table I-27). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, carbazole, 4-methyl-2-pentanone, benzene, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table I-22 had HQ values less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE

Lead: The high HQ value for lead was less than 1.0. The low HQ value was 43.9, which was more than 50 times the background HQ value of 0.765. As discussed in Section I.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 5.93, the HQ for lead at Site 22 was 0.167, with a background HQ of 0.00292. Based on this information, lead at Site 22 poses no significant potential for risk to the raptor community.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 22 at frequencies ranging from 41 to 92 percent out of a total of 66 samples collected. Calculated EPCs ranged from 0.016 to 0.612 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the raptor community from residual levels of HMW and LMW PAHs associated with Site 22 cannot be discounted.

SVOC: The literature data were not adequate to develop an avian ERV for the SVOC carbazole. Carbazole was detected in only 1 of 11 samples at a concentration below the maximum reporting limit of 0.39 mg/kg. Impacts of carbazole on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

VOCs: The literature data were not adequate to develop avian ERVs for the VOCs 4-methyl-2-pentanone, benzene, ethylbenzene, toluene, and xylene. VOCs were detected in up to 10 of 18 samples collected at Site 22, with maximum concentrations ranging from 0.003 to 72 mg/kg. In general, VOCs only will have toxic effects at higher doses, in the 500- to 1,000-mg/kg range (ATSDR 1992b, 1996a, 1996b). Although the risk posed to raptors from residual VOC compounds in soils at Site 22 is not fully known, it is postulated to be low because mammals and birds quickly metabolize VOCs (ATSDR 1992b, 1996a, 1996b).

I.2.3.4.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 22

The results of the HQ calculations and QEs indicate potential risk to small mammals and passerines from lead. Because of the high magnitude of the HQs for these receptors, lead may pose a risk to ecological receptors at Site 22.

I.2.3.5 Ecological Risk Assessment Results for Site 23

The following sections relay the results of the ERA for Site 23 for each of the assessment endpoints evaluated. HQ values for Site 23 are presented on Table I-28.

I.2.3.5.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Cadmium was the only ecological COPC with an HQ above 1.0 using the low TRV for mammals (Table I-28). Literature data were not adequate to develop ERVs for n-nitroso-diphenylamine for small mammals. All other ecological COPCs presented in Table I-23 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Cadmium: The high TRV HQ value for cadmium was below 1.0. The low TRV HQ value was 1.23, which was less than 7 times above the background HQ of 0.191. Cadmium was detected in 14 of 30 soil samples collected at Site 23. The calculated EPC was 1.43 mg/kg, while the calculated background EPC was 0.49 mg/kg. Cadmium is a known teratogen in mammals; however, the GI absorption of cadmium in mammals is very limited. Based on the ATSDR

(1999b) "Toxicological Profile for Cadmium," GI absorption of cadmium in mammals ranges from 0.5 to 3 percent for monkeys, 1 to 2 percent for mice and rats, 2 percent for goats, and 5 percent for pigs and lambs to 16 percent for cattle. Assuming a conservative absorption rate of 16 percent, a revised low TRV HQ value for cadmium would be 0.196. Based on this, cadmium poses no significant potential for risk to small mammals.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOC n-nitroso-diphenylamine. N-nitroso-diphenylamine was detected in 4 of 36 samples at a concentration below the maximum reporting limit of 7 mg/kg. Impacts on wildlife from n-nitroso-diphenylamine are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

I.2.3.5.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Cadmium and lead were the only ecological COPCs with an HQ above 1.0 using the low TRV for the song sparrow and the robin (Table I-28). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, n-nitroso-diphenylamine and toluene. All other ecological COPCs presented in Table I-23 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Cadmium: The high HQ values for the Alameda song sparrow and the American robin were below 1.0. The low HQ values for the sparrow and robin were 15 and 6.57, which exceeded the background HQs of 0.851 and 0.385, respectively. Cadmium was detected in 14 of 30 samples collected within the Site 23 at concentrations ranging from 0.18 mg/kg to 10 mg/kg; while in background soils, cadmium was detected in 29 of 88 samples at concentrations ranging from 0.1 mg/kg to 0.82 mg/kg. Based on this information, cadmium at Site 23 poses a potential risk to passerines.

Lead: The high HQ values for the Alameda song sparrow and the American robin were below 1.0. The low HQ values for the sparrow and robin were 77 and 36.3, which exceeded the background HQs of 2.71 and 9.07, respectively. These HQs may, however, be driven by the overly conservative low TRV, as described in Section I.2.3.1.2. Using the allometrically converted TRVs, reevaluation of the lead HQ at Site 23 was calculated as 0.294 for the song sparrow with a background HQ of 0.103 and as 0.138 for the robin with a background HQ of 0.0484. Based on this information, lead at Site 23 poses no significant potential for risk to passerines.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 23 at frequencies ranging from 8.3 to 59 percent out of a total of 180 samples collected. Calculated EPCs ranged from 0.028 to 0.13 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the passerine community from residual levels of HMW and LMW PAHs associated with Site 22 cannot be discounted.

SVOC: The literature data were not adequate to develop an avian ERV for the SVOC n-nitroso-diphenylamine. N-nitroso-diphenylamine was detected in 4 of 36 samples at a concentration below the maximum reporting limit of 7 mg/kg. Impacts of n-nitroso-diphenylamine on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

I.2.3.5.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Lead was the only ecological COPCs with an HQ above 1.0 using the low TRV for raptors (Table I-28). Literature data were not adequate to develop ERVs for HMW PAHs, LMW PAHs, n-nitroso-diphenylamine, and toluene. All other ecological COPCs presented in Table I-23 had HQ values less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that require a QE.

Lead: The high HQ value for lead was less than 1.0. The low HQ value was 2.18, which was less than 3 times the background HQ value of 0.765. As discussed in Section I.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 5.93, the HQ for lead at Site 23 was 0.00829, with a background HQ of 0.00292. Based on this information, lead at Site 23 poses no significant potential risk to the raptor community.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 23 at frequencies ranging from 8.3 to 59 percent out of a total of 180 samples collected. Calculated EPCs ranged from 0.028 to 0.13 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987a). The risk posed to the raptor community from residual levels of HMW and LMW PAHs associated with Site 23 cannot be discounted.

SVOCs: The literature data were not adequate to develop an avian ERV for the SVOC n-nitroso-diphenylamine. N-nitroso-diphenylamine was detected in 4 of 36 samples at a concentration below the maximum reporting limit of 7 mg/kg. Impacts of n-nitroso-diphenylamine on wildlife are not well documented; however, based on the low frequency of detection and low concentration, these impacts are postulated to be low.

I.2.1.5 Discussion of Conclusions of the Ecological Risk Assessment for Site 23

The results of the HQ calculations and QEs indicate potential risk to passerines from cadmium. Based on the low magnitude of the low HQ, the limited habitat at Site 23, and the planned future use of the site, no risks to ecological receptors have been identified that require further evaluation or mitigation.

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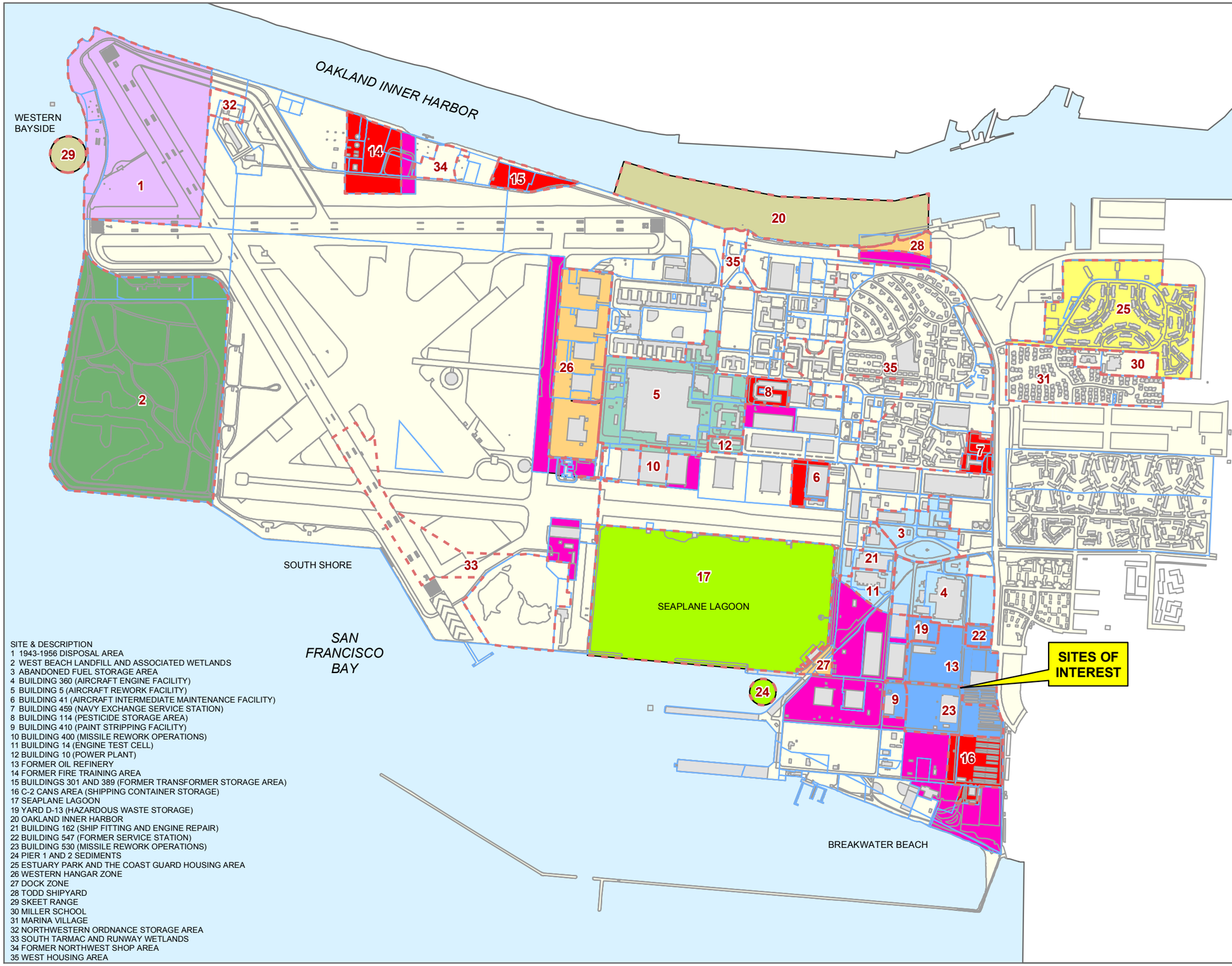
FIGURES



SITE & DESCRIPTION
1 1943-1956 DISPOSAL AREA
2 WEST BEACH LANDFILL AND ASSOCIATED WETLANDS
3 ABANDONED FUEL STORAGE AREA
4 BUILDING 360 (AIRCRAFT ENGINE FACILITY)
5 BUILDING 5 (AIRCRAFT REWORK FACILITY)
6 BUILDING 41 (AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY)
7 BUILDING 459 (NAVY EXCHANGE SERVICE STATION)
8 BUILDING 114 (PESTICIDE STORAGE AREA)
9 BUILDING 410 (PAINT STRIPPING FACILITY)
10 BUILDING 400 (MISSILE REWORK OPERATIONS)
11 BUILDING 14 (ENGINE TEST CELL)
12 BUILDING 10 (POWER PLANT)
13 FORMER OIL REFINERY
14 FORMER FIRE TRAINING AREA
15 BUILDINGS 301 AND 389 (FORMER TRANSFORMER STORAGE AREA)
16 C-2 CANS AREA (SHIPPING CONTAINER STORAGE)
17 SEAPLANE LAGOON
19 YARD D-13 (HAZARDOUS WASTE STORAGE)
20 OAKLAND INNER HARBOR
21 BUILDING 162 (SHIP FITTING AND ENGINE REPAIR)
22 BUILDING 547 (FORMER SERVICE STATION)
23 BUILDING 530 (MISSILE REWORK OPERATIONS)
24 PIER 1 AND 2 SEDIMENTS
25 ESTUARY PARK AND THE COAST GUARD HOUSING AREA
26 WESTERN HANGAR ZONE
27 DOCK ZONE
28 TODD SHIPYARD
29 SKEET RANGE
30 MILLER SCHOOL
31 MARINA VILLAGE
32 NORTHWESTERN ORDNANCE STORAGE AREA
33 SOUTH TARMAC AND RUNWAY WETLANDS
34 FORMER NORTHWEST SHOP AREA
35 WEST HOUSING AREA

CERCLA SITE BOUNDARY
BUFFER ZONE
OPERABLE UNIT 1
OPERABLE UNIT 2A
OPERABLE UNIT 2B
OPERABLE UNIT 2C
OPERABLE UNIT 3
OPERABLE UNIT 4A
OPERABLE UNIT 4B
OPERABLE UNIT 4C
OPERABLE UNIT 5
OPERABLE UNIT 6
BUILDING
LAND COVER
OPEN WATER

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

600 0 600 1200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE I-1
OPERABLE UNITS, CERCLA SITES AND BUFFER ZONES
OU-2A
Environmental Risk Assessment
Remedial Investigation Report

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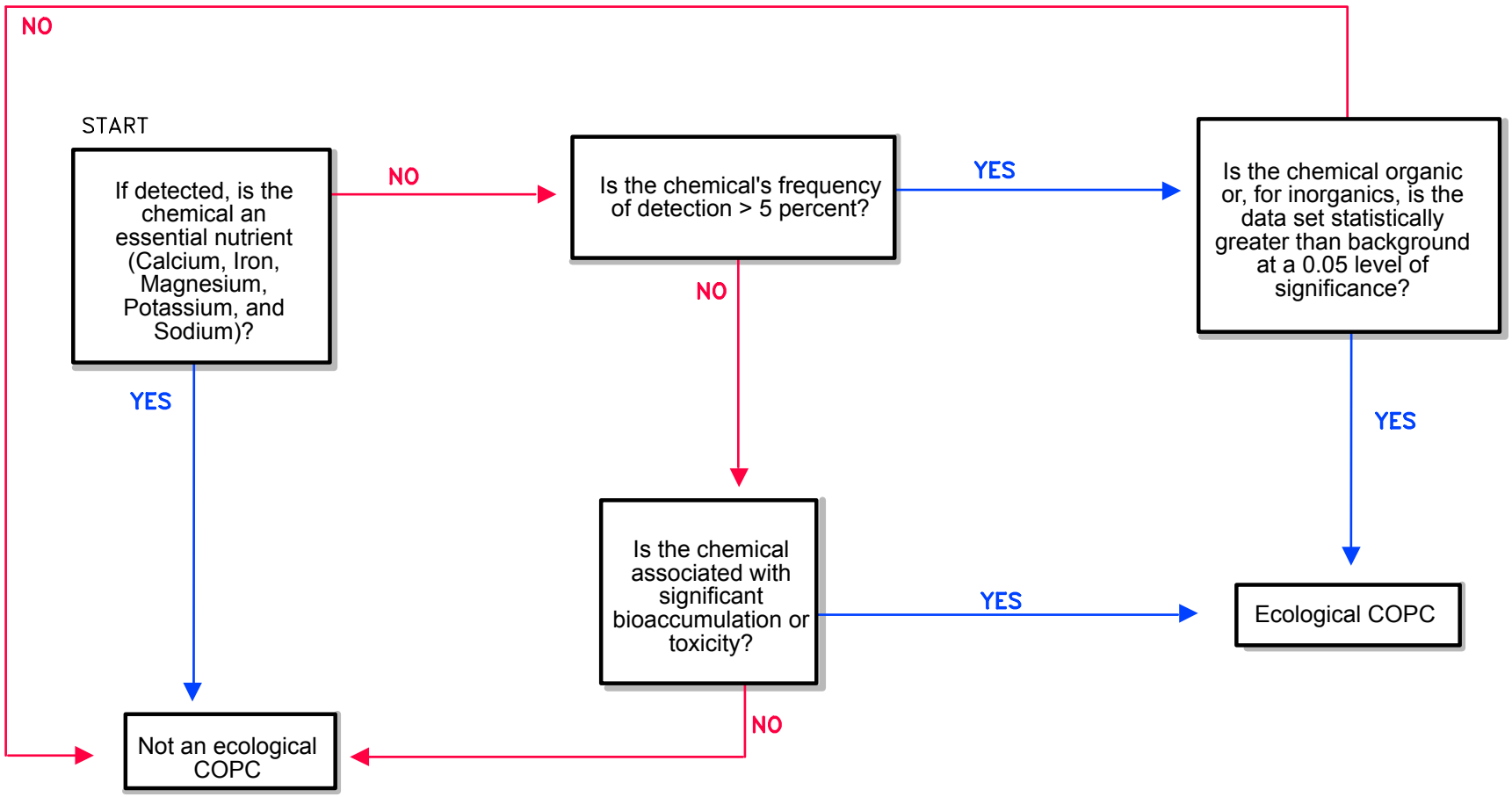


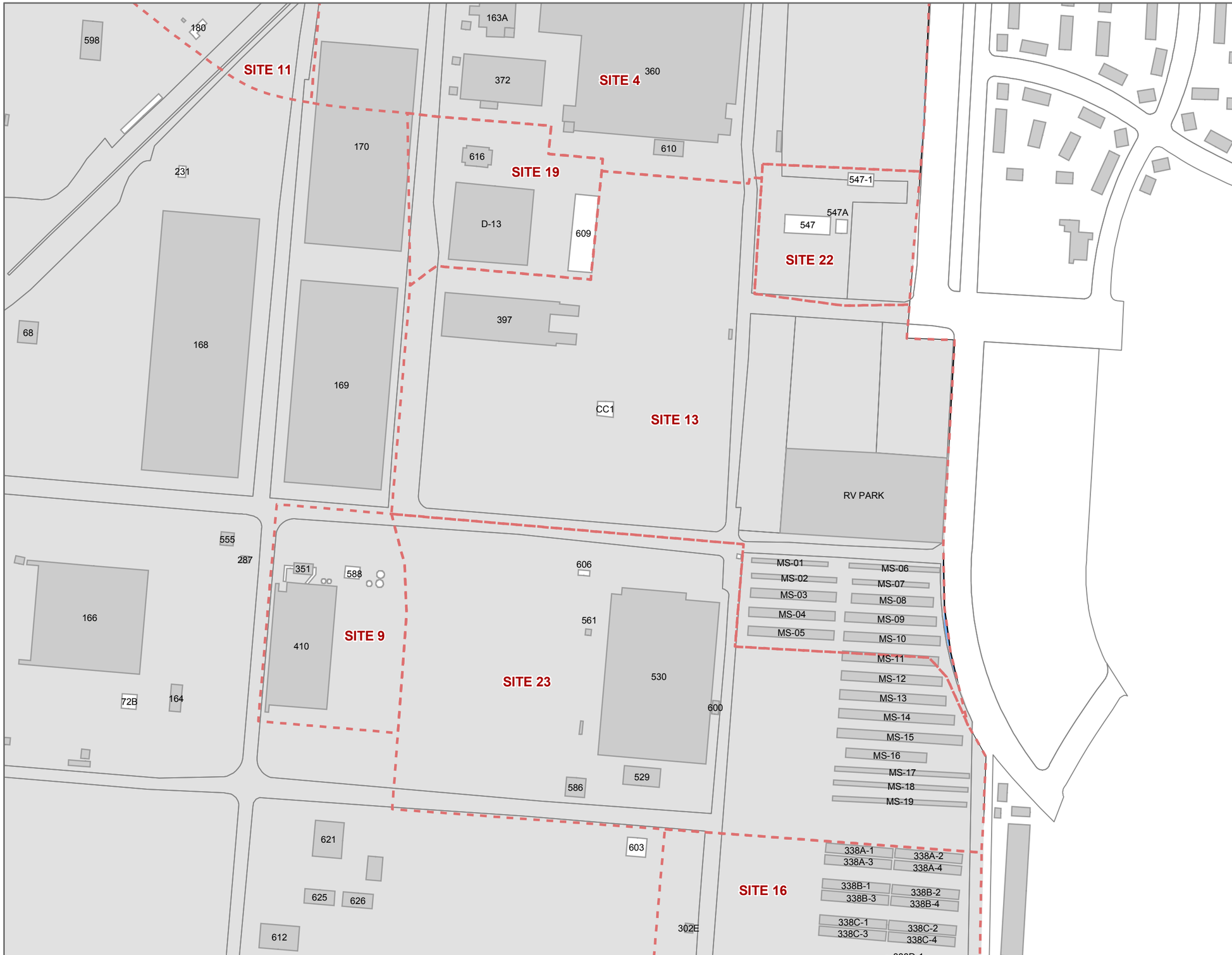
LEGEND

COPC CHEMICAL OF POTENTIAL CONCERN

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE I-2
DECISION TREE FOR ECOLOGICAL COPC SELECTION FOR SURFACE SOILS AND RHIZOSPHERE
Ecological Risk Assessment for
Sites 9, 13, 19, 22, and 23



CERCLA SITE BOUNDARY

HABITAT

Intensively Developed

LAND COVER

BUILDING

Present

Removed

Note:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

N

100 0 100 200 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE I-3
ECOLOGICAL HABITAT MAP OF OU-2A SITES 9, 13, 19, 22 AND 23
OU-2A
Environmental Risk Assessment
Remedial Investigation Report

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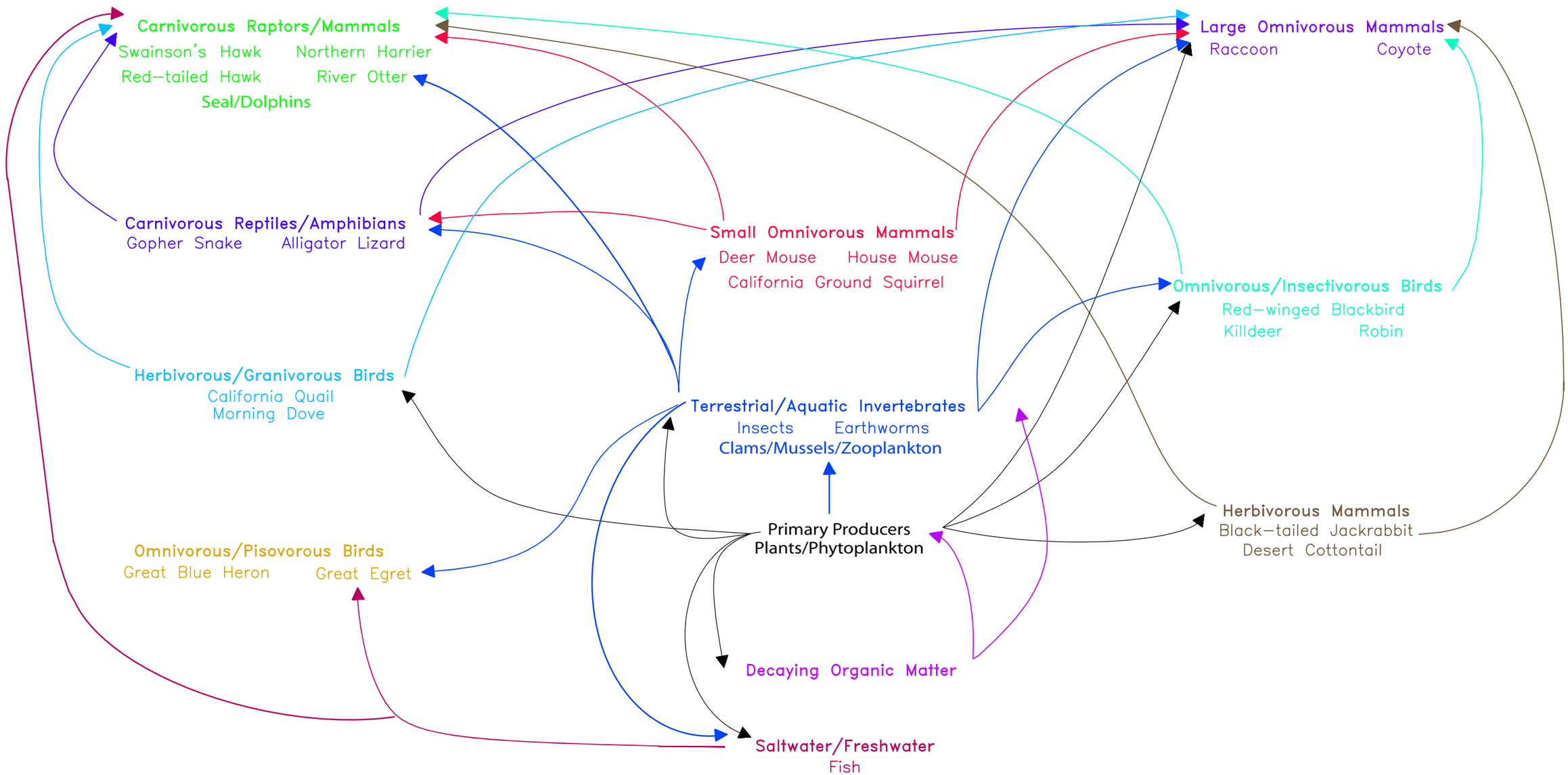

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U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE I-4
TERRESTRIAL FOOD WEB
Ecological Risk Assessment for
Sites 9, 13, 19, 22, and 23

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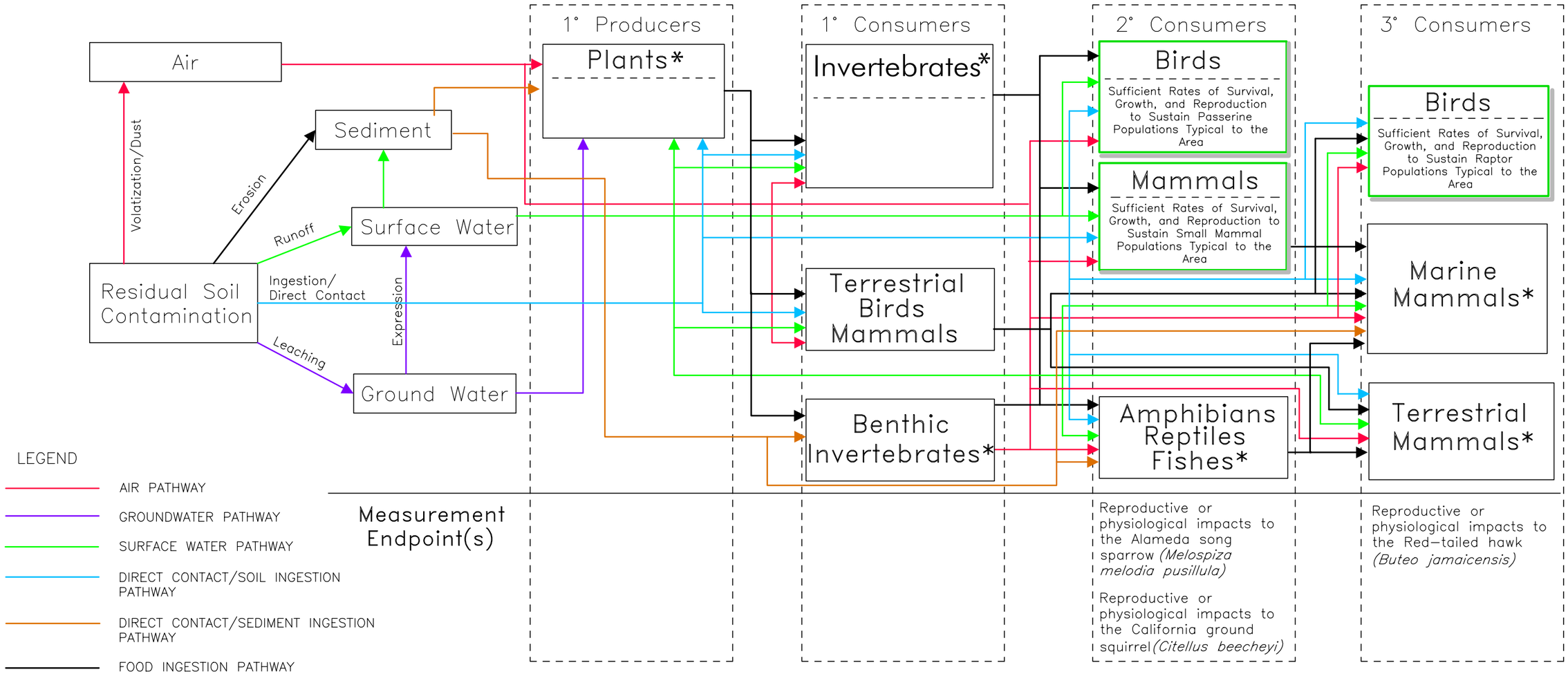

LEGEND

- AIR PATHWAY
- GROUNDWATER PATHWAY
- SURFACE WATER PATHWAY
- DIRECT CONTACT/SOIL INGESTION PATHWAY
- DIRECT CONTACT/SEDIMENT INGESTION PATHWAY
- FOOD INGESTION PATHWAY
- ASSESSMENT ENDPOINTS

1° PRIMARY

2° SECONDARY

3° TERTIARY

* THESE CONSUMERS ARE PRESENT AT ALAMEDA POINT BUT WERE NOT ASSESSED AS AN ENDPOINT

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE I-5
GENERIC ECOLOGICAL CONCEPTUAL SITE MODEL
Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23

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TABLES

TABLE I-1: SPECIAL STATUS SPECIES – PLANTS, FISH, REPTILES, AND MAMMALS

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

	Common Name	Scientific Name
Plants[a]	Contra Costa goldfields	*Lasthenia conjugens*
	Santa Cruz tarplant	*Holocarpha macradenia*
	Kellogg's horkelia	*Horkelia cuneata sericea*
	Point Reyes bird's beak	*Cordylanthus maritimus palustris*
	Adobe sanicle	*Sanicula maritima*
Fish[b]	Chinook salmon, winter run	*Oncorhynchus tshawytscha*
	Longfin smelt	*Spirinchus thaleichthys*
	Delta smelt	*Hypomesus transpacificus*
	Coho salmon	*Oncorhynchus kisutch*
Reptile[c]	Alameda whipsnake	*Masticophis lateralis euryxanthus*
Mammals[d]	Salt marsh harvest mouse[4]	*Reithrodontomys raviventris*
	San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*
	Townsend's western big-eared bat	*Plecotus townsendii townsendii*
	California mastiff bat	*Eumops perotis californicus*
	Northern (Steller) sea lion	*Eumetopias jubatus*
	Saltmarsh wandering shrew	*Sorex vagrens halicoetes*
	Alameda Island mole	*Scapanus latimanus parvus*

Notes:

a Rare plant species listed as potentially occurring at Alameda Point. These plants were not identified during vegetation surveys performed in 1995 and 1997.

b Rare fish species that may occur in the open water areas adjacent to Alameda Point.

c Special status species that may occur at Alameda Point.

d In 1995, a survey for the salt marsh harvest mouse was conducted in the West Beach Landfill Wetland and in the Runway Area Wetland to identify potential receptors for evaluation in ecological risk assessments being conducted by the Navy for the IR program. No individuals were captured during these surveys of the West Beach Landfill Wetland and Runway Area Wetland.

Reference:

U.S. Fish and Wildlife Service. 1993. "Listed and Proposed Endangered and Threatened Species and Candidate Species that may Occur in the Area of the Proposed Closure of Naval Air Station, Alameda, Alameda County, California (1-1-94-SP-192, December 31, 1993)." Enclosure attached to letter from Dale A. Pierce, FWS, to John H. Kennedy, U.S. Department of Navy.

TABLE I-2: SPECIAL STATUS SPECIES – BIRDS

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

	COMMON NAME	SCIENTIFIC NAME
Birds[a]	California least tern	*Sterna antillarum browni*
	American peregrine falcon	*Falco peregrinus anatum*
	Western snowy plower, coastal population	*Charadrius alexandrinus nivosus*
	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*
	Alameda song sparrow	*Melospiza melodia pusillula*
	Double-crested cormorant, rookery sites	*Phalacrocorax auritus*
	California black rail	*Laterallus jamaicensis coturniculus*
	California clapper rail	*Rallus longirostris obsoletus*
	Caspian tern, nesting colonies	*Sterna caspia*
	Forster's tern, nesting colonies	*Sterna forsteri*
	California brown pelican, nesting colony	*Pelecanus occidentalis californicus*
	California horned lark	*Eremophila alpestris actia*
	Loggerhead shrike	*Lanius ludovicianus*
	California gull	*Larus californicus*
	Northern harrier, nesting sites	*Circus cyaneus*
	Merlin	*Falco columbarius*
	Long-billed curlew, breeding	*Numenius americuanus*
	Burrowing owl, burrowing sites	*Athene cunicularia*
	Common loon, breeding	*Gavia imer*
	Fork-tailed storm petrel, rookery	*Ocanodroma furcata*
	American white pelican, nesting colony	*Pelicanus erythrorhynchos*
	Clark's grebe	*Aechmophorus clarkii*
	Western grebe	*Aechmophorus occidentalis*
	Great blue heron, rookery	*Ardea herodias*
	Great egret, rookery	*Casmerodius albus*
	Snowy egret, rookery	*Egreta thula*
	Black-crowned night heron, rookery	*Nycticorax nycticorax*
	Black-shouldered kite, nesting	*Elanus caeruleus*
	Common murre, nesting colony	*Uria aalge*

Notes:

a Special status bird species and associated sensitive habitats (such as breeding, nesting, and rookery sites) that occur or may occur at Alameda Point.

Reference:

U.S. Fish and Wildlife Service. 1993. "Listed and Proposed Endangered and Threatened Species and Candidate Species that May Occur in the Area of the Proposed Closure of Naval Air Station, Alameda, Alameda County, California (1-1-94-SP-192, December 31, 1993)." Enclosure attached to letter from Dale A. Pierce, FWS, to John H. Kennedy, U.S. Department of Navy.

TABLE I-3: TERRESTRIAL HABITAT SUMMARY FOR OU-2A SITES

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

Habitat Type	Dominant Vegetation	Observed Animal Species	Relative Occurrence
Site 9			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 13			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 19			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 22			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 23			
Urban/Ornamental Landscapes	None (paved)	None	NA

Note:

NA Not applicable

TABLE I-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Metals						
Antimony	2.67E+01[a]	EPA (2003)	Various	Reproductive and physiological effects in small mammals	189[a]	2.50E+01
Arsenic	4.70E+00	Navy (1998)	Brown and others (1976)	Decrease in water intake, kidney weight/body weight ratio, respiratory effects in Sprague-Dawley rats	110	4.26E+00
Barium	1.98E+01	Sample and others (1996)	Borzelleca and others (1988)	Mortality in female rats	350	1.92E+01
Beryllium	6.60E+00	Sample and others (1996)	Schroeder and Mitchener (1971)	Adverse physiological effects in rats	350	6.42E+00
Cadmium	2.64E+00	Navy (1998)	Schroeder and Mitchener (1971)	Increase in young deaths and runts; failure to breed in mice	31.4	2.22E+00
Chromium	1.31E+01	Sample and others (1996)	Steven and others (1976) as cited in Eisler (1986)	Mortality in rats	350	1.28E+01
Copper	6.32E+02	Navy (1998)	Hebert and others (1993)	Decreased water consumption, body weight, and increased mortality in mice	24.7	5.24E+02
Lead	2.41E+02	Navy (1998)	Wise 1981	Decrease in body weight, liver weight, and kidney weight in mice	18.7	1.96E+02
Mercury	4.00E+00	Navy (1998)	Wobeser and others (1976)	Adverse effects on the nervous system in rats	187.5	3.75E+00
Selenium	1.21E+00	Navy (1998)	Schroeder and Mitchener (1971)	Increase in young deaths and the number of runts in mice	24.6	1.00E+00
Zinc	4.11E+02	Navy (1998)	Shlicker and Cox (1968)	Decreased fetus weight, fetal liver weight, and body weight in Nulliparous rats	175	3.84E+02
Pesticides						
Chlordane	9.20E+00	Sample and others (1996)	Keplinger and others (1986)	Reproductive effects in mice	30	7.72E+00
DDTt[b]	1.60E+01	Navy (1998)	EPA (1995)	Reproductive effects in rats	320	1.55E+01
Heptachlor Epoxide	6.80E+00	Navy (1998)	Narotsky and others (1995)	Decrease in weekly weight gain in rat pups	204	6.40E+00
PCBs[c]						
Total PCBs	1.28E+00	Navy (1998)	Linzey (1987)	Decrease in survival/litter; increase in birth interval, decrease number of young per litter in mice	22.85	1.06E+00

TABLE I-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
PAHs						
HMW PAHs[d]	3.28E+01	Navy (1998)	Rigdon and Neal (1969)	Increase in pulmonary adenoma	30.5	2.75E+01
LMW PAHs[e]	1.50E+02	Navy (1998)	Navarro and others (1991)	Decrease in weight gain during gestation period	270.2	1.44E+02
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.83E+02	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	1.53E+02
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	4.58E+04	Sample and others (1996)	Lamb and others (1987)	Reproductive effects in mice	30	3.84E+04
Di-n-butylphthalate	1.83E+03	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	1.54E+03
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	2.40E+00	Sample and others (1996)	Schwetz and others (1978)	Significant reduction in survival and growth in rats	350	2.33E+00
VOCs						
1,2-Dichloroethene	4.52E+02	Sample and others (1996)	Palmer and others (1979)	Adverse physiological effects in mice	30	3.79E+02
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	2.50E+02	Sample and others (1996)	Microbiological Associates (1986)	Adverse effect in kidney and liver function in rats	350	2.43E+02
Acetone	5.00E+02	Sample and others (1996)	EPA (1986)	Adverse physiological effects in rats	350	4.86E+02
Benzene	2.64E+02	Sample and others (1996)	Nawrot and Staples (1979)	Decrease in fetal weights, increase maternal mortality, and embryonic resorption	30	2.21E+02
Carbon Disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene Chloride	5.00E+01	Sample and others (1996)	NCA 1982	Adverse effects to the liver in rats	350	4.86E+01
Tetrachloroethene	7.00E+00	Sample and others (1996)	Buben and O'Flaherty (1985)	Hepatoxicity in mice	30	5.87E+00
Toluene	2.60E+02	Sample and others (1996)	Nawrot and Staples (1979)	Adverse effects on reproduction in mice	30	2.18E+02

TABLE I-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	7.00E+00	Sample and others (1996)	Bubin and O'Flaherty (1985)	Hepatoxicity in mice	30	5.87E+00
Xylene	2.60E+00	Sample and others (1996)	Marks and others (1982)	Adverse effects on reproduction in mice	30	2.18E+00

Notes:

a	High TRV and BW is the calculated geometric mean of all LOAELs and BWs presented in EPA (2003).
b	DDTt TRV based on DDT; individual TRVs not developed.
c	PCB TRV based on Aroclor 1254; individual TRVs not developed.
d	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
e	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

EPA. 2003. Ecological Soil Screening Levels for Antimony, Interim Final. OSWER Directive 9285.7-61. November.

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-5: LOW TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Metals						
Antimony	6.00E-02[a]	EPA (2003)	Various	Reproductive and physiological effects in small mammals	160[a]	5.56E-02
Arsenic	3.20E-01	Navy (1998)	Schroeder and others (1968)	Adverse effect on growth rates, survival, glycosuria, proteinuria, blood pressure, tumors, and heart weight and adverse effect on serum glucose in females (rats)	332	3.10E-01
Barium	5.10E+00	Sample and others (1996)	Perry and others (1983)	Growth and hypertension in rats	435	5.02E+00
Beryllium	6.60E-01	Sample and others (1996)	Schroeder and Mitchener (1971)	Adverse physiological effects in rats	350	6.42E-01
Cadmium	6.00E-02	Navy (1998)	Webster (1988)	NOAEL for effects on fetal weight	32.2	5.05E-02
Chromium	3.28E+00	Sample and others (1996)	McKenzie and others (1958)	Physiological effects in rats	350	3.19E+00
Copper	2.67E+00	Navy (1998)	Pocino and others (1991)	Adverse effect on food ingestion rate, body weight, number of cells in the thymus, or mortality in mice	30	2.24E+00
Lead	1.00E+00	HERD 2002	Fowler and others (1980)	Adverse effects on renal systems in rats	208	9.42E-01
Mercury	2.50E-01	Navy (1998)	Wobeser and others (1976)	Adverse effects on the nervous system in rats	187.5	2.34E-01
Selenium	5.00E-02	Navy (1998)	Harr and others (1966)	Hepatic lesions in Wistar rats	24.6	4.14E-02
Zinc	9.61E+00	Navy (1998)	Aughey and others (1977)	Hypertrophy and vacuolation of pancreatic islets cells and fascicolata cells in the adrenal cortex	25.5	7.98E+00
Pesticides						
Chlordane	4.60E+00	Sample and others (1996)	Keplinger and others (1986)	Reproductive effects in mice	30	3.86E+00
DDTt[b]	8.00E-01	Navy (1998)	EPA (1995)	Reproductive effects in rats	320	7.73E-01
Heptachlor Epoxide	1.30E-01	Navy (1998)	Narotsky and others (1995)	Decrease in weekly weight gain in rat pups	204	1.22E-01
PCBs[c]						
Total PCBs	3.60E-01	Navy (1998)	Simmons and McKee (1992)	NOAEL for liver weight, drug induced sleep time, or enzyme activity in mice	20.6	2.95E-01

TABLE I-5: LOW TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
PAHs						
HMW PAHs[d]	1.31E+00	Navy (1998)	Neal and Rigdon (1967)	Occurrences of gastric neoplasts and change of life span in mice	30.5	1.10E+00
LMW PAHs[e]	5.00E+01	Navy (1998)	Navarro and others (1991)	Increase in maternal toxicity	276.5	4.79E+01
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.83E+01	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	1.53E+01
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	4.58E+03	Sample and others (1996)	Lamb and others (1987)	Reproductive effects in mice	30	3.84E+03
Di-n-butylphthalate	5.50E+02	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	4.61E+02
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	2.40E-01	Sample and others (1996)	Schwetz and others (1978)	Significant reduction in survival and growth in rats	350	2.33E-01
VOCs						
1,2-Dichloroethene	4.52E+01	Sample and others (1996)	Palmer and others (1979)	Adverse physiological effects in mice	30	3.79E+01
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	2.50E+01	Sample and others (1996)	Microbiological Associates (1986)	Adverse effect in kidney and liver function in rats	350	2.43E+01
Acetone	1.00E+02	Sample and others (1996)	EPA (1986)	Adverse physiological effects in rats	350	9.72E+01
Benzene	2.64E+01	Sample and others (1996)	Nawrot and Staples (1979)	Decrease in fetal weights, increase maternal mortality, and embryonic resorption	30	2.21E+01
Carbon Disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene Chloride	5.85E+00	Sample and others (1996)	NCA 1982	Adverse effects to the liver in rats	350	5.69E+00
Tetrachloroethene	1.40E+00	Sample and others (1996)	Buben and O'Flaherty (1985)	Hepatoxicity in mice	30	1.17E+00
Toluene	2.60E+01	Sample and others (1996)	Nawrot and Staples (1979)	Adverse effects on reproduction in mice	30	2.18E+01

TABLE I-5: LOW TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	7.00E-01	Sample and others (1996)	Bubin and O'Flaherty (1985)	Hepatoxicity in mice	30	5.87E-01
Xylene	2.10E+00	Sample and others (1996)	Marks and others (1982)	Adverse effects on reproduction in mice	30	1.76E+00

Notes:

a	Low TRV and BW is the calculated geometric mean of all LOAELs and BWs presented in EPA (2003).
b	DDTt TRV based on 4,4'-DDT; individual TRVs not developed.
c	PCB TRV based on Aroclor 1254; individual TRVs not developed.
d	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
e	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HERD	California Department of Toxic Substances Control Human and Ecological Risk Division
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

EPA. 2003. Ecological Soil Screening Levels for Antimony, Interim Final. OSWER Directive 9285.7-61. November.

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

HERD. 2002. "Revised U.S. Environmental Protection Agency Region 9 Biological Technical Assistance Group Mammalian Toxicity Reference Value for Lead: Justification and Rationale." HERD Ecological Risk Assessment Note, No. 5. November 21.

TABLE I-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Metals						
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	9.74E+00
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	9.74E+00
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	2.91E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	7.82E+00
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	2.18E+00
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	2.86E+01
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	4.18E+00
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	8.22E-02
Selenium	9.30E-01	Navy (1998)	Heinz and others (1989)	Decrease in hatchling success	1,108	4.16E-01
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard	955	7.93E+01

TABLE I-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Pesticides						
Chlordane[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995	Reproductive effects in mallards	1,000	6.85E-01
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995	Reproductive effects in mallards	1,000	6.85E-01
Heptachlor epoxide[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995	Reproductive effects in mallards	1,000	6.85E-01
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1,715.40	5.21E-01
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	7.30E+00
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	7.30E-01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA

TABLE I-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)
Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Metals						
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.43E+00
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.43E+00
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	1.45E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	3.82E-02
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	4.37E-01
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	1.15E+00
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	1.01E-02
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestral	130	2.65E+00
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, 1979)	Reproductive effects in mallards	1,000	1.78E-02
Selenium	2.30E-01	Navy (1998)	Heinz and others (1989)	Adverse effects in hatchling body weight and survival, effect on number of hatchlings produced per hen, and malformed embryos in mallards	1,107	1.03E-01
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	7.93E+00
Pesticides						
Chlordane[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	3.20E-03
DDTt[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	3.20E-03
Heptachlor epoxide[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	3.20E-03

TABLE I-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)
Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	4.30E-02
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	7.30E-01
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E-01	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	7.30E-02
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

TABLE I-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)
Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Metals						
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	1.29E+01
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	1.29E+01
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	3.85E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	1.04E+01
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	2.89E+00
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	3.78E+01
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	5.53E+00
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	1.09E-01
Selenium	9.30E-01	Navy (1998)	Heinz and others (1989)	Decrease in hatchling success	1,108	5.51E-01
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard	955	1.05E+02

TABLE I-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Pesticides						
Chlordane[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995)	Reproductive effects in mallards	1,000	9.07E-01
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA (1995)	Reproductive effects in mallards	1,000	9.07E-01
Heptachlor epoxide[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA (1995)	Reproductive effects in mallards	1,000	9.07E-01
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1715.4	6.90E-01
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	9.66E+00
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	9.66E-01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA

TABLE I-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-9: LOW TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for SItes 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Metals						
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	3.22E+00
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	3.22E+00
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	1.92E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	5.06E-02
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	5.79E-01
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	1.52E+00
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	1.33E-02
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestral	130	3.50E+00
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, 1979)	Reproductive effects in mallards	1,000	2.36E-02
Selenium	2.30E-01	Navy (1998)	Heinz and others (1989)	Adverse effects in hatchling body weight and survival, effect on number of hatchlings produced per hen, and malformed embryos in mallards	1,107	1.36E-01
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	1.05E+01

TABLE I-9: LOW TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for SItes 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Pesticides						
Chlordane[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	4.24E-03
DDTt[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	4.24E-03
Heptachlor epoxide[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	4.24E-03
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	5.69E-02
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	9.66E-01
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E-01	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	9.66E-02
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA

TABLE I-9: LOW TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for SItes 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based o naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-10: HIGH TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Metals						
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.18E+01
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.18E+01
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	6.52E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	1.75E+01
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	4.90E+00
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	6.41E+01
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	9.38E+00
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	1.84E-01
Selenium	9.30E-01	Navy (1998)	Heinz and others (1989)	Decrease in hatchling success	1,108	9.34E-01
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard ducks	955	1.78E+02

TABLE I-10: HIGH TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
Pesticides						
Chlordane[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA (1995)	Reproductive effects in mallards	1,000	1.54E+00
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA (1995)	Reproductive effects in mallards	1,000	1.54E+00
Heptachlor epoxide[b]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA (1995)	Reproductive effects in mallards	1,000	1.54E+00
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1715.4	1.17E+00
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	1.64E+01
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	1.64E+00
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA

TABLE I-10: HIGH TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based High TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted High TRV (mg/kg-day)
VOCs (Continued)						
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Metals						
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.46E+00
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.46E+00
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	3.25E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	8.58E-02
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	9.80E-01
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	2.58E+00
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	2.26E-02
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestral	130	5.93E+00
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, 1979)	Reproductive effects in mallards	1,000	4.00E-02
Selenium	2.30E-01	Navy (1998)	Heinz and others (1989)	Adverse effects in hatchling body weight and survival, effect on number of hatchlings produced per hen, and malformed embryos in mallards	1,107	2.31E-01
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	1.78E+01

TABLE I-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
Pesticides						
Chlordane[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	7.18E-03
DDTt[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	7.18E-03
Heptachlor epoxide[b]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	7.18E-03
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	9.64E-02
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
4-Chloro-3-methylphenol	NV	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	1.64E+00
Carbazole	NV	NA	NA	NA	NA	NA
Diethylphthalate	NV	NA	NA	NA	NA	NA
Di-n-butylphthalate	1.10E-01	Sample and others (1996)	Peakall (1974)	Reproductive effects in doves	155	1.64E-01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
1,2-Dichloroethene	NV	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NV	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Methylene chloride	NV	NA	NA	NA	NA	NA
Tetrachloroethene	NV	NA	NA	NA	NA	NA

TABLE I-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda,

Ecological COPC	Literature-Based Low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically Converted Low TRV (mg/kg-day)
VOCs						
Toluene	NV	NA	NA	NA	NA	NA
Trichloroethene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor 1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, anthracene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. “Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-12: ASSESSMENT AND ASSOCIATED MEASUREMENT ENDPOINTS

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

Assessment Endpoint	Associated Measurement Endpoint
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area	Reproductive or physiological impacts to the California ground squirrel (*Citellus beecheyi*), as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area	Reproductive or physiological impacts to the Alameda song sparrow (*Melospiz melodia pusillula*) and the American robin (*Turdus migratorius*) as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area	Reproductive or physiological impacts to the red-tailed hawk (*Buteo jamaicensis*), as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs

Notes:

HQ	Hazard quotient
LOAEL	Lowest observed adverse effects level
NOAEL	No observed adverse effects level
TRV	Toxicity reference value

TABLE I-13: PLANT AND INVERTEBRATE BIOCONCENTRATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2A SITES

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

Ecological COPC	$LogK_{ow}$	Soil to Soil Invertebrate BCFs[a]	Soil to Plant BCFs[a]
Metals			
Antimony	NA	0.22	0.2
Arsenic	NA	0.11	0.036
Barium	NA	0.22	0.15
Beryllium	NA	0.22	0.01
Cadmium	NA	0.96	0.364
Chromium	NA	0.01	0.0075
Copper	NA	0.04	0.4
Lead	NA	0.03	0.045
Mercury[b]	NA	1.1398	0.051
Selenium	NA	0.22	0.016
Zinc	NA	0.56	0.0000000000012
Pestides and PCBs			
Chlordane	5.16	1,202.40	0.04
DDTt	6.51	1.26	0.00937
Heptachlor epoxide[c]	5.4	1.4[e]	0.0489[e]
Total PCBs[d]	6.8	1.13[d]	0.01[d]
PAHs and SVOCs			
HMW and LMW PAHs[e]	5.6	0.063	0.00991
4-Chloro-3-methylphenol	3.1	24.7	0.626
Bis(2-ethylhexyl)phthalate	7.6	1,309	0.038
Carbazole	3.23	31.6	0.526
Diethylphthalate	2.47	7.53	1.45
Di-n-butyl phthalate	4.9	736.4	0.057
n-Nitroso-diphenylamine	3.13	26.15	0.601
Pentachlorophenol	5.12	1,034	0.0449
VOCs			
1,2-Dichloroethene	2	3.11	2.704
1,3-Dichlorobenzene	3.53	55.6	0.353
4-Methyl-2-pentanone	1.31	0.85	6.77
Acetone	-0.24	0.05	52
Benzene	2.13	3.97	2.27
Carbon disulfide	1.94	2.77	2.93
Ethylbenzene	3.15	27.2	0.585

TABLE I-13: PLANT AND INVERTEBRATE BIOCONCENTRATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2A SITES (Continued)

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23
Alameda Point, Alameda, California

Ecological COPC	$LogK_{ow}$	Soil to Soil Invertebrate BCFs[a]	Soil to Plant BCFs[a]
VOCs (Continued)			
Methylene chloride	1.25	0.755	7.34
Tetrachloroethene	3.4	43.51	0.42
Toluene	2.73	12.3	1.02
Trichloroethene	2.61	9.81	1.2
Xylene	3.2	29.84	0.548

Notes:

a Based on values or regression equations presented by EPA (1999).

b Based on BCF for total mercury, which assumed 87 percent of detected mercury consisting of divalent mercury and 13 percent consisting of methylmercury (EPA 1999).

c Based on BCF for parent compound, heptachlor (EPA 1999).

d Based on BCF for Aroclor 1254 (EPA 1999).

e Based on the average of the BCFs presented in Tables C-1 and C-2 for PAHs presented by EPA (1999).

BCF Bioconcentration factor
COPC Chemical of potential concern
DDTt Sum of the concentrations of 4,4′-dichlorodiphenyldichloroethane, 4,4′-dichlorodiphenyldichloroethene, and 4,4′-dichlorodiphenyltrichloroethane
EPA U.S. Environmental Protection Agency
HMW High-molecular weight
K_{ow} Octanol-water partition coefficient
LMW Low-molecular weight
Log Lognormal
PAH Polynuclear aromatic hydrocarbon
PCB Polychlorinated biphenyl
SVOC Semivolatile organic chemical
VOC Volatile organic chemical

Reference:

EPA. 1999. "Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities." Solid Waste and Emergency Response. EPA530-D-99-001A. August.

TABLE I-14: CALCULATED BIOCONCENTRATION FACTORS FOR MAMMALS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Log K_{ow}	Ba_{mammal}[a] (day/kg)	$BCF_{soil\text{-}to\text{-}mammal}$[b] (unitless)	$BCF_{plant\text{-}to\text{-}mammal}$[b] (unitless)
Metals				
Antimony	NA	1.00E-03	1.99E-06	7.88E-05
Arsenic	NA	2.00E-03	3.98E-06	1.58E-04
Barium	NA	1.50E-04	2.99E-07	1.18E-05
Beryllium	NA	1.00E-03	1.99E-06	7.88E-05
Cadmium	NA	6.50E-06	1.29E-08	5.12E-07
Chromium	NA	5.50E-03	1.09E-05	4.33E-04
Copper	NA	1.00E-02	1.99E-05	7.88E-04
Lead	NA	3.00E-04	5.97E-07	2.36E-05
Mercury	NA	1.40E-02[c]	2.79E-05	1.10E-03
Selenium	NA	2.27E-03	4.52E-06	1.79E-04
Zinc	NA	9.00E-05	1.79E-07	7.09E-06
Pesticides and PCBs				
Chlordane	5.16	3.63E-03	7.22E-06	2.86E-04
DDTt[d]	6.51	2.04E-01	4.06E-04	1.61E-02
Heptachlor epoxide	5.4	6.31E-03	1.26E-05	4.97E-04
Total PCBs	6.8	1.59E-01	3.16E-04	1.25E-02
SVOCs				
HMW and LMW PAHs[e]	5.6	3.07E-02	6.11E-05	2.42E-03
4-Chloro-3-methylphenol	3.1	3.16E-05	6.29E-08	2.49E-06
Bis(2-ethylhexyl)phthalate	7.6	1.00E+00	1.99E-03	7.88E-02
Carbazole	3.23	4.27E-05	8.50E-08	3.36E-06
Diethylphthalate	2.47	7.41E-06	1.47E-08	5.84E-07
Di-n-butyl phthalate	4.9	2.00E-03	3.98E-06	1.58E-04
n-Nitroso-diphenylamine	3.13	3.39E-05	6.75E-08	2.67E-06
Pentachlorophenol	5.12	3.31E-03	6.59E-06	2.61E-04
VOCs				
1,2-Dichloroethene (Total)	2	2.51E-06	4.99E-09	1.98E-07
1,3-Dichlorobenzene	3.53	8.51E-05	1.69E-07	6.71E-06
4-Methyl-2-pentanone	1.31	5.13E-07	1.02E-09	4.04E-08
Acetone	-0.24	1.45E-08	2.89E-11	1.14E-09
Benzene	2.13	3.39E-06	6.75E-09	2.67E-07
Carbon Disulfide	1.94	2.19E-06	4.36E-09	1.73E-07
Ethylbenzene	3.15	3.55E-05	7.06E-08	2.80E-06
Methylene Chloride	1.25	4.47E-07	8.90E-10	3.52E-08
Tetrachloroethene	3.4	6.31E-05	1.26E-07	4.97E-06
Toluene	2.73	1.35E-05	2.69E-08	1.06E-06
Trichloroethene	2.61	1.02E-05	2.03E-08	8.04E-07
Xylene	3.2	3.98E-05	7.92E-08	3.14E-06

TABLE I-14: CALCULATED BIOCONCENTRATION FACTORS FOR MAMMALS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Notes:

a	For metals, the Bamammal value was presented in EPA 1998, unless noted otherwise. For organics, Ba_{mammal} values were calculated using the correlation equation derived by Travis and Arms (1984).
b	Calculated by multiplying the Bamammal by the soil and plant ingestion rate for the California ground squireel of 0.00199 kg/day-DW and 0.07879 kg/day-FW, respectively (EPA 1999).
c	Default Bamammal value of 0.02 kg/day-DW for total mercury, presented in EPA 1997, was used and converted to FW by assuming 70-percent moisture in mammals (EPA 1999).
d	Based on log Kow for 4,4-Dichlorodiphenyltrichloroethane
e	Based on the average of the Ba_{mammal} values presented in Tables C-1 and C-2 FOR PAHs presented by EPA (1999).
Ba_{mammal}	Biotransfer factor for mammals
$BCF_{plant\text{-}to\text{-}mammal}$	Bioconcentration factor from plant food item to mammals
$BCF_{soil\text{-}to\text{-}mammal}$	Bioconcentration factor from incidental soil ingestion to mammals
COPC	Chemical of potential concern
day/kg	Day per kilogram
DDTt	Sum of the concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
DW	Dry weight
EPA	U.S. Environmental Protection Agency
FW	Fresh weight
HMW	High molecular weight
kg/day	Kilogram per day
Kow	Octanol-water partition coefficient
LMW	Low molecular weight
Log	Lognormal
NA	Not applicable
ORD	Office of Research and Development
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
VOC	Volatile organic chemical

References:

EPA. 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-99-001A. August.

EPA. 1998. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-98-001A. July.

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TABLE I-15: FOOD-CHAIN MULTIPLIERS BY TROPHIC LEVEL FOR ECOLOGICAL CONSTITUENTS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Ecological COPC	Log K_{ow}	Food-Chain Multiplier[a] Trophic Level of Consumer		
		2	3	4
Metals[b]				
Antimony	NA	1	1	1
Arsenic	NA	1	1	1
Barium	NA	1	1	1
Beryllium	NA	1	1	1
Cadmium	NA	1	1	1
Chromium	NA	1	1	1
Copper	NA	1	1	1
Lead	NA	1	1	1
Mercury	NA	1	1	1
Selenium	NA	1	1	1
Zinc	NA	1	1	1
Pesticides and PCBs				
Chlordane	5.16	1	4.2	3.9
DDTt	6.91	1	14	27
Heptachlor epoxide	5.4	1	5.5	5.8
Total PCBs	6.8	1	14	27
SVOCs				
HMW and LMW PAH[a]	5.6	1	7.1	8.6
4-Chloro-3-methylphenol	3.1	1	1	1
Bis(2-ethylhexyl)phthalate	7.6	1	12	17
Carbazole	3.23	1	1	1
Diethylphthalate	2.47	1	1	1
Di-n-butyl phthalate	4.9	1	2.8	2.2
n-Nitroso-diphenylamine	3.13	1	1	1
Pentachlorophenol	5.12	1	3.6	3.2
VOCs				
1,2-Dichloroethene (Total)	2	1	1	1
1,3-Dichlorobenzene	3.53	1	1.1	1
4-Methyl-2-pentanone	1.31	1	1	1
Acetone	-0.24	1	1	1
Benzene	2.13	1	1	1
Carbon Disulfide	1.94	1	1	1
Ethylbenzene	3.15	1	1	1
Methylene Chloride	1.25	1	1	1
Tetrachloroethene	3.4	1	1.1	1
Toluene	2.73	1	1	1
Trichloroethene	2.61	1	1	1
Xylene	3.2	1	1	1

TABLE I-15: FOOD-CHAIN MULTIPLIERS BY TROPHIC LEVEL FOR ECOLOGICAL CONSTITUENTS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Notes:

a	Obtained from EPA 1999
b	Since FCMs are based on LogKow value of chemical, FCMs were not presented for metals. Assumed a FCM of 1.
COPC	Chemical of potential concern
DDTt	Sum of the concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
FCM	Food-chain multiplier
HMW	High molecular weight
LMW	Low molecular weight
Kow	Octanol-water partition coefficient
Log	Lognormal
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
VOC	Volatile organic chemical

References:

EPA. 1999. "Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities." Solid Waste and Emergency Response. EPA30-D-99-001A. August.

TABLE I-16: VALUES FOR EXPOSURE FACTORS FOR MEASUREMENT ENDPOINT RECEPTORS

Ecological Risk Assessment for Sites 6, 7, 8, and 16, Alameda Point, Alameda, California

Exposure Parameters	Abbreviation	Units	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk
Daily Food Ingestion Rate[a]	Total Food IR	kg/day-FW	0.0984	0.01498	0.03511	0.327
		kg/day-DW	0.03161	0.00486	0.01267	0.0898
Incidental Soil Ingestion Rate[b]	Soil IR	kg/day-DW	0.00199	0.000457	0.0012	0.00063
Plant Percentage of Diet[c]	Plant Percent	percent	80%	50%	50%	--
Plant Ingestion Rate[c]	Plant IR	kg/day-FW	0.07879	0.00749	0.0176	--
Invertebrate Percentage of Diet[d]	Invertebrate Percent	percent	20%	50%	50%	--
Invertebrate Ingestion Rate[d]	Invert IR	kg/day-FW	0.0197	0.00749	0.0176	--
Vertebrate Percentage of Diet[e]	Vertebrate Percent	percent	--	--	--	100%
Vertebrate Ingestion Rate[e]	Vert IR	kg/day-FW	--	--	--	0.327
Site Use Factor[f]	SUF	unitless	1.00	1.00	1.00	1.00
Body Weight[g]	BW	kg	0.562	0.0199	0.081	1.13

Notes:

a Based on the formula presented by Nagy (2001). DW and FW both calculated since wildlife tissues assessed on a FW basis and soil is assessed on a DW basis.

b For California ground squirrel, based on estimated percent soil in diet of jack rabbits, 6.3 percent, multiplied by the total IR (Arthur and Gates [1988], as cited in EPA 1993); for Alameda song sparrow, based on sediment consumption by wild turkey (9.4 percent of total IR) (Beyer and others 1994); and for red-tailed hawk, based on estimated percent soil in diet of bald eagles, 0.7 percent (Beyer and others 1994), multiplied by the total food IR for dry matter intake (Nagy 2001).

c For California ground squirrel, plant IR based on 80 percent of net food IR (California Wildlife Exposure Factor and Toxicity Database 2000); for Alameda song sparrow and American robin, plant IR baed on 50 percent of net food IR (EPA 1993).

d For California ground squirrel, invertebrate IR based on 20 percent of net food IR (California Wildlife Exposure Factor and Toxicity Database 2000); for Alameda song sparrow and American robin, invertebrate IR based on 50 percent of net food IR (EPA 1993).

e Vertebrate IRs for the red-tailed hawk calculated based upon 100 percent of the net food IR.

f Site use factor based upon the conservative estimate of 100 percent use of all receptors at all times.

g For the California ground squirrel, based on the average female body weight (Holecamp and Nunes 1989); for the Alameda song sparrow, based on the mean value for male and female adults during nesting, post-nesting, and winter (Dunning 1993); for the American robin, based on the average body weight of an adult robin; for the red-tailed hawk, based on the average body weight of an adult red-tailed hawk.

-- This exposure parameter is not applicable to this receptor.

EPA U.S. Environmental Protection Agency

FW Fresh weight

DW Dry weight

IR Ingestion rate

kg Kilogram

kg/day Kilogram per day

References:

Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood. 1996. *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations.* CRC Press, Inc. Boca Raton, Flo

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TABLE I-17: SURFACE SOIL BACKGROUND STATISTICS

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg)	UCL95[a] (mg/kg)
Metals						
Aluminum[b]	88/88	2,880	26,800	4,965	6,417.49	7,073.7
Antimony[c]	2/88	0.89	1	2.4	2.16	2.9
Arsenic[c]	33/88	0.74	23	2.9	4.59	6.39
Barium[b]	85/88	0.3	198	38.75	53.01	63.26
Beryllium[c]	25/88	0.09	0.77	0.3	0.37	0.49
Cadmium[c]	29/88	0.1	0.82	0.3	0.4	0.49
Calcium[b]	88/88	1,360	19,200	2,600	3,683.74	4,201.93
Chromium[b]	66/88	11.4	81.7	29.5	33.5	35.74
Cobalt[d]	66/88	1.9	14	5.35	5.37	6.45
Copper[b]	83/88	4.2	89.4	9.7	13.12	15.23
Iron[b]	88/88	760	26,900	8,140	10,072.09	11,092.99
Lead[c]	27/88	1.3	41	5.9	5.31	7.54
Magnesium[b]	88/88	1,510	42,400	2,240	2,867.67	3,156.01
Manganese[b]	88/88	50	1,060	108.5	143.63	159.52
Mercury[c]	0/22	NC	NC	0.17	NC	NC
Molybdenum[c]	0/85	NC	NC	1.4	NC	NC
Nickel[b]	88/88	11.6	88.5	24	29.17	31.64
Potassium[b]	87/88	310	6,382	770	902.98	996.73
Selenium[c]	1/88	5.7	5.7	5	4.05	4.67
Silver[c]	2/88	0.44	0.61	0.7	1.07	1.88
Sodium[b]	68/88	88.1	3,510	340	422.62	718.2
Thallium[c]	1/88	5.3	5.3	3.1	3.2	4.16
Titanium[d]	66/66	223	1,020	372.5	407.1	436.76
Vanadium[b]	88/88	12.8	62.3	20	22.23	23.68
Zinc[b]	88/88	14	84	24.85	28.55	30.93

Notes:

a	The UCL95 may be less than the minimum detected concentration or exceed the maximum detected concentration, because one-half of the quantitation limit was used as a proxy value for non-detected results. The UCL95 was calculated using a distribution-dependent formula.
b	Distribution assumed to be lognormal based on examination of probability plots and outlier box plots
c	Distribution not tested.
d	Distribution determined to be lognormal
mg/kg	Milligram per kilogram
NC	Not calculated, detection of frequency lower than 50 percent
UCL95	95th percentile upper confidence limit on the arithmetic mean

TABLE I-18: SURFACE SOIL BACKGROUND HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Antimony	1.70E-03[a]	7.63E-01[a]	3.42E-02[b]	1.37E-01[b]	1.52E-02[b]	6.10E-02[b]	1.77E-03[b]	7.06E-03[b]
Arsenic	1.20E-02[a]	1.65E-01[a]	4.33E-02[b]	1.74E-01[b]	1.96E-02[b]	7.86E-02[b]	2.03E-03[b]	8.10E-03[b]
Barium	4.54E-02[a]	1.74E-01[a]	2.45E-01[b]	4.91E-01[b]	1.09E-01[b]	2.19E-01[b]	1.29E-02[b]	2.59E-02[b]
Beryllium	8.72E-04[a]	8.72E-03[a]	NV	NV	NV	NV	NV	NV
Cadmium	4.36E-03[b]	1.91E-01[b]	4.16E-03[a]	8.51E-01[a]	1.87E-03[a]	3.85E-01[a]	1.57E-03[a]	3.20E-01[a]
Chromium	1.12E-02[a]	4.50E-02[a]	4.44E-01[b]	2.21E+00[b]	2.12E-01[b]	1.06E+00[b]	8.31E-03[b]	4.16E-02[b]
Copper	3.40E-04[a]	7.95E-02[a]	2.99E-02[a]	7.43E-01[a]	1.37E-02[a]	3.40E-01[a]	6.86E-04[a]	1.70E-02[a]
Lead	2.06E-04[a]	4.28E-02[a]	6.55E-02[b]	2.71E+01[b]	3.07E-02[b]	1.27E+01[b]	1.84E-03[b]	7.65E-01[b]
Lead, alternate TRV[c]	NA	NA	NA	1.03E-01[b]	NA	4.84E-02[b]	NA	2.92E-03[b]
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	5.32E-02[b]	1.30E+00[a]	1.20E+00[b]	4.83E+00[b]	5.33E-01[b]	2.16E+00[b]	6.65E-02[b]	2.69E-01[b]
Zinc	1.87E-03[b]	8.98E-02	9.12E-02[a]	9.12E-01[a]	4.01E-02[a]	4.01E-01[a]	5.73E-03[a]	5.23E-02[a]

Notes:

a	TRV based on an physiological effect
b	TRV based on an reproductive effect
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.
COPC	Chemical of potential concern
HQ	Hazard quotient
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
ND	Not detected in background samples
NV	Reference value not available, HQ could not be calculated
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-19: SITE 9 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	26/26	NA	2,890	11,900	4,785.49	CSB	
Antimony[c]	1/26	0.46 - 6.4	0.47	0.47	0.47	FOD	
Arsenic[c]	8/26	0.52 - 11	0.85	5.9	3.3	CSB	
Barium[d]	26/26	NA	16.3	266	84.32		X
Beryllium[b]	17/26	0.2 - 1.1	0.09	1.2	0.8		X
Cadmium[c]	9/26	0.06 - 1.1	0.11	0.49	0.32	CSB	
Chromium[b]	26/26	NA	22	178	45.87		X
Cobalt[c]	12/26	0.8 - 5.3	3.4	23	6.4	CSB	
Copper[b]	23/26	0.4 - 5.3	4.1	89.4	16.94	CSB	
Iron[e]	26/26	NA	5,480	19,300	8,725.68	EN	
Lead[b]	15/26	0.24 - 5.4	1.3	9.1	5.2		X
Manganese[b]	26/26	NA	68	1,050	137.07	CSB	
Nickel[d]	26/26	NA	17	46.1	24.12	CSB	
Titanium[b]	12/12	0.2 - 5.3	223	1,020	450.67	CSB	
Vanadium[b]	26/26	NA	13	35.4	20.27	CSB	
Zinc[b]	26/26	NA	15.7	80.6	28.34	CSB	
SVOCs (mg/kg)							
2-Methylnaphthalene[c]	18/39	0.00022 - 0.0042	0.00023	1.5	0.22		X
Acenaphthene[c]	5/39	0.00022 - 0.0063	0.00045	0.14	0.022		X
Acenaphthylene[c]	6/39	0.00017 - 0.0068	0.00021	0.0029	0.003		X
Anthracene[c]	14/39	0.0002 - 0.0058	0.00023	0.043	0.009		X
Benzo(a)anthracene[b]	24/39	0.00014 - 0.0095	0.00018	0.019	0.0104		X
Benzo(a)pyrene[f]	28/39	0.00015 - 0.0074	0.00021	0.039	0.0111		X
Benzo(b)fluoranthene[b]	26/39	0.00015 - 0.0068	0.00021	0.054	0.015		X
Benzo(g,h,i)perylene[f]	32/39	0.00011 - 0.0079	0.00014	0.11	0.042		X
Benzo(k)fluoranthene[b]	20/39	0.00016 - 0.0095	0.00021	0.011	0.008		X
Chrysene[b]	26/39	0.00016 - 0.0089	0.00021	0.15	0.028		X
Dibenzo(a,h)anthracene[c]	17/39	0.00019 - 0.0074	0.00033	0.034	0.0092		X
Fluoranthene[f]	27/39	0.00018 - 0.01	0.0003	0.051	0.0133		X
Fluorene[c]	13/39	0.00018 - 0.005	0.00023	0.38	0.055		X
Indeno(1,2,3-cd)pyrene[b]	25/39	0.00016 - 0.0105	0.00023	0.016	0.0094		X
Naphthalene[c]	16/39	0.00022 - 0.005	0.00025	0.49	0.093		X
n-Nitroso-diphenylamine[c]	4/13	0.34 - 0.73	0.038	0.054	0.054		X
Pentachlorophenol[c]	1/13	1.6 - 3.5	0.43	0.43	0.43		X
Phenanthrene[b]	30/39	0.00016 - 0.0089	0.00017	0.64	0.035		X
Pyrene[f]	30/39	0.00012 - 0.0084	0.00014	0.11	0.0182		X
VOCs (mg/kg)							
1,2-Dichloroethene (Total)[c]	2/21	0.005 - 0.12	0.001	0.13	0.034		X
2-Butanone[c]	1/21	0.01 - 0.12	0.009	0.009	0.009	FOD - NB	
Ethylbenzene[c]	1/21	0.005 - 0.12	0.2	0.2	0.042		X
Tetrachloroethene[c]	1/21	0.005 - 0.12	0.001	0.001	0.001		X
Toluene[c]	9/21	0.005 - 0.12	0.004	0.73	0.12		X
Xylene (Total)[c]	5/21	0.005 - 0.12	0.002	3.1	0.43		X

TABLE I-19: SITE 9 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be unknown but assumed to be lognormal based on examination of probability plots and outlier box plots.
c	Distribution not tested.
d	Distribution determined to be unknown but assumed to be normal based on examination of probability plots and outlier box plots.
e	Distribution determined to be normal.
f	Distribution determined to be lognormal.
CSB	Concentrations within statistical background
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Millogram per kilogram
NA	Not applicable, frequency of detection is 100 percent
NB	Non-bioaccumulating
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE I-20: SITE 13 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	73/73	NA	45.8	18,200	8,862.85	CSB	
Antimony[c]	18/75	0.45 - 7.5	0.37	8.2	2.43		X
Arsenic[b]	43/75	0 - 12	1.2	20	6.68		X
Barium[b]	71/75	0 - 25	11.6	376	62.81	CSB	
Beryllium[c]	20/75	0.05 - 1.2	0.13	1.9	0.49	CSB	
Cadmium[c]	32/75	0 - 2.4	0.05	18	1.09	CSB	
Chromium[b]	75/75	NA	3.6	337	34.75	CSB	
Cobalt[b]	56/75	0 - 6.3	2	15.2	6.53	CSB	
Copper[b]	65/75	0 - 6.3	3.9	160	17.32	CSB	
Iron[b]	73/73	NA	2,790	74,800	10,981.69	EN	
Lead[b]	54/81	0 - 47.2	1	602	83.59		X
Manganese[b]	73/73	NA	22.6	702	164.64	CSB	
Mercury[c]	8/37	0.01 - 0.19	0.01	0.4	0.12		X
Molybdenum[c]	1/75	0.15 - 6.3	5.9	5.9	1.85	FOD	
Nickel[d]	73/75	0 - 6.3	2.6	278	35.68	CSB	
Selenium[c]	14/75	0 - 12	0.14	12	3.27		X
Silver[c]	3/75	0.14 - 6.3	0.23	1.6	1.29	FOD	
Thallium[c]	1/75	0.11 - 12	2.7	2.7	2.7	FOD	
Titanium[b]	38/38	NA	209	632	401.11	CSB	
Vanadium[e]	75/75	NA	6.8	76.8	23.85	CSB	
Zinc[e]	75/75	NA	7	7,120	300.45		X
Pesticides (mg/kg)							
4,4'-DDE[c]	2/38	0.0021 - 0.16	0.0037	0.031	0.018		X
4,4'-DDT[c]	3/38	0.0021 - 0.16	0.0021	0.16	0.03		X
Heptachlor Epoxide[c]	1/35	0.001 - 0.082	0.0054	0.0054	0.0054		X
SVOCs (mg/kg)							
2-Methylnaphthalene[c]	112/243	0.00021 - 0.191	0.00025	39	1.03		X
2,4-Dimethylphenol[c]	1/54	0 - 34	0.14	0.14	0.14	FOD - NB	
Acenaphthene[c]	42/243	0.00021 - 0.057	0.00026	0.77	0.036		X
Acenaphthylene[c]	65/243	0.00016 - 0.062	0.00018	0.87	0.039		X
Anthracene[c]	88/243	0.00019 - 0.052	0.00025	12	0.282		X
Benzo(a)anthracene[b]	142/243	0.00013 - 0.086	0.00014	3.4	0.146		X
Benzo(a)pyrene[b]	135/243	0.00014 - 0.067	0.00021	2.4	0.131		X
Benzo(b)fluoranthene[b]	133/243	0.00014 - 0.062	0.00023	1.6	0.123		X
Benzo(g,h,i)perylene[b]	143/243	0.0001 - 0.072	0.00035	1.5	0.14		X
Benzo(k)fluoranthene[c]	107/243	0.00015 - 0.086	0.00023	1.4	0.068		X
Carbazole[c]	2/14	0 - 3.6	0.13	0.27	0.27		X
Chrysene[b]	146/243	0.00015 - 0.081	0.00016	4.6	0.25		X
Dibenzo(a,h)anthracene[c]	94/243	0.00018 - 0.067	0.00034	1.3	0.051		X
di-n-Butylphthalate[c]	1/54	0.33 - 34	0.031	0.031	0.031		X
Fluoranthene[b]	135/243	0.00017 - 0.091	0.00019	1.9	0.124		X
Fluorene[c]	71/243	0.00017 - 0.048	0.00021	9.1	0.246		X
Indeno(1,2,3-cd)pyrene[c]	107/243	0.00015 - 0.095	0.00028	1.6	0.068		X
Naphthalene[c]	95/243	0.00021 - 0.048	0.00026	6.4	0.232		X
n-Nitroso-diphenylamine[c]	12/53	0.33 - 34	0.042	1.2	1.2		X
Pentachlorophenol[c]	3/54	0.87 - 170	0.27	1	1		X
SVOCs (Continued) (mg/kg)							
Phenanthrene[b]	136/243	0.00015 - 0.081	0.00022	9.6	0.181		X
Pyrene[b]	133/243	0.00011 - 0.076	0.0002	2.7	0.159		X

TABLE I-20: SITE 13 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
VOCs (mg/kg)							
Acetone[c]	3/43	0.005 - 1.3	0.15	0.19	0.103		X
Benzene[c]	9/48	0 - 0.63	0.001	0.082	0.04		X
Carbon Disulfide[c]	3/43	0.005 - 0.63	0.001	0.002	0.002		X
Ethylbenzene[c]	12/48	0 - 0.63	0.00069	0.56	0.065		X
Toluene[f]	26/48	0 - 0.63	0.001	1.6	0.22		X
Xylene (Total)[c]	13/48	0 - 0.63	0.0011	2.9	0.3		X

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be unknown but assumed to be lognormal based on examination of probability plots and outlier box plots.
c	Distribution not tested.
d	Distribution determined to be normal.
e	Distribution determined to be unknown but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be lognormal.
CSB	Concentrations within statistical background
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Millogram per kilogram
NA	Not applicable, frequency of detection is 100 percent
NB	Non-bioaccumulating
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE I-21: SITE 19 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	24/24	NA	2,840	10,900	6,140.13	CSB	
Arsenic[c]	3/24	2.5 - 13	3.1	9.5	6.63	CSB	
Barium[d]	21/24	0.2 - 26	15.3	570	109.56		X
Beryllium[c]	3/24	0.13 - 1.3	0.37	0.4	0.4	CSB	
Cadmium[c]	7/24	0.2 - 1.3	0.2	7.4	1.36	CSB	
Chromium[b]	24/24	NA	5.8	67	32.46	CSB	
Cobalt[c]	9/24	0.8 - 6.4	3.4	9.7	4.98	CSB	
Copper[b]	21/24	0.6 - 6.4	5.9	138	51.58		X
Iron[b]	24/24	NA	4,670	32,300	12,861.46	EN	
Lead[c]	8/24	3.5 - 6.4	6.6	303	41.18		X
Manganese[d]	24/24	NA	72	897	274.35	CSB	
Molybdenum[c]	1/24	0.31 - 6.4	1.6	1.6	1.6	FOD	
Nickel[e]	24/24	NA	5.5	64	29.52	CSB	
Silver[c]	2/24	0.38 - 6.4	0.43	0.7	0.7	CSB	
Thallium[c]	1/24	2.7 - 13	3.3	3.3	3.3	FOD	
Titanium[e]	24/24	NA	220	819	470.28	CSB	
Vanadium[b]	24/24	NA	12	41.5	22.48	CSB	
Zinc[e]	24/24	NA	14	292	64.64		X
Cyanide[c]	1/32	0.5 - 1.3	0.59	0.59	0.56	FOD	
SVOCs (mg/kg)							
2-Chlorophenol[c]	1/28	0.34 - 11	1.5	1.5	0.95	FOD - NB	
2-Methylnaphthalene[b]	20/39	0.00022 - 0.008	0.00026	0.0061	0.0061		X
4-Chloro-3-Methylphenol[b]	1/28	0.34 - 11	1.5	1.5	0.95		X
Acenaphthene[c]	7/39	0.00022 - 0.012	0.0003	0.0018	0.0018		X
Acenaphthylene[b]	21/39	0.00017 - 0.013	0.0002	0.019	0.0173		X
Anthracene[b]	23/39	0.0002 - 0.011	0.00027	0.047	0.0137		X
Benzo(a)anthracene[e]	32/39	0.00014 - 0.019	0.00024	0.32	0.04		X
Benzo(a)pyrene[e]	31/39	0.00015 - 0.014	0.00023	0.52	0.043		X
Benzo(b)fluoranthene[e]	32/39	0.00015 - 0.013	0.00034	0.28	0.035		X
Benzo(g,h,i)perylene[e]	35/39	0.00011 - 0.016	0.0002	0.4	0.072		X
Benzo(k)fluoranthene[e]	26/39	0.00016 - 0.019	0.0002	0.33	0.035		X
Bis(2-ethylhexyl)phthalate[c]	2/28	0.34 - 11	0.11	0.89	0.89		X
Chrysene[e]	36/39	0.00016 - 0.018	0.00021	0.42	0.036		X
Dibenzo(a,h)anthracene[c]	19/39	0.00019 - 0.014	0.0003	0.04	0.013		X
Diethylphthalate[c]	2/28	0.34 - 11	6.2	7.7	2.11		X
Di-n-Butylphthalate[c]	1/28	0.34 - 11	7.3	7.3	1.92		X
Fluoranthene[e]	36/39	0.00018 - 0.02	0.00035	0.64	0.043		X
Fluorene[c]	15/39	0.00018 - 0.01	0.00019	0.00064	0.0064		X
Indeno(1,2,3-cd)pyrene[e]	33/39	0.00016 - 0.021	0.00029	0.47	0.047		X
Naphthalene[b]	31/39	0.00022 - 0.01	0.00027	0.025	0.009		X
n-Nitroso-diphenylamine[c]	7/28	0.34 - 11	0.048	0.9	0.9		X
Pentachlorophenol[c]	3/28	0.84 - 33	0.41	1.6	1.6		X
Phenanthrene[e]	31/39	0.00016 - 0.018	0.00037	0.17	0.026		X
Pyrene[e]	37/39	0.00012 - 0.017	0.00024	0.71	0.048		X

TABLE I-21: SITE 19 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
VOCs (mg/kg)							
1,3-Dichlorobenzene[c]	1/9	0.005 - 0.52	0.59	0.59	0.29		X
Acetone[c]	2/19	0.01 - 1.4	0.004	0.007	0.007		X
Methylene Chloride[c]	2/19	0.005 - 1.4	0.011	0.03	0.03		X
Tetrachloroethene[c]	1/20	0.005 - 0.68	0.004	0.004	0.004		X
Toluene[c]	15/20	0.005 - 0.68	0.002	1	0.292		X
Trichloroethene[c]	1/20	0.005 - 0.68	0.004	0.004	0.004		X
Xylene[c]	3/20	0.005 - 0.68	0.003	0.19	0.031		X

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be unknown but assumed to be lognormal based on examination of probability plots and outlier box plots.
c	Distribution not tested.
d	Distribution determined to be normal.
e	Distribution determined to be unknown but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be lognormal.
CSB	Concentrations within statistical background
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Millogram per kilogram
NA	Not applicable, frequency of detection is 100 percent
NB	Non-bioaccumulating
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE I-22: SITE 22 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	30/30	NA	3,120	26,800	8,095.06	CSB	
Arsenic[c]	11/30	0.52 - 12	1.4	18	5.37	CSB	
Barium[d]	30/30	NA	0.3	140	70.45		X
Beryllium[c]	14/30	0.2 - 1.2	0.2	1.8	0.73	CSB	
Cadmium[c]	13/30	0.08 - 1.2	0.1	4.3	0.78	CSB	
Chromium[e]	30/30	NA	11.4	50.8	34.56	CSB	
Cobalt[e]	19/30	0.8 - 5.9	3.6	10.4	6.63	CSB	
Copper[b]	30/30	NA	5.6	86.2	23.26		X
Iron[b]	30/30	NA	760	21,400	10,966.4	EN	
Lead[e]	22/30	0.24 - 5.9	2.1	9,890	1,780.33		X
Manganese[b]	30/30	NA	72.4	352	176.64	CSB	
Mercury[c]	1/11	0.15 - 0.18	0.46	0.46	0.2	CSB	
Nickel[d]	30/30	NA	11.6	47	27.8	CSB	
Selenium[c]	3/30	0.54 - 12	0.66	0.74	0.74		X
Silver[c]	1/30	0.18 - 5.9	1.2	1.2	1.2	FOD	
Titanium[f]	19/19	0.2 - 5.9	264	590	432.99	CSB	
Vanadium[f]	30/30	NA	13.9	62.3	26.1	CSB	
Zinc[b]	30/30	NA	16.6	151	55.17		X
Pesticides (mg/kg)							
4,4'-DDD[c]	2/19	0.0021 - 0.17	0.0024	0.009	0.009		X
4,4'-DDE[c]	4/19	0.0021 - 0.17	0.0061	0.023	0.023		X
4,4'-DDT[c]	3/19	0.0021 - 0.17	0.0027	0.053	0.046		X
alpha-Chlordane[c]	2/10	0.082 - 0.87	0.0009	0.027	0.027		X
gamma-Chlordane[c]	2/10	0.082 - 0.87	0.0014	0.022	0.022		X
SVOCs (mg/kg)							
2-Methylnaphthalene[f]	49/66	0.00022 - 0.084	0.00026	36	0.612		X
Acenaphthene[c]	21/54	0.00022 - 0.0096	0.00029	0.13	0.021		X
Acenaphthylene[f]	27/66	0.00017 - 0.01	0.00035	0.056	0.013		X
Anthracene[f]	32/55	0.0002 - 0.0043	0.00041	0.08	0.02		X
Benzo(a)anthracene[e]	50/59	0.00014 - 0.0097	0.00028	0.11	0.054		X
Benzo(a)pyrene[e]	53/58	0.00015 - 0.0073	0.00017	0.19	0.047		X
Benzo(b)fluoranthene[e]	55/61	0.00015 - 0.007	0.00025	0.17	0.045		X
Benzo(g,h,i)perylene[e]	53/61	0.00011 - 0.0081	0.0002	0.2	0.04		X
Benzo(k)fluoranthene[e]	48/58	0.00016 - 0.0097	0.0002	0.085	0.032		X
Carbazole[c]	1/11	0.34 - 0.39	0.018	0.018	0.018		X
Chrysene[e]	56/61	0.00016 - 0.0092	0.00022	0.14	0.048		X
Dibenzo(a,h)anthracene[c]	33/66	0.00019 - 0.0076	0.00035	0.038	0.016		X
Fluoranthene[e]	54/61	0.00018 - 0.0103	0.0004	0.35	0.091		X
Fluorene[c]	23/55	0.00018 - 0.012	0.0003	0.091	0.019		X
Indeno(1,2,3-cd)pyrene[e]	46/57	0.00016 - 0.0105	0.00017	0.13	0.049		X
Naphthalene[f]	50/66	0.00022 - 0.105	0.00027	34	0.363		X
Phenanthrene[e]	47/58	0.00016 - 0.0092	0.00045	0.25	0.108		X
Pyrene[e]	52/62	0.00012 - 0.0087	0.00059	0.33	0.131		X

TABLE I-22: SITE 22 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point,

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
VOCs (mg/kg)							
4-Methyl-2-pentanone[c]	1/14	0.0059 - 7.2	72	72	14.3		X
Benzene[c]	1/15	0.005 - 7.2	0.006	0.006	0.006		X
Ethylbenzene[c]	7/15	0.005 - 7.2	0.012	52	9.65		X
Toluene[f]	10/18	0.005 - 7.2	0.003	28	8.51		X
Xylene (Total)[c]	6/15	0.005 - 7.2	0.07	22	4.67		X

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be unknown but assumed to be lognormal based on examination of probability plots and outlier box plots.
c	Distribution not tested.
d	Distribution determined to be normal.
e	Distribution determined to be unknown but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be lognormal.
CSB	Concentrations within statistical background
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Millogram per kilogram
NA	Not applicable, frequency of detection is 100 percent
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE I-23: SITE 23 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	30/30	NA	2,880	21,900	5,564.98	CSB	
Antimony[c]	5/30	0.46 - 6.9	2.4	4.8	3.13		X
Arsenic[c]	7/30	0.52 - 12	0.84	4.3	4.30	CSB	
Barium[d]	26/26	NA	18.8	300	77.8		X
Beryllium[c]	4/30	0.2 - 1.2	0.13	0.22	0.22	CSB	
Cadmium[c]	14/30	0.06 - 1.2	0.18	10	1.43		X
Chromium[d]	31/31	NA	7.3	76.9	33.92	CSB	
Cobalt[b]	19/30	0.8 - 5.8	2.8	13.3	5.83	CSB	
Copper[b]	26/30	0.4 - 5.8	4.5	113	28.76	CSB	
Iron[b]	30/30	NA	4,690	25,900	9,138.31	EN	
Lead[c]	14/31	0.24 - 5.9	1.3	120	21.44		X
Manganese[d]	30/30	NA	69.8	414	141.33	CSB	
Nickel[b]	30/30	NA	4.7	32	24.2	CSB	
Silver[c]	1/30	0.18 - 5.8	0.38	0.38	0.38	FOD	
Thallium[c]	2/30	0.4 - 12	2.9	3.3	3.3	CSB	
Titanium[b]	25/25	NA	234	879	438.09	CSB	
Vanadium[b]	30/30	NA	12	82	21.92	CSB	
Zinc[b]	29/30	0.6 - 5.8	17	79	37.52	CSB	
Pesticides and PCBs (mg/kg)							
4,4'-DDT[c]	2/16	0.0021 - 0.094	0.0028	0.0054	0.0054		X
Aroclor-1260[c]	1/16	0.017 - 0.94	0.038	0.038	0.038		X
SVOCs (mg/kg)							
2-Methylphenol[c]	1/36	0.34 - 7	0.021	0.021	0.021	FOD - NB	
2-Methylnaphthalene[c]	53/180	0.00022 - 0.0423	0.00024	0.031	0.028		X
4-Methylphenol[c]	1/36	0.34 - 7	0.048	0.048	0.048	FOD - NB	
2,4-Dimethylphenol[c]	1/36	0.34 - 7	0.052	0.052	0.052	FOD - NB	
Acenaphthene[c]	15/180	0.00022 - 0.063	0.00024	0.072	0.029		X
Acenaphthylene[c]	36/180	0.00017 - 0.069	0.00021	0.037	0.029		X
Anthracene[c]	43/180	0.0002 - 0.058	0.00021	0.43	0.035		X
Benzo(a)anthracene[b]	96/180	0.00014 - 0.095	0.00021	2.1	0.078		X
Benzo(a)pyrene[b]	91/180	0.00015 - 0.074	0.00027	2	0.091		X
Benzo(b)fluoranthene[b]	93/180	0.00015 - 0.069	0.00039	2	0.09		X
Benzo(g,h,i)perylene[b]	107/180	0.00011 - 0.079	0.00016	1.3	0.13		X
Benzo(k)fluoranthene[c]	71/180	0.00016 - 0.095	0.00021	1.6	0.072		X
Chrysene[b]	101/180	0.00016 - 0.09	0.00033	2.3	0.083		X
Dibenzo(a,h)anthracene[c]	69/178	0.00019 - 0.074	0.00024	0.39	0.033		X
Fluoranthene[b]	93/180	0.00018 - 0.1	0.00022	3.4	0.119		X
Fluorene[c]	29/180	0.00018 - 0.053	0.00018	0.059	0.029		X
Indeno(1,2,3-cd)pyrene[c]	85/180	0.00016 - 0.11	0.0002	1.4	0.068		X
Naphthalene[c]	62/180	0.00022 - 0.053	0.00024	0.037	0.028		X
n-Nitroso-diphenylamine[c]	4/36	0.34 - 7	0.046	0.22	0.22		X
Phenanthrene[c]	87/177	0.00016 - 0.09	0.00019	1.5	0.072		X
Pyrene[b]	103/180	0.00012 - 0.085	0.00019	2.7	0.126		X
VOCs (mg/kg)							
Toluene[c]	11/23	0.005 - 0.029	0.007	1.1	0.15		X

TABLE I-23: SITE 23 SURFACE SOIL DETECTED CONSTITUENT SCREENING--SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be unknown but assumed to be lognormal based on examination of probability plots and outlier box plots.
c	Distribution not tested.
d	Distribution determined to be normal.
e	Distribution determined to be unknown but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be lognormal.
CSB	Concentrations within statistical background
DDT	Dichlorodiphenyltrichloroethane
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Millogram per kilogram
NA	Not applicable, frequency of detection is 100 percent
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE I-24: SITE 9 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Barium	6.05E-02[a]	2.31E-01[a]	3.26E-01[b]	6.54E-01[b]	1.45E-01[b]	2.92E-01[b]	1.72E-02[b]	3.45E-02[b]
Beryllium	1.42E-03[a]	1.42E-02[a]	QE	QE	QE	QE	QE	QE
Chromium	1.44E-02[a]	5.78E-02[a]	5.70E-01[b]	2.84E+00[b]	2.73E-01[b]	1.36E+00[b]	1.07E-02[b]	5.33E-02[b]
Lead	1.42E-04[a]	2.95E-02[b]	4.51E-02[b]	1.87E+01[b]	2.11E-02[b]	8.79E+00[b]	1.27E-03[b]	5.28E-01[b]
Lead alternate low TRV[c]	NA	NA	NA	7.12E-02[b]	NA	3.34E-02[b]	NA	2.01E-03[b]
HMW PAHs	3.55E-05[a]	8.87E-04[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	1.80E-05[b]	5.40E-05[b]	QE	QE	QE	QE	QE	QE
n-Nitroso-diphenylamine	QE	QE	QE	QE	QE	QE	QE	QE
Pentachlorophenol	6.69E+00[a]	6.69E+01[a]	QE	QE	QE	QE	QE	QE
1,2-Dichlorethene	1.42E-05[a]	1.42E-04[a]	QE	QE	QE	QE	QE	QE
Ethylbenzene	QE	QE	QE	QE	QE	QE	QE	QE
Tetrachloroethene	2.62E-04[a]	1.31E-03[a]	QE	QE	QE	QE	QE	QE
Toluene	2.49E-04[b]	2.49E-03[b]	QE	QE	QE	QE	QE	QE
Xylene	2.09E-01[b]	2.59E-01[b]	QE	QE	QE	QE	QE	QE

Notes:

a	TRV based on an physiological effect.
b	TRV based on an reproductive effect.
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes, an alternative, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.
COPC	Chemical of potential concern
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint-qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-25: SITE 13 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Antimony	1.42E-03[a]	6.39E-01[a]	2.86E-02[b]	1.15E-01[b]	1.28E-02[b]	5.11E-02[b]	1.48E-03[b]	5.92E-03[b]
Arsenic	1.25E-02[a]	1.72E-01[a]	4.53E-02[b]	1.81E-01[b]	2.05E-02[b]	8.21E-02[b]	2.12E-03[b]	8.47E-03[b]
Lead	2.28E-03[a]	4.75E-01[b]	7.26E-01[b]	3.00E+02[b]	3.40E-01[b]	1.41E+02[b]	2.04E-02[b]	8.48E+00[b]
Lead alternate low TRV[c]	NA	NA	NA	1.14E+00[b]	NA	5.37E-01[b]	NA	3.23E-02[b]
Mercury	1.42E-03[a]	2.27E-02[a]	6.63E-01[b]	3.06E+00[b]	2.90E-01[b]	1.34E+00[b]	4.34E-02[b]	2.00E-01[b]
Selenium	3.77E-02[b]	9.10E-01[a]	8.37E-01[b]	3.38E+00[b]	3.73E-01[b]	1.51E+00[b]	4.65E-02[b]	1.88E-01[b]
Zinc	1.81E-02[b]	8.72E-01[a]	8.86E-01[a]	8.86E+00[a]	3.96E-01[a]	3.90E+00[a]	5.56E-02[a]	5.56E-01[a]
DDTt	1.48E-04[b]	2.97E-03[b]	3.49E-02[b]	7.46E+00[b]	1.53E-02[b]	3.26E+00[b]	3.18E-02[b]	6.83E+00[b]
Heptachlor epoxide	4.51E-05[b]	2.37E-03[b]	4.35E-03[b]	9.32E-01[b]	1.90E-03[b]	4.67E-01[b]	1.56E-03[b]	3.36E-01[b]
HMW PAHs	2.71E-04[a]	6.76E-03[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	8.41E-05[b]	2.53E-04[b]	QE	QE	QE	QE	QE	QE
Carbazole	QE	QE	QE	QE	QE	QE	QE	QE
Di-n-butylphthalate	5.20E-04[b]	1.74E-03[b]	1.18E+01[b]	1.18E+02[b]	5.12E+00[b]	5.12E+01[b]	2.26E+00[b]	2.26E+01[b]
n-Nitroso-diphenylamine	QE	QE	QE	QE	QE	QE	QE	QE
Pentachlorophenol	1.56E+01[a]	1.56E+02[a]	QE	QE	QE	QE	QE	QE
Acetone	1.87E-04[a]	9.33E-04[a]	QE	QE	QE	QE	QE	QE
Benzene	3.27E-05[b]	3.27E-04[b]	QE	QE	QE	QE	QE	QE
Carbon disulfide	QE	QE	QE	QE	QE	QE	QE	QE
Ethylbenzene	QE	QE	QE	QE	QE	QE	QE	QE
Toluene	4.56E-04[b]	4.56E-03[b]	QE	QE	QE	QE	QE	QE
Xylene	1.46E-01[b]	1.80E-01[b]	QE	QE	QE	QE	QE	QE

TABLE I-25: SITE 13 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Notes:

a	TRV based on an physiological effect.
b	TRV based on an reproductive effect.
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes, an alternative, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.
COPC	Chemical of potential concern
DDTt	Summed concentration of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint-qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-26: SITE 19 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Barium	7.86E-02[a]	3.01E-01[a]	4.24E-01[b]	8.50E-02[b]	1.89E-01[b]	3.79E-01[b]	1.08E-01[b]	2.16E-01[b]
Copper	1.15E-03[a]	2.69E-01[a]	1.01E-01[a]	2.52E+00[a]	4.62E-02[a]	1.15E+00[a]	9.76E-03[a]	2.43E-01[a]
Lead	1.12E-03[a]	2.34E-01[b]	3.58E-01[b]	1.48E+02[b]	1.67E-01[b]	6.96E+01[b]	4.06E-02[b]	1.68E+01[b]
Lead alternate low TRV[c]	NA	NA	NA	5.64E-01[b]	NA	2.65E-01[b]	NA	6.42E-02[b]
Zinc	3.90E-03[b]	1.88E-01[a]	1.91E-01[a]	1.91E+00[a]	8.39E-02[a]	8.39E-01[a]	5.91E-02[a]	5.91E-01[a]
4-Chloro-3-methylphenol	QE	QE	QE	QE	QE	QE	QE	QE
Bis(2-ethylhexyl)phthalate	2.67E-01[b]	2.67E+00[b]	6.01E+01[b]	6.01E+02[b]	2.61E+01[b]	2.61E+02[b]	2.06E+01[b]	2.06E+02[b]
Diethylphthalate	1.60E-05[b]	1.60E-04[b]	QE	QE	QE	QE	QE	QE
Di-n-butylphthalate	3.22E-02[b]	1.08E-01[b]	7.29E+02[b]	7.29E+03[b]	3.17E+02[b]	3.17E+03[b]	2.49E+02[b]	2.49E+03[b]
HMW PAHs	8.86E-05[a]	2.22E-03[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	3.29E-06[b]	9.89E-06[b]	QE	QE	QE	QE	QE	QE
n-Nitroso-diphenylamine	QE	QE	QE	QE	QE	QE	QE	QE
Pentachlorophenol	2.49E+01[a]	2.49E+02[a]	QE	QE	QE	QE	QE	QE
1,3-Dichlorobenzene	QE	QE	QE	QE	QE	QE	QE	QE
Acetone	1.27E-05[a]	6.34E-05[a]	QE	QE	QE	QE	QE	QE
Methylene chloride	9.47E-05[a]	8.09E-04[a]	QE	QE	QE	QE	QE	QE
Tetrachloroethene	1.05E-03[a]	5.25E-03[a]	QE	QE	QE	QE	QE	QE
Toluene	6.05E-04[b]	6.05E-03[b]	QE	QE	QE	QE	QE	QE
Trichloroethene	2.50E-04[a]	2.50E-03[a]	QE	QE	QE	QE	QE	QE
Xylene	1.51E-02[b]	1.86E-02[b]	QE	QE	QE	QE	QE	QE

Notes:

a TRV based on an physiological effect.

b TRV based on an reproductive effect.

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes, an alternative, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

COPC	Chemical of potential concern	NA	Not applicable
HMW	High molecular weight	PAH	Polynuclear aromatic hydrocarbon
LMW	Low molecular weight	QE	No TRV developed for Ecological COPC and endpoint-qualitative evaluation only
mg/kg-day	Milligram per kilogram per day	TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-27: SITE 22 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Barium	5.05E-02[a]	1.93E-01[a]	2.72E-01[b]	5.47E-01[b]	1.22E-01[b]	2.44E-01[b]	6.02E-04[b]	1.21E-03[b]
Copper	5.18E-04[a]	1.21E-01[a]	4.56E-02[a]	1.13E+00[a]	2.09E-02[a]	5.19E-01[a]	2.06E-04[a]	5.11E-03[a]
Lead	4.86E-02[a]	1.01E+01[b]	1.55E+01[b]	6.40E+03[b]	7.24E+00[b]	3.01E+03[b]	1.06E-01[b]	4.39E+01[b]
Lead alternate low TRV[c]	NA	NA	NA	2.44E+01[b]	NA	1.14E+01[b]	NA	1.67E-01[b]
Selenium	8.53E-03[b]	2.26E-01[a]	1.89E-01[b]	7.65E-01[b]	8.45E-02[b]	3.42E-01[b]	4.97E-04[b]	2.01E-03[b]
Zinc	3.33E-03[b]	1.60E-01[a]	1.63E-01[a]	1.63E+00[a]	7.16E-02[a]	7.16E-01[a]	1.73E-04[a]	1.73E-03[a]
alpha-Chlordane	1.47E-01[b]	2.95E-01[b]	1.78E+01[b]	3.82E+03[b]	7.76E+00[b]	1.66E+03[b]	6.35E-05[b]	1.36E-02[b]
gamma-Chlordane	1.20E-01[b]	2.40E-01[b]	1.45E+01[b]	3.08E+03[b]	6.32E+00[b]	1.35E+03[b]	6.17E-05[b]	1.32E-02[b]
DDTt	2.41E-04[b]	4.83E-03[b]	5.67E-02[b]	1.20E+01[b]	2.48E-02[b]	5.30E+00[b]	3.05E-03[b]	6.55E-01[b]
HMW PAHs	1.19E-04[a]	2.97E-03[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	4.75E-05[b]	1.43E-04[b]	QE	QE	QE	QE	QE	QE
Carbazole	QE	QE	QE	QE	QE	QE	QE	QE
4-Methyl-2-pentanone	7.09E-03[a]	7.09E-02[a]	QE	QE	QE	QE	QE	QE
Benzene	4.91E-06[b]	4.91E-05[b]	QE	QE	QE	QE	QE	QE
Ethylbenzene	QE	QE	QE	QE	QE	QE	QE	QE
Toluene	1.76E-02[b]	1.76E-01[b]	QE	QE	QE	QE	QE	QE
Xylene	2.27E+00[b]	2.81E+00[b]	QE	QE	QE	QE	QE	QE

TABLE I-27: SITE 22 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

Notes:

a	TRV based on an physiological effect.
b	TRV based on an reproductive effect.
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes, an alternative, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

COPC	Chemical of potential concern
DDTt	Summed concentration of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint-qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE I-28: SITE 23 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 9, 13, 19, 22, and 23, Alameda Point, Alameda, California

	MEASUREMENT ENDPOINTS							
	Reproductive or Physiological Impacts to the California Ground Squirrel		Reproductive or Physiological Impacts to the Alameda Song Sparrow		Reproductive or Physiological Impacts to the American Robin		Reproductive or Physiological Impacts to the Red-tailed Hawk	
	HAZARD QUOTIENT							
Ecological COPC	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**	**High TRV**	**Low TRV**
Antimony	1.83E-03[a]	8.23E-01[a]	3.69E-02[b]	1.48E-01[b]	1.64E-02[b]	6.58E-02[b]	1.91E-03[b]	7.62E-03[b]
Barium	5.58E-02[a]	2.14E-01[a]	3.01E-01[b]	6.04E-01[b]	1.34E-01[b]	2.69E-01[b]	1.59E-02[b]	3.18E-02[b]
Cadmium	2.79E-02[b]	1.23E+00[b]	7.33E-02[a]	1.50E+01[a]	3.20E-02[a]	6.57E+00[a]	4.59E-03[a]	9.35E-01[a]
Lead	5.84E-04[a]	1.22E-01[b]	1.86E-01[b]	7.70E+01[b]	8.72E-02[b]	3.63E+01[b]	5.24E-03[b]	2.18E+00[b]
Lead alternate low TRV[c]	NA	NA	NA	2.94E-01[b]	NA	1.38E-01[b]	NA	8.29E-03[b]
Total PCB	1.55E-03[b]	5.58E-03[a]	3.27E-02[b]	3.97E-01[b]	1.43E-02[b]	1.74E-01[b]	2.98E-02[b]	3.61E-01[b]
DDTt	1.67E-05[b]	3.34E-04[b]	3.92E-03[b]	8.40E-01[b]	1.72E-03[b]	3.67E-01[b]	3.58E-03[b]	7.68E-01[b]
HMW PAHs	1.91E-04[a]	4.79E-03[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	1.03E-05[b]	3.09E-05[b]	QE	QE	QE	QE	QE	QE
n-Nitroso-diphenylamine	QE	QE	QE	QE	QE	QE	QE	QE
Toluene	3.11E-04[b]	3.11E-03[b]	QE	QE	QE	QE	QE	QE

Notes:

a	TRV based on an physiological effect.
b	TRV based on an reproductive effect.
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes, an alternative, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.
COPC	Chemical of potential concern
DDTt	Summed concentration of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint-qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

ATTACHMENT I1
ECOTOXICOLOGICAL PROFILES FOR CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

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ACRONYMS AND ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
BCF	Bioconcentration factors
Ca	Calcium
COPEC	Chemical of potential ecological concern
DCE	Dichloroethene
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
DHHS	Department of Health and Himan Services
DNA	Deoxyribonucleic acid
EPA	U.S. Environmental Protection Agency
g/mL	Grams per milliliter
GTF	Glucose tolerance factor
HSDB	Hazardous Substances Database
IARC	International Agency Research Cancer
ICA	International Copper Association
K	Potassium
Koc	Organic carbon/water partition coefficients
Kow	Octanol-Water Coefficient
LC	Lethal concentration
LCLo	Lowest published lethal concentration
LD50	Lethal dose of 50 percent
LOEC	Lowest observed effect concentration
Mg	Magnesium
mg/kg	Milligram per kilogram
mg/kg/day	Milligram per kilogram per day
mg/L	Milligram per liter
mg/m^3	Milligram per cubic meter
mg/mL	Milligram per milliliter
mL/g	Milliliter per gram

Na-K	Sodium-potassium
NAS	National Academy of Sciences
NCRR	National Center for Research Resources
NLM	U.S. National Library of Medicine
NOAEL	No observed adverse effect level
NRCC	National Research Council Canada
NTP	National Toxicology Program
P	Phosphorous
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Perchloroethylene
PCDD	Polychlorodibenzodioxin
PCDF	Polychlorodibenzofuran
ppt	Parts per trillion
PRG	Preliminary remediation goal
ppm	Parts per million
redox	Oxidation-reduction
RBC	Risk-based concentration
RfD	Reference dose
SRC	Southeastern Research Center
SVOC	Semivolatile organic compund
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TCE	Trichloroethylene
VOC	Volatile organic compound
WHO	World Health Organization

1.0 INTRODUCTION

The following sections present identified literature data on toxicological effects of chemicals of potential ecological concern (COPEC) identified at Alameda Point, Alameda, California (Alameda Point). Section 2.0 presents data on metals; Section 3.0 presents data on chlorinated pesticides; Section 4.0 presents data on polychlorinated biphenyls (PCB); Section 5.0 presents data on polynuclear aromatic hydrocarbons (PAH); Section 6.0 presents data on semivolatile organic compounds (SVOC); Section 7.0 presents data on volatile organic compounds (VOC); and Section 8.0 presents the references used to prepare this document.

Bioconcentration in this document is defined as the net accumulation of a substance by an organism as a result of uptake from an aqueous solution. Bioaccumulation is defined as the net accumulation of a substance by an organism as a result of uptake from all environmental sources, including food and water, which are ingested. The amount of a substance that is bioaccumulated in an organism also could be defined as the body burden of the substance in an organism. Biomagnification is defined as the sequential increase in concentration of a chemical from one trophic level to the next.

2.0 METALS

The following sections present data on ecotoxicological effects of various metals identified as COPECs at Alameda Point.

2.1 ANTIMONY

The analysis of tissue samples from lower trophic levels (invertebrates and small mammals) in a food chain suggests that biomagnification did not occur and that mobility of antimony in food chains is low (Ainsworth 1988). This theory is further strengthened by an investigation found that antimony concentrations in small mammals resulting from dietary intake were "very low in all experiments in comparison to the antimony concentrations in the diet" (Ainsworth and Others 1991). Consequently, food chain transfer of antimony to upper trophic-level consumers appears to be negligible.

The toxic action mechanism of metals and arsenic lies in their ability to bind to thiol groups of biological molecules, destroying their function (Balazs and Others 1986). Antimony occurs in the same column of the periodic table of the elements as arsenic; antimony participates in bonding, similar to arsenic. Compared to arsenic, antimony has a lower affinity for bonding to sulfur-containing proteins and for causing protein-DNA cross links (Gebel 1997). Consequently, antimony should possess a lower toxicity compared to arsenic. Therefore, the screening-level ecological risk assessment could use the arsenic toxicity reference value (TRV) as a conservative approach to estimating risk.

2.1.1 Plants

Antimony is considered to be a nonessential metal and is easily taken up by plants if available in soil in soluble forms (Kabata-Pendias and Pendias 1984). The only information found on phytotoxicity was a secondary reference noting undefined, qualitative phytotoxic effects on plants grown in surface soil (Kabata-Pendias and Pendias 1984).

2.1.2 Invertebrates

No information was identified on the effects of antimony on invertebrates.

2.1.3 Amphibians and Reptiles

No information was identified on the effects of antimony on amphibians and reptiles.

2.1.4 Fish and Aquatic Organisms

No information was identified on the effects of antimony on fish and aquatic organisms.

2.1.5 Birds

No information was identified on the effects of antimony on birds.

2.1.6 Mammals

No information was identified on the effects of antimony on mammals.

2.2 ARSENIC

Arsenic is a naturally occurring element that is widely distributed in the environment and is used in metallurgy to harden copper, lead, and alloys and is used in the manufacture of certain types of glass. Historically, some forms of arsenic have been used as pesticides.

Arsenic is present in the environment in both inorganic and organic forms. The bioavailability and toxicity of arsenic are dependent on the chemical and physical forms of arsenic, the exposure route, and the species of concern. Inorganic arsenic is present in the environment in two major forms, arsenate, and arsenite. In the environment, arsenate is more abundant and bioaccumulates more rapidly than arsenite; however, arsenite is the more toxic form (Sadiq 1992). Any environmental conditions that promote an increase in arsenite concentrations will increase the toxicity of arsenic in the environment. The redox environment is the most important environmental parameter that affects the bioavailability of arsenic. Reduced conditions in the environment cause the ratio of arsenite to arsenate to increase, which increases the toxicity of arsenic in the environment. In addition to redox, the pH of the aquatic environment influences

arsenic toxicity. As the pH of water increases, arsenic toxicity decreases as more arsenate is produced (Sadiq 1992).

Marine organisms accumulate more arsenic than freshwater organisms. Arsenate is more readily bioaccumulated than arsenite (Sadiq 1992). Bioconcentration factors (BCF) experimentally determined for arsenic appear to be relatively low. Methylated species of arsenic are transferred efficiently in the food chain (Eisler 1988a); however, it does not appear to be biomagnified through the food chain (Eisler 1988a; Callahan and Others 1979; U.S. Environmental Protection Agency [EPA] 1982a, 1983e, as cited in Agency for Toxic Substances and Disease Registry [ATSDR] 1993a).

2.2.1 Plants

Terrestrial plants may accumulate arsenic by root uptake from the soil or by absorption of airborne arsenic deposited on the leaves. Certain species of plants may accumulate substantial levels of arsenic (Shaw 1990). Soil concentrations of arsenic have been known to reduce crop plant yields (Eisler 1988a). If the roots of the plant absorb excess arsenic, the plant will stop growing and developing (Eisler 1988a). The chemical form of arsenic absorbed by plants will determine the type of toxic effect plants will express. Effects can range from inhibition of light activation, wilting, chlorosis, browning, dehydration, and death (Eisler 1988a).

Marine phytoplankton have the ability to bioconcentrate inorganic arsenic to high levels, then chemically transform arsenic by methylation. Methylated species are efficiently transferred in the food chain (Eisler 1988a); however, arsenic does not appear to be biomagnified through the food chain (Eisler 1988a; Callahan and Others 1979; EPA 1982a, 1983e, as cited in ATSDR 1993a).

2.2.2 Invertebrates

Arsenic has been used as a pesticide in the past. Arsenic may reduce growth and metabolism of soil microbiota, may reduce numbers of bacteria and protozoa, and may adversely affect earthworms by reducing their numbers in the soil (National Research Council Canada [NRCC] 1978, as cited in Eisler 1988a).

2.2.3 Amphibians and Reptiles

Very little information was available on the effects of arsenic on amphibians and reptiles. One report states, however, that developing toad embryos exposed to arsenic concentrations observed that 50 percent of developing embryos died or were malformed (Eisler 1988a).

2.2.4 Fish and Aquatic Organisms

Arsenic can produce both carcinogenic and mutagenic effects in aquatic organisms (Eisler 1988a). Toxic effects of arsenic in fish include impaired behavior, reduced growth, lack

of appetite, and failure to metabolize food (Eisler 1988a). The chemical form of arsenic, the type of organism, and the organism's life stage all influence the organism's susceptibility to arsenic poisoning. In general, the earlier life stages and smaller organisms are more sensitive to arsenic concentrations (Sadiq 1992).

In addition to the stage of development of an organism, the toxic effect of arsenic is influenced by the type of organism. Marine organisms accumulate more arsenic than freshwater organisms. Bioaccumulation of arsenic in marine organisms is influenced by the amount of arsenic in seawater and is further influenced by the marine organism's feeding habits. Bottom feeders appear to be more sensitive to arsenic concentrations than other types of fish (Sadiq 1992). This is because bottom feeders filter the water column and ingest arsenic-containing particulate matter for food. As a result, bottom feeders, such as mollusks, accumulate more arsenic in their soft tissue than fish (Sadiq 1992). Fish, on the other hand, do not have to filter the water column for food and as a result, the main route of uptake involves diffusion of dissolved residual around the gill membrane (Sadiq 1992).

2.2.5 Birds

Some species of birds are more sensitive to arsenic exposure, while others appear to be more tolerant of arsenic exposure (Eisler 1988a). The acute oral exposure of inorganic arsenic destroys the blood vessel lining in the gut, which can result in lower blood pressure (Eisler 1988a). The acute, oral exposure of arsenite in birds was observed to cause hepatocyte damage by arsenic inhibition of the sodium pump in cells (Eisler 1988a). Acute effects of arsenite in birds include muscular incoordination, debility, slowness, spasmodic movement, falling, hyperactivity, fluffed feathers, drooped eyelids, huddled position, unkempt appearance, loss of righting reflex, immobility, and seizures (Eisler 1988a). Chronic effects include systemic, growth, behavioral, and reproductive problems (Stanley and Others 1994; Whitworth and Others 1991; Camardese and Others 1990).

2.2.6 Mammals

Arsenic is a carcinogen, teratogen, and a possible mutagen. Adverse effects produced by arsenic are highly dose-dependent. At low levels, arsenic may be an essential nutrient and substitute for phosphorous in biochemical reactions (ATSDR 1993a). At high levels, however, arsenic is recognized as an effective poison. Chronic exposure to low levels of arsenic can produce malaise and fatigue, gastrointestinal distress, anemia and basophilic stippling, neuropathy, and skin lesions, which can develop into skin cancer. Water-soluble arsenic is absorbed efficiently from the gastrointestinal tract and circulated throughout the body. Trivalent arsenic is detoxified in the liver by conversion to methylarsenic acid and dimethylarsenic acid, which are the principal forms excreted in the urine. The body burden of arsenic can reach considerable levels, because it can be sequestered in nails, hair, bones, teeth, skin, liver, kidneys, and lungs (ATSDR 1993a). In mammalian species, arsenic is a teratogen that can pass the placental barrier and produce fetal death and malformations, consisting of exencephaly, eye defects, and renal and gonadal agenesis (Eisler 1988a; ATSDR 1993a; Domingo 1994).

2.3 BARIUM

Barium is an alkaline earth metal that is widely distributed in the environment and is used to produce alloys, paints, soap, paper, rubber, ceramics, and glass. Barium is naturally present in plant and animal tissue and may be an essential element in trace amounts.

The solubility of barium compounds influences adsorption and toxicity. Soluble barium compounds are more easily adsorbed by organisms compared to their lower soluble counterparts and may be accumulated in the skeleton (Amdur and Others 1991).

Barium is found mainly in inorganic complexes and is stable in the +2 valence state. Environmental conditions in soil, such as pH, Eh, cation exchange capacity, and calcium carbonate levels, will affect the movement of barium in the environment (ATSDR 1990a). In an aquatic environment, barium will most likely precipitate out of solution as a barium sulfate or barium carbonate or the barium ion will adsorb to particulate matter (ATSDR 1990a).

Barium can bioaccumulate in terrestrial and aquatic organisms (ATSDR 1990a), and marine plants can bioconcentrate barium by a factor of 1,000 times the concentration found in water. Marine animals, plankton, and brown algae have reported BCFs of 100, 120, and 260, respectively (ATSDR 1990a), and terrestrial plants bioconcentrate low levels of barium from the soil (ATSDR 1990a).

2.3.1 Plants

Some plants may accumulate barium from soil, for example, Brazil nuts can accumulate high levels of barium (Amdur and Others 1991; ATSDR 1990a).

Plants, probably in a manner similar to calcium and magnesium, easily take up soluble forms of barium, but barium is not readily translocated from roots to shoots (Peterson and Girling 1981). Barium has been reported to inhibit seed germination, enzyme activation, and uptake of calcium and magnesium by roots. Common symptoms are brown, retarded roots and stunted foliage (Romney and Childress 1965).

2.3.2 Invertebrates

No information was identified on the effects of barium on invertebrates.

2.3.3 Amphibians and Reptiles

No information was identified on the effects of barium on amphibians and reptiles.

2.3.4 Fish and Aquatic Organisms

Little information was identified on the effects of barium on fish and aquatic organisms. In the aquatic environment, the route for the transport of metals into fish is through the gill, gut, or skin (Pulsford and Others 1992). In one study, however, barium was observed to inhibit chlorine absorption in the intestine of winter flounder (Chamey and Taglietta 1992).

2.3.5 Birds

No information was identified on the effects of barium on birds.

2.3.6 Mammals

In addition to skeletal deposition, ingestion of barium salts can result in gastrointestinal distress, muscular paralysis, lowered pulse rate, muscle stimulation, and irregular cardiac contractions (Amdur and Others 1991). Rats exposed to barium concentrations in their diet showed toxic responses. In both acute and chronic oral exposure scenarios, increased blood pressure was observed in exposed rat populations (ATSDR 1990a). In other acute exposure studies, gastrointestinal effects and respiratory weakness were observed in exposed populations (ATSDR 1990a). Ovary weight and ovary-to-brain weight ratios both decreased as a result of acute, oral exposure to barium in rat populations (Borzelleca and Other 1988, as cited in ATSDR 1990a). Published data concerning developmental, reproductive, or carcinogenic effects of barium on mammalian species are very limited (ATSDR 1990a).

2.4 BERYLLIUM

In most types of soil, beryllium is expected to be tightly sorbed onto clay particles (ATSDR 1993b). Beryllium is expected to have limited mobility in soil, although its mobility may increase as a result of formation of soluble hydroxide complexes in soils of higher pH (Callahan and Others 1979, as cited in ATSDR 1993b).

In aquatic environments, most beryllium is usually present sorbed to suspended matter or to sediment, rather than in a dissolved form in the water column. Beryllium may precipitate into sediment as a result of a formation of insoluble complexes and usually is sorbed onto clay particles in sediment. A high percentage of beryllium is expected to be immobile in water as a result of this association with sediment particles, although at a high pH, the formation of water-soluble complexes with hydroxide ions may increase the solubility and mobility of beryllium (Callahan and Others 1979, as cited in ATSDR 1993b).

Bioconcentration of beryllium in fish is not likely because of the low absorption of beryllium from the water column by aquatic animals. Significant biomagnification of beryllium within the food chain has not been observed (ATSDR 1993b).

2.4.1 Plants

No information was identified on the effects of beryllium on plants.

2.4.2 Invertebrates

No information was identified on the effects of beryllium on invertebrates.

2.4.3 Amphibians and Reptiles

Very little information was available on the effects of beryllium on amphibians and reptiles. However, in a journal article, Jagoe and others (1993) suggest that the toxic effects of beryllium are similar to those by aluminum. In general, metals induce their toxic effects in the gill surface (skin) of amphibians. Reduced survival of adult populations of frogs and salamanders has been observed when the study organisms were chronically exposed to aluminum in the test water (Horne and Dunson 1995). In addition, aluminum exposure was shown to cause a significant increase in embryonic mortality (Horne and Dunson 1995).

2.4.4 Fish and Aquatic Organisms

Very little information was available on the effects of beryllium on fish and aquatic organisms. However, in a journal article, Jagoe and Others (1993) suggest that the toxic effects of beryllium are similar to those produced by aluminum. In general, metals induce their toxic effects in the gill surface of aquatic organisms. Like other metals, beryllium affects the physiological processes occurring at the gill surface, including ion regulation and gas exchange (Jagoe and Others 1993). At low concentrations, beryllium causes gill damage. At higher concentrations, effects include development of chloride cell apical crypts, increased mucus production, microridge loss, epithelial hyperplasia, and fusions of primary lamellae (Jagoe and Others 1993). Beryllium water concentrations were found to cause gill abnormalities and damage to the fish species studied (Jagoe and Others 1993).

2.4.5 Birds

No information was identified on the effects of beryllium on birds.

2.4.6 Mammals

The major toxicological effects of beryllium occur when the compound is inhaled from the air and beryllium is then deposited in the lungs of mammals. The mammals that were studied include mice, rats, rabbits, and monkeys. The toxicological effects of beryllium in the lung include pneumonitis, hypersensitivity, and chronic granulomatous pulmonary disease (Amdur and Others 1991).

2.5 CADMIUM

Cadmium is a naturally occurring element. It is used in the production of nickel-cadmium batteries, metal plating, pigments, plastics, synthetics, and alloys. Cadmium in soils may leach into water, especially under acidic conditions (Callahan and Others 1979; Elinder 1985, as cited in ATSDR 1999a), and cadmium-containing soil particles may be distributed into the air or eroded into water (ATSDR 1999a). In the aquatic environment, the bioavailability of cadmium depends on such factors as pH, redox potential, water hardness, and the presence of other complexing agents. The most bioavailable form of cadmium is the Cd^{2+} ion. An increase in temperature or salinity will increase the bioavailable form of cadmium and as a result, increase the bioaccumulation and toxicity of cadmium to aquatic organisms. A decrease in pH will increase the amount of cadmium ions in water and increase bioaccumulation in aquatic organisms (Sadiq 1992).

Cadmium has no essential biological function and is highly toxic to plants and animals. It is a carcinogen and teratogen and a suspected mutagen. Cadmium is associated with severe sublethal effects on reproduction at relatively low environmental concentrations (Eisler 1985a). Cadmium is bioconcentrated and bioaccumulated easily by aquatic and terrestrial organisms at all trophic levels (Eisler 1985a). Bioconcentration in fish depends on the pH and the organic content of the water (John and Others 1987, as cited in ATSDR 1999a). Although some data suggest that lower trophic levels display biomagnification of cadmium, available data, particularly for animals at the top of the food chain, are inconclusive (Beyer and Others 1996; Gochfield and Burger 1982, as cited in ATSDR 1999a).

2.5.1 Plants

Cadmium is known to be toxic to plants at much lower soil concentrations than other heavy metals. Plants more readily take up cadmium than other metals (EPA 1981) and as a result, some plants can accumulate high levels of cadmium in developing leaflets (Morishita and Boratynski 1992).

2.5.2 Invertebrates

Very little information was available concerning the effects of cadmium on invertebrates. Some insects can accumulate large quantities of cadmium without observable adverse effects (Jamil and Hussain 1992). Certain insects, such as caddis flies, can accumulate high levels of cadmium in their gill tissue (Sadiq 1992).

2.5.3 Amphibians and Reptiles

No information was identified concerning the effects of cadmium on amphibians and reptiles.

2.5.4 Fish and Aquatic Organisms

Marine organisms appear more resistant to cadmium than are freshwater organisms. Cadmium accumulates in the gill tissue of mussels, the digestive glands of scallops, and the liver and kidney of bony fish and sharks (Loring and Prosi 1986, Bryan and Gibbs 1973, and Grimanis and Others 1978, as cited in Sadiq 1992). In general, however, cadmium accumulates in the liver and kidney of fish (Sindayigaya and Others 1994; Sadiq 1992). Cadmium has been shown to be highly toxic in aquatic environments and has been implicated as the cause of deleterious effects on fish and aquatic organisms, including increased mortality, respiratory disruptions, altered enzyme levels, abnormal muscular contractions, reduced growth, and reduced reproduction (Eisler 1985a). Cadmium concentrations in water caused damage to the reproductive organs of fish, a decrease in the survival rate of fish embryos, and a reduction of growth rates of fry (EPA 1976). Crustaceans appear to be more sensitive to cadmium concentrations, compared with fish and mollusks (Sadiq 1992), and younger stages of aquatic life appear to be more sensitive to cadmium than adults (Sadiq 1992).

2.5.5 Birds

Sublethal effects in birds include growth retardation, nephrotoxicity, anemia, damage to the testicles and absorptive epithelium of the duodenum, reduced egg production, and effects on calcium absorption (Scheuhammer 1987).

2.5.6 Mammals

In mammalian species, cadmium concentrates in the liver and kidneys and is excreted in the urine at a very slow rate. The acute toxic effects of cadmium given orally include nausea, vomiting, salivation, diarrhea, and abdominal cramps. Immediate death may be caused by shock and dehydration; renal and cardiopulmonary failure may cause death a week or so after ingestion. Chronic toxicity effects of cadmium given orally to rats are decreased motor skills, peripheral neuropathy, weakness, and muscle atrophy. When inhaled, cadmium is a carcinogen that can produce tumors in the lung, trachea, and bronchus.

Cadmium is a known developmental toxin causing teratogenic and mutagenic effects. Parental doses of cadmium have been shown to decrease testosterone and produce adverse effects on the testes and prostate of test animals. Prenatal exposure to cadmium has fetotoxic effects, such as reduced fetal weights (ATSDR 1999a), and can cause adverse effects during development of the lung, brain, testes, eye, and palate (Domingo 1994). It is believed that small amounts of cadmium could affect embryonic deoxyribonucleic acid (DNA) and protein synthesis (Domingo 1994).

2.6 CHROMIUM

Chromium is a metal that is listed by EPA as one of 129 priority pollutants (Keith and Telliard 1979), and is considered to be one of the 14 most noxious heavy metals (Jenkins 1981).

Chromium also is listed among the 25 hazardous substances thought to pose the most significant potential threat to human health at priority Superfund sites (Department of Health and Human Services and EPA 1987). Chromium received special attention in studies of subsurface agricultural irrigation drainage waters of the San Joaquin Valley of California, because it was determined to be a "substance of definite concern" (Moore and Others 1990).

Chromium can exist in oxidation states ranging from -2 to +6, but is most frequently found in the environment in the trivalent and hexavalent oxidation states (Eisler 1986a). The trivalent and hexavalent forms are the most important, because the +2, +4, and +5 forms are unstable and are rapidly converted to +3, which is oxidized to +6 (Eisler 1986a). Chromium compounds are stable in the trivalent state and occur in nature in this state in ores such as ferrochromite. The hexavalent state is the second most stable state. Although hexavalent chromium rarely occurs naturally, it is produced from anthropogenic sources (ATSDR 1993c). Most of the hexavalent chromium in the environment is a result of domestic and industrial emissions. Interaction of hexavalent chromic oxide, dichromate, or chromate compounds with organic compounds can result in reduction to the comparatively less toxic trivalent form (Eisler 1986a). Hexavalent chromium is often in the form of chromates, dichromates, or chromic acid; most have a yellow color, and all are toxic (Grolier Electronic Publishing 1988; Meyers 1990). Both trivalent and hexavalent chromium occur as dissolved chromium (Hem 1989).

EPA regards all chromium compounds as toxic, although the most toxic and carcinogenic chromium compounds tend to be the strong oxidizing agents, with an oxidation state of +6 (Meyers 1990). Hexavalent chromium compounds tend to be strong oxidizers and are associated with cancer risk and kidney damage (Meyers 1990). Divalent and trivalent compounds of chromium often (not always) have a lower toxicity or biological hazard associated with them (Moore and Others 1990; Patnaik 1992). The hazards associated with chromium are highly related to chemical speciation (Long and Morgan 1990; Meyers 1990).

The toxic mechanism of action differs for hexavalent chromium as compared to trivalent chromium (Moore and Others 1990). Hexavalent chromium causes cellular damage through its role as a strong oxidizing agent, whereas trivalent chromium can inhibit various enzyme systems or react with organic molecules (Moore and Others 1990). Strong oxidizing agents can cause damage to DNA and many other tissue structures.

As in the case of other metals, the overall hazard presented by chromium may be partly related to the solubility of the specific form of chromium (Meyers 1990). Substances having a low solubility in water often are not as easily absorbed through the gastrointestinal tract, as are those substances with higher solubilities (Meyers 1990). Some hexavalent chromium compounds tend to be more toxic than the trivalent compounds, not only because the oxidizing potential is high, but because some of the hexavalent forms more easily penetrate biological membranes (Eisler 1986a). Trivalent chromium has low toxicity because of poor membrane permeability and noncorrosivity, while hexavalent chromium is highly toxic, because it possesses strong oxidizing characteristics and readily pushes through membranes (NRCC 1977; Hazardous Substances Database [HSDB] 1999).

Both trivalent and hexavalent chromium are significant from the standpoint of potential impacts to fish and wildlife (Eisler 1986a; Rompala and Others 1984). Most of the notoriety associated with chromium as a potentially harmful environmental contaminant, however, is caused by the toxic, carcinogenic, oxidizing agent and reproductive risk hazards of hexavalent chromium compounds (HSDB 1999; Patnaik 1992; Manahan 1992; Meyers 1990; Jones 1990).

Little is known about the relationship between concentrations of total chromium in the environment and biological effects on the organisms living there (Eisler 1986a). Depending on the physical and chemical state of the chromium, the same elemental concentration has a wide variety of mobilities and reactivates and therefore produces different effects (Eisler 1986a).

Certain hexavalent chromium compounds, when administered through inhalation at high doses, have the potential to induce lung tumors in humans and experimental animals (Jones 1990). However, at low levels of exposure, hexavalent chromium ions are reduced in epithelial lining fluid of the respiratory tract, blood, and other fluids, before the hexavalent ions can interact with DNA, unless the dose is sufficient to overwhelm the body's reduction capacity (Jones 1990).

Small amounts of trivalent chromium are considered to be essential in animals and humans (HSDB 1999). Trivalent chromium is an essential human and animal nutrient at levels of 50 to 200 micrograms per day (Jones 1990).

Trivalent chromium is the only form of chromium known to play a beneficial, biological role. The form must be supplied as a stable complex, because trivalent chromium exists as a relatively insoluble macromolecule at normal blood pH. The known biological effect of trivalent chromium is the maintenance of normal glucose tolerance (Moore and Others 1990).

Trivalent chromium is an essential element for fungi and vertebrates in general (HSDB 1999; Manahan 1992). Trivalent chromium is considered to be essential for glucose and lipid metabolism in mammals, and a deficiency of it produces symptoms of diabetes mellitus (Manahan 1992; HSDB 1999). Trivalent chromium is essential for the maintenance of normal glucose tolerance in animals and humans, and the factor or group of factors containing trivalent chromium (called glucose tolerance factor or "GTF") has been suggested to be responsible for this favorable action of chromium (HSDB 1999).

2.6.1 Plants

The greatest chromium hazard to plants is posed in acidic, sandy soil with low organic content (HSDB 1999). In plants, chromium interferes with uptake translocation, and accumulation by plant tops of calcium, potassium, magnesium, phosphorus, boron, and copper aggravates iron deficiency chlorosis by interfering with iron metabolism (HSDB 1999).

Chromium is not an essential element in plants. The hexavalent form is more soluble and available to plants than the trivalent form and is considered to be the more toxic form. In soils within a normal Eh and pH range, hexavalent chromium, a strong oxidant, is likely to be reduced

to the less-available trivalent chromium, although trivalent chromium may be oxidized to hexavalent chromium in the presence of oxidized manganese (Bartlett and James 1979). In nutrient solution, however, both trivalent and hexavalent chromium are taken up about equally by plants and are toxic to plants (McGrath 1982). Hexavalent chromium is more mobile in plants than trivalent chromium, but translocation varies with plant type. After plant uptake, chromium generally remains in the roots because of the many binding sites in the cell wall, particularly the trivalent chromium ions (Smith and Others 1989). Symptoms of toxicity include stunted growth, poorly developed roots, and leaf curling.

2.6.2 Invertebrates

Little information was identified on the effects of chromium on invertebrates. Polychaete worms, clams, crabs, and oysters have been shown to take up chromium; excess chromium in these species leads to decreased weight gain, increased oxygen consumption, impaired reproduction, and increased hematocrit (Moore and Others 1990).

2.6.3 Amphibians and Reptiles

No information was identified on the effects of chromium on amphibians and reptiles.

2.6.4 Fish and Aquatic Organisms

Chromium toxicity to aquatic biota is influenced significantly by abiotic variables such as water hardness, temperature, pH, and salinity. Biological factors, such as species, life stage, and potential differences in sensitivities of local populations, influence the susceptibility of the organisms to chromium toxicity.

It has been reported that freshwater fish seem to be relatively tolerant of chromium (EPA 1988; Flora and Others 1984).

Rainbow trout exposed to excessive hexavalent chromium developed severe gill damage, precipitated by hypertrophy and hyperplasis (Moore and Others 1990). Toxicity in aquatic species is known to be affected by water hardness, pH, temperature, species, and organism size (Moore and Others 1990). Hard water conditions promote the toxicity of hexavalent chromium (Moore and Others 1990).

2.6.5 Birds

No information was identified on the effects of chromium on birds.

2.6.6 Mammals

In mammals, trivalent chromium is an essential nutrient. Adequate trivalent chromium nutrition improves growth and longevity and, along with insulin, helps to maintain correct glucose, lipid, and protein metabolism (NRCC 1976; HSDB 1999). The biologically active form of chromium, called the GTF, is a complex of chromium, nicotinic acid, and possibly, amino acids (ATSDR 1993c).

Chromium is considered to be a significant potential threat to human health. However, in trace amounts, chromium is considered to be one of the least toxic elements, because normal stomach pH converts hexavalent chromium to trivalent chromium (Moore and Others 1990). One to two hundred times the normal, total body load of chromium usually can be tolerated in mammals without evidence of negative effects (Moore and Others 1990). The therapeutic dose to toxic dose ratio for trivalent chromium in rats has been calculated at about 1:10,000 (Moore and Others 1990).

Studies with mammals have suggested that trivalent chromium is not well absorbed from the intestinal tract. For example, rat studies have indicated that only a few percent of an oral chromium +3 dose crosses the intestinal wall, regardless of previous dietary history. However, in studies of small intestinal absorption in black ducks (*Anas rubripes*), Eastin and Others (Eisler1986a), measured equal rates of absorption of trivalent hexavalent chromium. Also, it was noted that the ionic form of chromium influenced the degree of its absorption, with anionic chromium complexes being better absorbed (Moore and Others 1990).

Although trivalent chromium is an essential nutrient, exposure to high levels through inhalation, ingestion, or dermal contact may cause some health effects (ATSDR 1993c). In general, the toxicity of trivalent chromium to mammals is low, because membrane permeability is poor and it is noncorrosive (Eisler 1986a). However, chromium deficiency is unknown, and too much chromium can be harmful to humans (American Medical Association 1989).

2.7 COPPER

Copper is a naturally occurring element that is widely distributed in the environment. Copper is the main component of alloys, which include brass, bronze, and gun metal. Copper is an essential trace mineral nutrient and a toxicant (ATSDR 1990b).

Copper is very mobile under oxidizing and acidic conditions and immobile in organic-rich and reducing environments. Adsorption increases with pH and higher organic matter content. In aquatic systems, copper binds primarily to organic matter and forms complexes with both organic and inorganic ligands (mainly with calcium carbonate) that settle out in sediments (Kirk-Othmer 1965). Under normal pH and redox conditions, copper tends to be present in sediments in the form of organic complexes and coprecipitates with iron and manganese oxides and cupric carbonate complexes.

Copper is an essential nutrient and is homeostatically controlled; therefore, biomagnification is not a significant fate process for copper. Bioaccumulated copper is stored in the liver, kidney, bone marrow, and hair (Talmage and Walton 1991). Fish can bioconcentrate copper, with BCFs ranging from the tens to the hundreds. Mollusks have BCFs for copper that range up to 30,000 (Perwack and Others 1980; Chapman and Others 1968; Raymont 1972).

2.7.1 Plants

Based on yield reductions of 14 to 28 percent in agronomic and grassland plants, 100 milligrams per kilogram (mg/kg) of total copper in the soil is considered to be a threshold concentration for toxicity to plants (International Copper Association [ICA] 1992).

Copper is a micronutrient essential for plant nutrition and is required as a cofactor for many enzymes. Furthermore, it is an essential part of a copper protein involved in photosynthesis. Root absorption appears to be passive, perhaps in organo-copper complexes (Jarvis and Whitehead 1983), and active through a specific carrier (Fernandes and Henriques 1991). When copper is adsorbed to cells in the root system, it may result in low-copper soils. The form in which copper is taken into the root affects its binding there (Wallace and Romney 1977). Copper can be transported in the xylem and phloem of plants complexed with amino acids.

The most common toxicity symptoms include reduced growth, poorly developed root systems, and leaf chlorosis (Wong and Bradshaw 1982). The basic deleterious effect of copper is related to the root system, where it interferes with enzyme functioning (Mukherji and Das Gupta 1972), but it also strongly interferes with photosynthesis and fatty acid synthesis (Smith and Others 1985).

2.7.2 Invertebrates

Copper is used as an ingredient in many fungicides and insecticides applied to agricultural crops (Meister 1995). Based on yield reductions of 14 to 28 percent in agronomic and grassland plants, 100 mg/kg of total copper in the soil is considered to be a threshold concentration for toxicity to soil invertebrates (ICA 1992).

2.7.3 Amphibians and Reptiles

Copper is highly toxic to amphibians. Environmental conditions, including pH and water hardness, and the life stage of the amphibian exposed affect the organism's sensitivity and adverse response to exposure to metal concentrations in water. Copper increased rates of mortality in environments with high-pH and low-hardness water (Horne and Dunson 1995). Although information concerning amphibians and metal toxicity is limited, it is believed that the primary mechanism of action of metal-induced toxicity and low pH environments is body loss of sodium across the gill surface (Horne and Dunson 1995). Tadpoles were affected adversely when exposed to aqueous copper concentrations (Owen 1981). Copper is toxic to certain types

of frogs and salamanders during both acute and chronic exposure studies, causing embryonic curling, body loss of sodium, and mortality (Horne and Dunson 1995). Earlier life stages of amphibians appear to be more sensitive to copper toxicity than later life stages (Horne and Dunson 1995).

No information was identified on the effects of copper in reptiles.

2.7.4 Fish and Aquatic Organisms

Copper is highly toxic in aquatic environments and is a priority pollutant (EPA 1992). Copper is toxic to many fish and aquatic organisms, including mussels, stripped bass, bluegill, and carp. Copper is mainly accumulated in the gill, liver, filaments, stomach, and intestine; however, the gill is the primary organ for concentrating copper in aquatic organisms (Owen 1981). Copper concentrations can significantly affect fish egg hatchability and reduce fry growth (EPA 1976). The age and species of organism influence the toxicity characteristics of copper. In general, younger organisms are affected at lower concentration levels.

2.7.5 Birds

Copper can produce toxic effects in birds. Diets containing elevated copper levels can slow the growth rate, diminish egg production, and cause developmental abnormalities in different avian species (Owen 1981).

2.7.6 Mammals

Toxic effects of copper have been studied on many animals, including cats, dogs, cattle, sheep, rats, mice, horses, guinea pigs, pigs, and monkeys. Different species of animals display varying levels of sensitivity to copper. However, the main organ affected by exposure to copper is the liver, where copper primarily accumulates in subcellular organelles, causing liver cirrhosis. In addition to liver cirrhosis, copper exposure can cause necrotic kidney tubules and brain damage (Owen 1981). Acute, toxic effects of copper given orally include gastrointestinal irritation, vomiting (including blood), low blood pressure, jaundice caused by liver necrosis, and coma. Chronic exposure to copper can cause accumulation of copper in the body, leading to lesions in the liver, brain, and eye and hemolytic anemia.

2.8 LEAD

Lead has been characterized as a poison for centuries and environmental pollution from lead is well documented (Eisler 1988b). Lead has been used in the production of solder, pipes, paint, ceramics, roofing materials, caulking, and ammunition and also was used as a gasoline additive. From a geochemical perspective, lead is ubiquitous and occurs in rocks, soils, water, plants, animals, and air. Lead is neither essential nor beneficial to living organisms, and all data show that the biological effects are adverse. Lead is a mutagen and a teratogen. When absorbed in excessive amounts, lead also is carcinogenic or cocarcinogenic, impairs reproduction, adversely

impairs liver and thyroid functions, and interferes with resistance to infectious disease (Eisler 1988b). In general, lead is toxic in most of its chemical forms and can be incorporated into the body through inhalation, ingestion, dermal absorption, and placental transfer. Lead is a poison that accumulates in the body and upon reaching a certain level, it starts to affect behavior, as well as hematopoietic, vascular, nervous, renal, and reproductive systems (Eisler 1988b).

The biological availability and fate of lead in soil is affected by such factors as soil pH, organic content, ion-exchange characteristics, and the amount of lead in the soil (National Science Foundation 1977, as cited in ATSDR 1999b). Plants and animals may bioconcentrate and bioaccumulate lead; however, biomagnification has not been well documented. Several studies have shown that invertebrates can accumulate lead in their tissues; however, the variability in the extent of lead bioaccumulation suggests that the mechanisms of lead uptake range between species. Organolead compounds, such as trialkyl and tetraalkyl lead compounds are more toxic than inorganic forms and have been shown to bioconcentrate in aquatic organisms. High accumulations of lead from ambient seawater by marine plants are well documented. Although lead is bioconcentrated from water, little evidence suggests that it is transferred through the food chain (Wong and Others 1978, Branica and Konrad 1980, and Settle and Patterson 1980, as cited in Eisler 1988b). Lead concentrations tend to decrease with increasing trophic level in food chains in freshwater and marine habitats (Wong and Others 1978 and Stewart and Schulz-Baldes 1976, as cited in Eisler 1988b).

2.8.1 Plants

Lead is not essential for plants, and excessive amounts can cause growth inhibition as well as a reduction in photosynthesis, mitosis, and water absorption (Demayo and Others 1982, as cited in Eisler 1988b). Roots take up lead passively, and translocation to shoots is limited (Wallace and Romney 1977). It is bound to the outside of roots, in the apoplast, and in cell walls and organelles or absorbing roots (Koeppe 1981). In the plant, lead may exist in a naturally chelated form or in pyro- or orthophosphate forms. The phytotoxicity of lead is relatively low compared with other trace elements. It affects mitochondrial respiration and photosynthesis by disturbing electron transfer reactions (Miles and Others 1972).

2.8.2 Invertebrates

A concentration of 12,800 mg/kg of lead in soil is associated with reductions in natural populations of decomposers such as fungi, earthworms, and arthropods (Beyer and Anderson 1985, as cited in Eisler 1988b).

2.8.3 Amphibians and Reptiles

Environmental conditions, including pH and water hardness, and the life stage of the amphibian exposed, affect the organism's sensitivity and adverse response to exposure to metal concentrations in water. Although information concerning amphibians and metal toxicity is limited, the primary mechanism of action of metal-induced toxicity in low pH environments is believed to be body loss of sodium across the gill surface (MacDonald and Wood 1993, as cited

in Horne and Dunson 1995). Reduced rates of learning acquisition and retention were observed in tadpoles exposed to lead water concentrations. Limited evidence has been published on the effects of lead in amphibians; however, lead may be important as a toxicant to developing embryos (Horne and Dunson 1995).

2.8.4 Fish and Aquatic Organisms

Lead is toxic to most aquatic organisms; however, adverse effects are modified by environmental conditions. Fish continuously exposed to toxic concentrations of dissolved lead show various signs of poisoning, including spinal curvature, anemia, degeneration of the caudal fin, destruction of spinal neurons, reduced ability to swim against a current, destruction of the respiratory epithelium, muscular atrophy, paralysis, renal pathology, growth inhibition, retardation of sexual maturity, testicular and ovarian histopathology, decreased fry survival rate, and death (Eisler 1988b; EPA 1976).

2.8.5 Birds

Absorbed lead produces a variety of effects in avian species, including damage to the nervous system, muscular paralysis, inhibition of heme synthesis, damage to kidneys, damage to the liver, and death (Mudge 1983, as cited in Eisler 1988b). Sublethal lead exposure also may have adverse effects of reproduction in some avian species by decreasing plasma calcium, inhibition of growth, and reduced chick hatchability.

2.8.6 Mammals

Lead can have multiple effects in mammalian species. Lead may cause damage to the nervous system, hematological effects, kidney dysfunction, sterility, abortion, neonatal mortality, growth retardation, delays in maturation, and reduced body weight (Amdur and Others 1991; Eisler 1988b). Younger mammals may have greater sensitivity to lead toxicity because of their developing blood brain barrier. Developing capillaries in the brain allow lead levels in the blood to be transported to newly formed components of the brain (Amdur and Others 1991).

2.9 MERCURY

Inorganic and organic forms of mercury are relatively well characterized within an ecotoxicological context. Methyl-mercury and other organomercurical compounds (including ethyl- and phenyl-mercuricals) are among the most toxic organometals in the environment and bioaccumulate through the food chain (Fimreite 1979). The chemical form of mercury influences its distribution in the body, and comparative toxicity data suggest that the organic species (ethyl-, methyl-, and phenyl-mercury) of the metal are far more toxic than inorganic mercury (Peterle 1991). In general, methyl-mercury, as well as its metallic (Hg^0), mercurous (Hg^+), and mercuric (Hg^{++}) forms, are nonessential and exert their toxicity at the biochemical level as inhibitors of enzyme-catalyzed reactions.

Mercury is a known mutagen, teratogen, and carcinogen. Its toxicity and environmental effects vary with its form, dose, and route of ingestion and with the species, sex, age, and general condition of the organism (Eisler 1987a; Fimreite 1979). Depending on the pH, salt content, and composition of the soil, mercury usually forms various complexes with chloride and hydroxide ions in the soil (Alloway 1990).

Biotransformation is an important fate process in the environmental partitioning of mercury. Under favorable conditions, microorganisms in soil and sediment can convert various forms of mercury to methyl-mercury, which is more available for uptake by various organisms and for transport in the food chain and more mobile than inorganic forms (Peterle 1991).

Mercury has a high potential for bioaccumulation and biomagnification (Eisler 1987a). Methylated mercury is the form most readily bioconcentrated and bioaccumulated (Kramer and Neidhart 1975). Biomagnification of methyl-mercury has been documented for both aquatic and terrestrial food chains (Eisler 1987a). Concentrations of methyl-mercury in upper trophic-level fish reportedly have been biomagnified on the order of 10,000 to 100,000 times those concentrations found in ambient waters (Callahan and Others 1979). The accumulation of mercury by aquatic organisms is enhanced at elevated water temperatures, reduced water salinity or hardness, reduced water pH, increased age of the organism, and reduced organic matter in the medium. Mercury transfers and biomagnification through mammalian food chains is well documented.

2.9.1 Plants

Plants take up mercury from the soil in relatively insignificant amounts because roots appear to act as a barrier. However, mercury compounds applied to other parts of plants appear to be readily absorbed and translocated (Adriano 1986).

Mercury and its compounds taken up by roots are translocated to only a limited extent in plants. Organic forms of mercury may be translocated to a greater degree than inorganic forms in some plants (Huckabee and Blaylock 1973). Gay (1975) reports that pea plants (*Pisum sativum*) form methyl-mercury as an intermediate product from mercury added to the soil in organic and inorganic forms.

2.9.2 Invertebrates

Some types of invertebrates can accumulate mercury through the food chain with little or no observable effects (Jamil and Hussain 1992). In certain types of flies, however, methyl-mercury can alter chromosomes, causing abnormalities in offspring (NAS 1978 and Khera 1979, as cited in Eisler 1987a). Mercury concentrations in soil have been observed to cause reduced segment regeneration in worms, and at elevated levels, mortality (Abbasi and Soni 1983, as cited in Eisler 1987a). For marine invertebrates, mercury was observed to inhibit reproduction (Eisler 1987a).

2.9.3 Amphibians and Reptiles

Little information was identified on the effects of mercury on amphibians and reptiles. In one study, frogs did not metamorphose when exposed to mercury concentrations (Eisler 1987a).

2.9.4 Fish and Aquatic Organisms

Methyl-mercury appears to be the most toxic form of mercury (MacDonald 1993). Earlier developmental stages of fish and aquatic organisms are more sensitive to mercury toxicity than more mature individuals. Effects of chronically exposed fish and aquatic organisms include loss of appetite, brain lesions, cataracts, abnormal motor coordination, and behavioral changes. In addition to chronic symptoms of mercury toxicity, mercury at comparatively low concentrations adversely affects reproduction, growth, behavior, metabolism, blood chemistry, osmoregulation, and oxygen exchange of marine and freshwater organisms (Eisler 1987a). Mercury is very toxic to aquatic organisms because of its ability to bind to sulphydryl groups (Sindayigaya and Others 1994). Degree of toxicity is increased in elevated water temperatures and in reduced salinity environments (Eisler 1987a).

2.9.5 Birds

Sublethal effects of mercury on birds, administered by a variety of routes, include adverse effects on growth, development, reproduction, blood and tissue chemistry, metabolism, and behavior (Eisler 1987a). Reproductive effects are noted at low doses long before acute effects are noticeable in exposed adult populations (Scheuhammer 1987). Significant reproductive effects of chronic dietary inorganic mercury exposure in birds include delayed testicular development, altered mating behavior, reduced fertility, reduced survivability and growth in young, and gonadal atresia. Mercury also is transferred to the egg in avian species, where it has adverse effects on the developing embryo (Peterle 1991).

2.9.6 Mammals

Methyl-mercury is the more acutely toxic form of mercury. Mercury can cause adverse neurological, renal, behavioral, and reproductive effects in mammals. Nephrotoxicity is the most common effect mercury has on mammals. Acute toxicity responses to the organic form of the metal include ataxia, aphagia, tremors, and diminished capacities for coordinated movements. In chronic exposures, methyl-mercury intoxication is characterized by central nervous system and peripheral nervous system neuropathies (Linstrom and Others 1991, as cited in ATSDR 1994a). Methyl-mercury also exhibits reproductive effects in both sexes as well as in the developing embryo and fetus (Cagiano and Others 1990). Methyl-mercury can cause other reproductive effects, which include diminished neurological function and behavioral deficits in newborns (Khera and Tabacova 1973).

2.10 SELENIUM

Selenium is an essential trace element but is harmful at concentrations only slightly higher than the nutritional requirement (Eisler 1985b). Results of laboratory studies and field investigations with fish, mammals, and birds have led to general agreement that elevated concentrations of selenium in diet or water are associated with reproductive abnormalities and growth retardation. Not as extensively documented, are reports of selenium-induced chromosomal aberrations, intestinal lesions, shifts in species composition of freshwater algal communities, swimming impairment of protozoa, and behavioral modifications (Eisler 1985b).

In aerobic waters, selenium is present in the quadravalent oxidation state as selenite or in the hexavalent oxidation state as selenate. These chemical species are very soluble, and most of the selenium discharged into the aquatic environment is transported in these forms to the ocean. Selenium has a sorptive affinity for hydrous metals oxides, clays, and organic materials. Sorption by sediments or suspended solids can result in enrichment of selenium concentrations in sediment beds. Sorption or precipitation with hydrous iron oxides is probably the major control on mobility of selenium in aerobic waters. Selenium can be methylated by a variety of organisms, including benthic microflora. In a reducing environment, hydrogen selenide may be formed. Both the methylated forms and hydrogen selenide are volatile and may escape to the atmosphere. Formation of volatile selenium compounds in the sediments can remobilize sorbed selenium (Eisler 1985b).

Current understanding of selenium toxicology indicates that ecological effects are primarily caused by selenium in the food chain, rather than selenium dissolved in the water column (Philips 1988, Luoma and Others 1992, as cited in Taylor and Others 1992). Once in the water column, selenium enters the food chain through bioconcentration by phytoplankton, which are then consumed in large quantities by crustaceans and bivalves. Fish and waterfowl, in turn, eat crustaceans and bivalves. Bioconcentration, bioaccumulation, and biomagnification of selenium can increase selenium levels more than 1,000-fold from water to fish and animals (Saiki and Lowe 1987, as cited in Taylor and Others 1992). The greatest step increase occurs between water and phytoplankton and other aquatic plants; subsequent steps in the food chain typically increase selenium concentrations by a factor of 2 to 6 (Lemly and Smith 1987, as cited in Taylor and Others 1992). BCFs for various species of marine algae range from 16,000 to 337,000, depending on the species and water column levels (Zhang and Others 1990, as cited in Taylor and Others 1992).

2.10.1 Plants

Selenium has been observed to cause growth retardation in freshwater green algae (Hutchinson and Stokes 1975, Klaverkamp and Others 1983, as cited in Eisler 1985b).

Selenium is not proven to be essential for plant growth. Plants absorb selenium as selenite, selenate, or an organic form of selenium. Generally, the selenate form is the most toxic. It is believed that selenate is taken up actively, while selenite uptake is largely passive (Peterson and Girling 1981). Selenium is translocated to all parts of the plant, including the see, in low-

molecular-weight compounds (Broyer and Others 1972). Toxicity symptoms include chlorosis, stunting, and yellowing of the leaves. The mechanism of toxicity is thought to be indiscriminate replacement of sulphur by selenium in proteins and nucleic acids, with disruptions in metabolism (Trelease and Others 1960).

2.10.2 Invertebrates

No information was identified on the adverse effects of selenium on invertebrates.

2.10.3 Amphibians and Reptiles

Little information was identified on the effects of selenium on amphibians and reptiles. One report states that during frog development, cranial and vertebral deformities and lower survival were documented when exposed to selenium concentrations (Browne and Dumont 1979, as cited in Eisler 1985b).

2.10.4 Fish and Aquatic Organisms

In general, selenite is more toxic to earlier life stages, and the degree of the effect is increased with increasing temperatures (Klaverkamp and Others 1983, as cited in Eisler 1985b). Selenium is teratogenic, and its toxicity depends greatly on its chemical form (Eisler 1985b). It has been suggested that selenite is more toxic than selenate and is preferentially concentrated over selenate by mussels (EPA 1990, as cited in Eisler 1985b). Signs of selenium poisoning include loss of equilibrium, lethargy, loss of coordination, muscle spasms, protruding eyes, swollen abdomen, liver degeneration and swelling, reduced blood hemoglobin levels, increased white blood cell numbers, swollen gill lamella with extensive cellular vacuolization, and necrotic and degenerating ovarian follicles (Ellis and Others 1937, Sorenson 1984, as cited in Eisler 1985b). Elevated concentrations of selenium were observed to cause reproductive failure, anemia, reduced hatch, reduced growth, reduced swimming rate, and chromosomal aberrations in aquatic organisms (Hodson and Others 1980, Adams 1976, Bovee and O'Brien 1982, and Krishnaja and Rege 1982, as cited in Eisler 1985b).

2.10.5 Birds

Selenium exposure in the diet or drinking water of avian species is associated with reproductive abnormalities, congenital malformations, selective bioaccumulation, and growth retardation (Eisler 1985b). Selenium has been observed to cause reduced hatching of eggs, decreased egg weight, decreased egg production, anemia, and embryo deformation, including deformed eyes, beaks, wings, and feet (Ort and Latshaw 1978 and Harr 1979, as cited in Eisler 1985b).

2.10.6 Mammals

Chronic effects of selenium on mammals include reproductive abnormalities such as congenital malformations; reduced numbers of young in litters; high mortality of young; infertility among

surviving young in rats, mice, swine, and cattle; and intestinal lesions (Harr 1978 and National Center for Research Resources [NCRR] 1983, as cited in Eisler 1985b).

Chronic exposure of selenium, known as alkali disease, has been observed in cattle, hogs, and horses that graze on feed containing elevated levels of selenium. Adverse effects include deformed hooves; hair loss; lassitude; articular cartilage erosion; reduced conception; increased reabsorption of fetuses; and heart, kidney, and liver degeneration (Eisler 1985b).

2.11 ZINC

Zinc is an essential trace element for all living organisms, and zinc deficiency can be a problem for both plants and animals. Zinc is primarily used as a protective coating for metals and in the production of alloys, such as bronze and brass. Adverse effects of zinc exposure to animals include growth retardation, testicular atrophy, skin changes, and poor appetite (Prasad 1979, as cited in Eisler 1993). Most of the zinc introduced into aquatic environments eventually is partitioned into sediment. Zinc released from sediment is enhanced under conditions of high dissolved oxygen, low salinity, and low pH. Dissolved zinc usually consists of the hydrated zinc ion and various organic and inorganic complexes. In reducing conditions, organically bound zinc typically forms insoluble sulfides (MacDonald 1993).

BCFs vary widely between and within species of aquatic organisms (Eisler 1993). In marine environments, the most effective zinc accumulators included red and brown algae, ostreid and crassotreid oysters, and scallops. Invertebrates can bioaccumulate large quantities of zinc (Jamil and Hussein 1992), which potentially could be passed on to upper trophic-level consumers. Studies show that bony structures can act as long-term repositories for zinc (Macapinlac and Others 1966). Zinc concentrations have been shown to increase with increasing trophic levels from phytoplankton to zooplankton but not to fish (Balasubramanian and Others 1995).

2.11.1 Plants

Zinc is an essential nutrient for plant growth in small amounts but is toxic to plants at elevated levels. Zinc can cause significant adverse effects on growth, survival, and reproduction in representative sensitive species of aquatic plants (Eisler 1993). Elevated levels of zinc in soil can cause mortality in some terrestrial plants and inhibit photosynthesis in others (Eisler 1993).

2.11.2 Invertebrates

Certain terrestrial and aquatic invertebrates are sensitive to zinc. Reduced growth, inhibited reproduction, and reduced survival are effects that zinc can have on both terrestrial and aquatic invertebrates (Eisler 1993).

2.11.3 Amphibians and Reptiles

Environmental conditions, including pH and water hardness, and the life stage of the amphibian exposed both affect the organism's sensitivity and adverse response to exposure to metal concentrations in water. Although information concerning amphibians and metal toxicity is limited, the primary mechanism of action of metal-induced toxicity and low pH environments is believed to be body loss of sodium across the gill surface (MacDonald and Wood 1993, as cited in Horne and Dunson 1995). In one study, no significant effects occurred of acute and chronic exposures of frogs and salamanders and their larvae to zinc (Horne and Dunson 1995). In addition, the pH of the aquatic environment had no effect on the toxicity of zinc, unlike the other metals that were studied (Horne and Dunson 1995).

However, another study observed that zinc caused significant adverse effects on growth, survival, and reproduction in representative sensitive species of amphibians (Eisler 1993). In this study, zinc was shown to cause teratogenic effects to frog embryos (Eisler 1993).

2.11.4 Fish and Aquatic Organisms

The gill epithelium is the primary route of zinc entry into the body of fish (Eisler 1993). Zinc can cause significant adverse effects on growth, survival, and reproduction in representative, sensitive species of protozoa, sponges, mollusks, crustaceans, echinoderms, and fish (Eisler 1993). Zinc has been shown to cause teratogenic effects to fish embryos (Eisler 1993).

2.11.5 Birds

Different species of birds have varying sensitivities to zinc exposure. Acute effects of zinc in ducks caused mortality and pancreatic degradation (Eisler 1993). Reduced growth and death were observed in poultry chicks fed diets containing elevated zinc levels. Younger stages of life appear to be more sensitive to zinc exposure. The pancreas and bone are primary target organs of zinc in birds (Eisler 1993). Decreased weight gain was observed in Japanese quail, chickens, and turkeys fed diets containing zinc (NAS 1980).

2.11.6 Mammals

Zinc is relatively nontoxic in mammals; however, excessive zinc intake adversely affects survival of all tested mammals and produces a wide variety of neurological, hematological, immunological, hepatic, renal, cardiovascular, developmental, and genotoxic effects (Eisler 1993). The pancreas and bone are primary target organs of zinc exposure in mammals (Eisler 1993). Toxic effects of zinc can be observed in many domestic animals, including dogs, cats, ferrets, cattle, sheep, and horses, as a result of ingesting zinc-containing objects (Eisler 1993). Zinc concentrations in the diet of pregnant rats and sheep caused increased incidence of hypocuprosis, still births, and fetal resorptions (Ketchenson and Others 1969, Campbell and Mill 1979, as cited in Domingo 1994).

3.0 PESTICIDES

The following sections present data on ecotoxicological effects of various chlorinated pesticides identified as COPECs at Alameda Point.

3.1 CHLORDANE (ALPHA AND GAMMA)

Chlordane is a broad-spectrum, organochlorine pesticide, consisting of about 45 components. Historically used to control soil invertebrate pests, chlordane also adversely affected nontarget species. Although federal law currently prohibits use of chlordane in the United States, persistent chlordane residues and metabolites from past use continue to pose an ecological threat (Eisler 1990). Chlordane and its metabolites do not degrade to any significant extent either biotically or abiotically in either aquatic or terrestrial ecosystems. Chlordane in water does not undergo considerable hydrolysis, oxidation, or photolysis, and biodegradation is minimal (Gore and Others 1971, as cited in HSDB 1999). Because of chlordane's low water solubility, high lipid solubility, low vapor pressure, and strong tendency to sorb to soil and sediment particles, it persists in soil and sediments for extended periods (EPA 1988, as cited in Eisler 1990). Sorption of chlordane to sediment is expected to be a major aquatic fate process (Callahan and Others 1979, as cited in HSDB 1999).

Based on field tests, soil column leaching tests, and K_{oc} estimation, chlordane is expected to be immobile in soil (Cohen 1986, as cited in HSDB 1999). Surface-applied chlordane usually remains in the top 20 centimeters of most soils. Little biodegradation occurs in soil; chlordane residues have been detected in soils 14 years (EPA 1988, as cited in Eisler 1990) and 20 years (Beeman and Matsumura 1981, as cited in ATSDR 1994a) after application. Volatilization is the most important pathway for chlordane release from the surface of soil (ATSDR 1994a).

Chlordane is known to bioconcentrate, particularly in long-lived, carnivorous organisms having large amounts of body lipids (Eisler 1990). Chlordane bioconcentration has been shown to increase with trophic levels from zooplankton to marine mammals in marine ecosystems, causing biomagnification of total chlordane through the food chain, with residues peaking in marine mammals (Kawano and Others 1986). Chlordane biomagnification in carnivorous birds is also considerable.

3.1.1 Plants

Chlordane residues have been detected in vegetable crops grown in soils treated with chlordane (U.S. Department of Agriculture 1965, as cited in HSDB 1999). Chlordane is taken up by rooted, aquatic vascular plants, both from water and sediment. Chlordane bioconcentrates in roots and is translocated to shoots (ATSDR 1994a).

3.1.2 Invertebrates

Chlordane is toxic to terrestrial invertebrates. Chlordane was used extensively to control grubs, ants, and snails (Eisler 1990). Earthworms were nontarget soil species that were adversely affected by chlordane. Sediment concentrations of chlordane were fatal to sandworms (*Nereis virens*) in 12 days (McLeese and Others 1982, as cited in Eisler 1990). Chlordane effects decreased with increasing soil temperature and organic content (NRCC 1975, as cited in Eisler 1990).

3.1.3 Amphibians and Reptiles

Symptoms of chlordane poisoning in frogs include neuromuscular changes, excessive thrashing, and tremors (Kaplan and Overpeck 1964, as cited in Power and Others 1989). California newts had greatly elevated chlordane residues in the liver, as compared to the stomach and carcass.

3.1.4 Fish and Aquatic Organisms

Chlordane adversely affects survival, reproduction, and growth in aquatic invertebrates and fish. Symptoms of poisoning in fish include hyperexcitability, increased respiration rate, erratic swimming, loss of equilibrium, and convulsions (Eisler 1990). Other symptoms recorded were immobilization, impaired reproduction, and histopathology (NRCC 1975, as cited in Eisler 1990).

3.1.5 Birds

Lethal effects of chlordane in birds result primarily from chlordane metabolites, most notably oxychlordane and heptachlor epoxide; oxychlordane is the most toxic and persistent of the two (Eisler 1990). Reproductive impairment has been documented in waterfowl species from a wetland treated with chlordane. Organisms metabolize chlordane into several isomers, of which oxychlordane is the most toxic and persistent, even when compared to its parent chemicals (World Health Organization [WHO] 1984, as cited in Eisler 1990; Kawano and Others 1986). These isomers can persist in avian tissues for up to 35.4 years (Eisler 1990). Chlordane interacts with other chemicals to cause additive or synergistic effects, particularly when combined with other organochlorines, such as endrin, methoxychlor, and aldrin, in northern bobwhites (Ludke 1976, as cited in Eisler 1990). Symptoms of poisoning include sluggishness, drooped eyelids, fluffed feathers, reduced food intake, and weight loss (Eisler 1990).

3.1.6 Mammals

Warm-blooded animals readily absorb chlordane through dermal contact, ingestion, and inhalation, and after residues are absorbed, they concentrate in the fat, liver, kidney, brain, and muscle (WHO 1984, as cited in Eisler 1990). Chlordane is a nerve stimulant whose physiological target sites are nerve and muscle membranes (Greenhalgh 1986, as cited in Eisler 1990). Chronic, dietary chlordane adversely affects physiology, growth, and fertility of

laboratory mammals, including enlargement and increased pathology of the liver in rats and mice. It also elevates residues in cow's milk, reduces sexual activity and litter viability in rats, depresses growth, delayes development, decreases immune competence, and decreases viability of offspring in mice (Talamantes and Jang 1977, WHO 1984, as cited in Eisler 1990). Chlordane interacts with other chemicals to cause additive or synergistic effects, particularly when combined with other organochlorines such as endrin, methoxychlor, and aldrin in mice (Klaassen and Others 1986, as cited in Eisler 1990).

3.2 DICHLORODIPHENYLTRICHLOROETHANE AND METABOLITES

Historically, dichlorodiphenyltrichloroethane (DDT) and related organochlorine insecticides were used worldwide in pest control. In 1972, DDT was banned in the United States, because DDT was highly toxic to nontarget species. DDT generally occurs as a constituent of a mixture of chlorinated, organic compounds, two of the most important being dichlorodiphenyldichloroethene (DDE) and dichlorodiphenyldichloroethane (DDD). DDE and DDD are also metabolites of DDT. All three have similar fate and transport properties. DDT, like many organochlorine contaminants, is characterized by its persistence in the environment, potential for volatilization and transport to unaffected areas, lipophilic nature, toxicity of metabolites, and variability of species responses to chronic exposure to DDT and its metabolites (Peterle 1991). DDT, DDE, and DDD are only slightly soluble in water and adhere to soil and sediment particles (Thibodeaux 1979). DDT and related organochlorine chemicals are slowly biodegraded in soil and in aquatic ecosystems (Alexander 1965, as cited in Forsyth and Others 1983). These chlorinated hydrocarbons tend to be highly persistent in soil and often have half-life estimates of greater than 15 years (Lichtenstein and Others 1959, Stewart and Others 1971, as cited in ATSDR 1992c).

In addition to their relatively long half-life, organochlorine chemicals like DDT are highly lipophilic and as a result, DDT and similar chemicals have very high BCFs. Biomagnification also has been observed for DDT and its metabolites (Bevenue 1976, as cited in Forsyth and Others 1983). The biomagnification of DDT (and related organochlorine pesticides) has been well documented (Hoffman and Others 1995), and the deleterious effects associated with trophic level transfer in both aquatic and terrestrial food chains remains a concern (EPA 1995a). DDT is most widely known for its reproductive effects on birds, primarily piscivorous species, and for its toxicity to aquatic fish and invertebrates.

3.2.1 Plants

Terrestrial plants can accumulate elevated levels of DDT (Forsyth and Others 1983). DDT can reduce photosynthesis in plants and reduce the ability of the plant to withstand environmental changes. In addition, DDT can decrease the amount of oxygen produced by aquatic plants (EPA 1975).

3.2.2 Invertebrates

DDT was once used as an insecticide. Once invertebrates have adapted to DDT, they can accumulate it at high levels (Forsyth and Others 1983). DDT can cause immobilization, reproductive impairment, embryo deformation, reduced growth, and mortality in both terrestrial and aquatic invertebrates (EPA 1975).

3.2.3 Amphibians and Reptiles

DDT has been observed to cause developmental deformities and hyperactivity in tadpoles (Osborn and Others 1981). DDT causes developmental deformities by disrupting the organization of epithelial cells into glands. This can cause blunt snouts and deformed brains in exposed tadpoles (Osborn and Others 1981).

3.2.4 Fish and Aquatic Organisms

DDT is very toxic to fish and aquatic organisms. Even at very low concentrations, DDT can cause mortality. In fish, DDT inhibits ATPase activity in cellular synthesis and osmoregulation (EPA 1975). DDT affects thyroid activity, alters behavior and activity, affects learning processes, causes developmental defects, and disrupts cellular energy use in fish (EPA 1975). DDT also adversely affects the reproductive success of fish because of its chemical characteristics that allow DDT to become concentrated in the egg yolk. When this happens, developing fry feed on the DDT-containing yolk, eventually causing increased fry mortality after birth (EPA 1975).

3.2.5 Birds

Reproductive effects of DDT and its metabolites on birds have been well characterized. Organochlorines, including DDT, have been implicated in the thinning of eggshells of at least 54 species of 10 orders of birds (Stickel 1975, as cited in Peterle 1991). DDT is believed to affect the calcium transport and deposition from the female to the egg, resulting in eggshell thinning. In addition to eggshell thinning other birds treated with DDE showed delayed egg laying, reduced hatchability, and alteration of egg size, weight, and content (Vangilder and Peterle 1980, 1981, and 1983, as cited in Peterle 1991).

3.2.6 Mammals

Low levels of exposure to DDT and organochlorines have caused reproductive effects in mink, bats, shrews, and sea lions (Peterle 1991). In several animal species, acute, oral exposure to high doses of DDT has been associated with DDT-induced tremors or myoclonus (abrupt, involuntary contractions of skeletal muscles), hyperexcitability, convulsions, and reduced fertility (EPA 1975). Chronic exposure of experimental animals to DDT is associated with tremors and hyperirritability. DDT-induced developmental effects include decreased fetal body weight, decreased fetal brain and kidney weight, embryotoxicity, fetotoxicity, and neonatal mortality.

Reproductive effects of chronic exposure produced abortions, stillbirths, increased maternal and fetal mortality, delayed estrus, a reduction in male libido, and a lack of mammary gland development.

3.3 HEPTACHLOR AND HEPTACHLOR EPOXIDE

Heptachlor is a persistent insecticide that is nonphytotoxic at insecticidal concentrations. Heptachlor was used extensively from 1953 to 1974 as a soil and seed treatment, protecting a variety of crops from pests, and also was used to control termites and household insects. EPA proposed cancellation of nearly all registered uses of heptachlor in 1974 because of its potential cancer risk, persistence, and potential to bioaccumulate and biomagnify throughout the food chain. In the United States, heptachlor use was stopped in 1983 (Beyer and Others 1996). The only commercial use of heptachlor products still permitted today is fire ant control in power transformers. Heptachlor epoxide is a breakdown product of heptachlor and is a metabolic product in bacteria and animals.

3.3.1 Plants

No information was identified on the effects of heptachlor on plants.

3.3.2 Invertebrates

Heptachlor was used as an insecticide to control soil pests (Beyer and Others 1996).

3.3.3 Amphibians and Reptiles

In amphibians, heptachlor was observed to be moderately toxic to tadpoles (Sanders 1970, as cited in Power and Others 1989).

In reptiles, heptachlor has been observed to cause mortality in snakes, aquatic turtles, box turtles, and lizards (DeWitt and George 1960, Matschke 1961, as cited in Hall 1980).

3.3.4 Fish and Aquatic Organisms

Low levels of heptachlor affect carbohydrate metabolism, osmoregulation, and hemostatic mechanisms in fish (Srivastava and Mishra 1987).

3.3.5 Birds

Effects of heptachlor have been documented on several species of birds, including Canada geese, American kestrels, and Japanese quail. Heptachlor has been known to decrease reproductive success in birds and decrease chick survival rates (Blus and Others 1984, Henny and Others 1983, and Grolleau and Froux 1973, as cited in Beyer and Others 1996).

3.3.6 Mammals

Heptachlor is absorbed from the gastrointestinal tract of animals, as indicated by the presence of heptachlor or its metabolites in serum, fat, liver, kidney, and muscle after oral exposure. Animal studies have shown that heptachlor undergoes epoxidation, producing heptachlor epoxide, which is more toxic than its parent compound. Hyperexcitability, incoordination, paralysis of the hind legs, difficulty in walking or standing, loss of the righting reflex, whole-body tremors, and self-mutilation are some of the reactions observed in a variety of animals after ingesting heptachlor. Ingestion of heptachlor also seemed to cause a severe decrease in the pregnancy rate of rats. There is evidence of transplacental, as well as lactational, transfer to human fetuses. The majority of the heptachlor and its metabolites are eliminated through bile into feces (ATSDR 1993i).

4.0 POLYCHLORINATED BIPHENYLS

PCB, or Aroclors®, are among the most persistent anthropogenic compounds in the environment, resisting degradation for years. This family of compounds contains 209 individual congeners. PCBs have been widely used as coolants and lubricants because of their insulating and nonflammable properties. PCB manufacturing was halted in 1977 because of its ability to bioaccumulate in the environment and adversely affect wildlife.

PCBs remain in the environment for long periods of time, because physiochemical properties of PCBs allow them to resist environmental degradation processes. The degree of chlorination and the position of chlorine substituents of PCBs influence their susceptibility to environmental degradation processes. Because of their physicochemical characteristics, PCBs partition into soil and sediment particles and organic matter. Depending on the particular PCB congener, K_{oc} range from 510 to 13,300,000. As a general rule, most K_{oc} for PCB mixtures are greater than 5,000 (Sklarew and Others 1987, as cited in HSDB 1999).

The environmental persistence of PCBs, combined with their hydrophobic nature, allows them to bioconcentrate, bioaccumulate, and biomagnify in the environment. Physicochemical properties of PCBs influence the extent of uptake and metabolic fate of PCBs in an organism. The ability of animals to metabolize PCBs tends to increase in the following order: fish< birds< mammals (Matthews and Others 1984, as cited in HSDB 1999). PCBs are absorbed from the stomach, skin, and lungs. PCBs initially concentrate in the liver, blood, and muscle, and if they are resistant to metabolism, they are sequestered into fat tissue, where they persist.

In general, bioaccumulation of PCBs is rapid, depuration is slow, and diet appears to be an important route of PCB accumulation. PCB body burdens in marine organisms, particularly benthic organisms, appear to be directly related to log PCB concentrations in sediments (Shaw and Connell 1982, as cited in Eisler 1986b). In terrestrial or semi-aquatic vertebrates, PCBs tend to bioaccumulate to their highest concentrations in the livers of fish-eating birds, followed by species that feed on small birds and mammals, worms, and insects (NAS 1979, as cited in Eisler 1986b).

4.1 PLANTS

Soil algae exhibit depressed photosynthesis and growth inhibition when exposed to concentrations of PCBs (Eisler 1986b). In other studies, algae exposed to PCB concentrations had an increased mortality rate, decreased reproduction, and impaired growth (Beyer and Others 1996).

4.2 INVERTEBRATES

No information was identified on the effects of PCBs on terrestrial invertebrates.

4.3 AMPHIBIANS AND REPTILES

No information was identified on the effects of PCBs on amphibians and reptiles.

4.4 FISH AND AQUATIC ORGANISMS

Adverse effects associated with exposure to PCBs in aquatic organisms include decreased growth, reproductive toxicity, mutagenicity, histopathology, and a variety of biochemical perturbations (Eisler 1986b; Beyer and Others 1996). Reproductive toxicity has been reported for several aquatic species, and effects include reduced survival of developing eggs, increased mortality in eggs and fry, and reduced fertilization success (Eisler 1986b).

4.5 BIRDS

Birds exposed to PCB concentrations have shown the following effects: disruptions in normal patterns of growth, reproduction, metabolism, and behavior (Peakall and Others 1972, as cited in Eisler 1986b). PCBs can damage the liver, kidney, spleen, and thyroid in birds (Beyer and Others 1996). However, reproductive impairment is the most sensitive endpoint for birds exposed to PCBs. Reproductive effects caused by PCB exposure include embryo mortality, teratogenic effects, decreased hatching success, and reduced eggshell thickness (Beyer and Others 1996).

4.6 MAMMALS

PCB exposures in mammals are associated with adverse effects, including reproductive impairment and failure, physiological, altered behavior, and mutagenic, carcinogenic, and teratogenic (Eisler 1986b; Beyer and Others 1996). In mammals, the most consistent, pathological changes occur in the liver. In females, however, PCBs are transferred through lactation and placenta from adult to offspring; therefore, in utero effects and fetotoxicity may be expressed.

5.0 POLYNUCLEAR AROMATIC HYDROCARBONS

PAH compounds range from low-molecular-weight PAHs composed of two aromatic rings, including naphthalene, to high-molecular-weight PAHs, bearing three or more aromatic rings, including phenanthrene and benzo(a)pyrene. There are thousands of PAH compounds, each differing in the number and position of the aromatic rings and the amount of substitutions in their basic structure. These substitutions may include methyl, oxygen, or other elemental groups. PAH solubility decreases with increasing molecular weight and increasing log K_{ow} values (Eisler 1987).

In aquatic environments, PAHs may evaporate, disperse in the water column, become incorporated into bottom sediments, concentrate in aquatic biota, or experience photodegradation, chemical oxidation, or biodegradation (Suess 1976, as cited in Eisler 1987). Depending on the physicochemical characteristics of the individual compound, the compound will sorb primarily to suspended sediment or colloids, while only about 30 to 35 percent will dissolve into the water column (Lee and Grant 1981, as cited in Eisler 1987). PAHs in aquatic sediments degrade very slowly in the absence of penetrating radiation (Suess 1976, as cited in Eisler 1987) and may persist for long time periods in oxygen-poor basins or in anoxic sediments (Neff 1979, as cited in Eisler 1987).

PAHs cause a wide variety of adverse biological effects in numerous organisms under laboratory conditions, including effects on survival, growth, metabolism, and tumor formation. Inter- and intraspecies responses to PAHs are quite variable and are modified by interaction with other inorganic and organic compounds, including other PAHs (Eisler 1987). PAHs also have been observed to enhance cytochrome P_{450} levels in the liver. Cytochrome P_{450} and mixed function oxidases primarily are responsible for detoxifying chemicals in the liver, and when these chemicals are altered, the toxicity of other compounds that the organisms encounter may be greater than they would be otherwise. In this way, PAHs lower the organism's resistance to other toxins (Amdur and Others 1991). Higher-molecular-weight PAHs are known to be carcinogenic, mutagenic, and teratogenic to a wide variety of organisms, including aquatic life, amphibians, birds, and mammals. Lower-molecular-weight PAHs generally are not carcinogenic but are more acutely toxic than their higher-molecular-weight relatives (Eisler 1987). Lower-molecular-weight PAHs show little tendency to biomagnify in food chains and are relatively rapidly metabolized in vertebrates, provided that toxicity is not expressed.

Many species of aquatic organisms in freshwater or marine environments rapidly bioconcentrate and bioaccumulate low concentrations of PAHs. The ability of PAHs to bioconcentrate and bioaccumulate is chemical-specific. Molecular weight, the position of the aromatic rings, and the type of substitutions all influence the ability of a compound to bioconcentrate and bioaccumulate in ecological receptors. Species-specific characteristics also are critical in evaluating the bioconcentration potential of PAHs; organisms with relatively high lipid contents tend to bioconcentrate PAHs to greater amounts than others (Eisler 1987).

5.1 PLANTS

The biological fate of PAHs in soils is poorly understood. Much of the available information suggests that plants, fungi, and soil bacteria absorb lower-molecular-weight PAHs from soils. These materials may be available for uptake from the rhizosphere through the root (ATSDR 1995a). In general, phytotoxic effects caused by PAH exposure have not been observed; however, very little data have been published on this subject (Eisler 1987). One study observed that PAH concentrations inhibited algae growth (Bastian and Toetz 1982, as cited in Environment Canada 1994b).

5.2 INVERTEBRATES

No information was identified on the effects of PAHs on invertebrates.

5.3 AMPHIBIANS AND REPTILES

No information was identified on the effects of PAHs on amphibians and reptiles.

5.4 FISH AND AQUATIC ORGANISMS

PAHs vary substantially in their toxicity to aquatic organisms. Toxicity of PAHs tends to increase with increasing molecular weight, particularly increasing alkyl substitution. PAHs have been linked to various liver tumors in fish (Environment Canada 1994b), and increased mortality has been observed in water fleas, nymphs, and mayflies exposed to PAHs (Krantzberg and Boyd 1992, Murphy and Others 1993, as cited in Environment Canada 1994b). Sediment PAH concentrations have been observed to cause liver lesions in flatfish and brown bullheads (Eisler 1987). PAHs and their metabolites also suppress the immune system in aquatic organisms.

5.5 BIRDS

For birds, several investigations have suggested that the presence of PAHs in petroleum causes embryo toxicity in avian species (Hoffman and Gay 1981, Albers 1983, as cited in Eisler 1987). Embryo effects include reduced embryo growth, incomplete skeletal ossification, and defects in the eye, brain, liver, and bill.

5.6 MAMMALS

PAH compounds are distinct in their ability to produce tumors in skin and in most epithelial tissues of mammals. Some PAHs have been linked to increased occurrence of leukemia, lung adenoma, and stomach tumors in mice. PAHs have resulted in altered hematopoietic function, as well as development of pathological conditions in lymphoid tissues. Impaired reproduction is frequently observed in chronic exposures where ovotoxicity and antispermatogenic effects have

been noted. Other systemic effects include adrenal necrosis, as well as changes in the intestinal and respiratory epithelia. Many PAHs induce metabolic enzymes, including the mixed-function oxidases present in the liver. Some PAHs and their metabolites also suppress the immune system, which has resulted in decreased responsiveness to mitogens and an increased susceptibility to disease. The majority of available information on toxicological properties of PAHs is focused on their carcinogenicity to mammals (EPA 1980, Lee and Grant 1981, as cited in Eisler 1987).

6.0 SEMIVOLATILE ORGANIC COMPOUNDS

The following sections present data on ecotoxicological effects of various semivolatile organic compounds (SVOC) identified as COPECs at Alameda Point.

6.1 4-CHLORO-3-METHYLPHENOL

Chlorophenols are a group of chemicals that are produced by adding chlorines to phenol. Some chlorophenols are used as pesticides, while others are used in antiseptics (ATSDR 1999c). 4-Chloro-3-methylphenol can be formed inadvertently in waters that have undergone chlorination treatment and by evaporation or waste releases from product formulation or end products containing the compound (U.S. National Library of Medicine [NLM] 2002).

Chlorophenols will stick to soil and sediments at the bottom of lakes, streams, and rivers. Low levels of chlorophenols in water, soil, or sediment are broken down and removed from aerobic environments in a few days to weeks by microorganisms. However, chlorophenols are not readily degradable in anaerobic environments and are relatively persistent in groundwater aquifers. Aquatic hydrolysis, bioconcentration, and volatilization are not important processes of the environmental fate of 4-chloro-3-methylphenol (NLM 2002; ATSDR 1999).

6.1.1 Plants

A study using lettuce seeds were exposed for duration of 21 days to a direct application of 4-chloro-3-methylphenol, which determined an EC50 of 2.3 mg/L (EPA 2003).

6.1.2 Invertebrates

No information was identified on the effects of 4-chloro-3-methylphenol on invertebrates.

6.1.3 Amphibians and Reptiles

No information was identified on the effects of 4-chloro-3-methylphenol on amphibians and reptiles.

6.1.4 Fish and Aquatic Organisms

Various toxicity tests for 4-chloro-3-methylphenol have been conducted using fish and other aquatic organisms. These studies have determined EC50 and LC50 concentrations. LC50 concentrations for such species as the water flea and the great pond snail after a 96-hour exposure duration range from 3.1 mg/L to 17.2 mg/l (EPA 2003).

6.1.5 Birds

A study using 16-week old northern bobwhite quail were exposed for duration of 14 days to 4-chloro-3-methylphenol throught the oral exposure route. This study determined a LD50 of 1,540 mg/kg (EPA 2003).

6.1.6 Mammals

In laboratory studies, animals that received high levels of chlorophenols in food or water developed liver and immune system effects. They did not gain as much weight as animals not fed the compounds (ATSDR 1999).

High levels of chlorophenols given to pregnant female rats in their drinking water reduced the number of babies they had, and caused low birth weights. Chlorophenols have not been shown to cause birth defects in animals (ATSDR 1999).

6.2 BIS(2-ETHYLHEXYL)PHTHALATE

Bis(2-ethylhexyl)phthalate is used widely to make plastics. Bis(2-ethylhexyl)phthalate is a component of many products found in homes and automobiles, as well as in the medical and packaging industries. Its wide use and distribution, as well as its high volatility and persistence, lead to its common occurrence in fish, water, and sediments.

Acute toxic effects may include the death of animals, birds, or fish and death of, or low growth rate in, plants. Acute effects are seen 2 to 4 days after animals or plants come in contact with a toxic chemical substance. Bis(2-ethylhexyl)phthalate has low acute toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term effects of bis(2-ethylhexyl)phthalate to plants, birds, or land animals.

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure to a toxic chemical. Bis(2-ethylhexyl)phthalate has low chronic toxicity to aquatic life. Insufficient data are available to evaluate or predict the long-term effects of bis(2-ethylhexyl)phthalate to plants, birds, or land animals.

Bis(2-ethylhexyl)phthalate is slightly soluble in water. Concentrations of less than 1 milligram will mix with a liter of water. Bis(2-ethylhexyl)phthalate is slightly persistent in water, with a half-life of between 2 to 20 days. About 42.8 percent of bis(2-ethylhexyl)phthalate eventually will end up in terrestrial soil; about 40 percent will end up in aquatic sediments; and about 17 percent will end up in air. Some substances increase in concentration, or bioaccumulate, in living organisms as they breathe contaminated air, drink contaminated water, or eat contaminated food. These chemicals can become concentrated in the tissues and internal organs of animals and humans.

6.2.1 Plants

No information was identified on the effects of bis(2-ehtylhexyl)phthalate on plants.

6.2.2 Invertebrates

No information was identified on the effects of bis(2-ehtylhexyl)phthalate on invertebrates.

6.2.3 Amphibians and Reptiles

No information was identified on the effects of bis(2-ehtylhexyl)phthalate on amphibians and reptiles.

6.2.4 Fish and Aquatic Organisms

The concentration of bis(2-ethylhexyl)phthalate found in fish tissues is expected to be much higher than the average concentration of in the water from which the fish was taken; however, little information was identified on the effects of bis(2-ehtylhexyl)phthalate on the toxicity of fish and aquatic organisms.

6.2.5 Birds

No information was identified on the effects of bis(2-ehtylhexyl)phthalate on birds.

6.2.6 Mammals

While significant reproductive effects were observed among mice on diets containing 0.1 percent and 0.3 percent bis(2-ethylhexyl)phthalate, no adverse effects were observed among the 0.01 percent dose group. Because the study considered exposure during critical lifestage, the 0.01 percent dose was considered to be a chronic no observed adverse effect level (NOAEL). The 0.0 percent dose was considered to be a chronic lowest observed adverse effect level.

6.3 CARBAZOLE

Carbazole occurs in the products of incomplete combustion of nitrogen containing organic matter. Carbazole is a heterocyclic aromatic compound produced during coal gasification and in cigarette smoke. Coal tar produced at high temperatures contains an average of 1.5 percent carbazole. Several thousand tons of carbazole are produced each year from coal tar and crude oil. It is widely used in synthesis of dyes, pharmaceuticals, and plastics. It is used in making photographic plates sensitive to ultraviolet light, and is a reagent for lignin, carbohydrates, and formaldehyde. Carbazole also is used in the manufacture of reagents, explosives, insecticides, lubricants, and rubber antioxidants. It serves as an odor inhibitor in detergents.

Carbazole is an extremely weak base and is incompatible with strong oxidizing agents. It reacts with nitrogen oxides. Potassium hydroxide fusion yields a salt. The water solubility of carbazole is less than 1 milligram per milliliter (mg/mL) at 19 °C. The melting point is 247°C; the boiling point is -355°C; the flash point is 220°C. The natural form of carbazole is white crystals, plates, or leaflets.

6.3.1 Plants

No information was identified on the effects of carbazole on plants.

6.3.2 Invertebrates

Carbazole is used as an insecticide; however, information regarding the specific effects of carbazole on invertebrates was not identified.

6.3.3 Amphibians and Reptiles

No information was identified on the effects of carbazole on amphibians and reptiles.

6.3.4 Fish and Aquatic Organisms

A bioaccumulation experiment on large rainbow trout showed that concentrations of carbazole expressed on a per gram basis were highest in fatty tissue, followed by internal organs, then liver or muscle, while blood displayed the lowest levels. Most of the total body burden of this compound was in muscle and internal organs, which represent the largest volume of the fish, while smaller amounts were in blood and liver. However, compared with four other similar compounds, carbazole showed the lowest concentrations within any tissue. It was concluded that both exposure through food and sediment, carbazole bioaccumulated under chronic exposure conditions. Also, the ratio of concentrations in tissues can be indicative of the contaminant dose and time of exposure to the compound (Hellou and Yeats 2000). No information on the consequenses of bioaccululation of carbazole on aquatic organisms was identified.

6.3.5 Birds

No information was identified on the effects of carbazole on birds.

6.3.6 Mammals

Carbazole is a poison when introduced by an intraperitoneal route, moderately toxic when ingested, and a suspected carcinogen (limited evidence from the IARC) (IARC and WHO 1983). The lowest published lethal dose for a rat is 500 mg/kg when taken orally. The lethal dose of 50 percent (LD50) mice killed is 200 mg/kg when introduced by intraperitoneal means (Clansky 1990; IARC and WHO 1983; Lewis and Tatkin 1989).

6.4 DIETHYLPHTHALATE

Diethylphthalate is used as a plasticizer, solvent for resins, wetting agent, and insect repellent (NLM 2002). The release of diethylphthalate into the environment from degradation of these products is relatively easy, since it is not a part of the chain of chemicals that make up the plastics. Diethylphthalate is expected to have moderate to low mobility in soil under typical environmental conditions. Biodegradation is expected to occur under both aerobic and anaerobic conditions with an estimated anaerobic half-life of about 5 days. Volatilization from soils will be relatively low (ATSDR 1995b). In aquatic environments, diethylphthalate will adsorb to suspended solids and sediment. Volatization from water surfaces will be slow. The compound is expected to biodegrade in aquatic environments with estimated half-lives of about 3 and 28 days for aerobic and anaerobic condtions, respectively (NLM 2002).

6.4.1 Plants

No information was identified on the effects of diethylphthalate on plants.

6.4.2 Invertebrates

No information was identified on the effects of diethylphthalate on invertebrates

6.4.3 Amphibians and Reptiles

No information was identified on the effects of diethylphthalate on amphibians and reptiles.

6.4.4 Fish and Aquatic Organisms

Bluegill fish exposed to 9.42 microgram per liter of diethylphthalate for 21 days had a measured BCF value of 117. An experimental log BCG value of 2.07 was measured in clams. Based on these studies, the potential for bioconcentration in aquatic organisms is considered high (NLM 2002).

6.4.5 Birds

No information was identified on the effects of diethylphthalate on birds.

6.4.6 Mammals

Diethylphthalate is not classified as a human or animal carcinogen. Teratogenic effects in animal studies have not been noted. In general, this compound is rapidly absorbed, metablolized, and excreted when ingested. Acute feeding of animals has determined that this compound is non-toxic. Chronic feeding of 5 percent diethylphthalate to rats showed a decrease in the growth rate of rats without any effect on food consumption. However, similar studies with dogs showed no chronic effects of the compound to this species (NLM 2002).

6.5 DI-N-BUTYLPHTHALATE

Di-n-butylphthalate is used as a plasticizer, solvent for resins, fuel propellent, and insect propellent (NLM 2002). It is only slightly soluble in water and does not easily evaporate (or volatilize) (ATSDR 2001). Di-n-butylphthalate is expected to have low mobility in soil. Biodegradation is expected to occur under both aerobic and anaerobic conditions. In aquatic environments, di-n-butylphthalate will adsorb to sediment or particulate matter. Volatization from water surfaces will be slow. The compound is expected to biodegrade in aquatic environments with estimated half-lives of about 3 and 28 days for aerobic and anaerobic condtions, respectively (NLM 2002; ATSDR 2001). Tertogenic effects from exposure to di-n-butylphthalate have been observed in several studies, as noted in the following sections.

6.5.1 Plants

Cabbage seedlings were killed when the volume of di-n-butylphthalate reached toxic levels (concentrations of up to 2,010 picograms per liter) in the air (NLM 2002).

6.5.2 Invertebrates

Di-n-butylphthalate was not toxic to female houseflies when applied at high doses, either topically or by injection (NLM 2002).

6.5.3 Amphibians and Reptiles

No information was identified on the effects of diethylphthalate on amphibians and reptiles.

6.5.4 Fish and Aquatic Organisms

Based on experimental BCF values ranging from 12 to 117 measured in oysters, fish, and shrimp, bioconcentration in aquatic organisms is low to moderate (NLM 2002).

Toxicities to fecundity in *Daphnia magna* and the fathead minnow were assessed and it was determined that 1.8 milligrams per liter of di-n-butylphthalate showed significant reduction in reproduction for Daphnia magna and decrease in the survival of fathead minnow embroyos (NLM 2002).

6.5.5 Birds

Mallard ducks fed a continuous diet of duck mash containing 10 mg/kg of di-n-butylphthalate for 5 months, showed no significant accumulation of the chemical.

6.5.6 Mammals

Di-n-butylphthalate is not classified as a human or animal carcinogen. Teratogenic effects have been seen in rat studies during gestation. Effects such as skeletal abnormalities, such as, absence of tail, twisted legs, and abnormal skull bones, as well as, reduced weight of fetuses were observed compared to controls (NLM 2002).

6.6 N-NITROSODIPHENYLAMINE

N-nitrosodiphenylamine is a solid chemical used in the rubber industry. Its primary use is as a staining retarder for natural and synthetic rubbers. It most likely enters the environment from industrial discharges and spills.

Acute toxic effects may include the death of animals, birds, and fish and death of, or low growth rate in, plants. Acute effects are seen 2 to 4 days after animals or plants come in contact with n-nitrosodiphenylamine. Insufficient data are available to evaluate or predict the acute, short-term effects of n-nitrosodiphenylamine to aquatic life, plants, birds, or land animals.

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposures to a toxic chemical. Insufficient data are available to evaluate or predict the chronic, long-term effects of n-Nitrosodiphenylamine to aquatic life, plants, birds, or land animals.

6.6.1 Plants

No information was identified on the effects of n-nitrosodiphenylamine on plants.

6.6.2 Invertebrates

Neuhauser and Callahan (1990) examined at the effect of this compound on growth and reproduction of *Eisenia fetida* after 56 days of growth in horse manure. A concentration of 1,400 ppm (the lowest concentration tested) caused a 37 percent reduction in cocoon production.

6.6.3 Amphibians and Reptiles

No information was identified on the effects of n-nitrosodiphenylamine on amphibians and reptiles.

6.6.4 Fish and Aquatic Organisms

No information was identified on the effects of n-nitrosodiphenylamine on fish and aquatic organisms.

6.6.5 Birds

No information was identified on the effects of n-nitrosodiphenylamine on birds.

6.6.6 Mammals

No information was identified on the effects of n-nitrosodiphenylamine on mammals.

6.7 PENTACHLOROPHENOL

Pentachlorophenol (PCP) is a semivolatile, chlorinated phenolic compound and is a priority pollutant. PCP is an anthropogenic substance, made from other chemicals, and does not occur naturally in the environment. At one time, it was one of the most widely used biocides in the United States. PCP is a restricted-use insecticide, fungicide, molluscicide, defoliant, herbicide, and wood preservative, and it is no longer available to the general public. PCP has two forms: pentachlorophenol and the sodium salt of pentachlorophenol. The sodium salt dissolves easily in water, but PCP does not. This compound is among 31 substances classified by the Worker Health and Safety Unit of the California Department of Food and Agriculture as having high carcinogenic or oncogenic potential and is listed by EPA as a carcinogen. PCP is a substance whose widespread use, mainly in wood protection and pulp and paper mills, has led to extensive environmental contamination.

6.7.1 Plants

Hulzebos and Others (1993) evaluated the effects of PCP on lettuce growth in two soils and in solution. Soils with a high clay content produced higher EC_{50} values for PCP. Toxic levels of PCP caused reduced fresh weight of shoots of oats (*Avenas sativa*) after 14 days of exposure and turnips (*Brassica rapa*) after 10 days of exposure in a sandy loam soil. The EC_{50}s for oats and turnips were 20 and 10 ppm, respectively.

6.7.2 Invertebrates

Fitzgerald and Others (1996) investigated the role of species, temperature, and soil type on toxicity of PCP to earthworms. Researchers estimated incipient lethal levels (ILL), which they define as a time-dependent LC_{50}. ILLs for *Eisenia fetida* grown for 14 days in an artificial soil at 24 or 15 °C were 37 and 27 ppm, respectively. The ILL for *Eisenia fetida* grown for 14 days in a clay soil at 24 °C was 72 ppm. The ILL for *Eisenia fetida* at 24 °C was 168 ppm. *Lumbricus terrestris* grown at 15 °C had an ILL of 191 ppm.

6.7.3 Amphibians and Reptiles

PCP may affect growth and survival in sensitive aquatic species.

6.7.4 Fish and Aquatic Organisms

Little information was identified on the effects of PCP on fish and aquatic organisms.

6.7.5 Birds

Avian fatalities have been reported for low oral doses of PCPs. Chlorophenols appear to be mildly hepatotoxic, and studies in animals indicate that PCP may reduce humoral and cell-mediated immunity, as well as act as a cocarcinogen (HSDB 1999). Acute, dietary studies (using oral doses high enough to cause relatively quick toxicity), feeding this compound to mammal and bird species, place it in the "moderately toxic" category for mallards and pheasants and the "relatively nontoxic" category for Japanese quail.

6.7.6 Mammals

Animal studies indicate that rat embryos are most susceptible to the toxic effect of PCP during the early phases of organogenesis (HSDB 1999). Teratogenic activities of highly purified PCP and pentachloroanisole, administered in the diet of Sprague-Dawley rats of both sexes, revealed embryonic deaths following treatment with PCP at the rate of 43 mg/kg/day, while lower doses of the compound induced dose-related reductions in body weight. At the rate of 13 mg/kg/day, PCP reduced the crown to rump length and increased the skeletal alterations of the fetus. Decreased numbers of corpora lutea and embryonic death were recorded following the administration of PCP at the rate of 4 and 41 mg/kg/day. At the same dose, PCP reduced the body weight and crown to rump length of male fetuses, while their female counterparts were not affected.

7.0 VOLATILE ORGANIC COMPOUNDS

The following sections present data on ecotoxicological effects of the VOCs identified as COPECs at Alameda Point.

7.1 1,2-DICHLOROETHENE

1,2-dichloroethene (DCE) is a clear, colorless, flammable liquid, consisting of a mixture of the cis- and trans-isomers. It is used as an intermediate to make other chemicals and as a cleaning solvent. It may enter the environment from industrial or municipal discharges or spills.

Acute effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic toxicity of 1,2-DCE is moderate in aquatic life. Insufficient data are available to evaluate or predict the long-term effects of 1,2-DCE to plants, invertebrates, birds, or terrestrial animals.

7.1.1 Plants

No information was identified on the effects of 1,2-DCE on plants.

7.1.2 Invertebrates

No information was identified on the effects of 1,2-DCE on invertebrates.

7.1.3 Amphibians and Reptiles

No information was identified on the effects of 1,2-DCE on amphibians and reptiles.

7.1.4 Fish and Aquatic Organisms

No information was identified on the effects of 1,2-DCE on fish and aquatic organisms.

7.1.5 Birds

No information was identified on the effects of 1,2-DCE on birds.

7.1.6 Mammals

No information was identified on the effects of 1,2-DCE on mammals.

7.2 1,3-DICHLOROBENZENE

1,3-dichlorobenzene is used as a fumigant and an insecticide. It is highly volatile, which is an important fate process of the chemical from dry soils. However, it is also expected to adsorb to sediment or particulate matter in aquatic environments. Based on experimental BCF values ranging from 60 to 370, which was measured in carp and trout, the potential for bioconcentration in aquatic organisms is considered moderate to high (NLM 2002). Biodegradation of the compound by microorganisms in soil and water is expected to be slow to non-existent.

7.2.1 Plants

1,3-dichlorobenzene was identified, but not quantified in plant material grown in an Illinois coal refuse reclamation site. This indicates that plants can take up and store 1,3-dichlorobenzene. No information was identified on the toxic effects of 1,3-dichlorobenzene on plants (NLM 2002).

7.2.2 Invertebrates

No information was identified on the toxic effects of 1,3-dichlorobenzene on invertebrates.

7.2.3 Amphibians and Reptiles

No information was identified on the toxic effects of 1,3-dichlorobenzene on amphibians and reptiles.

7.2.4 Fish and Aquatic Organisms

Chronic toxicities were developed for fathead minnows exposed from the embroyo through the early juvenile development stage. The range from the NOAEL and LOAEL for 1,3-dichlorobenze was 1,000 to 2,300 microgram per liter. The tissue concentration of 1,3-dichlorobenzene at the NOAEL was between 120 to 160 microgram per gram, while the mean BCF was 97. The 96-hour lethal concentration value for juvenile fish was 7,800 micrograms per liter (NLM 2002).

7.2.5 Birds

No information was identified on the toxic effects of 1,3-dichlorobenzene on birds.

7.2.6 Mammals

1,3-dichlorobenzene is not classified as a human or animal carcinogen.

7.3 4-METHYL-2-PENTANONE

This compound also is known as methyl isobutyl ketone (MIBK). The chemical is used as a solvent for vinyl, epoxy, acrylic, natural resins, nitrocellulose, and dyes. Additionally, it is used as an extracting agent for the production of antibiotics or the removal of paraffins from mineral oil. MIBK also occurs naturally in oranges and grapes. MIBK will have a high mobility through soils, but will volatilize easily from the dry soil surfaces and water surfaces. In water, MIBK will not adsorb to suspended solids or sediment. Biodegradation will occur both in aerobic and anaerobic conditions, and bioconcentration in organisms will be low based on an estimated BCF value of 6 (NLM 2002).

7.3.1 Plants

No information was identified on the toxic effects of MIBK on plants.

7.3.2 Invertebrates

No information was identified on the toxic effects of MIBK on invertebrates.

7.3.3 Amphibians and Reptiles

No information was identified on the toxic effects of MIBK on amphibians and reptiles.

7.3.4 Fish and Aquatic Organisms

A 24-hour single dose of 460 mg/L was identified as the LC50 concentration for the goldfish, while in the water flea the 24-hour single dose LC50 was measured at 4,300 mg/L.

7.3.5 Birds

An LD50 concentration of `00 milligrams per kilogram was determined for the red-winged blackbird.

7.3.6 Mammals

An exposure of 16,800 ppm of MIBK for up to six hours killed 90 percent of guinea pigs exposed. While an exposure of 1,000 ppm of MIBK produced only minor respiratory effects and no eye and nose irritation to guinea pigs. A continuous inhalation exposure of 100 ppm of MIBK to Rhesus monkeys, dogs, and rats produced no significant changes in hematology, while rats exposed to the same amounts showed a decrease in liver and kidney weights.

7.4 ACETONE

Acetone is a colorless, liquid VOC that has a pungent, sweet odor and taste (Budavari 1996). Acetone is used as a solvent for fats, oils, waxes, resins, rubber, plastics, lacquers, varnishes, and rubber cement; in the manufacture of acetyl acid, chloroform, and other chemicals; for extraction of plant and animal substances; in purifying paraffin; and a main ingredient in nail polish remover (Budavari 1996).

Acetone is considered to be the least toxic solvent used in industry, but it is highly volatile, making inhalation the primary route of exposure. Dermal contact is a secondary route of exposure. The mechanism by which acetone enters the environment is through wastewater from industries who use and produce the compound. Acetone is not persistent in the environment and once released, it will volatilize quickly into the air from both soils and water (Benkelbberg and Others 1995, Alarie and Others 1995, as cited in HSDB 1999). It is not expected to adsorb to sediments or soils and because of its hydrophilic characteristic, it is not expected to bioconcentrate in wildlife receptors (HSDB 1999). As a vapor, acetone will undergo photodegrade (HSDB 1999).

7.4.1 Plants

No information was identified on the effects of acetone on plants.

7.4.2 Invertebrates

No information was identified on the effects of acetone on invertebrates.

7.4.3 Amphibians and Reptiles

No information was identified on the effects of acetone on amphibians and reptiles.

7.4.4 Fish and Aquatic Organisms

Results of various ecotoxicity tests of aquatic organisms produced LC_{50} and LD_{50} values from acetone exposure. The LC_{50} for brine shrimp and *Daphnia magna* is 2,100 mg/L 24 to 48 hr and 10 mg/L 24 to 48 hr, respectively. In fish, LC_{50} values for the bluegill sunfish, mosquito fish, and the guppy were 8,300 mg/L 96 hr; 13,000 mg/L 24 to 96 hr; and 7,032 mg/L 14 days, respectively. The LD_{50} for the goldfish was 5,000 mg/L 24 hr (Verschueren 1996). From this data, the lower trophic levels of aquatic organisms seem to exhibit greater sensitivity for adverse effects from acetone exposure than the higher trophic-level organisms.

7.4.5 Birds

Very few studies were identified on the effects of acetone on birds. Two ecotoxicity studies, on the ring-necked pheasant and the Japanese quail, established the LC_{50} for these organisms at 40,000 mg/L of acetone in the diet at an age of 10 to 14 days. No mortality of these birds was seen at concentrations below 40,000 mg/L (Hill and Camardese 1986, [USFWS] 1975, as cited in HSDB 1999). Ameenuddin and Sunde (1984) investigated the sensitivity of developing chicken embryos to various solvents and found that acetone, at a concentration of 0.10 mL per egg injected, significantly reduced the percentage hatchability and caused high embryonic mortality during the first week of incubation.

7.4.6 Mammals

Studies of various mammal receptors exposed to acetone vapors have shown very few (if any) ill effects, other than slight irritation of the eyes and nose (in cats), loss of reflexes (in guinea pigs), moderate corneal injury (in rabbits and rats), and cataracts (in guinea pigs) (Clayton and Clayton 1982). Very little information was found on the effects of ingestion of acetone-saturated water; however, this is the least likely route of exposure for wildlife.

7.5 BENZENE

Benzene is present in gasoline as an additive, and is manufactured to produce a variety of chemicals such as polymers, detergents, pesticides pharmaceuticals, dyes, plastics, and resins. Also, benzene can be used as a solvent for waxes, resins, oils, and natural rubbers. Benzene is naturally present in volcanos, as a constituent of crude oil, in forest fires, and as a plant volatile. Benzene is highly water-soluble. Generally, benzene will be removed from the atmosphere by rain. Volatility from moist soils is greater than from dry soils, and volatility from water surfaces is an important fate process. Soil mobility of benzene is relatively high. Abiotic degradation of benzene in the atmosphere will occur, with the half-life of the reaction estimated at 13 days. Biodegratdation of benzene in water is expected. Benzene is not expected to bioconcentrate in aquatic organisms; however, bioconcentration in mammals (humans) has been observed. Benzene has been classified as a known human carcinogen for all routes of exposure (NLM 2002).

7.5.1 Plants

No information was identified on the effects of benzene on plants.

7.5.2 Invertebrates

No information was identified on the effects of benzene on invertebrates.

7.5.3 Amphibians and Reptiles

No information was identified on the effects of benzene on amphibians and reptiles.

7.5.4 Fish and Aquatic Organisms

Adverse growth effects in blue crab juveniles were observed when exposed to sublethal concentrations (0.1 or 5 ppm) of benzene. The 96-hour LC 50 concentration for grass shrimp was measured at 27 ppm; 1,108 ppm for crab larvae; and 5.8 to 11 mg/l for bass (NLM 2002).

7.5.5 Birds

No information was identified on the effects of benzene on birds.

7.5.6 Mammals

Many experimental animal studies have indicated that benzene is a carcinogen. Benzene increases the risk of cancer in multiple organ systems, including the hematopoietic system, oral and nasal cavitites, liver, stomach, lung, ovaries, and mammary glad.

Respiratory effects have been noted in cats, primates, rabbits, and rats when exposed to benzene in acute inhalation studies.

Teratogenic effects have been noted in rats and mice studies. Such effects include decrease in pup survival and decrease in mean pup weights. No effects were noted in these studies between treated and control animals for maternal mortality, pregnancy rates, mean number of dead pups, and maternal body weight.

7.6 CARBON DISULFIDE

Carbon disulfide is used as a process solvent for phosphorus, sulfur, selenium, bromine, iodine, fats, resuns, and rubbers, and as a chemical intermediate in the manufacture of rayon, carbon tetrachloride, xanthogenates, soil disinfectants, and electronic vacuum tubes. The ocean, primarily the coastal area or other areas of high biological productivity, is a major global source of carbon disulfide. This “natural” source of carbon disulfide is generated by the reduction of sulfates in soil. Carbon disulfide is only slightly mobile in soils. Volatilization from moist soils occurs more rapidly than from dry soils, and volitilation from water surfaces is an important process in the fate and transport of carbon disulfide. Carbon disulfide does not significantly bioaccumulate in aquatic organisms (NLM 2002).

7.6.1 Plants

No information was identified on the effects of carbon disulfide on plants.

7.6.2 Invertebrates

No information was identified on the effects of carbon disulfide on invertebrates.

7.6.3 Amphibians and Reptiles

No information was identified on the effects of carbon disulfide on amphibians and reptiles.

7.6.4 Fish and Aquatic Organisms

No information was identified on the effects of carbon disulfide on fish and aquatic organisms.

7.6.5 Birds

No information was identified on the effects of carbon disulfide on birds.

7.6.6 Mammals

Teratogenic effects were studied in rats. Rats were exposed to 642 ppm carbon disulfide for 2 hours per day for the entire pregnancy. The results indicated that the reproductive success of treated groups was less than that of the control groups (NLM 2002).

7.7 ETHYLBENZENE

Ethylbenzene is a colorless liquid that occurs together with other aromatics. A typical, complex mixture of aromatics may be more toxic, hazardous, or carcinogenic in general than this compound would be alone.

Except for short-term hazards from concentrated spills, this compound has been associated more frequently with risk to humans than with risk to nonhuman species, such as fish and wildlife. This difference occurs partly because plants, fish, and birds take up only very small amounts and because this volatile compound tends to evaporate into the atmosphere, rather than persisting in surface waters or soils (ATSDR 1990c). However, VOCs, such as ethylbenzene, can pose a drinking water hazard when they accumulate in groundwater.

Ethylbenzene releases to water occur as a result of industrial discharges, use of gasoline fuel for boating, fuel spillage, leaking underground storage tanks, landfill leachate, and the inappropriate disposal of waste (ASTDR 1990c). Ocean releases occur as a result of offshore oil production, hydrocarbon venting, oil field brines, and tanker oil spills (ASTDR 1990c).

Effects of this volatile solvent to nonhuman biota often result from high concentrations immediately after a spill (before the compound has volatilized into the atmosphere) or as the

indirect result of contamination of groundwater. For example, if highly polluted groundwater enters surface waters from spring or seeps, local effects may occur in the mixing zone.

In comparison to chemicals such as PCBs, DDT, and other chlorinated pesticides, which are of great concern with respect to bioaccumulation, ethylbenzene does not bioaccumulate significantly in aquatic food species (ATSDR 1990c).

7.7.1 Plants

Little information was identified on the effects of ethylbenzene on plants.

7.7.2 Invertebrates

Little information was identified on the effects of ethylbenzene on invertebrates.

7.7.3 Amphibians and Reptiles

Little information was identified on the effects of ethylbenzene on amphibians and reptiles.

7.7.4 Fish and Aquatic Organisms

Little information was identified on the effects of ethylbenzene on fish and aquatic organisms.

7.7.5 Birds

Little information was identified on the effects of ethylbenzene on birds.

7.7.6 Mammals

Little information was identified on the effects of ethylbenzene on mammals.

7.8 METHYLENE CHLORIDE

Methylene chloride is a VOC and is a colorless liquid with a chloroform-like odor (HSDB 1999). Methylene chloride is used as a solvent for cellulose, plastic film, and adhesives; in insecticide processing and producting steroids and antibiotics; as an anesthetic paint remover, and degreaser; in decaffeinating coffee; and as a refrigerant (Budavari 1996).

The primary mechanism by which methylene chloride enters the environment is through air emissions from industries that produce and use the chemical and in wastewater. If released onto soil or into surface water, the chemical will volatilize quickly into the air because of its high vapor pressure (Dilling and Others 1795, DeWalle and Chain 1975, as cited in HSDB 1999). A

portion of spilled methylene chloride will leach through soil into groundwater (Dilling and Others 1975, as cited in HSDB 1999). Methylene chloride will adsorb strongly to peat moss; however, this mechanism of transport is minor compared to volatilization. Bioconcentration of methylene chloride is not expected, because it is hydrophilic and is excreted by the organism through normal, physiological mechanisms.

7.8.1 Plants

No information was identified on the effects of methylene chloride on plants.

7.8.2 Invertebrates

No information was identified on the effects of methylene chloride on invertebrates.

7.8.3 Amphibians and Reptiles

No information was identified on the effects of methylene chloride on amphibians and reptiles.

7.8.4 Fish and Aquatic Organisms

Various ecotoxicity studies have determined LC_{50} and LD_{50} values for aquatic receptors. The following is a summary of some of these findings. The LC_{50} values for Mysid shrimp and *Daphnia magna* exposed to methylene chloride were 256,000 µg/L/1/96 hr and 224,000 µg/L/1/48 hr, respectively (HSDB 1999). In fish, the LC_{50} for fathead minnow, bluegill, and guppies were 310 mg/L/1/96 hr, 230 mg/L 96 hr, and 294 mg/L in 14 days (HSDB 1999).

7.8.5 Birds

No information was identified on the effects of methylene chloride on birds.

7.8.6 Mammals

Studies on the toxic effects of methylene chloride on various mammal receptors have indicated evidence of carcinogenicity and adverse physiological effects to the kidneys and liver. The EPA (1999) Integrated Risk Information System databank on methylene chloride indicates increased incidence of hepatocellular neoplasms and alveolar/bronchiolar neoplasms in male and female mice and increased incidence of benign, mammary tumors in male and female rats, salivary gland sarcomas in male rats, and leukemia in female rats. Morris and Others (1979, as cited in HSDB 1999) showed toxic effects of methylene chloride to the livers of guinea pigs. Adverse renal effects were documented in rat studies (Kurppa and Vainio 1981; Kluwe and Others 1982, as cited in HSDB 1999).

7.9 TETRACHLOROETHENE

Tetrachloroethene, also known as perchloroethylene (PCE), is a carcinogenic priority pollutant that is used in dry cleaning and as an industrial solvent (EPA 1986, 1991).

This synthetic compound is widely used for dry cleaning fabrics and for metal degreasing operations. It also is used as a starting material for making other chemicals and is used in some consumer products. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell PCE when it is present in the air at a level of 1 ppm or more.

PCE enters the environment mostly by evaporating into the air during use. It also can enter water supplies and soil during disposal of sewage sludge and factory waste. PCE also may enter the air, soil, or water by leaking or evaporating from storage and waste sites (ATSDR 1995c).

PCE has received more publicity and attention as a potential hazard to humans than to fish and wildlife; therefore, more literature related to humans is available, and information on other species is comparatively sparse.

Effects of this volatile solvent to nonhuman biota often result from high concentrations immediately after a spill (before the compound has volatilized into the atmosphere) or as the indirect result of groundwater contamination. For example, if highly polluted groundwater comes into surface waters from springs or seeps, effects may occur in the mixing zone.

PCE has been shown to release lysosomal enzymes from granular fractions prepared from nematodes. Because the nematode gut seems to be specialized for lysosomal, intracellular digestion of nutrients, interference with this process may explain PCE action. It has been assumed that affected worms are paralyzed sufficiently to release their attachment to the intestinal wall (Goodman and Gilman 1975).

One potentially important aspect of PCE is its ability to break down into other hazardous compounds. PCE can be transformed by reductive dehalogenation to trichloroethylene (TCE), dichloroethylene, and vinyl chloride under anaerobic conditions. Therefore, when PCE levels have been reduced to acceptable levels, it is still necessary to verify that concentrations of suspected hazardous breakdown products also are acceptably low.

PCE has been classified as a probable human carcinogen by EPA (EPA 1986). It has been treated as a carcinogen for EPA preliminary remediation goals (PRG) and risk-based concentration (RBC) modeling (EPA 1995c, 1996).

PCE is likely to enter the environment through fugitive air emissions from dry cleaning and metal degreasing industries and by spills or accidental releases to air, soil, or water. If PCE is released to soil, it will evaporate into the atmosphere and leach to the groundwater. Biodegradation may be an important process in anaerobic soils based on laboratory tests with methanogenic columns. Slow biodegradation may occur in groundwater, where acclimated

populations of microorganisms exist. If PCE is released to water, it will be subject to rapid volatilization, with estimated half-lives ranging from less than 1 day to several weeks. It will not be expected to significantly biodegrade, bioconcentrate in aquatic organisms, or significantly adsorb to sediment. PCE will not be expected to significantly hydrolyze in soil or water under normal environmental conditions. If PCE is released to the atmosphere, it will exist mainly in the gas phase and will be subject to photo-oxidation, with estimates of degradation time ranging from an approximate half-life of 2 months to complete degradation in an hour. Some PCE in the atmosphere may be subject to washout in rain, based on the solubility of PCE in water; PCE has been detected in rain.

Low to moderate potential exists for bioconcentration of PCE (Environment Canada 1993a). Using a reported log K_{ow} of 3.40, a BCF of 226 was estimated. Based on the reported and estimated BCFs, PCE will not be expected to significantly bioconcentrate in aquatic organisms (Barrows and Others 1978).

7.9.1 Plants

A study was designed to assess the effects of PCE on the phytoplankton community at initial concentrations of 1.2 and 0.44 mg/L in separated compartments of an experimental pond. Measurements in surrounding water were made simultaneously to detect possible effects of compartmentalization. Residues as low as 0.1 mg/L could be analyzed in 5-day (low-dose) and 38-day (high-dose) postapplication tests. The phytoplankton community showed an increase in relative abundance and a decrease in species diversity. Studies of the frequency distribution of six selected phytoplankton species (*Spirogyra species, Microcystis flosaquae, Stichoccoccus bacillaris, Nitzschia acicularis, Chilomonas paramecium,* and *Actiniphrys species*) demonstrated the total elimination of at least four species from the treated compartments. Despite different dosing, only weak differences were found in toxic effects between the low- and high-dosed compartments. No significant, chemically induced effect was observed on the physicochemical properties of the treated water (Lay and Others 1984).

7.9.2 Invertebrates

Adverse effects to *Daphnia magna* occurred at concentrations as low as 0.44 mg/L (Environment Canada 1993a). A study was designed to evaluate the effects of PCE on the zooplankton community at initial concentrations of 1.2 and 0.44 mg/L in separated compartments of an experimental pond. Measurements in surrounding water were made simultaneously to detect possible effects of compartmentalization. Residues as low as 0.1 mg/L could be analyzed in 5-day (low-dose) and 38-day (high-dose) postapplication tests. In all applied biotopes, a lethal effect on the *Daphnia magna* population was detected. No significant, chemically induced effect was observed on the physicochemical properties of the treated water (Lay and Others 1984).

7.9.3 Amphibians and Reptiles

Little information was identified on the effects of PCE on amphibians and reptiles.

7.9.4 Fish and Aquatic Organisms

Long-term adverse effects to brook trout growth occurred at concentrations as low as 1.52 mg/L (Environment Canada 1993a).

LC_{50} values for *Cyprinodon variegatus* (sheepshead minnow) were between 29 and 52 mg/L for 4-day exposures. Death was not observed at concentrations below 29 mg for a 96-hour exposure (EPA 1997).

LC_{50} values for *Jordanella floridae* (flagfish) were 11.5 mg/L for a 24-hour exposure, 10.9 mg/L for a 48-hour exposure, 8.9 mg/L for a 72-hour exposure, and 4.0 and 8.4 mg/L for two 96-hour exposures. The lowest observed effect concentrations (LOEC) for death were 3.1 and 3.7 mg/L for a 10-day and a 28-day exposure, respectively (EPA 1997).

7.9.5 Birds

Little information was identified on the effects of PCE on birds.

7.9.6 Mammals

Results from inhalation studies in animals suggest that PCE is fetotoxic, but not teratogenic, at concentrations that are also maternally toxic (ATSDR 1995c).

Pregnant mice and rats were exposed to a concentration of 300 ppm. Both species were exposed for periods of 7 hours daily on Days 6 through 15 of gestation. No fetal toxicity or teratogenicity was detected (Shepard 1986; Kafafi and Others 1993).

Only one reproductive study in animals was identified, and it had serious limitations in design and conduct. Therefore, it provides no conclusive evidence for reproductive effects (ATSDR 1995c).

Male Swiss-Cox mice were administered PCE by gavage at doses of 0; 20; 100; 200; 500; 1,000; 1,500; and 2,000 mg/kg, 5 days per week for 6 weeks. Liver toxicity was evaluated by several parameters, including liver weight-to-body weight ration, hepatic triglyceride concentrations, DNA content, histopathological evaluation, and serum enzyme levels. Increased liver triglycerides were first observed in mice treated with 100 mg/kg. Liver weight-to-body weight ratios were significantly higher than controls for the 100-mg/kg group and slightly higher than controls in the 20-mg/kg group. A no observed adverse effect level (NOAEL) of 20 mg/kg/day was identified based on the absence of heptatoxic effects. After 5 days of exposure, a NOAEL of 20 mg/kg/day was identified (EPA 1996).

7.10 TOLUENE

Toluene is an organic solvent that is widely used, particularly in the paint, printing, and adhesive industries; toluene also is abused by "recreational" inhalation. Additionally, toluene is used as a gasoline additive (HSDB 1999). Toluene often occurs together with other aromatics (often including PAHs, alkyl PAHs, and benzene), and a typical complex mixture of such aromatics may be more toxic or hazardous, in general, than this compound would be alone.

Toluene can be released to soil through petroleum spills and from leaking underground storage tanks (Environment Canada 1993b). Toluene can be released into water through chemical and petroleum product spills and from discharges of industrial and municipal effluents (Environment Canada 1993b).

Toluene is dangerous to aquatic life in high concentrations. It may be dangerous if it enters water intakes (HSDB 1999). Water uses threatened are recreational, potable supply, fisheries, and industrial (EPA 1994).

Except for short-term hazards from concentrated spills, toluene frequently has been more associated with risk to humans than with risk to other species such as fish and wildlife. This is partly because plants, fish, and birds take up only very small amounts and because this VOC tends to evaporate into the atmosphere rather than persist in surface waters or soils (ATSDR 1994b). However, volatiles, such as toluene, can pose a drinking water hazard as a contaminant in groundwater.

Toluene has been studied for reproductive effects in laboratory animals and generally has not been teratogenic but has been fetotoxic at high doses that also were toxic to the mothers (Dabney 1994).

Toluene does not persist in water or soil, because it biodegrades and volatilizes rapidly to the atmosphere (Environment Canada 1993b). Accumulation of toluene is not expected to be important in any terrestrial or aquatic organism, and no reports exist indicating any significant organism bioconcentration or food chain biomagnification (Environment Canada 1993b).

BCFs for toluene in biota have been predicted to be between 15 and 70 (values less than 100 generally indicate that a compound is unlikely to undergo significant bioconcentration in organisms or biomagnification along food chains) (Environment Canada 1993b).

7.10.1 Plants

No information was identified on the effects of toluene on amphibians and reptiles.

7.10.2 Invertebrates

No information was identified on the effects of toluene on invertebrates.

7.10.3 Amphibians and Reptiles

No information was identified on the effects of toluene on amphibians and reptiles.

7.10.4 Fish and Aquatic Organisms

For aquatic biota, the most sensitive organism identified in long-term tests was the early life stages of rainbow trout. The reported LC_{50} was 0.02 mg/L for continuous, 27-day exposure of the embryo-larval stages. Coho salmon fry were the most sensitive aquatic organisms in acute tests, with a 96-hour LC_{50} of 5.5 mg/L. The 40-day, no observed effect concentration for growth of coho salmon fry was 1.4 mg/L, and the lowest observed effect concentration (LOEC) was 2.8 mg/L (Environment Canada 1993b).

Based on its lipophilic properties, toluene is expected to have a moderate tendency to bioconcentrate in fatty tissues of aquatic organisms. The BCF was estimated to be about 10.7 in fish and about 4.2 in mussels. Levels that accumulate in the flesh of aquatic species also depend on the degree to which the species metabolize toluene. The highest tissue levels of toluene tend to occur in species such as eels, crabs, and herring that have a low rate of toluene metabolism (ATSDR 1994b). Metabolism of toluene limits its tendency to biomagnify in the food chain (ATSDR 1994b).

7.10.5 Birds

No information was identified on the effects of toluene on birds.

7.10.6 Mammals

The weight of evidence indicates that toluene is not mutagenic in mammalian or microbial systems, and results concerning its potential to act as a promoter are inconclusive (Environment Canada 1993b). Results of chromosomal assays have been mixed (Dabney 1994).

7.11 TRICHLOROETHENE

TCE is a clear, colorless, nonflammable liquid. It is heavier than water. It is widely used as a solvent for fats, waxes, resins, ores, rubber, paints, and varnishes. It also is used in dry cleaning, in degreasing, and as an intermediate to make other organic chemicals. TCE may enter the environment from industrial discharges, municipal waste treatment plant discharges, or spills.

Acute, toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen 2 to 4 days after animals or plants come in contact with TCE. TCE has moderate, acute toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term effects of TCE to plants, birds, or land animals.

Chronic, toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposures to a toxic chemical. TCE has moderate chronic toxicity to aquatic life. Insufficient data are available to evaluate or predict the long-term effects of TCE to plants, birds, or land animals.

7.11.1 Plants

No information was identified on the effects of TCE on plants.

7.11.2 Invertebrates

No information was identified on the effects of TCE on invertebrates.

7.11.3 Amphibians and Reptiles

No information was identified on the effects of TCE on amphibians and reptiles.

7.11.4 Fish and Aquatic Organisms

No information was identified on the effects of TCE on fish and aquatic organisms.

7.11.5 Birds

No information was identified on the effects of TCE on birds.

7.11.6 Mammals

No information was identified on the effects of TCE on mammals.

7.12 XYLENE

Xylene, a widely used industrial solvent, is a mixture of *ortho*-, *meta*-, and *para*-isomers (HSDB 1999). While *o*-xylene is recognized as a distinct product in chemical analyses, the *m*- and *p*- isomers are generally not separated during most routine analyses. Therefore, results of xylene analyses in environmental samples usually are presented as the concentration of the *o*-isomer and the total concentration of the combine *m*- and *p*- isomers (Environment Canada 1993c).

Although most xylenes are released into the air, concentrations exposed to wildlife are at least 1,000 times less than the effects threshold estimated for inhalation of xylenes by mammals. Concentrations in ambient air are at least 1 million times less than the effects threshold recorded for plants. Except for short-term hazards from concentrated spills, this compound frequently has been more associated with risk to humans than with risk to other species such as fish and wildlife. This is partly because plants, fish, and birds take up only very small amounts, and because this VOC tends to evaporate into the atmosphere, rather than persisting in surface waters or soils (ATSDR 1993g); however, VOCs, like xylenes, can pose a drinking water hazard when they occur in groundwater.

Like benzene and toluene, xylenes are fairly volatile, and significant xylenes tend to quickly evaporate if exposed to the atmosphere (ATSDR 1993g). However, xylenes can be more persistent when in groundwater, sediment, or soil media not directly exposed to the atmosphere. Xylenes tend to migrate to groundwater, and persistence is an issue in groundwater, where in some cases, they may persist for months or years (ATSDR 1993g).

Most xylene in surface water evaporates into the air in less than a day. The rest of it biodegrades slowly into other chemicals. Plants, fish, and birds take up only very small amounts. Research has shown that it persists longer in groundwater than in lakes and rivers, probably because it can evaporate from surface water (ATSDR 1993g).

Xylene evaporates from soil surfaces. Xylene below the soil surface persists for several days and may travel down through the soil and enter groundwater. In soil and groundwater, it may be slowly biodegraded into less harmful compounds. It is not clearly known how long xylene trapped deep underground in soil or groundwater persists, but it may be months or years. Xylene persists longer in wet soil than in dry soil (ATSDR 1993g).

7.12.1 Plants

Field concentrations in shallow groundwater or pore water below 100 mg/L for any aqueous solution in contact with terrestrial plants are not considered to present an ecological risk. Toxicity of groundwater to plants may be affected by many variables (pH, Eh, cation exchange capacity, moisture content, organic content of soil, clay content of soil, differing sensitivities of various plants, and various other factors). Therefore, the solution benchmark should be used as a screening benchmark only, and site-specific tests would be necessary to develop a more rigorous bench mark for various combinations of specific soils and plant species (Will and Suter 1994).

Growth of the alga *Selenastrum capricornutum* was reduced by 50 percent after 72 hours of exposure to 3.2 to 4.9 mg/L of each of the xylene isomers. Exposure for 30 minutes to 300 mg/L resulted in a 65 to 100 percent kill of the freshwater macrophytes *Elodea spp.* and *Potamogeton* (Environment Canada 1993c).

7.12.2 Invertebrates

No information was identified on the effects of xylene on invertebrates.

7.12.3 Amphibians and Reptiles

No information was identified on the effects of xylene on amphibians and reptiles.

7.12.4 Fish and Aquatic Organisms

Xylenes are bioconcentrated in aquatic organisms to a limited extent. Although more information on bioconcentration would be helpful, the phenomenon of biomagnification is not expected to be important for xylene (ATSDR 1993g).

LC_{50} for *Carassius auratus* (goldfish) were 75.0, 30.55, and 36.81 mg/L (ppm) for 24-hour exposures; 25.1 and 36.81 mg/L for 48-hour exposure; 20.72 mg/L for a 72-hour exposure; and 36.81 mg/L for a 96-hour exposure (EPA 1997).

7.12.5 Birds

No information was identified on the effects of xylene on birds.

7.12.6 Mammals

Large amounts of xylene can cause changes in the liver and harmful effects in the kidneys, heart, lungs, and nervous system (ATSDR 1993g).

Long-term exposures of animals to low doses of xylene have not been well studied (ATSDR 1993g). Available animal data on the carcinogenicity of xylenes are inadequate to permit an evaluation (HSDB 1999).

Xylene does not appear to be particularly genotoxic (ATSDR 1993g). In limited studies to date, individual isomers were not found to be genotoxic when tested in a number of short-term tests (Fishbein 1985; HSDB 1999).

In rats, exposure to xylene (50 or 500 milligrams per cubic meter [mg/m^3]) resulted in embryotoxic and teratogenic effects. The brain, liver, lung, and heart were affected. The number of postimplantation losses increased by 9.7 and 168 percent in the 50- and 500-mg/m^3 xylene groups, respectively. The incidence of fetal skeletal abnormalities was increased by 62 and 177 percent (Mirkova and Others 1983; HSDB 1999).

The placental crossing of benzene and its alkyl derivatives, their embryotoxic effects, and incidence of fetal anomalies were investigated in rats, mice, and rabbits. In rats, all of the

components crossed the placenta and also appeared in the fetal blood and amniotic fluid. Concentrations were higher in the fetal blood than in the amniotic fluid, but both were lower than in the maternal blood. Xylenes and ethylbenzene increased the postimplantation loss. All of the organic solvents caused skeletal retardations of mouse fetuses and increased the incidence of retarded fetuses, at least at higher concentrations. The exposure of rabbits to 1,000 mg/m^3 of solvent caused a mild, toxic effect on mothers; fetal loss by abortion, and often a decrease in the weight of female fetus (Ungvary and Tatrai 1985; HSDB 1999).

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
47	revised HHRA	Section 2.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 3-6, Pages 3-24 through 3-32; Tables 3-17 through 3-32. Oneida Total Integrated Enterprises LLC 2011.

3.6 HUMAN-HEALTH RISK ASSESSMENT CONCLUSIONS

This section summarizes the findings of the revised baseline human-health risk assessments (HHRAs). The subsections that follow present specific results for the HHRAs that were conducted for IR Sites 9, 13, 19, 22, and 23.

Results presented represent total risk i.e., risk that includes metals at concentrations below the Alameda Point background dataset. The exposure pathways and risk-based guidelines used to calculate the cancer risk and noncancer hazard value are presented in detail in Appendix B. In addition, risk calculated based on the Cal-EPA toxicity factors and inputs are also presented in Appendix B.

The estimate of cancer risk and noncancer hazards for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

The results for cancer risks and noncancer hazard values for the following three exposure groups for soil (for surface soil, 0 feet to 2 feet bgs and subsurface soil, 0 feet to 8 feet bgs intervals) and groundwater are presented in Table 3-32:

- **Exposure Group 1**. All soil and groundwater pathways (residential development and residential use of groundwater) – for ingestion of soil and groundwater, inhalation of vapors in indoor and outdoor air, inhalation of vapors in indoor air while showering, inhalation of particulates from soil in outdoor air, and dermal contact with soil.
- **Exposure Group 2**. Pathways for soil and vapors from VOCs in groundwater (reasonable current and future use exposure, which includes residential development with the current municipal water supply) – for ingestion of soil and homegrown produce, inhalation of particulates from soil in outdoor air, inhalation of vapors in indoor and outdoor air, and dermal contact with soil.

  These exposure pathways represent the most reasonable current and future use as it is highly unlikely that shallow groundwater at OU-2A would be used as the primary source of untreated drinking water.
- **Exposure Group 3**. Exposure pathways for residential use of groundwater – for ingestion of groundwater, and inhalation of vapors in indoor air while showering.

In addition, vapor intrusion risks due to impacted groundwater under commercial use scenario were evaluated, and are presented in Appendix B. The following sections provide a summary of the risks by medium along with a discussion of the primary risk drivers for each site.

3.6.1 IR Site 9 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 9 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Future residential exposures were evaluated for IR Site 9. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Table 3-17 through 3-19.

3.6.1.1 SURFACE SOIL (0 – 2 FEET BGS DEPTH INTERVAL)

The total USEPA carcinogenic risk from exposure to surface soil at IR Site 9 for a residential setting is 1×10^{-5} (Table 3-17). Majority of the USEPA risk contribution is from the soil ingestion (55 percent) with arsenic contributing approximately 87 percent of the estimated risk.

The HI from exposure to surface soil at IR Site 9 is 3, with soil ingestion pathway contributing 50 percent of the total HI (Table 3-17). Chromium (43 percent), cobalt (12 percent), and iron (11 percent) contributed to the majority of the HI.

3.6.1.2 SUBSURFACE SOIL (0- TO 8-FOOT BGS DEPTH INTERVAL)

The total USEPA carcinogenic risk from exposure to subsurface soil at IR Site 9 for a residential setting is 6×10^{-5} (Table 3-18). Majority of the risk contribution is from the soil ingestion of homegrown produce (85 percent) pathway. Aroclor 1254 (25 percent) and dieldrin (19 percent) contributed to the majority of the estimated cancer risk.

The HI from exposure to subsurface soil at IR Site 9 is 6, with ingestion of homegrown produce pathway contributing 49 percent of the HI (Table 3-18). Aroclor 1254 (31 percent), chromium (15 percent), naphthalene (14 percent), and aroclor 1260 (13 percent) contributed to the majority of the total HI. Aroclor 1254 and Aroclor 1260 were reported in only one soil sample collected at location S9-B03 in 2007, and these reported concentrations were less their respective screening levels, i.e. EPA residential RSLs. Subsequent to the issuance of the Draft Final FS and based on regulatory agency comments and discussions, additional soil sampling was conducted to characterize PCBs at IR Site 9, and all these results were non-detects or less than their respective screening levels (see Appendix G).

3.6.1.3 GROUNDWATER

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 9 via domestic use and vapor intrusion is 1×10^{-3} (Table 3-19). Ninety nine percent of the risk contribution is from ingestion of groundwater pathway with VC, arsenic, and 1,2,3-trichloropropane contributing 52, 31, and 14 percent of the risk, respectively.

The total HI from exposure to groundwater at IR Site 9 via domestic use and vapor intrusion is 76. Majority of the risk is from ingestion of groundwater pathway (98 percent) with cobalt contributing to 65 percent of the risk.

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 9 via vapor intrusion only is 2×10^{-6} (Table 3-19). Majority of the cancer risk contribution is from VC.

3.6.1.4 SUMMARY

The total cancer risk estimates by exposure group are presented in Table 3-32. Under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply), the total USEPA cancer risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil at IR Site 9, a majority of the risk is associated with ingestion and homegrown produce pathways. In addition, lead was not reported above the screening threshold of 207 mg/kg. For groundwater, VC is the primary contributor to carcinogenic risk primarily due to groundwater ingestion pathway.

Metals, in particular, arsenic are a significant contributor to the carcinogenic risk. This risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. Although arsenic concentrations at selected locations at this site and throughout OU2A are above background value, these concentrations are generally within the range observed in the background dataset. In addition, large fluctuations in arsenic concentrations have been observed with arsenic concentrations from more recent sampling events being generally lower. In addition, there are no clear indications as

to the source of the elevated concentrations suggesting that they are consistent with ambient concentrations and may be an artifact of the fill placed at the site.

Other metals in groundwater such as cobalt, manganese, thallium and iron contribute to elevated hazard indices; these metals are also generally within ambient ranges found at Alameda Point. An analysis of distribution of metals in groundwater at IR Site 9 indicates that most of the relatively high concentrations of cobalt, manganese, and iron are present within the former ISCO removal action area. These concentrations are expected to decrease as the redox conditions in the aquifer revert back to normal (see Section 5.1.2 for details). Therefore, metals are not considered COCs for IR Site 9 groundwater.

Based on the revised risk characterization at Site 9, the following COCs have been identified and are evaluated in this FS:

Groundwater:

- VC
- 1,2,3-trichloropropane

Five additional COCs selected basis on ARARs are presented in Section 5.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 9.

3.6.2 IR Site 13 Risk Characterization

Noncancer hazards and cancer risks calculated for IR Site 13 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Future residential exposures were evaluated for IR Site 13. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Table 3-20 through 3-22.

3.6.2.1 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to surface soil at IR Site 13 for a residential setting is 5×10^{-5} (Table 3-20). Majority of the risk contribution is from the ingestion of soil (48 percent) and homegrown produce (40 percent) with arsenic and PAHs expressed as B(a)P equivalent contributing 51 and 27 percent of the total estimated risk, respectively.

The HI from exposure to surface soil at IR Site 13 is 3 with ingestion of soil pathway contributing 53 percent of the HI (Table 3-20). Chromium (24 percent), iron (13 percent), arsenic (12 percent) and cobalt (10 percent) contributed to the majority of the HI.

3.6.2.2 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to subsurface soil at IR Site 13 for a residential setting is 8×10^{-5} (Table 3-21). Majority of the risk contribution is from homegrown produce (58 percent) and soil ingestion (28 percent) pathways. Carbazole (40 percent), PAHs expressed as B(a)P equivalent (23 percent), and arsenic (21 percent) contributed to the majority of the EPA cancer risk.

The HI from exposure to subsurface soil at IR Site 13 is 3, with ingestion of soil and inhalation of vapors in indoor air originating from soil pathways collectively contributing approximately 38 and 23

percent of the total HI, respectively (Table 3-21). Naphthalene (20 percent) and chromium (16 percent) contributed to the majority of the total HI.

3.6.2.3 GROUNDWATER

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 13 via domestic use and vapor intrusion is 1×10^{-3} (Table 3-22). A majority of the risk contribution is from the ingestion of groundwater pathway (90 percent), with arsenic contributing to 85 percent of the risk and benzene contributing to 12 percent of the risk.

The HI from exposure to groundwater via domestic use is 20. A majority of the HI is associated with ingestion of groundwater (98 percent). Arsenic (60 percent), manganese (19 percent), and benzene (12 percent) contributed to the majority of the total HI.

The total USEPA carcinogenic risk at IR Site 13 from exposure to groundwater via vapor intrusion only is 1×10^{-5} (Table 3-22). Majority of the cancer risk contribution is from benzene.

3.6.2.4 SITE 13 SUMMARY

The total USEPA cancer risk estimates by exposure group are presented in Table 3-32. The total cancer risk estimates under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

Carbazole, arsenic, and PAHs are the major contributors to risk due to exposure to soil. Carbazole in the soil risk dataset was reported in only four of the 32 soil samples. Since the frequency of detection was low, the maximum reported concentration of 5.9 mg/kg collected at location B13-41 was used as the EPC. The computation of carcinogenic risk used a value from Health Effects Assessment Summary Table (HEAST) presented in the U.S. EPA PRG table 2004. It is a third tier source according to the Department of Defense and Office of Solid Waste and Emergency Response memos for the selection of toxicity criteria. It is used when there is no other federal or state peer-reviewed source. In this case, there are no Tier 1 or Tier 2 sources, so the HEAST value has been used. The EPC for arsenic in soil is less than the background value for OU-2A; therefore, risk due to arsenic is attributable to background risk. Extensive sampling within the areas identified as containing the TRW at IR Site 13 indicates that PAHs in shallow soil have an EPC below the Alameda screening value. The PAH concentrations at depths greater than four feet are consistent with other locations on Alameda Point.

Arsenic and benzene are significant contributors to the carcinogenic risk for groundwater. Metals such as arsenic and manganese along with VOCs i.e. mainly benzene contribute to elevated hazard indices. The carcinogenic and non-carcinogenic risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. Although arsenic and manganese concentrations at selected locations at this site and throughout OU2A are above background value, these concentrations are generally within the range observed in the background dataset. Most of the relatively high concentrations of metals were reported in wells MW13-07 and M07C-06. As explained in Section 3.4, reducing conditions exist in the vicinity of these two wells, which is likely the cause of high concentrations of metals in water. The metal concentrations are expected to decrease as the redox conditions in the aquifer revert back to normal.

Based on the revised risk characterization at IR Site 13, the following COCs have been identified and will be evaluated in this FS.

<u>Groundwater:</u>

- Benzene

Three additional COCs selected on the basis of ARARs are presented in Section 5.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 13.

3.6.3 IR Site 19 Risk Characterization

Noncancer hazards and cancer risks calculated for IR Site 19 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Future residential exposures were evaluated for IR Site 19. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Table 3-23 through 3-25.

3.6.3.1 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to surface soil at IR Site 19 for a residential setting is 3×10^{-5} (Table 3-23). Majority of the risk contribution is from the soil ingestion pathway (61 percent) with arsenic and PAHs expressed as B(a)P equivalent contributing 45 percent and 51 percent, respectively, of the total estimated risk.

The HI from exposure to surface soil at IR Site 19 is 3, with ingestion of soil pathway contributing 55 percent of the HI. Thallium, acetone, chromium, and iron account for 22, 21, 13, and 11 percent, respectively, of the total HI.

3.6.3.2 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to subsurface soil at IR Site 19 for a residential setting is 2×10^{-5} (Table 3-24). A majority of the risk contribution is associated with soil ingestion (57 percent), with arsenic and PAHs expressed as B(a)P equivalent contributing 49 percent and 42 percent of the total estimated risk, respectively.

The HI from exposure to subsurface soil at IR Site 19 is 3 with ingestion of soil pathway contributing 55 percent of the HI. Thallium, 2-chlorophenol, and chromium account for 23, 22, and 16 percent, respectively, of the total HI.

3.6.3.3 Groundwater

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 19 is 4×10^{-4} (Table 3-25). A majority of the risk contribution is from the ingestion of groundwater pathway (74 percent) with PCE, arsenic, and VC contributing 71 percent, 21 percent, and 8 percent of this total risk, respectively.

The total HI from exposure to groundwater at IR Site 19 via domestic use and vapor intrusion is 4. A majority of the risk is from ingestion of groundwater pathway (93 percent) with arsenic, thallium, and vanadium contributing to 27, 25, and 16 percent, respectively to total HI.

The total USEPA carcinogenic risk at IR Site 19 from exposure to groundwater via vapor intrusion only is 4×10^{-6} (Table 3-25). Majority of the risk contribution is from trichloroethene.

3.6.3.4 Site 19 Summary

The total USEPA cancer risk estimates under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure (Table 3-32), which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil, a majority of the risk contribution is from the soil ingestion pathway, with arsenic and benzo(a)pyrene contributing a significant percentage of the estimated risk. The EPC for arsenic is less than the background value for OU-2A soil; therefore, the risk due to arsenic is attributable to background risk. The EPCs for B(a)P equivalent concentrations were estimated to be 0.13 mg/kg (0 – 2 feet bgs) and 0.15 mg/kg (0 – 8 feet bgs), which are less than the Alameda Point screening level of 0.62 mg/kg.

For groundwater, a majority of the carcinogenic risk is due to PCE, VC, and arsenic. This risk is based on the ingestion of groundwater assumed to be extracted from groundwater beneath the site. The EPC of arsenic is less than the background value for OU-2A groundwater; therefore, risk due to arsenic is attributable to background risk.

Based on the revised risk characterization at Site 19, the following COCs have been identified and are evaluated in this FS:

Groundwater:

- PCE
- TCE
- VC

Further details on the selection of COCs for evaluation in the groundwater FS for IR Site 19 are presented in Section 5.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil at IR Site 19.

3.6.4 IR Site 22 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 22 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Future residential exposures were evaluated for Site 22. Cancer risks and noncancer adverse health effects are summarized in the following text and presented in Table 3-26 through 3-28. HHRA results by exposure group are presented in Table 3-32.

3.6.4.1 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to surface soil at IR Site 22 for a residential setting is 3×10^{-5} (Table 3-26). A majority of the USEPA risk contribution is from the soil ingestion pathway (54 percent) with arsenic contributing 68 percent of the estimated risk.

The HI from exposure to surface soil is 4, with ingestion of soil pathway contributing 43 percent of the HI (Table 3-26). Naphthalene, chromium, and cobalt contributed approximate 35, 14, and 12 percent to the total HI.

Lead exceeds the threshold value of 207 mg/kg at Site 22 with a maximum reported concentration of 9,890 mg/kg at one location (MW547-5) in a soil sample collected during the 1990 investigation. However, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure.

3.6.4.2 SUBSURFACE SOIL (0- TO 8-FOOT BGS DEPTH INTERVAL)

The total USEPA carcinogenic risk from exposure to subsurface soil at IR Site 22 for a residential setting is 8×10^{-5} (Table 3-27). A majority of the USEPA risk contribution is from the inhalation of volatiles in outdoor air (43 percent) and soil ingestion (23 percent) pathways with ethylbenzene, arsenic, benzene, and PAHs expressed as B(a)P equivalents, contributing 47, 18, 13, and 13 percent of the total estimated risk, respectively.

The HI from exposure to subsurface soil is 20, with inhalation of vapors primarily from petroleum hydrocarbons and naphthalene contributing 63 percent of the HI (Table 3-27). Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program.

3.6.4.3 GROUNDWATER

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 22 is 3×10^{-3} (Table 3-28). A majority of the USEPA risk contribution is from the ingestion of groundwater (78 percent) pathway. Petroleum hydrocarbons (benzene and ethylbenzene) contribute approximately 79 percent of the total risk with arsenic contributing 19 percent of the risk.

The HI from exposure to groundwater via domestic use and vapor intrusion is 138 with a majority of the HI (87 percent) associated with ingestion of petroleum-related constituents (benzene, toluene, ethylbenzene, and xylenes – 54 percent) and manganese (31 percent).

The total USEPA carcinogenic risk at IR Site 22 from exposure to groundwater via vapor intrusion only is 2×10^{-4} (Table 3-28). Majority of the risk contribution is from benzene.

3.6.4.4 SITE 22 SUMMARY

The total USEPA cancer risk estimates under the Exposure Group 2 scenario (Table 3-32) (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

A majority of the USEPA risk contribution is from the soil ingestion pathway with arsenic contributing a significant percentage of the estimated risk. The EPC for arsenic is less than the background value for OU-2A; therefore, the risk due to arsenic is attributable to background risk.

Lead exceeds the threshold value of 207 mg/kg at Site 22 with a maximum reported concentration of 9,890 mg/kg. However, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program.

For groundwater, benzene (a petroleum hydrocarbon constituent) is a major cancer and non-cancer risk driver. Therefore, a majority of the risk is associated with petroleum hydrocarbon constituents which are being addressed under the Petroleum program.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil or groundwater at IR Site 22.

3.6.5 IR Site 23 Risk Characterization

Noncancer hazards and cancer risks calculated for IR Site 23 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

Future residential exposures were evaluated for IR Site 23. Cancer risks and noncancer adverse health effects are summarized by pathway in Tables 3-29 through 3-31. HHRA results by exposure group are presented in Table 3-32.

3.6.5.1 Surface Soil (0 – 2 feet bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to surface soil at IR Site 23 for a residential setting is 3×10^{-5} (Table 3-29). A majority of the risk contribution is from the soil ingestion pathway (57 percent) with arsenic and PAHs expressed as B(a)P equivalents contributing 48 percent and 44 percent of the estimated risk, respectively.

The HI from exposure to surface soil at IR Site 23 is 3 with ingestion of soil pathway contributing 52 percent of the HI (Table 3-29). A majority of the risk contribution is from chromium, cadmium, cobalt, and iron contributing 25, 14, 10, and 10 percent of the total estimated hazard, respectively.

3.6.5.2 Subsurface Soil (0- to 8-foot bgs Depth Interval)

The total USEPA carcinogenic risk from exposure to subsurface soil at IR Site 23 for a residential setting is 3×10^{-5} (Table 3-30). Majority of the risk contribution is associated with the ingestion of soil pathway (59 percent), with arsenic and PAHs expressed as B(a)P equivalents contributing 35 and 44 percent of the estimated risk, respectively.

The HI from exposure to subsurface soil at IR Site 23 is 3, with the ingestion soil pathway contributing 56 percent of the HI (Table 3-30). A majority of the risk contribution is from thallium, chromium, and naphthalene contributing 22, 19, and 12 percent of the total estimated hazard, respectively.

3.6.5.3 Groundwater

The total USEPA carcinogenic risk from exposure to groundwater at IR Site 23 is 6×10^{-4}. A majority of the risk is from the groundwater ingestion pathway (66 percent). The majority of the risk is attributable to arsenic at 33 percent and 1,2-dibromo-3-chloropropane contributing 45 percent of the risk (see Table 3-31).

The total HI from exposure to groundwater due to domestic use and vapor intrusion at IR Site 23 is 7. The majority of the HI is attributable to arsenic at 37 percent, with manganese contributing 18 percent and 1,2-dibromo-3-chloropropane contributing 14 percent of the total HI.

The total USEPA carcinogenic risk at IR Site 23 from exposure to groundwater via vapor intrusion only is 4×10^{-7} (see Table 3-31).

3.6.5.4 Site 23 Summary

The total USEPA cancer risk estimates by exposure group are presented in Table 3-32. The total cancer risk estimates under the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil, a majority of the risk contribution is associated with the ingestion of soil pathway with arsenic and PAHs expressed as B(a)P equivalents contributing a significant percentage of the estimated risk.

The EPC for arsenic in soil is less than the background value for OU-2A; therefore, the risk due to arsenic in soil is attributable to background risk. The EPCs for B(a)P equivalent concentrations were estimated to be 0.23 mg/kg (0 – 2 feet bgs) and 0.17 mg/kg (0 – 8 feet bgs), which are less than the Alameda Point screening level of 0.62 mg/kg.

For groundwater, the majority of the cancer risk is attributable to arsenic and 1,2-dibromo-3-chloropropane. The majority of the HI is attributable to arsenic, manganese, and 1,2-dibromo-3-chloropropane. The frequency of detection of 1,2-dibromo-3-chloropropane in the groundwater risk dataset is less than 1 percent with a maximum reported concentration of 2 µg/L. 1,2-dibromo-3-chloropropane was reported in only one groundwater sample collected at well MW530-2 in 2006.

Similar to other sites, metals, in particular, arsenic is a significant contributor to the carcinogenic risk. This risk is based on the ingestion of groundwater is assumed to be extracted from groundwater beneath the site. The reported concentrations of arsenic at IR Site 23 are within the range observed in the background dataset. In addition, other metals such as manganese, and thallium that contribute to the elevated hazard index were also within ambient ranges found at Alameda Point.

No COCs requiring CERCLA response action were selected for further evaluation in this FS for soil or groundwater at IR Site 23.

Table 3-17: IR Site 9 - HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	6.1E+03	—	0.09	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.09	4
7440-38-2	**arsenic**	2.6E+00	6.2E-06	0.12	5.9E-07	0.01	4.3E-06	0.04	3.4E-09	0.00	—	—	—	—	1.1E-05	87	0.18	7
7440-39-3	**barium**	1.1E+02	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	**beryllium**	6.4E-01	—	0.00	—	0.02	—	—	4.6E-10	0.00	—	—	—	—	4.6E-10	0	0.02	1
7440-43-9	**cadmium**	3.1E-01	—	0.00	—	0.00	—	—	3.9E-10	0.00	—	—	—	—	3.9E-10	0	0.00	0
7440-47-3	chromium	7.2E+01	—	0.34	—	0.76	—	—	2.6E-07	—	—	—	—	—	2.6E-07	2	1.10	43
7440-48-4	**cobalt**	6.3E+00	—	0.30	—	0.01	—	—	1.7E-08	0.00	—	—	—	—	1.7E-08	0	0.31	12
7440-50-8	copper	4.4E+01	—	0.02	—	0.00	—	—	—	—	—	—	—	—	—	0	0.02	1
7439-89-6	**iron**	1.3E+04	—	0.27	—	0.01	—	—	—	—	—	—	—	—	—	0	0.28	11
7439-92-1	**lead**	1.0E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	manganese	4.9E+02	—	0.05	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.07	3
7439-97-6	**mercury**	4.5E-02	—	0.00	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	7.8E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	**nickel**	4.4E+01	—	0.03	—	0.02	—	0.02	3.5E-09	0.00	—	—	—	—	3.5E-09	0	0.07	3
7440-22-4	**silver**	3.1E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-62-2	**vanadium**	2.4E+01	—	0.05	—	0.05	—	—	—	—	—	—	—	—	—	0	0.10	4
7440-66-6	**zinc**	5.0E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
	Benzo(a)Pyrene Equivalent*	1.7E-02	8.2E-07	0.00	3.6E-07	0.00	2.4E-08	0.00	1.4E-11	—	—	—	—	—	1.2E-06	9	0.00	0
Semivolatile Organic Compounds																		
117-81-7	bis(2-ethylhexyl)phthalate	1.8E-01	3.9E-09	0.00	1.2E-09	0.00	9.6E-08	0.00	8.2E-12	—	—	—	—	—	1.0E-07	1	0.00	0
86-30-6	N-Nitrosodiphenylamine	5.9E-02	4.6E-10	—	—	—	—	—	—	—	—	—	—	—	4.6E-10	0	—	0
Volatile Organic Compounds																		
540-59-0	1,2-Dichloroethene	2.6E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
91-57-6	2-methylnaphthalene	6.7E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.03	—	0	0.03	1
83-32-9	acenaphthene	7.6E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	1.4E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	1.2E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	1.7E-01	—	0.00	—	0.00	—	—	—	—	3.4E-08	0.00	—	0.23	3.4E-08	0	0.23	9
129-00-0	pyrene	4.7E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
67-64-1	acetone	2.0E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
100-41-4	ethylbenzene	2.0E-01	3.4E-09	0.00	1.1E-09	0.00	—	—	—	—	3.2E-08	0.00	—	0.00	3.6E-08	0	0.00	0
108-88-3	toluene	4.9E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
1330-20-7	xylenes (total)	4.9E+00	—	0.00	—	0.00	—	—	—	—	—	0.02	—	—	—	0	0.02	1
		Totals by Pathway	7.E-06	1	1.E-06	1	4.E-06	0.09	3.E-07	0.02	7.E-08	0.02	0.E+00	0.26	1.E-05		3	
		% of Totals	55	50	7	35	35	4	2	1	1	1	0	10				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-18: IR Site 9 - HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	5.9E+03	—	0.08	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.09	2
7440-36-0	**antimony**	5.7E-01	—	0.02	—	0.00	—	—	—	—	—	—	—	—	—	0	0.02	0
7440-38-2	**arsenic**	1.9E+00	4.6E-06	0.09	4.3E-07	0.01	3.2E-06	0.03	2.5E-09	0.00	—	—	—	—	8.2E-06	14	0.13	2
7440-39-3	barium	9.0E+01	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	beryllium	4.9E-01	—	0.00	—	0.01	—	—	3.5E-10	0.00	—	—	—	—	3.5E-10	0	0.02	0
7440-43-9	cadmium	2.8E-01	—	0.00	—	0.00	—	0.02	3.5E-10	0.00	—	—	—	—	3.5E-10	0	0.02	0
7440-47-3	chromium	5.3E+01	—	0.25	—	0.56	—	—	1.9E-07	—	—	—	—	—	1.9E-07	0	0.82	15
7440-48-4	cobalt	5.7E+00	—	0.27	—	0.01	—	—	1.5E-08	0.00	—	—	—	—	1.5E-08	0	0.28	5
7440-50-8	**copper**	1.9E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	**iron**	1.0E+04	—	0.20	—	0.01	—	—	—	—	—	—	—	—	—	0	0.21	4
7439-92-1	lead	9.3E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	2.1E+02	—	0.02	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.03	1
7439-97-6	mercury	1.6E-01	—	0.01	—	0.00	—	0.01	—	0.00	—	—	—	—	—	0	0.02	0
7439-98-7	**molybdenum**	8.1E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	nickel	5.2E+01	—	0.04	—	0.03	—	0.02	4.1E-09	0.00	—	—	—	—	4.1E-09	0	0.09	2
7440-22-4	**silver**	1.4E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7440-28-0	**thallium**	1.2E-01	—	0.03	—	0.00	—	—	—	—	—	—	—	—	—	0	0.03	0
7440-62-2	**vanadium**	2.2E+01	—	0.04	—	0.05	—	—	—	—	—	—	—	—	—	0	0.10	2
7440-66-6	zinc	4.6E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
	Benzo(a)Pyrene Equivalent*	2.0E-02	9.9E-07	0.00	4.4E-07	0.00	2.9E-08	0.00	1.7E-11	—	—	—	—	—	1.5E-06	3	0.00	0
Semivolatile Organic Compounds																		
117-81-7	bis(2-ethylhexyl)phthalate	2.2E-01	4.8E-09	0.00	1.5E-09	0.00	1.2E-07	0.00	1.7E-12	—	—	—	—	—	1.2E-07	0	0.00	0
108-95-2	phenol	4.2E-02	—	0.00	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	6.9E-02	5.3E-10	—	1.7E-10	—	—	—	—	—	—	—	—	—	7.0E-10	0	—	0
87-86-5	Pentachlorophenol	4.3E-01	8.1E-08	0.00	6.4E-08	0.00	—	—	—	—	—	—	—	—	1.4E-07	0	0.00	0
72-43-5	4-chloro-3-methylphenol	5.3E-03	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
Volatile Organic Compounds																		
540-59-0	1,2-Dichloroethene	1.3E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
91-57-6	2-methylnaphthalene	7.5E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.03	—	0	0.03	1
83-32-9	acenaphthene	1.2E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	5.3E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	6.6E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	5.8E-01	—	0.00	—	0.00	—	—	—	—	1.1E-07	0.01	—	0.76	1.1E-07	0	0.77	14
129-00-0	pyrene	1.7E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
78-93-3	2-butanone	9.0E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
67-64-1	acetone	1.0E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
100-41-4	ethylbenzene	2.1E-02	3.7E-10	0.00	1.2E-10	0.00	—	—	—	—	3.4E-09	0.00	—	0.00	3.8E-09	0	0.00	0
127-18-4	Tetrachloroethene	1.0E-03	8.5E-10	0.00	2.7E-10	0.00	—	—	—	—	6.2E-10	0.00	2.1E-08	0.00	2.3E-08	0	0.00	0
108-88-3	toluene	6.0E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
1330-20-7	xylenes (total)	3.2E-01	—	0.00	—	0.00	—	—	—	—	—	0.00	—	—	—	0	0.00	0
Pesticides/Polychlorinated Biphenyls																		
11097-69-1	PCB-1254 (Aroclor 1254)	1.2E-01	3.8E-07	0.08	1.8E-07	0.04	1.4E-05	1.59	—	—	—	—	—	—	1.4E-05	25	1.71	31
11096-82-5	PCB-1260 (Aroclor 1260)	1.0E-01	3.1E-07	0.07	1.5E-07	0.03	5.5E-06	0.64	—	—	—	—	—	—	6.0E-06	11	0.74	13
57-74-9	chlordane	1.6E-01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
60-57-1	Dieldrin	5.4E-03	1.4E-07	0.00	4.3E-08	0.00	1.1E-05	0.06	—	—	—	—	—	—	1.1E-05	19	0.06	1
319-86-8	delta-BHC	1.9E-02	3.9E-08	0.00	—	—	5.2E-06	0.06	—	—	—	—	—	—	5.3E-06	9	0.06	1
1031-07-8	Endosulfan sulfate	3.7E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
72-20-8	Endrin	1.8E-03	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
7421-93-4	Endrin aldehyde	2.1E-03	—	0.00	—	—	—	0.00	—	—	—	—	—	—	—	0	0.01	0
58-89-9	gamma-BHC (Lindane)	1.5E-02	2.6E-08	0.00	4.1E-09	0.00	3.5E-06	0.05	—	—	—	—	—	—	3.5E-06	6	0.05	1
1024-57-3	Heptachlor epoxide	4.9E-03	7.0E-08	0.01	2.2E-08	0.00	6.2E-06	0.24	—	—	—	—	—	—	6.3E-06	11	0.25	4
72-43-5	Methoxychlor	5.3E-03	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
72-55-9	p,p'-DDE	3.4E-03	1.8E-09	0.00	5.7E-10	0.00	7.5E-08	0.00	—	—	—	—	—	—	7.8E-08	0	0.00	0
50-29-3	p,p'-DDT	1.2E-02	6.4E-09	0.00	1.0E-09	0.00	2.2E-07	0.01	—	—	—	—	—	—	2.3E-07	0	0.01	0
		Totals by Pathway	7.E-06	1	1.E-06	1	5.E-05	3	2.E-07	0.01	1.E-07	0.01	2.E-08	1	6.E-05		6	
		% of Totals	12	23	2	14	85	49	0	0	0	0	0	14				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005).

The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-19: IR Site 9 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals														
7429-90-5	**Aluminum, dissolved**	5.0E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	3.6E-04	—	0.07	—	—	—	0.00	—	—	—	0	0.07	0
7440-38-2	Arsenic, dissolved	1.5E-02	3.0E-04	3.70	—	—	1.6E-06	0.02	—	—	3.0E-04	31	3.72	5
7440-39-3	**Barium, dissolved**	1.3E-01	—	0.05	—	—	—	0.00	—	—	—	0	0.05	0
7440-41-7	**Beryllium, dissolved**	2.8E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-43-9	Cadmium, dissolved	4.6E-03	—	0.70	—	—	—	0.00	—	—	—	0	0.70	1
7440-70-2	Calciuim, dissolved	9.6E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-47-3	Chromium, dissolved	8.8E-03	—	0.24	—	—	—	0.00	—	—	—	0	0.24	0
7440-48-4	Cobalt, dissolved	2.1E-01	—	49.00	—	—	—	0.30	—	—	—	0	49.30	65
7440-50-8	Copper, dissolved	1.2E-01	—	0.24	—	—	—	0.00	—	—	—	0	0.24	0
7439-89-6	Iron, dissolved	2.4E+01	—	2.50	—	—	—	0.01	—	—	—	0	2.51	3
7439-92-1	Lead, dissolved	9.5E-03	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-95-4	Magnesium, dissolved	1.0E+02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	2.1E+00	—	7.00	—	—	—	0.03	—	—	—	0	7.03	9
7439-98-7	Molybdenum, dissolved	1.4E-02	—	0.24	—	—	—	0.00	—	—	—	0	0.24	0
7440-02-0	Nickel, dissolved	3.8E-01	—	1.30	—	—	—	0.00	—	—	—	0	1.30	2
7440-09-7	Potassium, dissolved	2.8E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7782-49-2	Selenium, dissolved	1.5E-03	—	0.02	—	—	—	0.00	—	—	—	0	0.02	0
7440-22-4	Silver, dissolved	6.6E-03	—	0.10	—	—	—	0.00	—	—	—	0	0.10	0
7440-23-5	Sodium, dissolved	9.3E+02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	6.4E-03	—	7.00	—	—	—	0.03	—	—	—	0	7.03	9
7440-62-2	Vanadium, dissolved	3.5E-02	—	0.50	—	—	—	0.00	—	—	—	0	0.50	1
7440-66-6	**Zinc, dissolved**	1.5E-01	—	0.04	—	—	—	0.00	—	—	—	0	0.04	0
Polynuclear Aromatic Hydrocarbons														
91-57-6	2-Methylnaphthalene	7.8E-03	—	0.13	—	—	—	0.30	—	—	—	0	0.43	1
91-20-3	Naphthalene	8.0E-03	—	0.04	—	—	—	0.02	—	0.01	—	0	0.06	0
Semivolatile Organic Compounds														
123-91-1	1,4-Dioxane (P-Dioxane)	1.3E-03	1.8E-07	0.00	—	—	7.0E-10	0.00	—	—	1.8E-07	0	0.00	0
105-67-9	2,4-Dimethylphenol	7.3E-03	—	0.03	—	—	—	0.00	—	—	—	0	0.03	0
95-48-7	2-Methylphenol (O-Cresol)	1.2E-02	—	0.02	—	—	—	0.00	—	—	—	0	0.02	0
106-44-5	4-Methylphenol (P-Cresol)	4.2E-02	—	0.60	—	—	—	0.00	—	—	—	0	0.60	1
65-85-0	Benzoic Acid	1.1E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
117-81-7	Bis(2-Ethylhexyl) Phthalate	1.3E-02	3.0E-06	0.05	—	—	—	0.00	—	—	3.0E-06	0	0.05	0
108-95-2	Phenol	6.1E-02	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
100-42-5	Styrene	3.6E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Volatile Organic Compounds														
71-55-6	1,1,1-Trichloroethane	8.9E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	2.2E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-00-5	1,1,2-Trichloroethane	2.7E-03	1.8E-06	0.05	2.4E-07	0.00	—	0.00	—	—	2.0E-06	0	0.05	0
75-34-3	1,1-Dichloroethane	5.8E-02	5.0E-06	0.02	4.9E-07	0.00	3.4E-07	0.00	—	—	5.8E-06	1	0.03	0
75-35-4	1,1-Dichloroethene	2.4E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
96-18-4	1,2,3-Trichloropropane	1.2E-03	1.3E-04	0.01	—	0.00	—	0.00	—	—	1.3E-04	14	0.01	0
95-63-6	1,2,4-Trimethylbenzene	2.7E-02	—	0.25	—	0.08	—	0.40	—	0.07	—	0	0.80	1
95-50-1	1,2-Dichlorobenzene	3.3E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0

Table 3-19: IR Site 9 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
107-06-2	1,2-Dichloroethane	4.0E-04	5.0E-07	0.00	5.0E-08	0.00	2.4E-08	0.00	—	—	5.7E-07	0	0.00	0
78-87-5	1,2-Dichloropropane	3.7E-04	1.7E-07	0.00	1.4E-08	0.00	—	0.00	—	—	1.8E-07	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	9.4E-03	—	0.01	—	0.04	—	0.01	—	0.03	—	0	0.09	0
142-28-9	1,3-Dichloropropane	3.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
106-46-7	1,4-Dichlorobenzene	2.0E-04	1.6E-08	0.00	1.1E-08	0.00	—	0.00	—	—	2.7E-08	0	0.00	0
78-93-3	2-Butanone	2.0E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-49-8	2-Chlorotoluene	1.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
591-78-6	2-Hexanone	6.0E-03	—	0.10	—	0.00	—	0.00	—	—	—	0	0.10	0
108-10-1	4-Methyl-2-pentanone	4.6E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
67-64-1	Acetone	1.2E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
71-43-2	Benzene	5.0E-04	5.0E-07	0.01	2.4E-08	0.00	5.6E-08	0.00	4.4E-08	0.00	6.2E-07	0	0.01	0
75-27-4	Bromodichloromethane	4.3E-04	4.0E-07	0.00	8.0E-08	0.00	—	0.00	2.6E-08	0.00	5.1E-07	0	0.00	0
75-25-2	Bromoform	6.1E-04	8.0E-08	0.00	3.7E-09	0.00	—	0.00	3.9E-10	0.00	8.4E-08	0	0.00	0
75-15-0	Carbon disulfide	2.4E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
108-90-7	Chlorobenzene	1.1E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-00-3	Chloroethane	4.0E-04	1.6E-08	0.00	—	0.00	—	0.00	—	—	1.6E-08	0	0.00	0
67-66-3	Chloroform	1.0E-03	5.0E-07	0.01	1.1E-07	0.00	—	0.00	—	—	6.1E-07	0	0.01	0
74-87-3	Chloromethane	9.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	5.5E-03	—	0.05	—	0.00	—	0.00	—	—	—	0	0.05	0
124-48-1	Dibromochloromethane	4.1E-04	5.0E-07	0.00	5.0E-08	0.00	—	0.00	9.6E-09	0.00	5.6E-07	0	0.00	0
75-71-8	Dichlorodifluoromethane	1.6E-02	—	0.01	—	0.00	—	0.00	—	0.10	—	0	0.10	0
100-41-4	Ethylbenzene	4.6E-03	8.0E-07	0.00	6.0E-08	0.00	4.0E-07	0.00	—	—	1.3E-06	0	0.01	0
108-20-3	Isopropyl Ether	2.9E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
98-82-8	Isopropylbenzene	3.3E-03	—	0.00	—	0.00	—	0.00	—	0.00	—	0	0.01	0
1634-04-4	Methyl Tert-Butyl Ether	1.4E-02	3.0E-07	0.00	1.4E-08	0.00	7.7E-09	0.00	—	—	3.2E-07	0	0.00	0
75-09-2	Methylene chloride	7.5E-04	8.0E-08	0.00	1.3E-09	0.00	2.9E-09	0.00	—	—	8.4E-08	0	0.00	0
104-51-8	N-Butylbenzene	2.5E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
103-65-1	N-Propylbenzene	5.9E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-47-6	o-Xylene	1.6E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
99-87-6	p-Isopropyltoluene	7.0E-03	—	0.01	—	0.00	—	0.01	—	—	—	0	0.02	0
135-98-8	Sec-Butylbenzene	3.1E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
98-06-6	T-Butylbenzene	8.5E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
994-05-8	Tert-Amyl Methyl Ether	8.1E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	1.7E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
127-18-4	Tetrachloroethene	8.8E-04	7.0E-06	0.01	2.5E-08	0.00	3.7E-06	0.00	1.5E-07	0.00	1.1E-05	1	0.01	0
108-88-3	Toluene	1.0E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	3.6E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-01-6	Trichloroethene	6.6E-04	6.0E-08	0.00	6.0E-09	0.00	8.7E-09	0.00	—	—	7.5E-08	0	0.00	0
75-69-4	Trichlorofluoromethane	2.4E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-01-4	Vinyl chloride (M)	6.8E-03	5.0E-04	0.13	5.0E-07	0.00	—	0.00	2.1E-06	0.01	5.0E-04	52	0.14	0
1330-20-7	Xylenes (total)	1.9E-02	—	0.01	—	0.00	—	0.01	—	—	—	0	0.02	0
7816-60-0	Xylenes, m & p	2.7E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
		Totals by Pathway	1.E-03	74	2.E-06	0.1	6.E-06	1	2.E-06	0.2	**1.E-03**		**76**	
		% of Totals	99	98	0	0	1	2	0	0				

Table 3-20: IR Site 13 - HHRA Summary by Pathway (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	1.0E+04	—	0.14	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.15	4
7440-36-0	antimony	1.3E+00	—	0.05	—	0.01	—	—	—	—	—	—	—	—	—	0	0.06	2
7440-38-2	**arsenic**	6.3E+00	1.5E-05	0.30	1.4E-06	0.03	1.0E-05	0.11	8.1E-09	0.00	—	—	—	—	2.6E-05	51	0.43	12
7440-39-3	barium	9.4E+01	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	beryllium	2.9E-01	—	0.00	—	0.01	—	—	2.1E-10	0.00	—	—	—	—	2.1E-10	0	0.01	0
7440-43-9	cadmium	2.0E+00	—	0.03	—	0.00	—	0.13	2.5E-09	0.00	—	—	—	—	2.5E-09	0	0.16	5
7440-47-3	chromium	5.4E+01	—	0.26	—	0.58	—	—	2.0E-07	—	—	—	—	—	2.0E-07	0	0.83	24
7440-48-4	cobalt	7.3E+00	—	0.35	—	0.01	—	—	2.0E-08	0.00	—	—	—	—	2.0E-08	0	0.36	10
7440-50-8	copper	3.2E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	iron	2.2E+04	—	0.44	—	0.01	—	—	—	—	—	—	—	—	—	0	0.45	13
7439-92-1	lead	8.7E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	2.7E+02	—	0.03	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.04	1
7439-97-6	mercury	1.0E-01	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	5.1E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	nickel	4.9E+01	—	0.03	—	0.03	—	0.02	3.9E-09	0.00	—	—	—	—	3.9E-09	0	0.08	2
7782-49-2	**Selenium**	2.0E+00	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7440-22-4	**silver**	2.4E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	4.1E-01	—	0.09	—	0.00	—	—	—	—	—	—	—	—	—	0	0.09	3
7440-62-2	vanadium	3.1E+01	—	0.06	—	0.07	—	—	—	—	—	—	—	—	—	0	0.13	4
7440-66-6	zinc	6.7E+02	—	0.03	—	0.00	—	0.07	—	—	—	—	—	—	—	0	0.11	3
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	1.3E-01	6.3E-07	0.00	2.8E-07	0.00	1.8E-08	0.00	1.1E-11	—	—	—	—	—	9.2E-07	2	0.00	0
50-32-8	benzo(a)pyrene-M	1.4E-01	6.9E-06	0.00	3.1E-06	0.00	2.0E-07	0.00	1.2E-10	—	—	—	—	—	1.0E-05	20	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.3E-01	6.1E-07	0.00	2.7E-07	0.00	1.8E-08	0.00	1.1E-11	—	—	—	—	—	9.0E-07	2	0.00	0
207-08-9	benzo(k)fluoranthene-M	6.6E-02	3.2E-08	0.00	1.4E-08	0.00	9.4E-10	0.00	5.5E-12	—	—	—	—	—	4.7E-08	0	0.00	0
218-01-9	chrysene-M	2.4E-01	1.2E-08	0.00	5.1E-09	0.00	3.4E-10	0.00	2.0E-12	—	—	—	—	—	1.7E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	2.2E-02	1.1E-06	0.00	4.7E-07	0.00	3.1E-08	0.00	2.0E-11	—	—	—	—	—	1.6E-06	3	0.00	0
206-44-0	fluoranthene	1.5E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	6.9E-02	3.4E-07	0.00	1.5E-07	0.00	1.4E-08	0.00	5.8E-12	—	—	—	—	—	5.0E-07	1	0.00	0
	Benzo(a)Pyrene Equivalent*	2.2E-01	1.1E-05	0.00	4.7E-06	0.00	3.1E-07	0.00	1.8E-10	—	—	—	—	—	1.6E-05	27	0.00	0
Semivolatile Organic Compounds																		
208-96-8	Acenaphthylene	1.5E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
84-74-2	Di-N-Butyl Phthalate	3.1E-02	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	1.8E-01	1.4E-09	—	4.4E-10	—	5.6E-08	—	1.4E-13	—	—	—	—	—	5.8E-08	0	—	0
87-86-5	Pentachlorophenol	6.4E-01	1.2E-07	0.00	9.5E-08	0.00	—	—	—	—	—	—	—	—	2.2E-07	0	0.00	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	4.7E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.02	—	0	0.02	1
83-32-9	acenaphthene	7.3E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	2.5E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	1.0E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	1.0E-01	—	0.00	—	0.00	—	—	—	—	2.0E-08	0.00	—	0.14	2.0E-08	0	0.14	4
129-00-0	pyrene	2.2E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
78-93-3	2-butanone	9.9E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
67-64-1	acetone	4.1E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
71-43-2	Benzene	6.6E-03	5.7E-10	0.00	1.8E-10	0.00	—	—	—	—	4.1E-09	0.00	1.8E-07	0.00	1.9E-07	0	0.00	0
75-15-0	Carbon disulfide	2.0E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
100-41-4	ethylbenzene	2.1E-02	3.5E-10	0.00	1.1E-10	0.00	—	—	—	—	3.3E-09	0.00	—	0.00	3.7E-09	0	0.00	0
108-88-3	toluene	3.9E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
75-09-2	Methylene chloride	2.7E-03	3.2E-11	0.00	1.0E-11	0.00	—	—	—	—	8.6E-11	0.00	4.6E-09	0.00	4.7E-09	0	0.00	0
1330-20-7	xylenes (total)	5.4E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	—	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																		
1024-57-3	Heptachlor epoxide	5.4E-03	7.7E-08	0.01	2.4E-08	0.00	6.8E-06	0.27	—	—	—	—	—	—	6.9E-06	13	0.28	8
72-55-9	p,p'-DDE	3.1E-02	1.7E-08	0.00	2.6E-09	0.00	6.9E-07	0.02	—	—	—	—	—	—	7.1E-07	1	0.02	1
50-29-3	p,p'-DDT	1.5E-01	7.8E-08	0.00	1.2E-08	0.00	2.7E-06	0.07	—	—	—	—	—	—	2.8E-06	5	0.08	2
	Totals by Pathway		2.E-05	1.85	6.E-06	0.76	2.E-05	0.70	2.E-07	0.01	3.E-08	0.00	2.E-07	0.16	5.E-05		3	
	% of Totals		48	53	11	22	40	20	0	0	0	0	0	5				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	7.2E+03	—	0.10	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.11	3
7440-36-0	antimony	9.9E-01	—	0.04	—	0.01	—	—	—	—	—	—	—	—	—	0	0.04	1
7440-38-2	**arsenic**	3.9E+00	9.2E-06	0.18	8.7E-07	0.02	6.4E-06	0.07	5.1E-09	0.00	—	—	—	—	1.6E-05	21	0.27	8
7440-39-3	barium	6.6E+01	—	0.00	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	beryllium	3.2E-01	—	0.00	—	0.01	—	—	2.3E-10	0.00	—	—	—	—	2.3E-10	0	0.01	0
7440-43-9	cadmium	5.3E-01	—	0.01	—	0.00	—	0.03	6.8E-10	0.00	—	—	—	—	6.8E-10	0	0.04	1
7440-47-3	chromium	3.5E+01	—	0.16	—	0.37	—	—	1.3E-07	—	—	—	—	—	1.3E-07	0	0.53	16
7440-48-4	cobalt	5.4E+00	—	0.26	—	0.01	—	—	1.5E-08	0.00	—	—	—	—	1.5E-08	0	0.27	8
7440-50-8	copper	1.9E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	iron	1.3E+04	—	0.25	—	0.01	—	—	—	—	—	—	—	—	—	0	0.26	8
7439-92-1	lead	9.1E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	1.7E+02	—	0.02	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.02	1
7439-97-6	mercury	7.6E-02	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	2.8E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	nickel	3.1E+01	—	0.02	—	0.02	—	0.01	2.5E-09	0.00	—	—	—	—	2.5E-09	0	0.05	2
7782-49-2	**Selenium**	5.7E-01	—	0.00	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.00	0
7440-22-4	**silver**	1.9E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	2.0E-01	—	0.04	—	0.00	—	—	—	—	—	—	—	—	—	0	0.05	1
7440-62-2	vanadium	5.0E+01	—	0.10	—	0.11	—	—	—	—	—	—	—	—	—	0	0.22	7
7440-66-6	zinc	1.5E+02	—	0.01	—	0.00	—	0.02	—	—	—	—	—	—	—	0	0.02	1
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	2.2E-01	1.1E-06	0.00	4.7E-07	0.00	3.1E-08	0.00	1.8E-11	—	—	—	—	—	1.6E-06	2	0.00	0
50-32-8	benzo(a)pyrene-M	1.7E-01	8.5E-06	0.00	3.8E-06	0.00	2.5E-07	0.00	1.5E-10	—	—	—	—	—	1.3E-05	16	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.1E-01	5.2E-07	0.00	2.3E-07	0.00	1.5E-08	0.00	9.0E-12	—	—	—	—	—	7.7E-07	1	0.00	0
207-08-9	benzo(k)fluoranthene-M	8.0E-02	3.9E-08	0.00	1.7E-08	0.00	1.1E-09	0.00	6.7E-12	—	—	—	—	—	5.8E-08	0	0.00	0
218-01-9	chrysene-M	3.4E-01	1.6E-08	0.00	7.3E-09	0.00	4.8E-10	0.00	2.8E-12	—	—	—	—	—	2.4E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	3.9E-02	1.9E-06	0.00	8.4E-07	0.00	5.6E-08	0.00	3.6E-11	—	—	—	—	—	2.8E-06	4	0.00	0
206-44-0	fluoranthene	2.1E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	7.9E-02	3.9E-07	0.00	1.7E-07	0.00	1.6E-08	0.00	6.7E-12	—	—	—	—	—	5.8E-07	1	0.00	0
	Benzo(a)Pyrene Equivalent*	2.7E-01	1.3E-05	0.00	5.8E-06	0.00	3.9E-07	0.00	2.3E-10	—	—	—	—	—	1.9E-05	23	0.00	0
Semivolatile Organic Compounds																		
208-96-8	Acenaphthaylene	2.5E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
85-01-8	phenanthrene	4.2E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
86-74-8	carbazole	5.9E+00	1.8E-07	0.00	—	—	3.1E-05	0.29	—	—	—	—	—	—	3.2E-05	40	0.30	9
132-64-9	Dibenzofuran	5.4E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
105-67-9	2,4-Dimethylphenol	1.2E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
117-81-7	bis(2-ethylhexyl)phthalate	3.0E-01	6.5E-09	0.00	2.0E-09	0.00	1.6E-07	0.00	2.1E-13	—	—	—	—	—	1.7E-07	0	0.00	0
84-74-2	Di-N-Butyl Phthalate	3.1E-02	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
86-30-6	N-Nitrosodiphenylamine	9.5E-02	7.3E-10	—	2.3E-10	—	2.9E-08	—	7.5E-14	—	—	—	—	—	3.0E-08	0	—	0
87-86-5	Pentachlorophenol	6.1E-01	1.1E-07	0.00	9.0E-08	0.00	—	—	—	—	—	—	—	—	2.0E-07	0	0.00	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	1.3E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	0.06	—	0	0.06	2
108-10-1	4-Methyl-2-pentanone	4.1E-02	—	—	—	—	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
83-32-9	acenaphthene	3.5E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	2.5E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	2.5E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	4.9E-01	—	0.00	—	0.00	—	—	—	—	5.86E-08	0.00	—	0.65	5.9E-08	0	0.65	20
129-00-0	pyrene	2.9E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
78-93-3	2-butanone	9.5E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
67-64-1	acetone	4.4E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
71-43-2	Benzene	1.4E-01	1.2E-08	0.00	3.9E-09	0.00	—	—	—	—	3.90E-08	0.00	4.0E-06	0.04	4.0E-06	5	0.04	1
75-15-0	Carbon disulfide	2.2E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
108-90-7	Chlorobenzene	2.0E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
100-41-4	ethylbenzene	4.9E-01	8.5E-09	0.00	2.7E-09	0.00	—	—	—	—	1.59E-08	0.00	—	0.00	2.7E-08	0	0.00	0
108-88-3	toluene	3.2E-01	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.01	—	0	0.01	0
75-09-2	Methylene chloride	4.1E-03	4.8E-11	0.00	1.5E-11	0.00	—	—	—	—	8.05E-09	0.00	7.7E-09	0.00	1.6E-08	0	0.00	0
1330-20-7	xylenes (total)	2.5E+00	—	0.00	—	0.00	—	—	—	—	—	0.00	—	—	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																		
1024-57-3	Heptachlor epoxide	5.4E-03	7.7E-08	0.01	2.4E-08	0.00	6.8E-06	0.27	—	—	—	—	—	—	6.9E-06	9	0.28	8
72-55-9	p,p'-DDE	5.8E-03	3.1E-09	0.00	4.9E-10	0.00	1.3E-07	0.00	—	—	—	—	—	—	1.3E-07	0	0.00	0
50-29-3	p,p'-DDT	1.1E-02	5.9E-09	0.00	9.3E-10	0.00	2.0E-07	0.01	—	—	—	—	—	—	2.1E-07	0	0.01	0
	Totals by Pathway		2.E-05	1	7.E-06	1	5.E-05	1	1.E-07	0	1.E-07	0	4.E-06	1	8.E-05		3	
	% of Totals		28	38	8	17	58	22	0	0	0	0	5	23				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-22: IR Site 13 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals														
7429-90-5	**Aluminum, dissolved**	5.2E-03	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	7.6E-04	—	0.13	—	—	—	0.00	—	—	—	0	0.13	1
7440-38-2	Arsenic, dissolved	4.9E-02	1.1E-03	12.00	—	—	3.1E-06	0.03	—	—	1.1E-03	85	12.03	60
7440-39-3	**Barium, dissolved**	5.3E-02	—	0.02	—	—	—	0.00	—	—	—	0	0.02	0
7440-41-7	**Beryllium, dissolved**	2.6E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-43-9	Cadmium, dissolved	2.4E-03	—	0.36	—	—	—	0.00	—	—	—	0	0.36	2
7440-70-2	Calciuim, dissolved	6.4E+01	—	—	—	—	—	—	—	—	—	0	—	0
7440-47-3	**Chromium, dissolved**	1.6E-03	—	0.04	—	—	—	0.00	—	—	—	0	0.04	0
7440-48-4	Cobalt, dissolved	1.2E-03	—	0.35	—	—	—	0.00	—	—	—	0	0.35	2
7440-50-8	Copper, dissolved	2.6E-03	—	0.00	—	—	—	0.00	—	—	—	0	0.01	0
7439-89-6	Iron, dissolved	1.2E-01	—	0.01	—	—	—	0.01	—	—	—	0	0.02	0
7439-92-1	**Lead, dissolved**	1.5E-03	—	—	—	—	—	—	—	—	—	0	—	0
7439-95-4	Magnesium, dissolved	2.9E+01	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	Manganese, dissolved	1.3E+00	—	3.70	—	—	—	0.05	—	—	—	0	3.75	19
7439-98-7	Molybdenum, dissolved	1.1E-02	—	0.13	—	—	—	0.00	—	—	—	0	0.13	1
7440-02-0	Nickel, dissolved	4.4E-03	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-09-7	Potassium, dissolved	1.0E+01	—	—	—	—	—	—	—	—	—	0	—	0
7782-49-2	**Selenium, dissolved**	3.6E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-22-4	Silver, dissolved	3.2E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-23-5	Sodium, dissolved	1.1E+02	—	—	—	—	—	—	—	—	—	0	—	0
7440-62-2	**Vanadium, dissolved**	1.9E-02	—	0.25	—	—	—	0.00	—	—	—	0	0.25	1
7440-66-6	**Zinc, dissolved**	1.0E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons														
91-20-3	Naphthalene	3.3E-02	—	0.12	—	—	—	0.08	—	0.0	—	0	0.22	1
Semivolatile Organic Compounds														
123-91-1	1,4-Dioxane (P-Dioxane)	1.1E-03	1.6E-07	—	—	—	5.7E-10	—	—	—	1.6E-07	0	—	0
Volatile Organic Compounds														
75-34-3	1,1-Dichloroethane	2.8E-04	9.0E-09	0.00	2.4E-09	—	1.7E-09	0.00	—	—	1.3E-08	0	0.00	0
87-61-6	1,2,3-Trichlorobenzene	5.2E-04	—	—	—	—	—	—	—	—	—	0	—	0
95-63-6	1,2,4-Trimethylbenzene	2.1E-03	—	0.02	—	0.01	—	0.03	—	—	—	0	0.06	0
95-50-1	1,2-Dichlorobenzene	3.2E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
107-06-2	1,2-Dichloroethane	5.3E-04	3.0E-07	0.00	7.0E-08	0.00	3.2E-08	0.00	—	—	4.0E-07	0	0.00	0
541-73-1	1,3-Dichlorobenzene	2.0E-04	—	—	—	—	—	—	—	—	—	0	—	0
106-46-7	1,4-Dichlorobenzene	4.5E-04	1.0E-08	0.00	2.5E-08	0.00	—	—	—	—	3.5E-08	0	0.00	0
78-93-3	2-Butanone	2.7E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.08	0
108-10-1	4-Methyl-2-pentanone	4.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
67-64-1	Acetone	7.8E-03	—	0.00	—	0.00	—	—	—	—	—	0	0.00	0
71-43-2	Benzene	9.4E-02	3.0E-05	2.30	—	0.08	1.1E-04	—	8.4E-06	0.08	1.5E-04	12	2.46	12
74-83-9	Bromomethane	6.3E-04	—	0.04	—	0.00	—	0.00	—	—	—	0	0.04	0
75-15-0	Carbon disulfide	2.5E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
108-90-7	Chlorobenzene	2.8E-04	—	0.00	—	0.00	—	—	—	—	—	0	0.00	0
67-66-3	Chloroform	6.2E-04	1.0E-07	0.00	7.0E-08	0.00	7.1E-09	—	—	—	1.8E-07	0	0.00	0
74-87-3	Chloromethane	3.0E-04	—	—	—	0.00	—	—	—	—	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	2.2E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
100-41-4	Ethylbenzene	1.4E-01	8.0E-06	0.11	1.3E-06	0.00	1.1E-07	0.00	4.3E-06	0.00	1.4E-05	1	0.12	1
108-20-3	Isopropyl Ether	8.0E-04	—	—	—	0.00	—	—	—	—	—	0	0.00	0
98-82-8	Isopropylbenzene	4.4E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	2.7E-04	3.0E-09	—	3.7E-10	0.00	1.5E-10	—	—	—	3.5E-09	0	0.00	0
75-09-2	Methylene chloride	6.3E-04	3.0E-08	0.00	1.3E-09	0.00	2.4E-09	0.00	—	—	3.4E-08	0	0.00	0
104-51-8	N-Butylbenzene	3.8E-04	—	—	—	—	—	—	—	—	—	0	—	0
103-65-1	N-Propylbenzene	3.2E-04	—	—	—	—	—	—	—	—	—	0	—	0
95-47-6	o-Xylene	4.6E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
99-87-6	p-Isopropyltoluene	3.1E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
135-98-8	Sec-Butylbenzene	3.4E-04	—	—	—	—	—	—	—	—	—	0	—	0
98-06-6	T-Butylbenzene	3.8E-04	—	—	—	—	—	—	—	—	—	0	—	0
75-65-0	Tert-Butyl Alcohol	3.7E-03	—	—	—	—	—	—	—	—	—	0	—	0
108-88-3	Toluene	5.4E-02	—	0.05	—	0.00	—	0.00	—	—	—	0	0.05	0
156-60-5	trans-1,2-Dichloroethene	2.6E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-01-6	Trichloroethene	3.5E-04	1.0E-08	—	3.7E-09	—	3.4E-09	—	—	—	1.7E-08	0	—	0
75-01-4	Vinyl chloride (M)	6.4E-04	3.0E-05	0.01	5.0E-08	0.00	—	—	—	—	3.0E-05	2	0.01	0
7816-60-0	Xylenes, m & p	1.6E-03	—	0.00	—	—	—	—	—	—	—	0	0.00	0
	Totals by Pathway		1.E-03	20	2.E-06	0.1	1.E-04	0.2	1.E-05	0.1	**1.E-03**		**20**	
	% of Totals		90	98	0	0	9	1	1	1				

Table 3-23: IR Site 19 - HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	5.81E+03	—	0.08	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.09	3
7440-38-2	**arsenic**	3.16E+00	7.4E-06	0.15	7.0E-07	0.01	5.2E-06	0.05	4.1E-09	0.00	—	—	—	—	1.3E-05	45	0.22	7
7440-39-3	**barium**	5.75E+01	—	0.00	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	**beryllium**	2.05E-01	—	0.00	—	0.01	—	—	1.5E-10	0.00	—	—	—	—	1.5E-10	0	0.01	0
7440-43-9	cadmium	1.37E+00	—	0.02	—	0.00	—	0.09	1.7E-09	0.00	—	—	—	—	1.7E-09	0	0.11	3
7440-47-3	**chromium**	2.72E+01	—	0.13	—	0.29	—	—	9.9E-08	—	—	—	—	—	9.9E-08	0	0.42	13
7440-48-4	**cobalt**	4.60E+00	—	0.22	—	0.01	—	—	1.3E-08	0.00	—	—	—	—	1.3E-08	0	0.22	7
7440-50-8	copper	7.49E+01	—	0.03	—	0.00	—	—	—	—	—	—	—	—	—	0	0.03	1
7439-89-6	iron	1.76E+04	—	0.36	—	0.01	—	—	—	—	—	—	—	—	—	0	0.37	11
7439-92-1	**lead**	6.28E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	manganese	4.23E+02	—	0.04	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.06	2
7439-97-6	**mercury**	4.24E-02	—	0.00	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7440-02-0	**nickel**	2.49E+01	—	0.02	—	0.01	—	0.01	2.0E-09	0.00	—	—	—	—	2.0E-09	0	0.04	1
7440-22-4	**silver**	7.00E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	3.30E+00	—	0.72	—	0.02	—	—	—	—	—	—	—	—	—	0	0.74	22
7440-62-2	**vanadium**	2.39E+01	—	0.05	—	0.05	—	—	—	—	—	—	—	—	—	0	0.10	3
7440-66-6	zinc	7.02E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	4.96E-02	2.4E-07	0.00	1.1E-07	0.00	7.1E-09	0.00	4.2E-12	—	—	—	—	—	3.6E-07	1	0.00	0
50-32-8	benzo(a)pyrene-M	1.77E-01	8.7E-06	0.00	3.8E-06	0.00	2.5E-07	0.00	1.5E-10	—	—	—	—	—	1.3E-05	44	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.28E-01	6.3E-07	0.00	2.8E-07	0.00	1.8E-08	0.00	1.1E-11	—	—	—	—	—	9.2E-07	3	0.00	0
207-08-9	benzo(k)fluoranthene-M	9.75E-02	4.8E-08	0.00	2.1E-08	0.00	1.4E-09	0.00	8.2E-12	—	—	—	—	—	7.0E-08	0	0.00	0
218-01-9	chrysene-M	5.36E-02	2.6E-09	0.00	1.2E-09	0.00	7.7E-11	0.00	4.5E-13	—	—	—	—	—	3.9E-09	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	6.94E-03	3.4E-07	0.00	1.5E-07	0.00	1.0E-08	0.00	6.4E-12	—	—	—	—	—	5.0E-07	2	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	5.70E-02	2.8E-07	0.00	1.2E-07	0.00	—	0.00	4.8E-12	—	—	—	—	—	4.0E-07	1	0.00	0
208-96-8	Acenaphthylene	3.32E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	6.06E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
206-44-0	fluoranthene	2.44E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phenanthrene	7.90E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.30E-01	6.4E-06	0.00	2.8E-06	0.00	1.9E-07	0.00	1.1E-10	—	—	—	—	—	9.4E-06	51	0.00	0
Semivolatile Organic Compounds																		
59-50-7	4-Chloro-3-methylphenol	1.50E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
117-81-7	bis(2-ethylhexyl)phthalate	8.90E-01	2.0E-08	0.00	6.2E-09	0.00	4.8E-07	0.01	6.5E-13	—	—	—	—	—	5.0E-07	2	0.01	0
84-66-2	Diethyl Phthalate	6.43E+00	—	0.00	—	0.00	—	0.02	—	—	—	—	—	—	—	0	0.03	1
84-74-2	Di-N-Butyl Phthalate	7.30E+00	—	0.00	—	0.00	—	0.06	—	—	—	—	—	—	—	0	0.06	2
86-30-6	N-Nitrosodiphenylamine	8.17E-02	6.3E-10	—	2.0E-10	—	2.5E-08	—	6.4E-14	—	—	—	—	—	2.6E-08	0	—	0
87-86-5	Pentachlorophenol	8.54E-01	1.6E-07	0.00	1.3E-07	0.00	—	—	1.2E-12	—	—	—	—	—	2.9E-07	1	0.00	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	1.39E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
95-57-8	2-Chlorophenol	1.50E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.01	0
83-32-9	acenaphthene	1.21E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
120-12-7	anthracene	7.04E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
86-73-7	fluorene	1.40E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	3.78E-03	—	0.00	—	0.00	—	—	—	—	7.4E-10	0.00	—	0.00	7.4E-10	0	0.00	0
129-00-0	pyrene	2.55E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
67-64-1	acetone	2.06E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.71	—	0	0.71	21
108-88-3	toluene	1.41E+00	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.03	—	0	0.03	1
75-09-2	Methylene chloride	4.73E-03	5.6E-11	0.00	6.5E-11	0.00	—	—	—	—	1.5E-10	0.00	7.9E-09	0.00	8.2E-09	0	0.00	0
71-55-6	1,1,1-Trichloroethane	1.94E-02	—	0.00	—	—	—	—	—	—	—	0.00	—	—	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.90E-01	—	0.00	—	—	—	—	—	—	—	—	0.0E+00	0.00	0.0E+00	0	0.00	0
1330-20-7	xylenes (total)	1.90E-01	—	0.00	—	0.00	—	—	—	—	—	0.00	0.0E+00	0.05	0.0E+00	0	0.05	1
		Totals by Pathway	2.E-05	2	5.E-06	0	6.E-06	0	1.E-07	0	9.E-10	0	8.E-09	1	**3.E-05**		**3**	
		% of Totals	61	55	18	13	20	8	0	0	0	0	0	24				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-24: IR Site 19 - HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with		Ingestion of Homegrown		Inhalation of Soil		Inhalation of Volatiles in		Inhalation of Vapors in		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	5.78E+03	—	0.08	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.09	3
7440-38-2	**arsenic**	2.85E+00	6.7E-06	0.13	6.3E-07	0.01	4.6E-06	0.05	3.7E-09	0.00	—	—	—	—	1.2E-05	49	0.19	6
7440-39-3	barium	1.02E+02	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	**beryllium**	2.03E-01	—	0.00	—	0.01	—	—	1.5E-10	0.00	—	—	—	—	1.5E-10	0	0.01	0
7440-43-9	cadmium	6.99E-01	—	0.01	—	0.00	—	0.04	8.9E-10	0.00	—	—	—	—	8.9E-10	0	0.06	2
7440-47-3	**chromium**	3.33E+01	—	0.16	—	0.35	—	—	1.2E-07	—	—	—	—	—	1.2E-07	0	0.51	16
7440-48-4	**cobalt**	4.78E+00	—	0.23	—	0.01	—	—	1.3E-08	0.00	—	—	—	—	1.3E-08	0	0.23	7
7440-50-8	copper	3.99E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	iron	1.51E+04	—	0.31	—	0.01	—	—	—	—	—	—	—	—	—	0	0.32	10
7439-92-1	lead	3.90E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	3.26E+02	—	0.03	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.04	1
7439-97-6	**mercury**	1.00E-01	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	1.60E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	**nickel**	3.02E+01	—	0.02	—	0.02	—	0.01	2.4E-09	0.00	—	—	—	—	2.4E-09	0	0.05	2
7440-22-4	**silver**	4.59E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	3.30E+00	—	0.72	—	0.02	—	—	—	—	—	—	—	—	—	0	0.74	23
7440-62-2	**vanadium**	2.28E+01	—	0.05	—	0.05	—	—	—	—	—	—	—	—	—	0	0.10	3
7440-66-6	zinc	6.49E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	7.64E-02	3.7E-07	0.00	1.7E-07	0.00	1.1E-08	0.00	6.4E-12	—	—	—	—	—	5.5E-07	2	0.00	0
50-32-8	benzo(a)pyrene-M	1.09E-01	5.3E-06	0.00	2.4E-06	0.00	1.6E-07	0.00	9.2E-11	—	—	—	—	—	7.9E-06	32	0.00	0
205-99-2	benzo(b)fluoranthene-M	9.60E-02	4.7E-07	0.00	2.1E-07	0.00	1.4E-08	0.00	8.1E-12	—	—	—	—	—	6.9E-07	3	0.00	0
207-08-9	benzo(k)fluoranthene-M	5.65E-02	2.8E-08	0.00	1.2E-08	0.00	8.1E-10	0.00	4.8E-12	—	—	—	—	—	4.1E-08	0	0.00	0
218-01-9	chrysene-M	9.01E-02	4.4E-09	0.00	2.0E-09	0.00	1.3E-10	0.00	7.6E-13	—	—	—	—	—	6.5E-09	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	7.16E-03	3.5E-07	0.00	1.6E-07	0.00	1.0E-08	0.00	6.6E-12	—	—	—	—	—	5.2E-07	2	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	8.70E-02	4.3E-07	0.00	1.9E-07	0.00	—	0.00	7.3E-12	—	—	—	—	—	6.1E-07	3	0.00	0
208-96-8	Acenaphthylene	2.58E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	1.04E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
206-44-0	fluoranthene	1.17E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phenanthrene	5.56E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.54E-01	7.5E-06	0.00	3.3E-06	0.00	2.2E-07	0.00	1.3E-10	—	—	—	—	—	1.1E-05	42	0.00	0
Semivolatile Organic Compounds																		
59-50-7	4Chloro-3-methylphenol	1.50E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
117-81-7	bis(2-ethylhexyl)phthalate	2.01E-01	4.4E-09	0.00	1.4E-09	0.00	1.1E-07	0.00	1.5E-13	—	—	—	—	—	1.1E-07	0	0.00	0
84-66-2	Diethyl Phthalate	6.28E+00	—	0.00	—	0.00	—	0.02	—	—	—	—	—	—	—	0	0.02	1
84-74-2	Di-N-Butyl Phthalate	5.31E+00	—	0.00	—	0.00	—	0.04	—	—	—	—	—	—	—	0	0.04	1
86-30-6	N-Nitrosodiphenylamine	1.13E-01	8.7E-10	—	2.7E-10	—	3.5E-08	—	8.9E-14	—	—	—	—	—	3.6E-08	0	—	0
87-86-5	Pentachlorophenol	6.50E-01	1.2E-07	0.00	9.6E-08	0.00	—	—	9.0E-13	—	—	—	—	—	2.2E-07	1	0.00	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	1.45E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
95-57-8	2-Chlorophenol	1.50E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	0.71	—	0	0.72	22
83-32-9	acenaphthene	1.14E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	4.99E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	1.44E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	4.74E-03	—	0.00	—	0.00	—	—	—	—	9.3E-10	0.00	—	0.01	9.3E-10	0	0.01	0
129-00-0	pyrene	1.65E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
78-93-3	2-butanone	1.06E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
67-64-1	acetone	1.63E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
127-18-4	Tetrachloroethene	3.93E-03	3.3E-09	0.00	3.9E-09	0.00	—	—	—	—	2.4E-09	0.00	8.3E-08	0.00	9.2E-08	0	0.00	0
108-88-3	toluene	7.41E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
75-09-2	Methylene chloride	6.03E-03	7.1E-11	0.00	8.2E-11	0.00	—	—	—	—	1.9E-10	0.00	1.0E-08	0.00	1.0E-08	0	0.00	0
71-55-6	1,1,1-Trichloroethane	4.13E-03	—	0.00	—	—	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.90E-01	—	0.00	—	—	—	—	—	—	—	—	—	0.05	—	0	0.05	1
75-00-3	Chloroethane	3.00E-03	1.4E-11	0.00	—	—	—	—	—	—	—	0.00	8.9E-09	0.00	8.9E-09	0	0.00	0
79-01-6	Trichloroethene	4.00E-03	8.1E-11	0.00	2.6E-11	0.00	—	—	—	—	7.9E-10	—	1.6E-06	0.00	1.6E-06	6	0.00	0
1330-20-7	xylenes (total)	1.33E-02	—	0.00	—	0.00	—	—	—	—	—	0.00	—	—	—	0	0.00	0
	Totals by Pathway		1.E-05	2	4.E-06	0	5.E-06	0	1.E-07	0	4.E-09	0	2.E-06	1	**2.E-05**		**3**	
	% of Totals		57	55	16	15	20	6	1	0	0	0	7	24				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-25: IR Site 19 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals														
7429-90-5	**Aluminum, dissolved**	2.8E-01	—	0.02	—	—	—	0.00	—	—	—	0	0.02	1
7440-36-0	**Antimony, dissolved**	9.6E-04	—	0.23	—	—	—	0.00	—	—	—	0	0.23	6
7440-38-2	**Arsenic, dissolved**	3.5E-03	8.0E-05	1.00	—	—	3.7E-07	0.01	—	—	8.0E-05	21	1.01	27
7440-39-3	**Barium, dissolved**	2.9E-02	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-41-7	**Beryllium, dissolved**	7.8E-04	—	0.03	—	—	—	0.00	—	—	—	0	0.03	1
7440-43-9	Cadmium, dissolved	8.8E-04	—	0.12	—	—	—	0.00	—	—	—	0	0.12	3
7440-70-2	Calciuim, dissolved	3.0E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	1.5E-03	—	0.04	—	—	—	0.00	—	—	—	0	0.04	1
7440-48-4	Cobalt, dissolved	1.1E-04	—	0.03	—	—	—	0.00	—	—	—	0	0.03	1
7440-50-8	**Copper, dissolved**	2.6E-03	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-89-6	**Iron, dissolved**	8.1E-02	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7439-92-1	**Lead, dissolved**	2.2E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-95-4	Magnesium, dissolved	4.5E+00	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	3.8E-02	—	0.12	—	—	—	0.00	—	—	—	0	0.12	3
7439-97-6	Mercury, dissolved	9.6E-05	—	0.02	—	—	—	0.00	—	—	—	0	0.02	1
7439-98-7	Molybdenum, dissolved	5.0E-03	—	0.07	—	—	—	0.00	—	—	—	0	0.07	2
7440-02-0	Nickel, dissolved	2.0E-03	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-09-7	Potassium, dissolved	1.1E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	9.3E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-22-4	Silver, dissolved	9.8E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-23-5	Sodium, dissolved	1.9E+02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	7.2E-04	—	0.90	—	—	—	0.01	—	—	—	0	0.91	25
7440-62-2	**Vanadium, dissolved**	3.8E-02	—	0.60	—	—	—	0.00	—	—	—	0	0.60	16
7440-66-6	Zinc, dissolved	4.7E-02	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons														
91-20-3	Naphthalene	1.9E-03	—	0.01	—	—	—	0.00	—		—	0	0.01	0
Semivolatile Organic Compounds														
123-91-1	1,4-Dioxane (P-Dioxane)	3.5E-03	6.0E-07	0.00	—	—	1.9E-09	0.00	—	—	6.0E-07	0	0.00	0
Volatile Organic Compounds														
71-55-6	1,1,1-Trichloroethane	2.0E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-34-3	1,1-Dichloroethane	6.2E-03	5.0E-07	0.00	5.0E-08	0.00	3.7E-08	0.00	—	—	5.9E-07	0	0.00	0
75-35-4	1,1-Dichloroethene	3.5E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
120-82-1	1,2,4-Trichlorobenzene	2.4E-04	1.3E-08	0.00	—	0.00	1.4E-08	0.00	—	—	2.7E-08	0	0.01	0
95-63-6	1,2,4-Trimethylbenzene	1.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	9.0E-05	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	1.6E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
106-43-4	4-Chlorotoluene	9.0E-05	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
67-64-1	Acetone	3.1E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
71-43-2	Benzene	2.2E-04	1.7E-07	0.00	9.0E-09	0.00	2.4E-08	0.00	—	—	2.0E-07	0	0.01	0
75-15-0	Carbon disulfide	7.7E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-00-3	Chloroethane	5.0E-04	1.8E-08	0.00	—	0.00	1.1E-09	0.00	—	—	1.9E-08	0	0.00	0
67-66-3	Chloroform	2.0E-04	9.0E-08	0.00	2.5E-08	0.00	—	0.00	—	—	1.2E-07	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	3.1E-03	—	0.02	—	0.00	—	0.00	—	—	—	0	0.03	1
100-41-4	Ethylbenzene	1.1E-04	1.7E-08	0.00	1.3E-09	0.00	1.0E-08	0.00	—	—	2.8E-08	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	3.1E-04	8.0E-09	0.00	3.8E-10	0.00	1.7E-10	0.00	—	—	8.6E-09	0	0.00	0
104-51-8	N-Butylbenzene	2.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
103-65-1	N-Propylbenzene	1.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-47-6	o-Xylene	1.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
127-18-4	Tetrachloroethene	2.2E-02	1.7E-04	0.13	6.0E-07	0.00	9.4E-05	0.10	3.7E-06	0.01	2.7E-04	71	0.24	6
108-88-3	Toluene	4.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	1.9E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-01-6	Trichloroethene	2.8E-03	2.9E-07	0.00	2.6E-08	0.00	3.7E-08	0.00	1.0E-07	0.11	4.6E-07	0	0.11	3
75-01-4	Vinyl chloride	4.7E-04	2.9E-05	0.01	3.0E-08	0.00	—	0.00	—	—	2.9E-05	8	0.01	0
7816-60-0	Xylenes, m & p	4.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
	Totals by Pathway		3.E-04	3	7.E-07	0.0	9.E-05	0.1	4.E-06	0.1	**4.E-04**		**4**	
	% of Totals		74	93	0	0	25	3	1	3				

Table 3-26: IR Site 22 - HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	1.1E+04	—	0.16	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.17	4
7440-38-2	**arsenic**	4.6E+00	1.1E-05	0.22	1.0E-06	0.02	7.6E-06	0.08	6.0E-09	0.00	—	—	—	—	2.0E-05	68	0.32	8
7440-39-3	barium	1.3E+02	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	beryllium	5.2E-01	—	0.00	—	0.02	—	—	3.8E-10	0.00	—	—	—	—	3.8E-10	0	0.02	1
7440-43-9	cadmium	8.0E-01	—	0.01	—	0.00	—	0.05	1.0E-09	0.00	—	—	—	—	1.0E-09	0	0.06	2
7440-47-3	**chromium**	3.5E+01	—	0.17	—	0.37	—	—	1.3E-07	—	—	—	—	—	1.3E-07	0	0.54	14
7440-48-4	cobalt	9.0E+00	—	0.42	—	0.01	—	—	2.4E-08	0.00	—	—	—	—	2.4E-08	0	0.44	12
7440-50-8	copper	4.2E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.02	0
7439-89-6	**iron**	1.4E+04	—	0.28	—	0.01	—	—	—	—	—	—	—	—	—	0	0.29	8
7439-92-1	lead	4.7E+03	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	2.3E+02	—	0.02	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.03	1
7439-97-6	**mercury**	5.7E-02	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	1.3E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	**nickel**	3.0E+01	—	0.02	—	0.02	—	0.01	2.4E-09	0.00	—	—	—	—	2.4E-09	0	0.05	1
7782-49-2	**Selenium**	5.7E-01	—	0.00	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.00	0
7440-22-4	**silver**	3.7E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	9.0E-01	—	0.20	—	0.01	—	—	—	—	—	—	—	—	—	0	0.20	5
7440-62-2	**vanadium**	3.4E+01	—	0.07	—	0.08	—	—	—	—	—	—	—	—	—	0	0.15	4
7440-66-6	zinc	6.5E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	3.8E-02	1.9E-07	0.00	8.2E-08	0.00	5.4E-09	0.00	3.2E-12	—	—	—	—	—	2.7E-07	1	0.00	0
50-32-8	benzo(a)pyrene-M	7.2E-02	3.5E-06	0.00	1.6E-06	0.00	1.0E-07	0.00	6.0E-11	—	—	—	—	—	5.2E-06	18	0.00	0
205-99-2	benzo(b)fluoranthene-M	5.5E-02	2.7E-07	0.00	1.2E-07	0.00	7.8E-09	0.00	4.6E-12	—	—	—	—	—	3.9E-07	1	0.00	0
207-08-9	benzo(k)fluoranthene-M	2.5E-02	1.2E-08	0.00	5.4E-09	0.00	3.6E-10	0.00	2.1E-12	—	—	—	—	—	1.8E-08	0	0.00	0
218-01-9	chrysene-M	4.7E-02	2.3E-09	0.00	1.0E-09	0.00	6.7E-11	0.00	3.9E-13	—	—	—	—	—	3.4E-09	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	7.9E-03	3.9E-07	0.00	1.7E-07	0.00	1.1E-08	0.00	7.3E-12	—	—	—	—	—	5.7E-07	2	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	5.1E-02	2.5E-07	0.00	1.1E-07	0.00	1.0E-08	0.00	4.3E-12	—	—	—	—	—	3.7E-07	1	0.00	0
208-96-8	Acenaphthylene	6.5E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	5.8E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
206-44-0	fluoranthene	1.2E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phenanthrene	7.9E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	9.3E-02	4.5E-06	0.00	2.0E-06	0.00	1.3E-07	0.00	7.8E-11	—	—	—	—	—	6.7E-06	24	0.00	0
Semi-Volatile Organic Compounds																		
86-74-8	Carbazole	1.8E-02	5.6E-10	0.00	—	—	9.6E-08	0.00	—	—	—	—	—	—	9.6E-08	0	0.00	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	1.4E+00	—	0.01	—	0.00	—	—	—	—	—	—	—	0.06	—	0	0.07	2
83-32-9	acenaphthene	1.4E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	9.3E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	1.1E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	9.8E-01	—	0.00	—	0.00	—	—	—	—	1.9E-07	0.01	—	1.29	1.9E-07	1	1.30	35
129-00-0	pyrene	9.5E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
100-41-4	ethylbenzene	1.2E-01	2.5E-09	0.00	6.5E-10	0.00	—	—	—	—	1.9E-08	0.00	—	0.00	2.2E-08	0	0.00	0
1330-20-7	xylenes (total)	8.4E-01	—	0.00	—	0.00	—	—	—	—	—	0.00	—	—	—	0	0.00	0
ides/Polychlorinated biphenyls																		
72-54-8	p,p'-DDD	9.0E-03	2.4E-09	0.00	5.3E-10	0.00	1.8E-07	0.01	1.9E-13	—	—	—	—	—	1.8E-07	1	0.01	0
72-55-9	p,p'-DDE	1.8E-02	9.7E-09	0.00	1.5E-09	0.00	4.0E-07	0.01	5.3E-13	—	—	—	—	—	4.1E-07	1	0.01	0
50-29-3	p,p'-DDT	5.3E-02	2.8E-08	0.00	4.5E-09	0.00	—	—	1.6E-12	—	—	—	—	—	3.3E-08	0	0.00	0
5103-71-9	alpha-chlordane	2.7E-02	1.5E-08	0.00	—	—	7.1E-07	0.02	—	—	—	—	—	—	7.3E-07	3	0.02	1
5103-74-2	beta-chlordane	2.2E-02	1.2E-08	0.00	—	—	5.8E-07	0.02	—	—	—	—	—	—	5.9E-07	2	0.02	0
		Totals by Pathway	2.E-05	2	3.E-06	1	1.E-05	0	2.E-07	0	2.E-07	0	0.E+00	1	**3.E-05**		**4**	
		% of Totals	54	43	11	14	34	6	1	0	1	0	0	36				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-27: IR Site 22 - HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	9.3E+03	—	0.13	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.14	1
7440-38-2	arsenic	3.4E+00	8.0E-06	0.16	7.6E-07	0.01	5.6E-06	0.06	4.4E-09	0.00	—	—	—	—	1.4E-05	18	0.23	1
7440-39-3	barium	8.2E+01	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	beryllium	4.8E-01	—	0.00	—	0.01	—	—	3.5E-10	0.00	—	—	—	—	3.5E-10	0	0.02	0
7440-43-9	cadmium	4.2E-01	—	0.01	—	0.00	—	0.03	5.4E-10	0.00	—	—	—	—	5.4E-10	0	0.03	0
7440-47-3	**chromium**	3.7E+01	—	0.17	—	0.39	—	—	1.3E-07	—	—	—	—	—	1.3E-07	0	0.56	3
7440-48-4	cobalt	6.0E+00	—	0.28	—	0.01	—	—	1.6E-08	0.00	—	—	—	—	1.6E-08	0	0.29	1
7440-50-8	**copper**	2.3E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	iron	1.3E+04	—	0.27	—	0.01	—	—	—	—	—	—	—	—	—	0	0.27	1
7439-92-1	lead	8.3E+02	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	1.8E+02	—	0.02	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.02	0
7439-97-6	mercury	8.8E-02	—	0.01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.01	0
7439-98-7	**molybdenum**	1.3E+00	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-02-0	nickel	3.3E+01	—	0.02	—	0.02	—	0.01	2.6E-09	0.00	—	—	—	—	2.6E-09	0	0.05	0
7782-49-2	**Selenium**	5.9E-01	—	0.00	—	0.00	—	0.00	—	0.00	—	—	—	—	—	0	0.00	0
7440-22-4	**silver**	2.5E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	9.0E-01	—	0.20	—	0.01	—	—	—	—	—	—	—	—	—	0	0.20	1
7440-62-2	**vanadium**	2.8E+01	—	0.06	—	0.06	—	—	—	—	—	—	—	—	—	0	0.12	1
7440-66-6	zinc	5.3E+01	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	6.4E-02	3.1E-07	0.00	1.4E-07	0.00	9.1E-09	0.00	5.4E-12	—	—	—	—	—	4.6E-07	1	0.00	0
50-32-8	benzo(a)pyrene-M	1.1E-01	5.2E-06	0.00	2.3E-06	0.00	1.5E-07	0.00	8.9E-11	—	—	—	—	—	7.6E-06	9	0.00	0
205-99-2	benzo(b)fluoranthene-M	8.6E-02	4.2E-07	0.00	1.9E-07	0.00	1.2E-08	0.00	7.2E-12	—	—	—	—	—	6.2E-07	1	0.00	0
207-08-9	benzo(k)fluoranthene-M	4.9E-02	2.4E-08	0.00	1.1E-08	0.00	7.1E-10	0.00	4.2E-12	—	—	—	—	—	3.6E-08	0	0.00	0
218-01-9	chrysene-M	7.2E-02	3.5E-09	0.00	1.6E-09	0.00	1.0E-10	0.00	6.0E-13	—	—	—	—	—	5.2E-09	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	1.1E-02	5.3E-07	0.00	2.4E-07	0.00	1.6E-08	0.00	1.0E-11	—	—	—	—	—	7.9E-07	1	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	7.3E-02	3.6E-07	0.00	1.6E-07	0.00	1.5E-08	0.00	6.2E-12	—	—	—	—	—	5.3E-07	1	0.00	0
208-96-8	Acenaphthylene	8.7E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	8.9E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
206-44-0	fluoranthene	1.8E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phenanthrene	1.1E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.4E-01	6.6E-06	0.00	2.9E-06	0.00	1.9E-07	0.00	1.1E-10	—	—	—	—	—	9.7E-06	13	0.00	0
Semivolatile Organic Compounds																		
59-50-7	4-Chloro-3-methylphenyl	5.7E+00	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
86-74-8	Carbazole	2.6E-02	8.2E-10	0.00	—	—	—	0.00	—	—	—	—	—	—	8.2E-10	0	0.00	0
108-95-2	phenol	3.0E-01	—	0.00	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.00	0
Volatile Organic Compounds																		
120-82-1	1,2,4-Trichlorobenzene	2.0E+00	—	0.00	—	0.00	—	—	—	—	—	0.03	—	3.22	—	0	3.25	16
95-57-8	2-Chlorophenol	3.1E+00	—	0.01	—	0.00	—	—	—	—	—	—	—	1.47	—	0	1.49	7
91-57-6	2-methylnaphthalene	4.2E+00	—	0.01	—	0.01	—	—	—	—	—	—	—	0.17	—	0	0.19	1
108-10-1	4-Methyl-2-pentanone	7.2E+01	—	0.01	—	—	—	—	—	—	—	0.00	—	0.20	—	0	0.22	1
83-32-9	acenaphthene	1.3E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	2.6E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	2.0E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	4.0E+00	—	0.00	—	0.00	—	—	—	—	7.8E-07	0.04	—	5.17	7.8E-07	1	5.21	26
129-00-0	pyrene	2.2E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
67-64-1	acetone	5.4E-03	—	0.00	—	0.00	—	—	—	—	—	0.00	—	0.00	—	0	0.00	0
71-43-2	Benzene	3.7E-01	3.2E-08	0.00	1.0E-08	0.00	—	—	—	—	2.2E-07	0.00	1.0E-05	0.10	1.1E-05	13	0.11	1
100-41-4	ethylbenzene	2.1E+02	3.6E-06	0.03	1.1E-06	0.01	—	—	—	—	3.3E-05	0.06	—	1.18	3.8E-05	47	1.28	6
108-88-3	toluene	2.7E+02	—	0.05	—	0.01	—	—	—	—	—	0.02	—	5.17	—	0	5.24	26
75-09-2	Methylene chloride	2.7E-03	3.2E-11	0.00	1.0E-11	0.00	—	—	—	—	8.5E-11	0.00	4.5E-09	0.00	4.7E-09	0	0.00	0
1330-20-7	xylenes (total)	2.4E+02	—	0.02	—	0.00	—	—	—	—	—	0.74	—	—	—	0	0.76	4
ides/Polychlorinated biphenyls																		
72-43-5	Methoxychlor	1.3E-02	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
5103-71-9	alpha-chlordane	1.4E-01	7.9E-08	0.00	—	—	3.8E-06	0.10	—	—	—	—	—	—	3.9E-06	5	0.11	1
5103-74-2	beta-chlordane	7.6E-02	4.2E-08	0.00	—	—	2.0E-06	0.05	—	—	—	—	—	—	2.0E-06	3	0.06	0
72-54-8	p,p'-DDD	9.0E-03	3.4E-09	0.00	5.3E-10	0.00	1.8E-07	0.01	1.9E-13	—	—	—	—	—	1.8E-07	0	0.01	0
72-55-9	p,p'-DDE	9.0E-03	4.8E-09	0.00	7.5E-10	0.00	2.0E-07	0.01	2.6E-13	—	—	—	—	—	2.0E-07	0	0.01	0
50-29-3	p,p'-DDT	8.8E-03	4.7E-09	0.00	7.4E-10	0.00	1.6E-07	0.00	2.6E-13	—	—	—	—	—	1.7E-07	0	0.00	0
		Totals by Pathway	2.E-05	1	5.E-06	1	1.E-05	0	2.E-07	0	3.E-05	1	1.E-05	17	**8.E-05**		**20**	
		% of Totals	23	7	6	3	15	1	0	0	43	4	13	84				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-28: IR Site 22 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals														
7429-90-5	**Aluminum, dissolved**	4.3E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	2.3E-03	—	0.48	—	—	—	0.00	—	—	—	0	0.48	0
7440-38-2	Arsenic, dissolved	2.3E-02	5.0E-04	6.00	—	—	2.4E-06	0.03	—	—	5.0E-04	19	6.03	4
7440-39-3	**Barium, dissolved**	3.3E-01	—	0.12	—	—	—	0.00	—	—	—	0	0.12	0
7440-41-7	**Beryllium, dissolved**	4.9E-04	—	0.02	—	—	—	0.00	—	—	—	0	0.02	0
7440-43-9	Cadmium, dissolved	9.0E-04	—	0.12	—	—	—	0.00	—	—	—	0	0.12	0
7440-70-2	Calciuim, dissolved	7.7E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	1.1E-03	—	0.03	—	—	—	0.00	—	—	—	0	0.03	0
7440-48-4	Cobalt, dissolved	5.0E-03	—	1.20	—	—	—	0.01	—	—	—	0	1.21	1
7440-50-8	Copper, dissolved	1.4E-02	—	0.03	—	—	—	0.00	—	—	—	0	0.03	0
7439-89-6	Iron, dissolved	9.5E+00	—	1.10	—	—	—	0.01	—	—	—	0	1.11	1
7439-92-1	**Lead, dissolved**	4.1E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-95-4	Magnesium, dissolved	9.3E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-96-5	Manganese, dissolved	1.1E+01	—	42.50	—	—	—	0.17	—	—	—	0	42.67	31
7439-98-7	Molybdenum, dissolved	4.0E-03	—	0.06	—	—	—	0.00	—	—	—	0	0.06	0
7440-02-0	Nickel, dissolved	1.3E-02	—	0.05	—	—	—	0.00	—	—	—	0	0.05	0
7440-09-7	Potassium, dissolved	2.2E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	1.0E-03	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-22-4	Silver, dissolved	1.7E-03	—	0.03	—	—	—	0.00	—	—	—	0	0.03	0
7440-23-5	Sodium, dissolved	2.3E+02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	7.3E-03	—	9.00	—	—	—	0.05	—	—	—	0	9.05	7
7440-62-2	**Vanadium, dissolved**	8.2E-03	—	0.12	—	—	—	0.00	—	—	—	0	0.12	0
7440-66-6	**Zinc, dissolved**	1.2E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons														
91-20-3	Naphthalene	1.3E-01	—	0.49	—	—	—	0.31	—	0.09	—	0	0.90	1
Semivolatile Organic Compounds														
100-42-5	Styrene	1.0E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Volatile Organic Compounds														
71-55-6	1,1,1-Trichloroethane	2.7E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-34-3	1,1-Dichloroethane	2.4E-03	1.7E-07	0.00	2.4E-08	0.00	1.4E-08	0.00	—	—	2.1E-07	0	0.00	0
75-35-4	1,1-Dichloroethene	3.9E-03	—	0.01	—	0.00	—	0.00	—	—	—	0	0.01	0
95-63-6	1,2,4-Trimethylbenzene	3.2E-03	—	0.04	—	0.01	—	0.00	—	0.01	—	0	0.05	0
95-50-1	1,2-Dichlorobenzene	9.4E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
107-06-2	1,2-Dichloroethane	1.2E-02	1.6E-05	0.05	1.3E-06	0.00	7.3E-07	0.00	8.6E-07	0.00	1.9E-05	1	0.05	0
108-67-8	1,3,5-Trimethylbenzene	1.7E-03	—	0.00	—	0.01	—	0.00	—	—	—	0	0.01	0
78-93-3	2-Butanone	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
67-64-1	Acetone	4.4E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
71-43-2	Benzene	1.7E+00	1.4E-03	41.69	6.0E-05	1.40	1.9E-04	5.00	1.5E-04	1.51	1.8E-03	67	49.60	36
74-83-9	Bromomethane	6.0E-04	—	0.04	—	0.00	—	0.00	—	—	—	0	0.04	0
75-15-0	Carbon disulfide	1.2E+00	—	1.00	—	0.04	—	0.16	—	0.29	—	0	1.49	1
67-66-3	Chloroform	7.3E-03	3.0E-06	0.06	9.0E-07	0.00	—	0.00	—	—	3.9E-06	0	0.06	0
74-87-3	Chloromethane	2.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	9.0E-05	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
100-41-4	Ethylbenzene	1.2E+00	1.7E-04	0.90	1.3E-05	0.02	1.0E-04	0.50	3.7E-05	0.03	3.2E-04	12	1.45	1
108-20-3	Isopropyl Ether	3.2E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
98-82-8	Isopropylbenzene	4.7E-02	—	0.04	—	0.00	—	0.00	—	0.01	—	0	0.04	0
1634-04-4	Methyl Tert-Butyl Ether	5.3E-04	1.4E-08	0.00	7.0E-10	0.00	2.6E-08	0.00	—	—	4.1E-08	0	0.00	0
75-09-2	Methylene chloride	1.0E-04	1.1E-08	0.00	2.5E-10	0.00	2.0E-09	0.00	—	—	1.3E-08	0	0.00	0
104-51-8	N-Butylbenzene	8.9E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
103-65-1	N-Propylbenzene	1.6E-01	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-47-6	o-Xylene	6.0E-04	—	0.00	—	0.00	—	0.03	—	—	—	0	0.03	0
99-87-6	p-Isopropyltoluene	4.1E-04	—	0.00	—	0.00	—	0.29	—	—	—	0	0.29	0
135-98-8	Sec-Butylbenzene	8.5E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	8.1E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
127-18-4	Tetrachloroethene	2.6E-03	1.8E-05	0.02	8.0E-08	0.00	3.7E-05	0.03	—	—	5.5E-05	2	0.05	0
108-88-3	Toluene	5.3E+00	—	4.90	—	0.02	—	0.03	—	0.03	—	0	4.98	4
79-01-6	Trichloroethene	1.9E-03	1.6E-07	0.00	2.4E-08	0.00	3.4E-08	0.00	—	—	2.2E-07	0	0.00	0
1330-20-7	Xylenes (total)	2.4E+01	—	10.00	—	6.00	—	1.30	—	—	—	0	17.30	13
7816-60-0	Xylenes, m & p	1.7E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
		Totals by Pathway	2.E-03	120	8.E-05	8	3.E-04	8	2.E-04	2	**3.E-03**		**138**	
		% of Totals	78	87	3	5	12	6	7	1				

Table 3-29: IR Site 23 - HHRA Summary by Pathway, Soil (0-2 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil			Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Cal/ EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																			
7429-90-5	**aluminum**	1.2E+04	—	0.17	—	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.18	6
7440-36-0	**antimony**	3.6E+00	—	0.13	—	—	0.02	—	—	—	—	—	—	—	—	—	0	0.15	5
7440-38-2	**arsenic**	3.9E+00	9.2E-06	0.18	8.7E-07	8.7E-07	0.02	6.4E-06	0.07	5.1E-09	0.00	—	—	—	—	1.6E-05	48	0.27	9
7440-39-3	barium	1.4E+02	—	0.01	—	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	**beryllium**	1.7E-01	—	0.00	—	—	0.01	—	—	1.2E-10	0.00	—	—	—	—	1.2E-10	0	0.01	0
7440-43-9	cadmium	5.5E+00	—	0.08	—	—	0.01	—	0.35	7.0E-09	0.00	—	—	—	—	7.0E-09	0	0.44	14
7440-47-3	**chromium**	5.0E+01	—	0.24	—	—	0.53	—	—	1.8E-07	—	—	—	—	—	1.8E-07	1	0.76	25
7440-48-4	**cobalt**	6.1E+00	—	0.29	—	—	0.01	—	—	1.7E-08	0.00	—	—	—	—	1.7E-08	0	0.30	10
7440-50-8	copper	7.2E+01	—	0.03	—	—	0.00	—	—	—	—	—	—	—	—	—	0	0.03	1
7439-89-6	**iron**	1.5E+04	—	0.31	—	—	0.01	—	—	—	—	—	—	—	—	—	0	0.32	10
7439-92-1	lead	2.3E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	2.5E+02	—	0.02	—	—	0.00	—	—	—	0.01	—	—	—	—	—	0	0.03	1
7440-02-0	**nickel**	2.7E+01	—	0.02	—	—	0.01	—	0.01	2.1E-09	0.00	—	—	—	—	2.1E-09	0	0.04	1
7440-22-4	**silver**	3.8E-01	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-62-2	vanadium	4.3E+01	—	0.09	—	—	0.10	—	—	—	—	—	—	—	—	—	0	0.18	6
7440-66-6	**zinc**	4.6E+01	—	0.00	—	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																			
56-55-3	benz(a)anthracene-M	1.5E-01	7.2E-07	0.00	3.2E-07	5.3E-07	0.00	2.1E-08	0.00	1.2E-11	—	—	—	—	—	1.1E-06	3	0.00	0
50-32-8	benzo(a)pyrene-M	1.5E-01	7.1E-06	0.00	3.1E-06	5.2E-06	0.00	2.1E-07	0.00	1.2E-10	—	—	—	—	—	1.0E-05	30	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.5E-01	7.4E-07	0.00	3.3E-07	5.4E-07	0.00	2.2E-08	0.00	1.3E-11	—	—	—	—	—	1.1E-06	3	0.00	0
207-08-9	benzo(k)fluoranthene-M	8.6E-02	4.2E-08	0.00	1.9E-08	3.1E-07	0.00	1.2E-09	0.00	7.3E-12	—	—	—	—	—	6.2E-08	0	0.00	0
218-01-9	chrysene-M	1.7E-01	8.1E-09	0.00	3.6E-09	5.9E-08	0.00	2.4E-10	0.00	1.4E-12	—	—	—	—	—	1.2E-08	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	2.5E-02	1.2E-06	0.00	5.5E-07	3.1E-07	0.00	3.6E-08	0.00	2.3E-11	—	—	—	—	—	1.8E-06	5	0.00	0
206-44-0	fluoranthene	2.5E-01	—	0.00	—	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	1.1E-01	5.1E-07	0.00	2.3E-07	3.7E-07	0.00	2.1E-08	0.00	—	—	—	—	—	—	7.6E-07	2	0.00	0
208-96-8	Acenaphthylene	3.1E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	1.1E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phananthrene	1.1E-01	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	2.3E-01	1.1E-05	0.00	5.0E-06	8.2E-06	0.00	3.3E-07	0.00	1.9E-10	—	—	—	—	—	1.7E-05	44	0.00	0
Semivolatile Organic Compounds																			
105-67-9	2,4-Dimethylphenol	5.2E-02	—	0.00	—	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
95-48-7	2-Methylphenol (O-Cresol)	2.1E-02	—	0.00	—	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
106-44-5	4-Methylphenol (P-Cresol)	4.8E-02	—	0.00	—	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
86-30-6	N-Nitrosodiphenylamine	2.1E-01	1.6E-09	—	5.0E-10	9.3E-10	—	6.4E-08	—	—	—	—	—	—	—	6.6E-08	0	—	0
Volatile Organic Compounds																			
91-57-6	2-methylnaphthalene	2.9E-03	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0.01	—	0	0.01	0
83-32-9	acenaphthene	4.0E-03	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	2.4E-02	—	0.00	—	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	3.4E-03	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	2.7E-03	—	0.00	—	2.4E-10	0.00	—	—	—	—	5.2E-10	0.00	—	0.00	5.2E-10	0	0.00	0
129-00-0	pyrene	2.1E-01	—	0.00	—	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
ides/Polychlorinated biphenyls																			
11096-82-5	PCB-1260 (Aroclor 1260)	3.8E-02	1.2E-07	0.03	5.6E-08	1.4E-07	0.01	2.1E-06	0.24	—	—	—	—	—	—	2.3E-06	7	0.28	9
50-29-3	p,p'-DDT	5.4E-03	2.9E-09	0.00	4.5E-10	4.5E-10	0.00	9.8E-08	0.00	—	—	—	—	—	—	1.0E-07	0	0.00	0
		Totals by Pathway	2.E-05	2	6.E-06	8.E-06	1	9.E-06	1	2.E-07	0	5.E-10	0	0.E+00	0	**3.E-05**		**3**	
		% of Totals	57	52	16	18	24	26	23	1	0	0	0	0	0				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-30: IR Site 23 - HHRA Summary by Pathway, Soil (0-8 feet bgs)

Analyte		Exposure Point Concentration (mg/kg)	Ingestion of Soil		Dermal Contact with Soil		Ingestion of Homegrown Produce		Inhalation of Soil Particulates in Outdoor Air		Inhalation of Volatiles in Outdoor Air		Inhalation of Vapors in Indoor Air Originating from Soil		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals																		
7429-90-5	**aluminum**	6.9E+03	—	0.10	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.10	3
7440-36-0	**antimony**	2.3E+00	—	0.08	—	0.02	—	—	—	—	—	—	—	—	—	0	0.10	3
7440-38-2	**arsenic**	2.1E+00	4.9E-06	0.10	4.7E-07	0.01	3.4E-06	0.04	2.7E-09	0.00	—	—	—	—	8.8E-06	35	0.14	5
7440-39-3	barium	9.1E+01	—	0.01	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.01	0
7440-41-7	**beryllium**	1.7E-01	—	0.00	—	0.00	—	—	1.2E-10	0.00	—	—	—	—	1.2E-10	0	0.01	0
7440-43-9	cadmium	1.1E+00	—	0.02	—	0.00	—	0.07	1.3E-09	0.00	—	—	—	—	1.3E-09	0	0.09	3
7440-47-3	**chromium**	3.7E+01	—	0.18	—	0.39	—	—	1.4E-07	—	—	—	—	—	1.4E-07	1	0.57	19
7440-48-4	**cobalt**	4.8E+00	—	0.22	—	0.01	—	—	1.3E-08	0.00	—	—	—	—	1.3E-08	0	0.23	8
7440-50-8	copper	3.6E+01	—	0.01	—	0.00	—	—	—	—	—	—	—	—	—	0	0.01	0
7439-89-6	**iron**	1.1E+04	—	0.22	—	0.01	—	—	—	—	—	—	—	—	—	0	0.22	7
7439-92-1	lead	1.7E+01	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	0
7439-96-5	**manganese**	1.6E+02	—	0.02	—	0.00	—	—	—	0.00	—	—	—	—	—	0	0.02	1
7440-02-0	**nickel**	2.5E+01	—	0.02	—	0.01	—	0.01	2.0E-09	0.00	—	—	—	—	2.0E-09	0	0.04	1
7440-22-4	**silver**	3.8E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
7440-28-0	**thallium**	3.0E+00	—	0.64	—	0.02	—	—	—	—	—	—	—	—	—	0	0.66	22
7440-62-2	vanadium	2.7E+01	—	0.05	—	0.06	—	—	—	—	—	—	—	—	—	0	0.11	4
7440-66-6	**zinc**	4.2E+01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.01	0
Polynuclear Aromatic Hydrocarbons																		
56-55-3	benz(a)anthracene-M	1.0E-01	5.1E-07	0.00	2.3E-07	0.00	1.5E-08	0.00	8.8E-12	—	—	—	—	—	7.5E-07	3	0.00	0
50-32-8	benzo(a)pyrene-M	1.1E-01	5.2E-06	0.00	2.3E-06	0.00	1.5E-07	0.00	9.0E-11	—	—	—	—	—	7.7E-06	30	0.00	0
205-99-2	benzo(b)fluoranthene-M	1.1E-01	5.6E-07	0.00	2.5E-07	0.00	1.6E-08	0.00	9.6E-12	—	—	—	—	—	8.2E-07	3	0.00	0
207-08-9	benzo(k)fluoranthene-M	6.4E-02	3.1E-08	0.00	1.4E-08	0.00	9.2E-10	0.00	5.4E-12	—	—	—	—	—	4.6E-08	0	0.00	0
218-01-9	chrysene-M	1.2E-01	5.7E-09	0.00	2.5E-09	0.00	1.7E-10	0.00	9.8E-13	—	—	—	—	—	8.4E-09	0	0.00	0
53-70-3	dibenz(a,h)anthracene-M	1.9E-02	9.2E-07	0.00	4.1E-07	0.00	2.7E-08	0.00	1.7E-11	—	—	—	—	—	1.4E-06	5	0.00	0
206-44-0	fluoranthene	1.7E-01	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
193-39-5	indeno(1,2,3-cd)pyrene-M	8.1E-02	4.0E-07	0.00	1.8E-07	0.00	1.7E-08	0.00	6.8E-12	—	—	—	—	—	5.9E-07	2	0.00	0
208-96-8	Acenaphthylene	3.4E-03	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
191-24-2	Benzo(g,h,i)perylene	8.4E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
85-01-8	Phananthrene	7.9E-02	—	0.00	—	—	—	—	—	—	—	—	—	—	—	0	0.00	0
	Benzo(a)Pyrene Equivalent	1.7E-01	8.3E-06	0.00	3.7E-06	0.00	1.5E-07	0.00	1.4E-10	—	—	—	—	—	1.2E-05	44	0.00	0
Semivolatile Organic Compounds																		
105-67-9	2,4-Dimethylphenol	5.2E-02	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
95-48-7	2-Methylphenol (O-Cresol)	2.1E-02	—	0.00	—	0.00	—	0.00	—	—	—	—	—	—	—	0	0.00	0
106-44-5	4-Methylphenol (P-Cresol)	4.8E-02	—	0.00	—	0.00	—	0.01	—	—	—	—	—	—	—	0	0.01	0
86-30-6	N-Nitrosodiphenylamine	1.3E-01	1.0E-09	—	3.2E-10	—	4.1E-08	—	1.1E-13	—	—	—	—	—	4.2E-08	0	—	0
Volatile Organic Compounds																		
91-57-6	2-methylnaphthalene	2.6E-01	—	0.00	—	0.00	—	—	—	—	—	—	—	0.01	—	0	0.01	0
83-32-9	acenaphthene	5.8E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
120-12-7	anthracene	1.7E-02	—	0.00	—	0.00	—	—	—	—	—	—	—	—	—	0	0.00	0
86-73-7	fluorene	8.9E-03	—	0.00	—	0.00	—	—	—	—	—	—	—	0.00	—	0	0.00	0
91-20-3	naphthalene	2.7E-01	—	0.00	—	0.00	—	—	—	—	5.3E-08	0.00	—	0.35	5.3E-08	0	0.36	12
129-00-0	pyrene	1.5E-01	—	0.00	—	0.00	—	—	—	0.00	—	—	—	0.00	—	0	0.00	0
108-88-3	toluene	9.5E-02	—	0.00	—	0.00	—	—	—	0.00	—	0.00	—	0.00	—	0	0.00	0
Pesticides/Polychlorinated biphenyls																		
11096-82-5	PCB-1260 (Aroclor 1260)	3.8E-02	1.2E-07	0.03	5.6E-08	0.01	2.1E-06	0.24	—	—	—	—	—	—	2.3E-06	9	0.28	9
50-29-3	p,p'-DDT	3.8E-03	2.0E-09	—	3.2E-10	0.00	6.8E-08	0.00	—	—	—	—	—	—	7.1E-08	0	0.00	0
8001-35-2	toxaphene	1.4E+00	2.4E-06	—	3.8E-07	—	—	—	—	—	—	—	—	—	2.8E-06	11	—	0
	Totals by Pathway		2.E-05	2	4.E-06	1	6.E-06	0	2.E-07	0	5.E-08	0	0.E+00	0	**3.E-05**		**3**	
	% of Totals		59	56	17	18	23	13	1	0	0	0	0	12				

*B(a)P Equivalent EPC and risk are computed separately based on relative contribution of other carcinogenic PAHs. PEFs are based on the updated Technical Support Document dated May 2005 (OEHHA 2005). The PEF for dibenz(a,h)anthracene was calculated using the ratio of inhalation unit risk for dibenz(a,h)anthracene and benzo(a)pyrene as per the 2005 OEHHA document.

Metals in **bold** indicate those attributed to background

Table 3-31: IR Site 23 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
Metals														
7429-90-5	**Aluminum, dissolved**	2.8E-02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-36-0	**Antimony, dissolved**	4.0E-04	—	0.07	—	—	—	0.00	—	—	—	0	0.07	1
7440-38-2	**Arsenic, dissolved**	9.4E-03	1.8E-04	2.40	—	—	6.9E-07	0.00	—	—	1.8E-04	33	2.40	37
7440-39-3	**Barium, dissolved**	8.5E-02	—	0.04	—	—	—	0.00	—	—	—	0	0.04	1
7440-41-7	**Beryllium, dissolved**	3.3E-04	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
7440-43-9	Cadmium, dissolved	3.8E-04	—	0.06	—	—	—	0.00	—	—	—	0	0.06	1
7440-70-2	Calciuim, dissolved	5.4E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-47-3	**Chromium, dissolved**	4.6E-03	—	0.12	—	—	—	0.00	—	—	—	0	0.12	2
7440-48-4	Cobalt, dissolved	1.4E-03	—	0.36	—	—	—	0.00	—	—	—	0	0.36	6
7440-50-8	**Copper, dissolved**	6.2E-02	—	0.12	—	—	—	0.00	—	—	—	0	0.12	2
7439-89-6	**Iron, dissolved**	7.7E-01	—	0.08	—	—	—	0.00	—	—	—	0	0.08	1
7439-92-1	**Lead, dissolved**	2.5E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-95-4	Magnesium, dissolved	4.0E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7439-96-5	**Manganese, dissolved**	3.8E-01	—	1.20	—	—	—	0.00	—	—	—	0	1.20	18
7439-98-7	Molybdenum, dissolved	4.6E-03	—	0.07	—	—	—	0.00	—	—	—	0	0.07	1
7440-02-0	Nickel, dissolved	5.7E-03	—	0.02	—	—	—	0.00	—	—	—	0	0.02	0
7440-09-7	Potassium, dissolved	2.7E+01	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7782-49-2	**Selenium, dissolved**	1.9E-03	—	0.03	—	—	—	0.00	—	—	—	0	0.03	0
7440-22-4	Silver, dissolved	2.9E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-23-5	Sodium, dissolved	7.5E+02	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
7440-28-0	**Thallium, dissolved**	4.9E-04	—	0.60	—	—	—	0.00	—	—	—	0	0.60	9
7440-62-2	**Vanadium, dissolved**	9.5E-03	—	0.13	—	—	—	0.00	—	—	—	0	0.13	2
7440-66-6	**Zinc, dissolved**	9.5E-03	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Polynuclear Aromatic Hydrocarbons														
91-20-3	Naphthalene	1.5E-03	—	0.01	—	—	—	0.00	—	—	—	0	0.01	0
Semivolatile Organic Compounds														
100-42-5	Styrene	2.3E-04	—	0.00	—	—	—	0.00	—	—	—	0	0.00	0
Volatile Organic Compounds														
630-20-6	1,1,1,2-Tetrachloroethane	5.0E-04	1.7E-07	0.00	1.4E-08	0.00	—	0.00	—	—	1.8E-07	0	0.00	0
71-55-6	1,1,1-Trichloroethane	2.3E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-34-5	1,1,2,2-Tetrachloroethane	5.0E-04	1.4E-06	0.01	1.3E-07	0.00	—	0.00	—	—	1.5E-06	0	0.01	0
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.0E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
79-00-5	1,1,2-Trichloroethane	5.0E-04	5.0E-07	0.01	3.8E-08	0.00	—	0.00	—	—	5.4E-07	0	0.01	0
75-34-3	1,1-Dichloroethane	3.1E-04	3.0E-08	0.00	2.5E-09	0.00	1.9E-09	0.00	—	—	3.4E-08	0	0.00	0
75-35-4	1,1-Dichloroethene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
563-58-6	1,1-Dichloropropene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
87-61-6	1,2,3-Trichlorobenzene	5.3E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
96-18-4	1,2,3-Trichloropropane	5.0E-04	5.0E-05	0.01	—	0.00	—	0.00	—	—	5.0E-05	9	0.01	0
120-82-1	1,2,4-Trichlorobenzene	5.0E-04	3.0E-08	0.00	—	0.00	3.1E-08	0.01	—	—	6.1E-08	0	0.01	0
95-63-6	1,2,4-Trimethylbenzene	5.0E-04	—	0.01	—	0.00	—	0.01	—	—	—	0	0.02	0
96-12-8	1,2-Dibromo-3-Chloropropane (M)	2.0E-03	7.0E-05	0.70	1.8E-04	0.20	—	0.00	—	—	2.5E-04	45	0.90	14
106-93-4	1,2-Dibromoethane	5.0E-04	1.4E-05	0.00	1.3E-06	0.00	—	0.00	2.6E-07	0.00	1.6E-05	3	0.01	0
95-50-1	1,2-Dichlorobenzene	1.5E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
107-06-2	1,2-Dichloroethane	5.0E-04	6.0E-07	0.00	6.0E-08	0.00	3.0E-08	0.00	—	—	6.9E-07	0	0.00	0
78-87-5	1,2-Dichloropropane	5.0E-04	3.0E-07	0.00	2.5E-08	0.00	—	0.00	—	—	3.3E-07	0	0.00	0
108-67-8	1,3,5-Trimethylbenzene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
541-73-1	1,3-Dichlorobenzene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
142-28-9	1,3-Dichloropropane	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
106-46-7	1,4-Dichlorobenzene	5.0E-04	4.0E-08	0.00	2.5E-08	0.00	—	0.00	—	—	6.5E-08	0	0.00	0
594-20-7	2,2-Dichloropropane	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
78-93-3	2-Butanone	3.2E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-49-8	2-Chlorotoluene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0

Table 3-31: IR Site 23 - HHRA Summary by Pathway, Groundwater

Analyte		Exposure Point Concentration (mg/L)	Ingestion of Groundwater		Inhalation of Groundwater While Showering		Dermal Contact With Groundwater While Showering		Inhalation of Vapors in Indoor Air Originating from Groundwater		Totals by Analyte			
CAS Number	Chemical		U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	Hazard Index	U.S. EPA Cancer Risk	% of Total	Hazard Index	% of Total
591-78-6	2-Hexanone	2.7E-03	—	0.04	—	0.00	—	0.00	—	—	—	0	0.04	1
106-43-4	4-Chlorotoluene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
108-10-1	4-Methyl-2-pentanone	3.8E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
67-64-1	Acetone	4.7E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
71-43-2	Benzene	1.9E-04	1.6E-07	0.00	7.0E-09	0.00	2.1E-08	0.00	—	—	1.9E-07	0	0.00	0
108-86-1	Bromobenzene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.01	0
74-97-5	Bromochloromethane	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-27-4	Bromodichloromethane	5.0E-04	5.0E-07	0.00	9.0E-08	0.00	—	0.00	—	—	5.9E-07	0	0.00	0
75-25-2	Bromoform	2.4E-04	3.0E-08	0.00	1.3E-09	0.00	—	0.00	1.5E-10	0.00	3.1E-08	0	0.00	0
75-15-0	Carbon disulfide	3.8E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
56-23-5	Carbon tetrachloride	5.0E-04	1.0E-06	0.06	3.7E-08	0.00	—	0.00	—	—	1.0E-06	0	0.06	1
108-90-7	Chlorobenzene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-00-3	Chloroethane	1.0E-03	5.0E-08	0.00	—	0.00	—	0.00	—	—	5.0E-08	0	0.00	0
67-66-3	Chloroform	5.0E-04	1.8E-07	0.00	6.0E-08	0.00	—	0.00	—	—	2.4E-07	0	0.00	0
74-87-3	Chloromethane	1.0E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-59-2	cis-1,2-Dichloroethene	1.1E-03	—	0.01	—	0.00	—	0.00	—	—	—	0	0.01	0
10061-01-5	cis-1,3-Dichloropropene	5.0E-04	8.0E-07	0.00	—	0.00	1.9E-08	0.00	—	—	8.2E-07	0	0.00	0
124-48-1	Dibromochloromethane	5.0E-04	6.0E-07	0.00	6.0E-08	0.00	—	0.00	—	—	6.6E-07	0	0.00	0
74-95-3	Dibromomethane	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-71-8	Dichlorodifluoromethane	1.0E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
100-41-4	Ethylbenzene	5.0E-04	8.0E-08	0.00	6.0E-09	0.00	4.4E-08	0.00	—	—	1.3E-07	0	0.00	0
87-68-3	Hexachlorobutadiene	5.0E-04	6.0E-07	0.04	5.0E-08	0.00	—	0.00	1.0E-07	0.04	7.5E-07	0	0.07	1
108-20-3	Isopropyl Ether	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
98-82-8	Isopropylbenzene	3.3E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
1634-04-4	Methyl Tert-Butyl Ether	2.5E-04	6.0E-09	0.00	3.6E-10	0.00	1.4E-10	0.00	—	—	6.5E-09	0	0.00	0
75-09-2	Methylene chloride	1.7E-03	1.7E-07	0.00	3.8E-09	0.00	6.6E-09	0.00	—	—	1.8E-07	0	0.00	0
104-51-8	N-Butylbenzene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
103-65-1	N-Propylbenzene	4.2E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
95-47-6	o-Xylene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
99-87-6	p-Isopropyltoluene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
135-98-8	Sec-Butylbenzene	3.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
98-06-6	T-Butylbenzene	3.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
994-05-8	Tert-Amyl Methyl Ether	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-65-0	Tert-Butyl Alcohol	5.7E-03	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
637-92-3	Tert-Butyl Ethyl Ether	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
127-18-4	Tetrachloroethene	5.0E-04	4.0E-06	0.00	1.3E-08	0.00	2.1E-06	0.00	—	—	6.2E-06	1	0.01	0
108-88-3	Toluene	2.2E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
156-60-5	trans-1,2-Dichloroethene	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
10061-02-6	trans-1,3-Dichloropropene	5.0E-04	8.0E-07	0.00	—	0.00	—	0.00	—	—	8.0E-07	0	0.00	0
79-01-6	Trichloroethene	5.0E-04	5.0E-08	0.00	5.0E-09	0.00	6.6E-09	0.00	—	—	6.2E-08	0	0.00	0
75-69-4	Trichlorofluoromethane	6.1E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
108-05-4	Vinyl acetate	1.0E-02	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
75-01-4	Vinyl chloride (M)	5.0E-04	4.0E-05	0.01	3.0E-08	0.00	—	0.00	—	—	4.0E-05	7	0.01	0
1330-20-7	Xylenes (total)	5.0E-04	—	0.00	—	0.00	—	0.00	—	—	—	0	0.00	0
	Totals by Pathway		4.E-04	6	2.E-04	0.2	3.E-06	0.0	4.E-07	0.0	**6.E-04**		**7**	
	% of Totals		66	96	33	3	1	0	0	1				

Table 3-32: HHRA Results by Exposure Group, Soil and Groundwater

Exposure Group Number	Exposure Group Definition	Site 9		Site 13		Site 19		Site 22		Site 23	
		U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index	U.S. EPA Cancer Risk	Noncancer Hazard Index
HHRA Results by Exposure Group, Soil (0 - 2 feet bgs) and Groundwater											
1	All soil and groundwater exposure pathways Total[a]	1.E-03	78	1.E-03	24	4.E-04	7	3.E-03	141	6.E-04	10
2	Exposure pathways for soil and vapors from VOCs in groundwater Total[a]	2.E-05	3	6.E-05	4	3.E-05	3	2.E-04	6	3.E-05	3
3	Exposure pathways for residential use of groundwater Total[a]	1.E-03	76	1.E-03	20	4.E-04	4	3.E-03	136	6.E-04	7
HHRA Results by Exposure Group, Soil (0 - 8 feet bgs) and Groundwater											
1	All soil and groundwater exposure pathways Total[a]	1.E-03	81	1.E-03	23	4.E-04	7	3.E-03	157	6.E-04	10
2	Exposure pathways for soil and vapors from VOCs in groundwater Total[a]	6.E-05	6	9.E-05	3	3.E-05	3	3.E-04	22	3.E-05	3
3	Exposure pathways for residential use of groundwater Total[a]	1.E-03	76	1.E-03	20	4.E-04	4	3.E-03	136	6.E-04	7

Note:
[a] includes all COPCs

Acronyms/Abbreviations:
Cal/EPA – California Environmental Protection Agency
COPC – chemical of potential concern
HHRA – human health risk assessment
NA – not applicable; without groundwater data, Exposure Group 2 is the only risk group
NC – not calculated; no COPCs in this category
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
48	organic analytes identified as COCs at IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

5.1.2.1 ORGANIC ANALYTES

The groundwater analytical data from Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) was used for selection of COCs for groundwater since it provides the most current representation of the nature and extent of contamination.

The rationale for selection of organic analytes as COCs is presented in the following sections.

Selection of Organic COCs based on Potential ARARs

The aquifer underlying the groundwater in the southeastern region of Alameda Point beneath OU-2A was classified as a Class II aquifer pursuant to the USEPA draft groundwater policy for classification of groundwater systems (Tetra Tech 2000). In addition, in accordance with Basin Plan for the Santa Francisco Bay Region (RWQCB 2007), the existing beneficial use designation for aquifer underlying OU-2A include municipal and domestic water supply. Therefore, federal or more stringent state MCLs constitute potential chemical-specific ARARs for organic analytes (see Section 5.1.4 for details) and were used for selection of organic COCs.

Organic analytes reported at concentrations exceeding their respective federal or more stringent state MCLs (chemical specific ARARs [see Section 5.1.4]) in groundwater at IR Sites 9, 13 and 19 during groundwater monitoring conducted as part of Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) were selected as COCs (see Section 3.3).

IR Site 9:

VC

1,1-DCA

cis-1,2-DCE

Benzene

Methyl tert-butyl Ether

1,1-DCE

IR Site 13:

Benzene

Ethylbenzene

Toluene

Xylene

IR Site 19:

TCE

PCE

VC

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

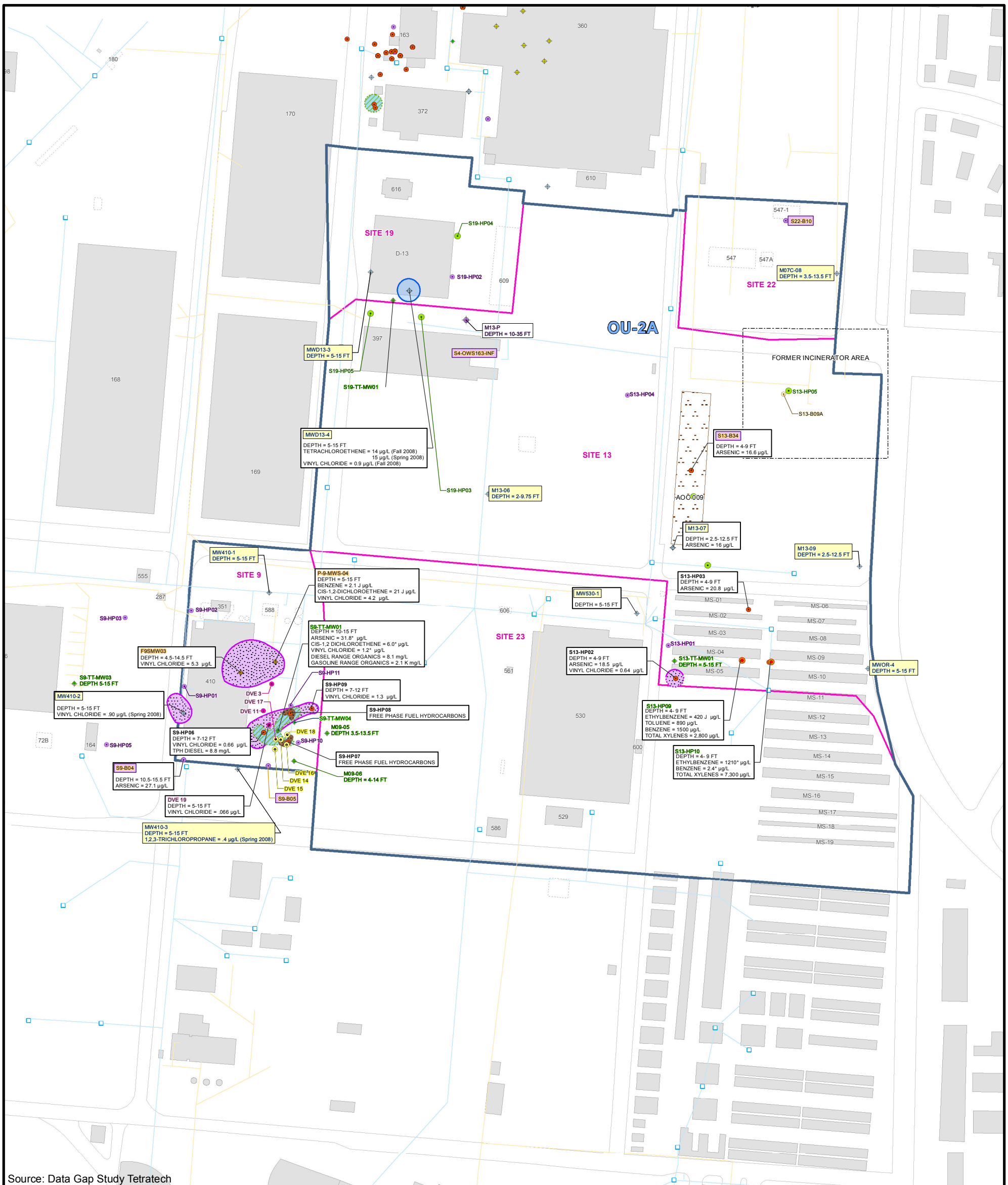
5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
49	inorganic analytes reviewed for IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 through 5-5; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.

IR SITES 9 AND 19

The metals for which the maximum reported concentration exceeded maximum reported value during the background study or EPC exceeded background value (95th quantile) included:

IR Site 9:

Arsenic

Chromium

Copper

Iron

Lead

Manganese

Selenium

Thallium

Vanadium

Zinc

IR Site 19:

Vanadium

Zinc

In addition to above metals, cobalt was reported at relatively high concentrations (up to 1,070 µg/L) in IR Site 9 groundwater. An analysis of distribution and magnitude of concentrations of these metals indicated that exceedances are not indicative of a release. For IR Sites 9 and 19, arsenic, chromium, selenium, thallium, vanadium, and zinc exceeded their respective maximum concentrations reported during the background study in less than 10 percent of the analyzed samples. The analysis of distribution of these exceedances indicates that they are isolated and sporadic, and are not indicative of a release. Therefore, arsenic, chromium, selenium, thallium, vanadium, and zinc were not considered COCs for IR Sites 9 and 19.

For IR Site 9, copper, iron, lead, and manganese exceeded their respective maximum concentrations reported during the background study in 8 to 20 percent of the samples. In addition, cobalt was reported at relatively high concentrations (up to 1,070 µg/L) in IR Site 9 groundwater. Most of the relatively high concentrations of these metals were reported in the wells (e.g. 9EMW01 through 9EMW04, 9IF-MW01L, 9IF-MW02U and 02L, 9IF-MW08U and 08L, and 9IF-MW10U and 10L) located in the areas where ISCO removal action was conducted in 2005-2006. The data analysis also indicates that in general for the same well, the concentrations of metals were higher in samples collected following injection of oxidant compared to the baseline sampling result. It is recommended that wells within the former ISCO removal action area be monitored in future to assess the anticipated decrease in metal concentrations as the redox conditions of the aquifer revert back to normal. Since copper, cobalt, iron, lead, and manganese concentrations are not indicative of a release, these metals were not considered COCs for IR Site 9.

The above analysis is for the metals data collected from 2002 to 2008. Figures 3-9 through 3-13 show distribution of metals exceeding MCLs based on the data collected from 2007 to 2010 as part of Data

Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL during these investigations is arsenic. An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that these exceedances are not indicative of a release (see Sections 3.3 for details). Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.

IR SITE 13

The metals for which the maximum reported concentrations exceeded maximum reported values during the background study or EPC exceeded background value (95th quantile) at IR Site 13 included:

Arsenic

Copper

Iron

Lead

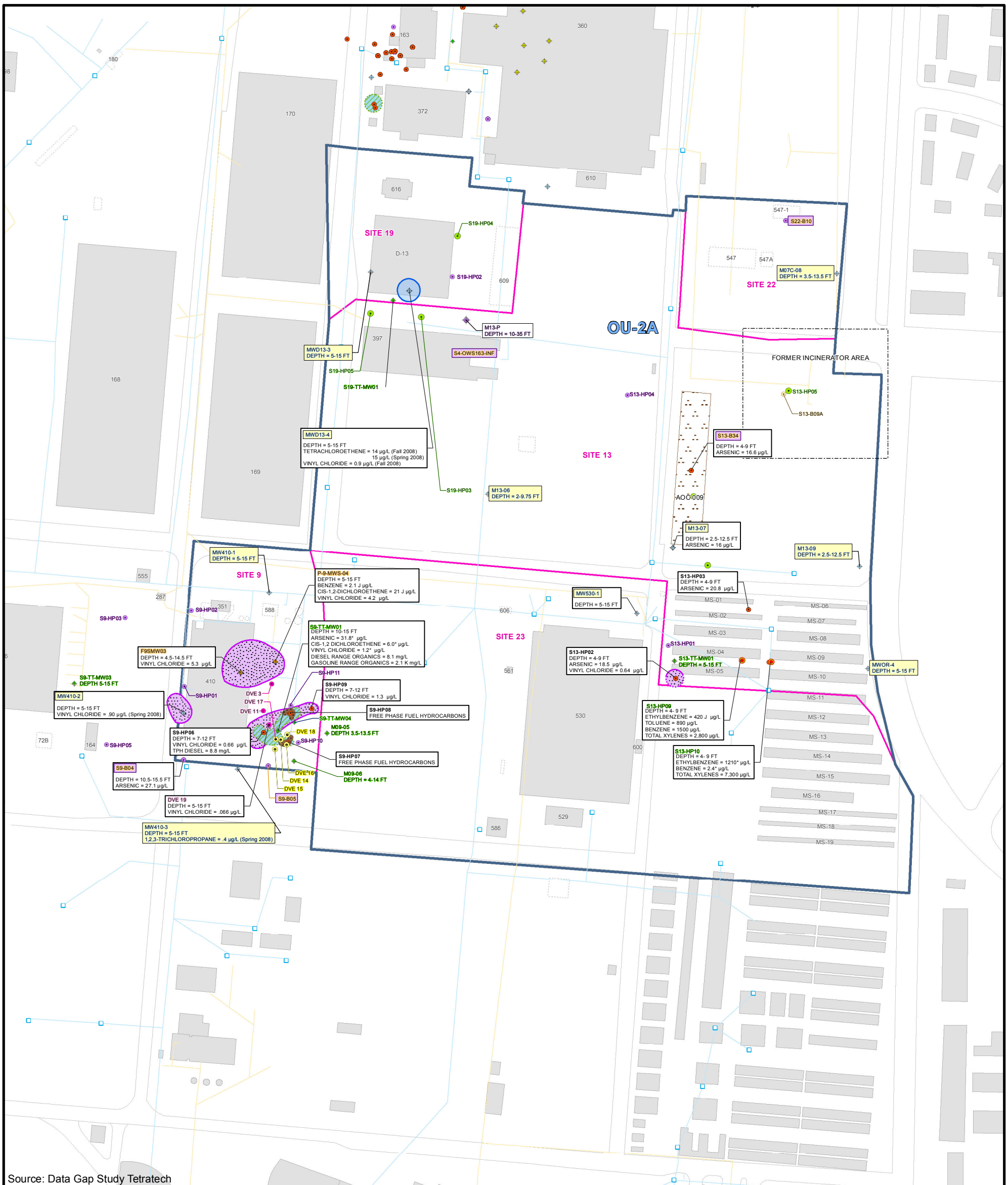
Manganese

Selenium

An analysis of distribution and magnitude of concentrations of these metals indicated that exceedances are not indicative of a release. Groundwater at most wells within OU-2A is indicative of reducing conditions (see Section 3.4). These reducing conditions are likely attributable to the presence of petroleum hydrocarbons and the associated biodegradation which lowers the DO. Arsenic, iron, and manganese exceeded their respective maximum concentrations reported during the background study in samples collected from one or more monitoring events for the following wells: M07C-06, M13-07, and MW-001. As explained in Section 3.4, these wells exhibit low DO and highly reducing conditions, which indicates that iron and manganese reduction likely accounts for relatively high concentrations of these metals. Arsenic mobilization may have also been caused due to reducing conditions. Therefore, locally high concentrations of arsenic, manganese and iron are likely attributable to reducing conditions in groundwater and are not indicative of a release.

Copper exceeded its maximum reported value during background study at one isolated location (D13-01) during sampling conducted in 2008. Lead exceeded its maximum reported value during background study at one isolated location (MW-001) during sampling conducted in 2002. However, sampling results for lead from the same well subsequent to 2002 show lead concentrations less than concentrations detected during the background study. Selenium exceeded its maximum reported value during background study at two isolated locations (M13-07 and M13-09) during 2003 or 2004 sampling events. However, sampling results for selenium from the same wells subsequent to 2004 show selenium concentrations less than concentrations detected during the background study.

The above analysis is for the metals data collected from 2002 to 2008. Figures 3-9 through 3-14 show distribution of metals exceeding MCLs based on the data collected from 2007 to 2010 as part of Data Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL at IR Site 13 during these investigations is arsenic (see Section 3.3.2 for details). An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that exceedances above MCL are not indicative of a release. Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
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- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
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- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
50	feasibility study evaluation for soil at IR Site 9	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.

4. Feasibility Study Evaluation for Soil

The Draft Final FS presented the development and evaluation of remedial alternatives for PAHs-impacted soil at IR Sites 9 and lead-impacted soil at IR Site 22. Subsequent to the issuance of the Draft Final FS (OTIE 2010) and based on regulatory agency comments and discussions, additional soil sampling was conducted to characterize PAHs and PCBs at IR Site 9 and lead at IR Site 22. Based on the results of these additional soil sampling results, no further action or evaluation of response action alternatives is required for these two soil sites at OU-2A. The results of this additional sampling are documented in the Technical Memorandum (see Appendix G), which summarizes the rationale for selecting soil COCs for the OU2A FS based on the BCT discussions. As a result, all previous text relating to the evaluation of soil alternatives for OU2A has been removed from this Final FS.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
51	organic analytes identified as COCs at IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

5.1.2.1 ORGANIC ANALYTES

The groundwater analytical data from Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) was used for selection of COCs for groundwater since it provides the most current representation of the nature and extent of contamination.

The rationale for selection of organic analytes as COCs is presented in the following sections.

Selection of Organic COCs based on Potential ARARs

The aquifer underlying the groundwater in the southeastern region of Alameda Point beneath OU-2A was classified as a Class II aquifer pursuant to the USEPA draft groundwater policy for classification of groundwater systems (Tetra Tech 2000). In addition, in accordance with Basin Plan for the Santa Francisco Bay Region (RWQCB 2007), the existing beneficial use designation for aquifer underlying OU-2A include municipal and domestic water supply. Therefore, federal or more stringent state MCLs constitute potential chemical-specific ARARs for organic analytes (see Section 5.1.4 for details) and were used for selection of organic COCs.

Organic analytes reported at concentrations exceeding their respective federal or more stringent state MCLs (chemical specific ARARs [see Section 5.1.4]) in groundwater at IR Sites 9, 13 and 19 during groundwater monitoring conducted as part of Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) were selected as COCs (see Section 3.3).

IR Site 9:

VC

1,1-DCA

cis-1,2-DCE

Benzene

Methyl tert-butyl Ether

1,1-DCE

IR Site 13:

Benzene

Ethylbenzene

Toluene

Xylene

IR Site 19:

TCE

PCE

VC

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

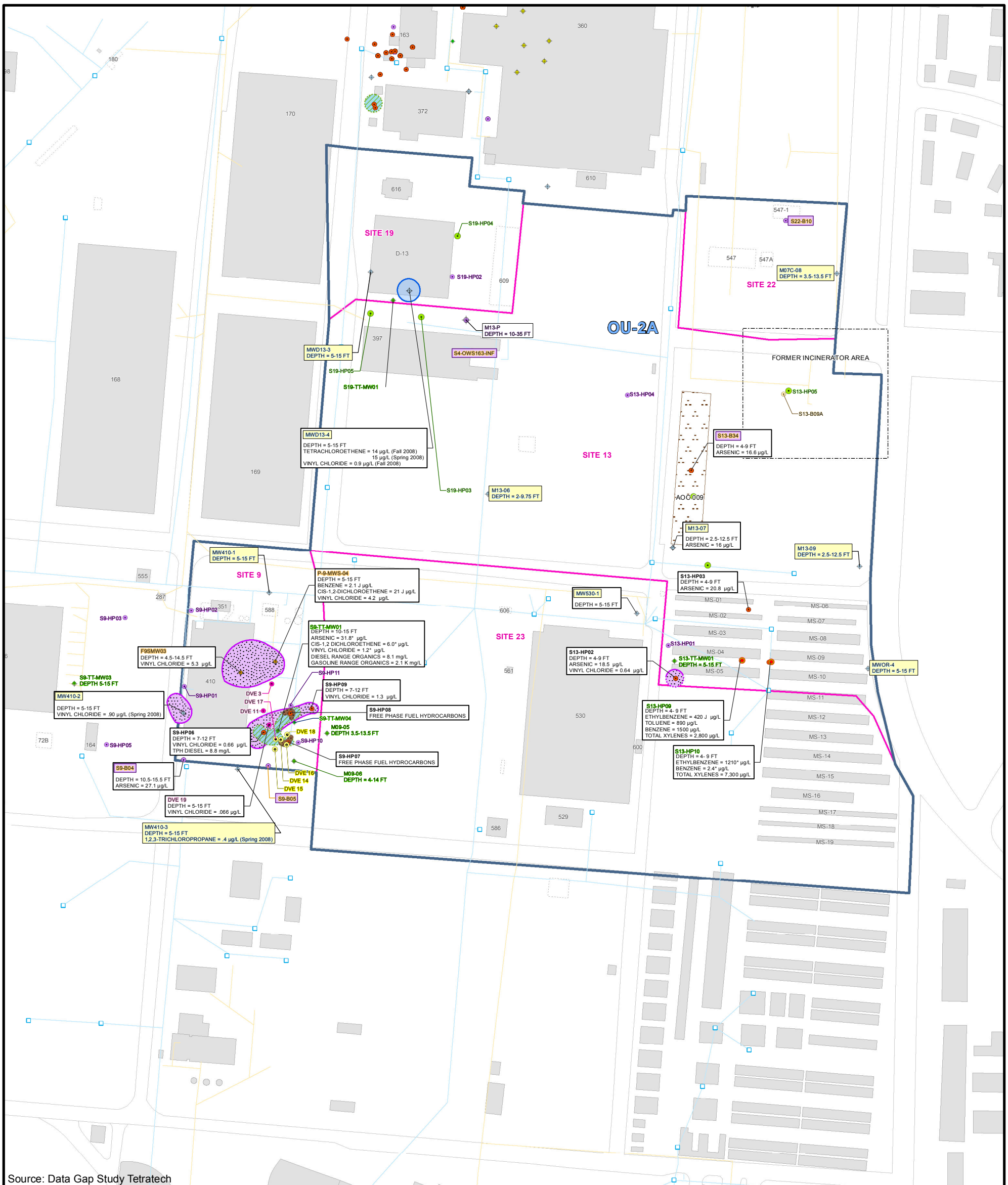
5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
52	inorganic analytes reviewed for IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 and 5-5; Figures 3-9 through 3-14. Oneida Total Integrated Enterprises LLC 2011.

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.

Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL during these investigations is arsenic. An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that these exceedances are not indicative of a release (see Sections 3.3 for details). Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.

IR SITE 13

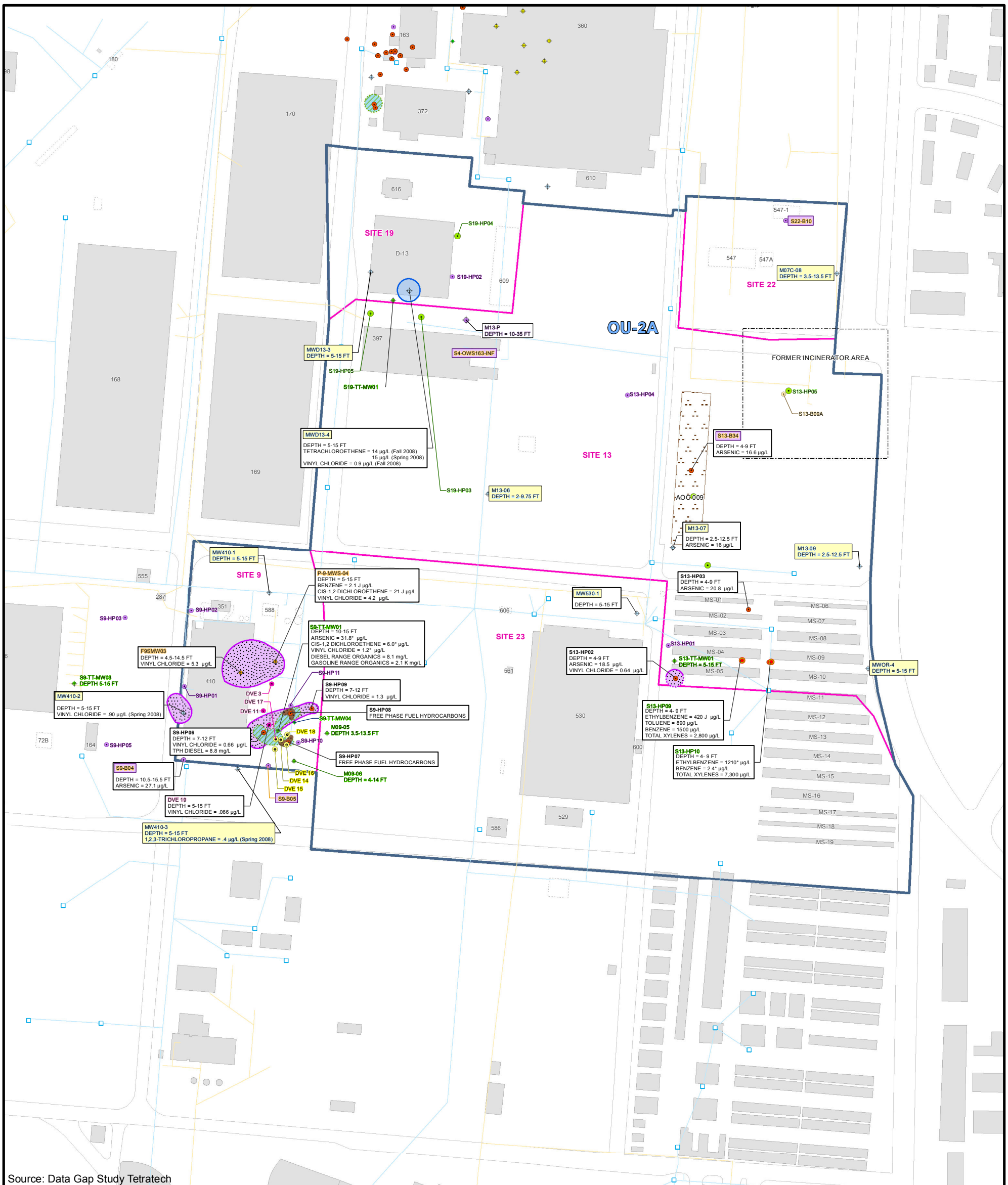
The metals for which the maximum reported concentrations exceeded maximum reported values during the background study or EPC exceeded background value (95th quantile) at IR Site 13 included:

- Arsenic
- Copper
- Iron
- Lead
- Manganese
- Selenium

An analysis of distribution and magnitude of concentrations of these metals indicated that exceedances are not indicative of a release. Groundwater at most wells within OU-2A is indicative of reducing conditions (see Section 3.4). These reducing conditions are likely attributable to the presence of petroleum hydrocarbons and the associated biodegradation which lowers the DO. Arsenic, iron, and manganese exceeded their respective maximum concentrations reported during the background study in samples collected from one or more monitoring events for the following wells: M07C-06, M13-07, and MW-001. As explained in Section 3.4, these wells exhibit low DO and highly reducing conditions, which indicates that iron and manganese reduction likely accounts for relatively high concentrations of these metals. Arsenic mobilization may have also been caused due to reducing conditions. Therefore, locally high concentrations of arsenic, manganese and iron are likely attributable to reducing conditions in groundwater and are not indicative of a release.

Copper exceeded its maximum reported value during background study at one isolated location (D13-01) during sampling conducted in 2008. Lead exceeded its maximum reported value during background study at one isolated location (MW-001) during sampling conducted in 2002. However, sampling results for lead from the same well subsequent to 2002 show lead concentrations less than concentrations detected during the background study. Selenium exceeded its maximum reported value during background study at two isolated locations (M13-07 and M13-09) during 2003 or 2004 sampling events. However, sampling results for selenium from the same wells subsequent to 2004 show selenium concentrations less than concentrations detected during the background study.

The above analysis is for the metals data collected from 2002 to 2008. Figures 3-9 through 3-14 show distribution of metals exceeding MCLs based on the data collected from 2007 to 2010 as part of Data Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL at IR Site 13 during these investigations is arsenic (see Section 3.3.2 for details). An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that exceedances above MCL are not indicative of a release. Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
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- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
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OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
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OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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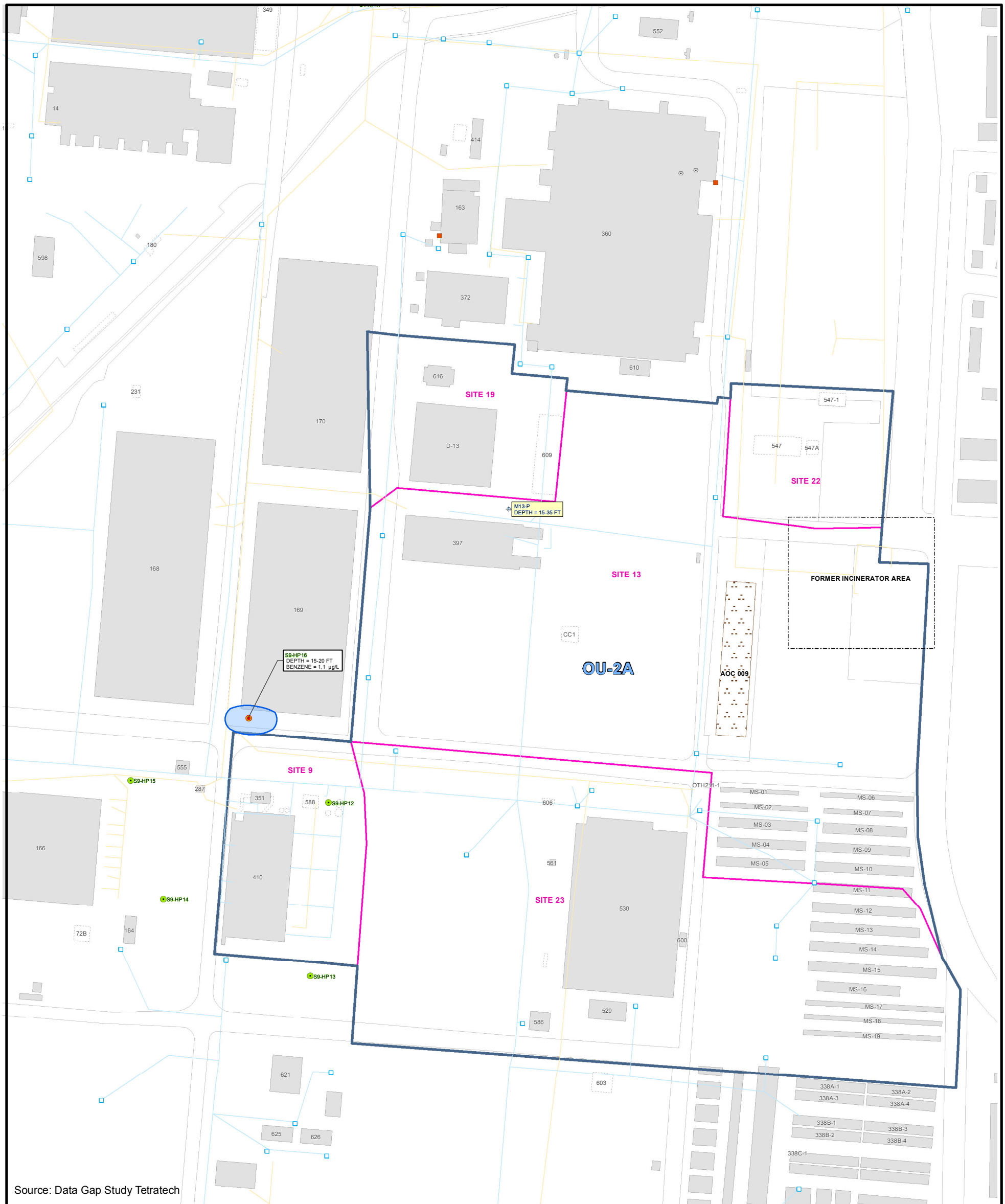

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
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- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
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- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (15 - 20 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-10

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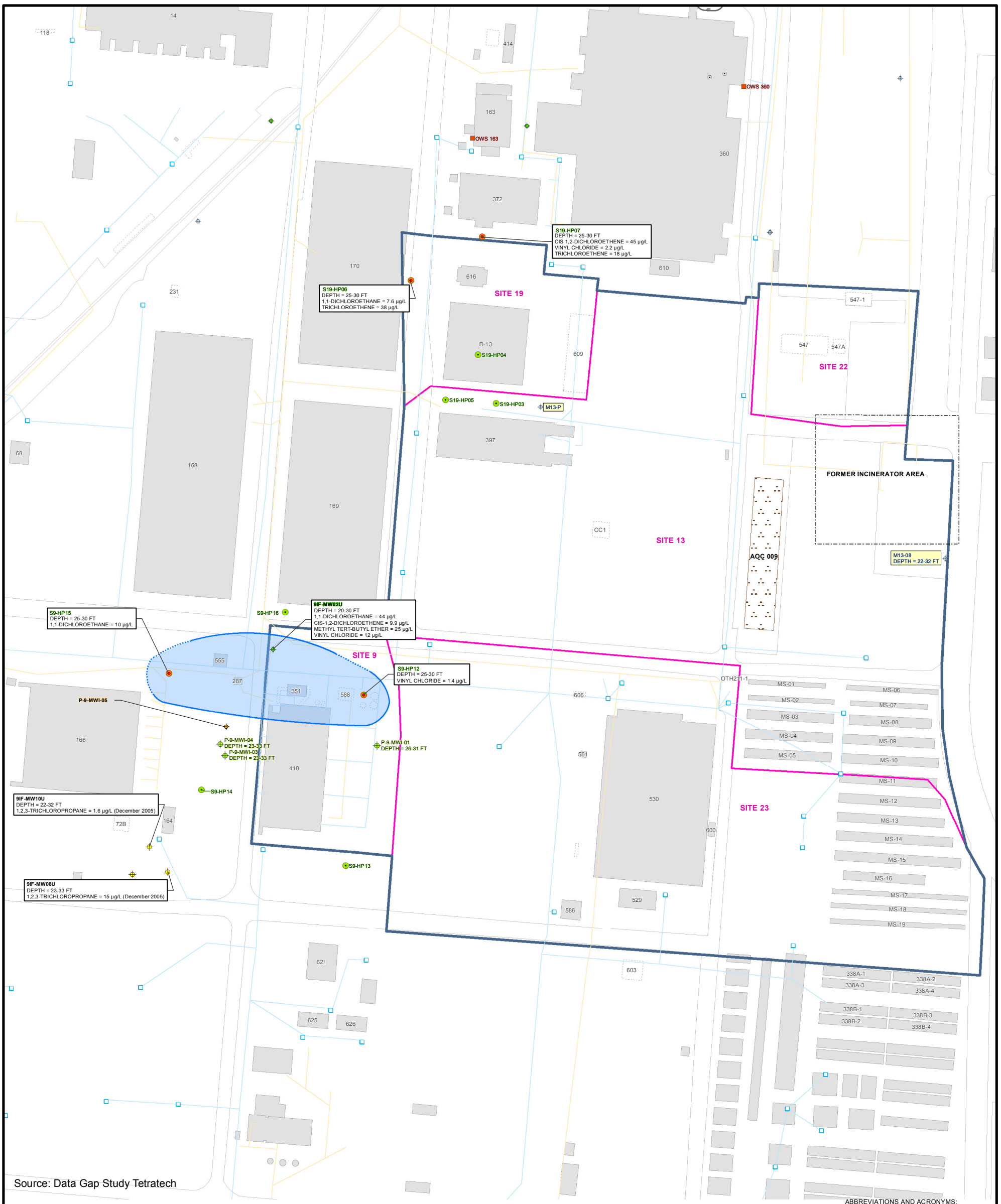

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-08 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS

Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (20 - 30 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-11

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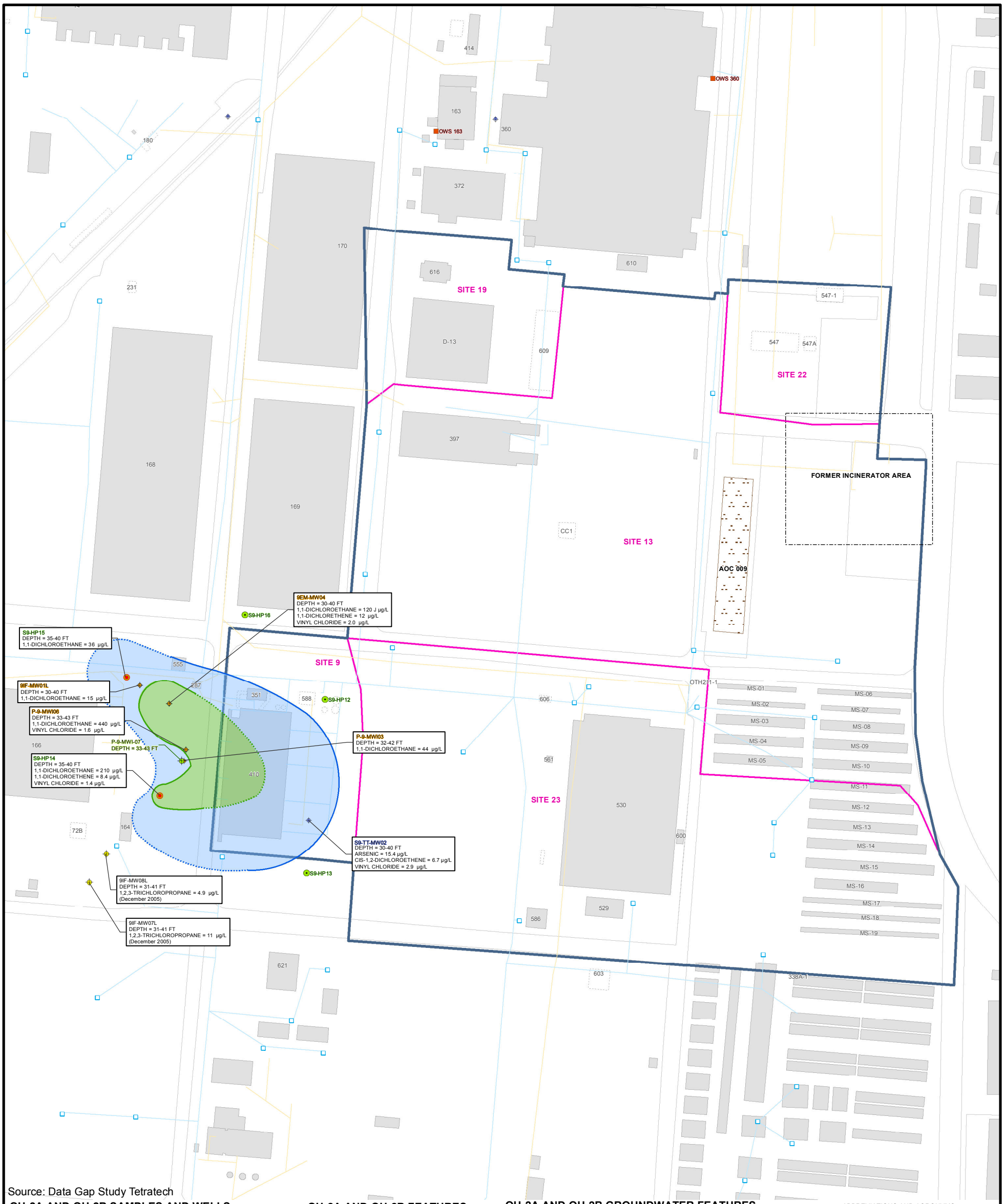

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
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- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
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- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
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N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (30 - 40 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-12

OTIE Oneida Total Integrated Enterprises

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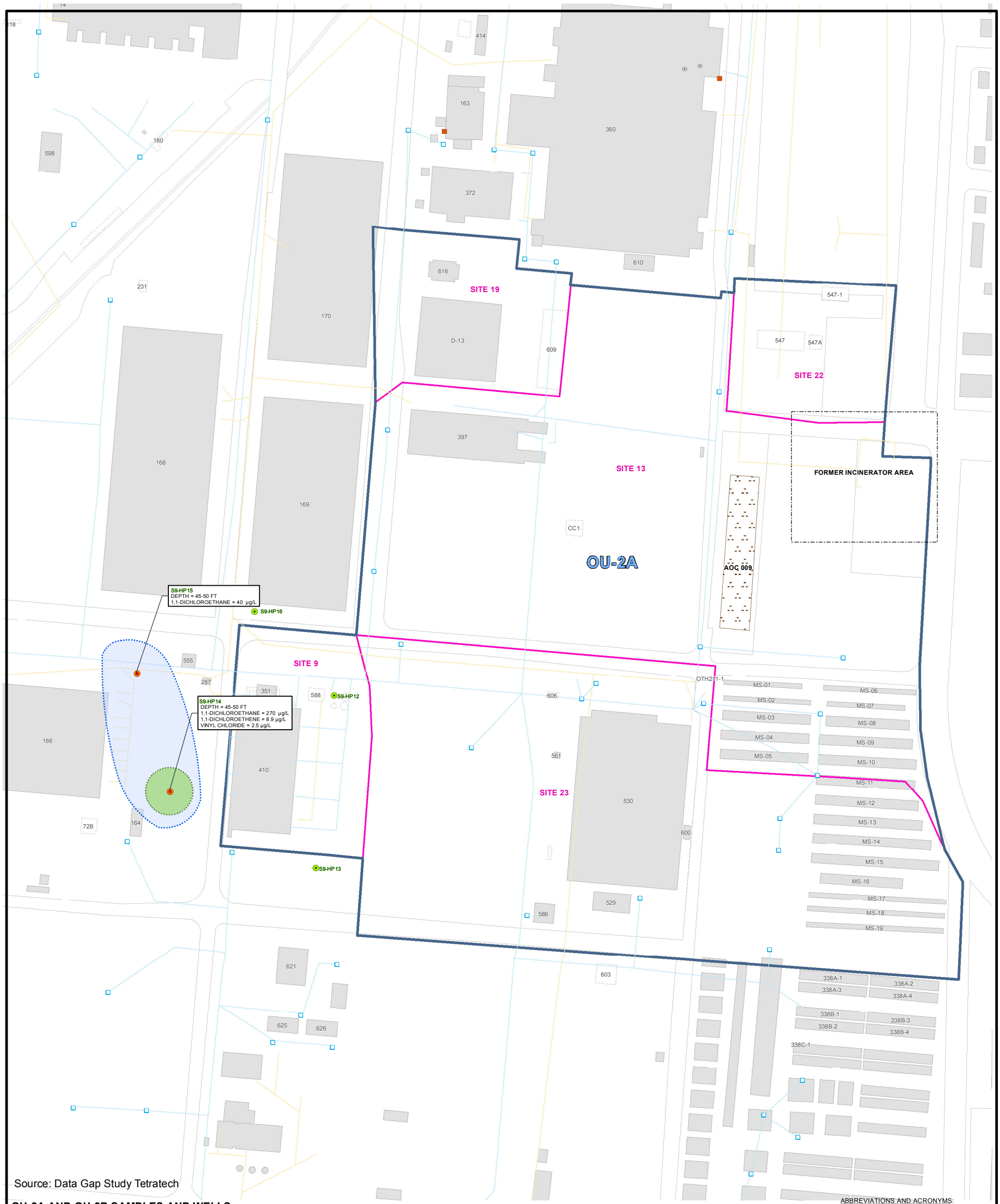

Source: Data Gap Study Tetratech

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- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION

OU-2A AND OU-2B FEATURES

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- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
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OU-2A AND OU-2B GROUNDWATER FEATURES

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ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (40 - 50 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-13

OTIE Oneida Total Integrated Enterprises

AECOM

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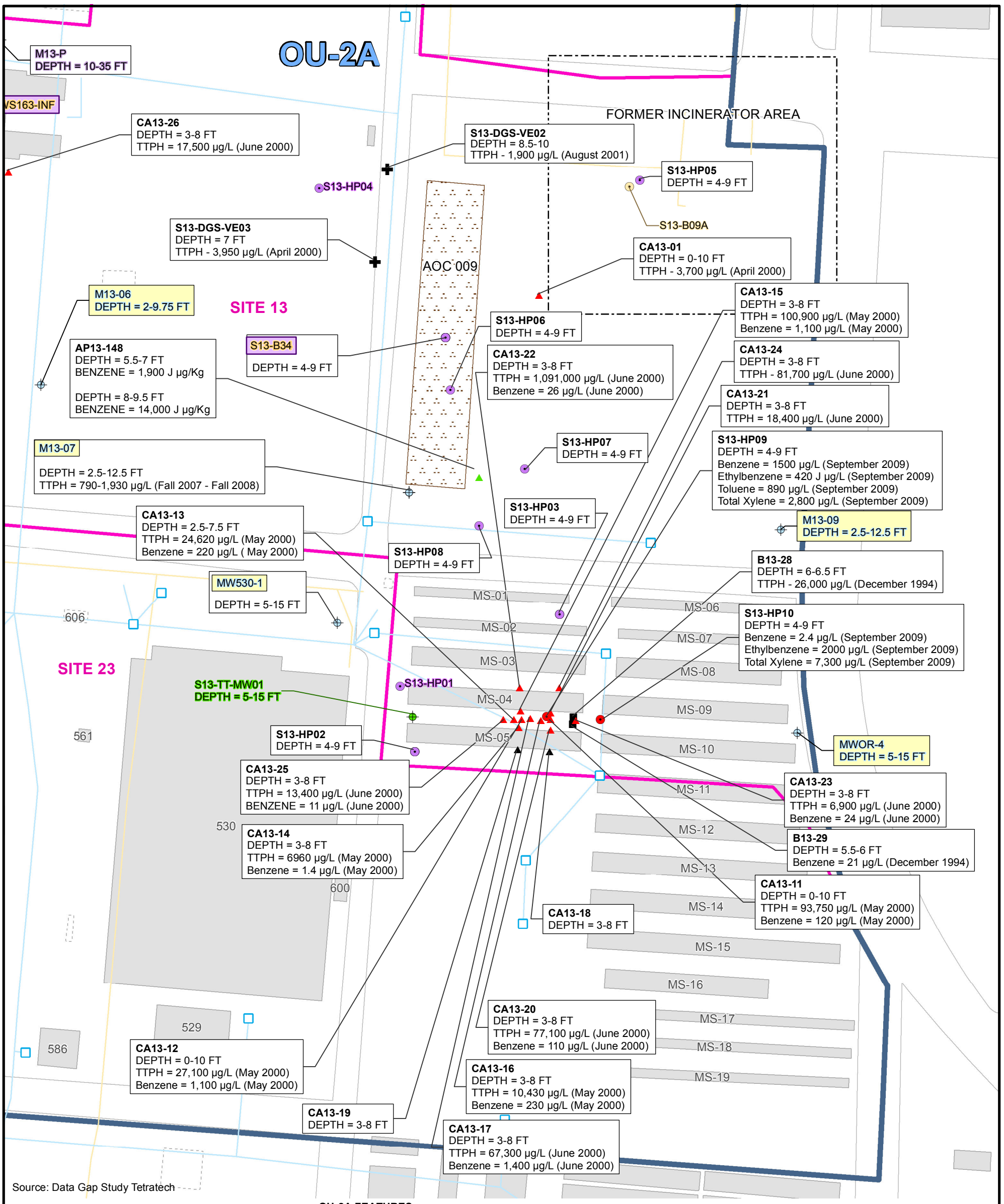


Source: Data Gap Study Tetratech

OU-2A SAMPLES AND WELLS

- S9-HP09 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2010)
- S3-HP04 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2010)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE LESS THAN MCL AND TTPH LESS THAN 1400 µG/L (SULTECH 2005B)
- VACCUM EXTRACTION - APRIL 2000 THROUGH AUGUST 2001
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE GREATER THAN MCL AND/OR TTPH GREATER THAN 1400 µG/L (SULTECH 2005B)
- BORINGS - DECEMBER 1994
- SOIL SAMPLE LOCATIONS - TRW INVESTIGATION (RBA 2008)

OU-2A FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF BENZENE ABOVE MCL (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF TTPH (SUM OF TPH-g, TPH-d, and TPH-mo) PLUME GREATER THAN 1,400 µg/L AS PRESENTED IN THE RI (DASHED WHERE INFERRED) (SULTECH 2005b)

N

0 100 200 Feet

1 inch = 100 feet

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
TPH-d - TPH AS DIESEL
TPH-g - TPH AS GASOLINE
TPH-mo - TPH AS MOTOR OIL
TRW - TARRY REFINERY WASTE
TTPH - Sum OF TPH-g, TPH-d, and TPH-mo
VOC - VOLATILE ORGANIC COMPOUND

OU-2A FS — Final

Benzene and TPH Results
IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-14

OTIE Oneida Total Integrated Enterprises — AECOM

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
53	feasibility study evaluation for soil at IR Site 13	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.

4. Feasibility Study Evaluation for Soil

The Draft Final FS presented the development and evaluation of remedial alternatives for PAHs-impacted soil at IR Sites 9 and lead-impacted soil at IR Site 22. Subsequent to the issuance of the Draft Final FS (OTIE 2010) and based on regulatory agency comments and discussions, additional soil sampling was conducted to characterize PAHs and PCBs at IR Site 9 and lead at IR Site 22. Based on the results of these additional soil sampling results, no further action or evaluation of response action alternatives is required for these two soil sites at OU-2A. The results of this additional sampling are documented in the Technical Memorandum (see Appendix G), which summarizes the rationale for selecting soil COCs for the OU2A FS based on the BCT discussions. As a result, all previous text relating to the evaluation of soil alternatives for OU2A has been removed from this Final FS.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
54	organic analytes identified as COCs at IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.1, Pages 5-2 through 5-3; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

5.1.2.1 ORGANIC ANALYTES

The groundwater analytical data from Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) was used for selection of COCs for groundwater since it provides the most current representation of the nature and extent of contamination.

The rationale for selection of organic analytes as COCs is presented in the following sections.

Selection of Organic COCs based on Potential ARARs

The aquifer underlying the groundwater in the southeastern region of Alameda Point beneath OU-2A was classified as a Class II aquifer pursuant to the USEPA draft groundwater policy for classification of groundwater systems (Tetra Tech 2000). In addition, in accordance with Basin Plan for the Santa Francisco Bay Region (RWQCB 2007), the existing beneficial use designation for aquifer underlying OU-2A include municipal and domestic water supply. Therefore, federal or more stringent state MCLs constitute potential chemical-specific ARARs for organic analytes (see Section 5.1.4 for details) and were used for selection of organic COCs.

Organic analytes reported at concentrations exceeding their respective federal or more stringent state MCLs (chemical specific ARARs [see Section 5.1.4]) in groundwater at IR Sites 9, 13 and 19 during groundwater monitoring conducted as part of Data Gap Study (Tetra Tech 2009), Supplemental DGI (Tetra Tech 2010) and basewide groundwater monitoring events from Summer 2007 through Fall 2008 (ITSI 2009a and ITSI 2009b) were selected as COCs (see Section 3.3).

IR Site 9:

VC

1,1-DCA

cis-1,2-DCE

Benzene

Methyl tert-butyl Ether

1,1-DCE

IR Site 13:

Benzene

Ethylbenzene

Toluene

Xylene

IR Site 19:

TCE

PCE

VC

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

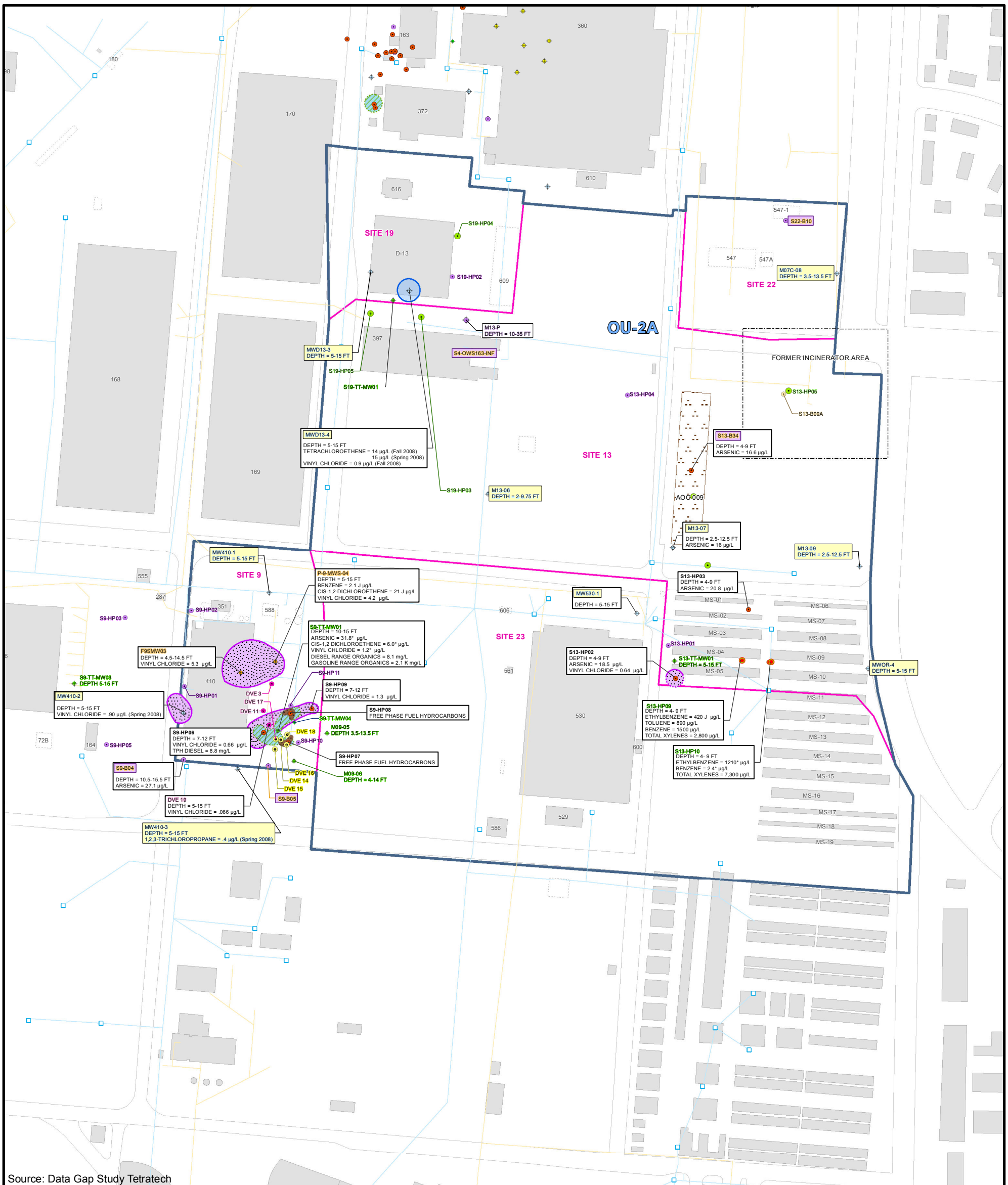
5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
55	inorganic analytes reviewed for IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.1.2.2, Pages 5-3 through 5-5; Figure 3-9. Oneida Total Integrated Enterprises LLC 2011.

Selection of Organic COCs based on Cancer/Non-cancer Risk Considerations

The second criteria used for selection of organic analytes as COCs included cancer risk and non-cancer HI. The organic analyte reported in groundwater at Site 9 and 19 was selected as COC if following conditions were satisfied (with few exceptions noted below):

1. Constituent was considered a risk driver (i.e. results in a cancer risk of greater than 10^{-6} or a non-cancer HI of greater than 1).

10. Constituent was reported at relatively high frequency and its distribution indicates a release

The following analytes were considered risk drivers (see Section 3.6):

IR Site 9:

1,2,3-Trichloropropane (1,2,3-TCP)

VC

IR Site 13:

Benzene

IR Site 19:

PCE

TCE

VC

For IR Site 9; 1,2,4 trimethylbenzene is considered a risk driver but was not selected as a COC. 1,2,4-trimethylbenzene occurs naturally in petroleum crude oil and is a gasoline additive. 1,2,4-trimethylbenzene was generally reported in the vicinity of dual vapor extraction (DVE) wells east of Building 410 (see Figure 3-9) and will be addressed as part of Petroleum Program.

5.1.2.2 INORGANIC ANALYTES

Inorganic analytes reported in groundwater at IR Sites 9, 13, and 19 include metals (see Section 3.3). Metals are naturally-occurring in groundwater; therefore, selection of metals as COCs required an evaluation if metal concentrations in groundwater at IR Sites 9, 13, and 19 are indicative of a release. This assessment included comparison of metal concentrations in groundwater at IR Sites 9, 13, and 19 (based on the data collected from 2002 to 2008) to their respective background values presented in Appendix A of the OU-2A RI (SulTech 2005) as follows:

Comparison of maximum reported concentration of a metal in groundwater at IR Sites 9 and 19 to the maximum reported value for that metal during the background study.

Comparison of exposure point concentration (EPC) (95 percent UCL of the mean) for a metal to the established background value (95th quantile) for that metal.

The results of above comparisons are presented in the subsections below.

IR SITES 9 AND 19

The metals for which the maximum reported concentration exceeded maximum reported value during the background study or EPC exceeded background value (95th quantile) included:

IR Site 9:

Arsenic

Chromium

Copper

Iron

Lead

Manganese

Selenium

Thallium

Vanadium

Zinc

IR Site 19:

Vanadium

Zinc

In addition to above metals, cobalt was reported at relatively high concentrations (up to 1,070 µg/L) in IR Site 9 groundwater. An analysis of distribution and magnitude of concentrations of these metals indicated that exceedances are not indicative of a release. For IR Sites 9 and 19, arsenic, chromium, selenium, thallium, vanadium, and zinc exceeded their respective maximum concentrations reported during the background study in less than 10 percent of the analyzed samples. The analysis of distribution of these exceedances indicates that they are isolated and sporadic, and are not indicative of a release. Therefore, arsenic, chromium, selenium, thallium, vanadium, and zinc were not considered COCs for IR Sites 9 and 19.

For IR Site 9, copper, iron, lead, and manganese exceeded their respective maximum concentrations reported during the background study in 8 to 20 percent of the samples. In addition, cobalt was reported at relatively high concentrations (up to 1,070 µg/L) in IR Site 9 groundwater. Most of the relatively high concentrations of these metals were reported in the wells (e.g. 9EMW01 through 9EMW04, 9IF-MW01L, 9IF-MW02U and 02L, 9IF-MW08U and 08L, and 9IF-MW10U and 10L) located in the areas where ISCO removal action was conducted in 2005-2006. The data analysis also indicates that in general for the same well, the concentrations of metals were higher in samples collected following injection of oxidant compared to the baseline sampling result. It is recommended that wells within the former ISCO removal action area be monitored in future to assess the anticipated decrease in metal concentrations as the redox conditions of the aquifer revert back to normal. Since copper, cobalt, iron, lead, and manganese concentrations are not indicative of a release, these metals were not considered COCs for IR Site 9.

The above analysis is for the metals data collected from 2002 to 2008. Figures 3-9 through 3-13 show distribution of metals exceeding MCLs based on the data collected from 2007 to 2010 as part of Data

Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL during these investigations is arsenic. An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that these exceedances are not indicative of a release (see Sections 3.3 for details). Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.

IR SITE 13

The metals for which the maximum reported concentrations exceeded maximum reported values during the background study or EPC exceeded background value (95th quantile) at IR Site 13 included:

Arsenic

Copper

Iron

Lead

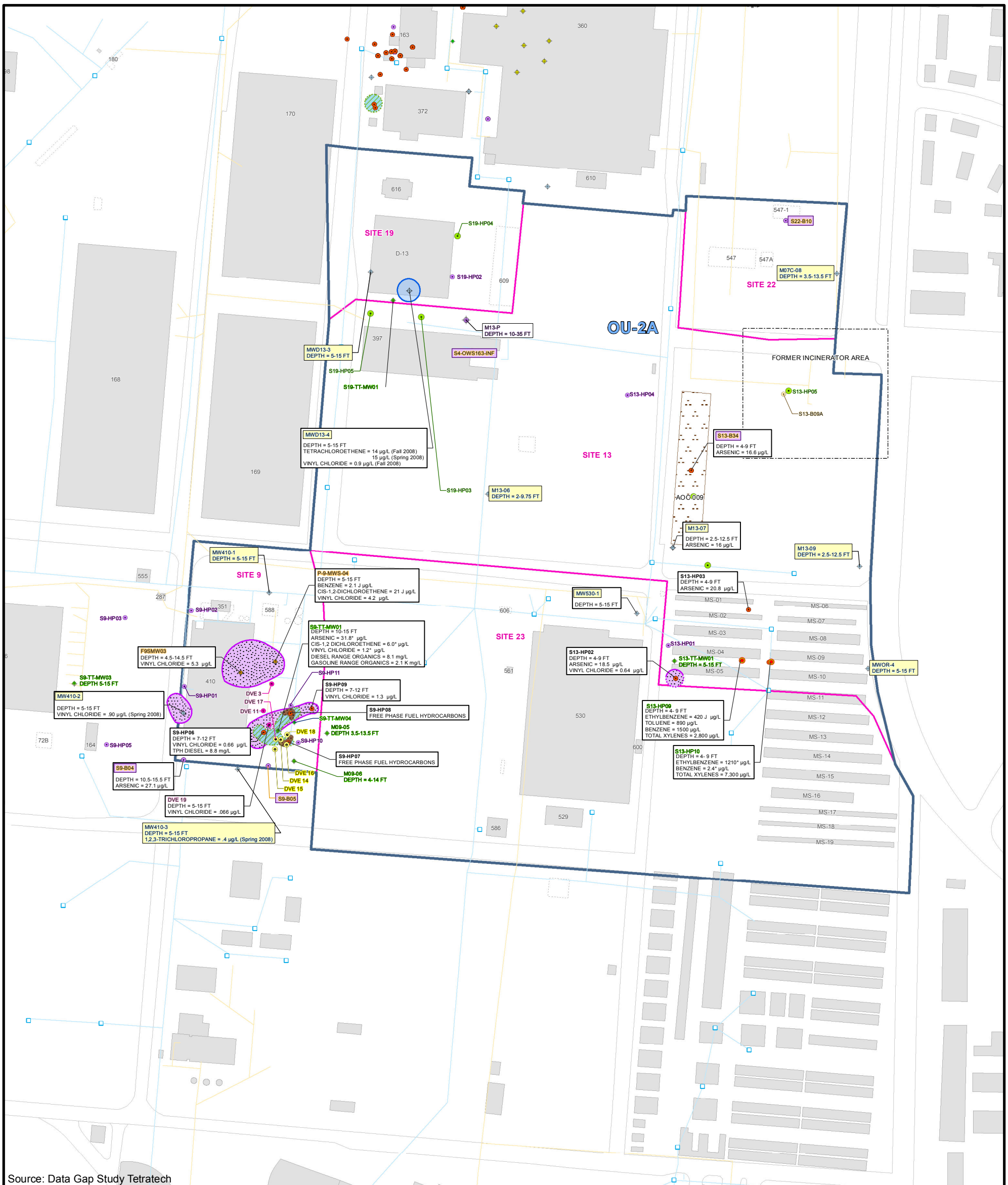
Manganese

Selenium

An analysis of distribution and magnitude of concentrations of these metals indicated that exceedances are not indicative of a release. Groundwater at most wells within OU-2A is indicative of reducing conditions (see Section 3.4). These reducing conditions are likely attributable to the presence of petroleum hydrocarbons and the associated biodegradation which lowers the DO. Arsenic, iron, and manganese exceeded their respective maximum concentrations reported during the background study in samples collected from one or more monitoring events for the following wells: M07C-06, M13-07, and MW-001. As explained in Section 3.4, these wells exhibit low DO and highly reducing conditions, which indicates that iron and manganese reduction likely accounts for relatively high concentrations of these metals. Arsenic mobilization may have also been caused due to reducing conditions. Therefore, locally high concentrations of arsenic, manganese and iron are likely attributable to reducing conditions in groundwater and are not indicative of a release.

Copper exceeded its maximum reported value during background study at one isolated location (D13-01) during sampling conducted in 2008. Lead exceeded its maximum reported value during background study at one isolated location (MW-001) during sampling conducted in 2002. However, sampling results for lead from the same well subsequent to 2002 show lead concentrations less than concentrations detected during the background study. Selenium exceeded its maximum reported value during background study at two isolated locations (M13-07 and M13-09) during 2003 or 2004 sampling events. However, sampling results for selenium from the same wells subsequent to 2004 show selenium concentrations less than concentrations detected during the background study.

The above analysis is for the metals data collected from 2002 to 2008. Figures 3-9 through 3-14 show distribution of metals exceeding MCLs based on the data collected from 2007 to 2010 as part of Data Gap investigation, Spring 2008 basewide monitoring, and Supplemental DGI. The only metal that exceeded its MCL at IR Site 13 during these investigations is arsenic (see Section 3.3.2 for details). An analysis of distribution and magnitude of concentrations of arsenic exceeding MCLs indicates that exceedances above MCL are not indicative of a release. Localized arsenic mobilization may have been caused due to reducing conditions in the subsurface due to petroleum hydrocarbon and chlorinated VOC constituents.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
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- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
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- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
56	feasibility study evaluation for soil at IR Site 19	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 4, Page 4-1. Oneida Total Integrated Enterprises LLC 2011.

4. Feasibility Study Evaluation for Soil

The Draft Final FS presented the development and evaluation of remedial alternatives for PAHs-impacted soil at IR Sites 9 and lead-impacted soil at IR Site 22. Subsequent to the issuance of the Draft Final FS (OTIE 2010) and based on regulatory agency comments and discussions, additional soil sampling was conducted to characterize PAHs and PCBs at IR Site 9 and lead at IR Site 22. Based on the results of these additional soil sampling results, no further action or evaluation of response action alternatives is required for these two soil sites at OU-2A. The results of this additional sampling are documented in the Technical Memorandum (see Appendix G), which summarizes the rationale for selecting soil COCs for the OU2A FS based on the BCT discussions. As a result, all previous text relating to the evaluation of soil alternatives for OU2A has been removed from this Final FS.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
57	soil and groundwater COCs at IR Site 22	Section 2.5.1.4	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Section 8.4.4, Page 30. Oneida Total Integrated Enterprises LLC 2011.

8.4.3 IR Site 22 Groundwater

The total USEPA and Cal-EPA carcinogenic risks from exposure to groundwater at IR Site 22 are 3×10^{-3} and 5×10^{-3}, respectively (Table 8-12). A majority of the USEPA risk contribution is from the ingestion of groundwater (78 percent) pathway. Petroleum hydrocarbons (benzene and ethylbenzene) contributed approximately 79 percent of the total risk and arsenic contributed 19 percent of the total risk. The HI from exposure to groundwater at IR Site 22 is 138 with a majority of the HI (87 percent) associated with ingestion of petroleum–related constituents (benzene, toluene, ethylbenzene and xylenes – 54 percent) and manganese (31 percent).

The total USEPA and Cal-EPA carcinogenic risks, excluding background contribution, from exposure to groundwater at IR Site 22 are 3×10^{-3} and 5×10^{-3}, respectively (Table 8-12). The HI, excluding background contribution, from exposure groundwater at IR Site 22 is 128.

The total USEPA and Cal-EPA carcinogenic risks at IR Site 22 *from exposure to groundwater via vapor intrusion only* is 2×10^{-4} and 6×10^{-4}, respectively (Table 8-12). Majority of the risk contribution is from benzene and ethylbenzene.

8.4.4 IR Site 22 Summary

The total cancer risk estimates for the Exposure Group 2 scenario (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is greater than the risk management range of 10^{-4} to 10^{-6} for carcinogens.

A majority of the USEPA risk contribution is from the soil ingestion pathway with arsenic contributing to a significant percent of the estimated risk. The EPC for arsenic is less than the background value for OU-2A; therefore, the risk due to arsenic is attributable to background risk.

As noted above, lead exceeded the threshold value of 207 mg/kg at Site 22 at a single location however, subsequent sampling adjacent to this location reported lead below its screening level of 207 mg/kg. Thus the single elevated concentration of lead in the surface sample does not indicate a widespread impact or unacceptable exposure. Petroleum hydrocarbon constituents in the subsurface soil contribute a significant portion of the elevated cancer risk and HI, and are being addressed under the Petroleum Program.

For groundwater, benzene (a petroleum hydrocarbon constituent) is a major cancer and non-cancer risk driver. Therefore, a majority of the risk is associated with petroleum hydrocarbon constituents which are being addressed under the Petroleum program.

No COCs requiring CERCLA response action were selected for further evaluation in the revised FS for soil or groundwater at IR Site 22.

8.5 IR Site 23 Risk Characterization

Noncancer hazards and cancer risks calculated for IR Site 23 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil and groundwater.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
58	soil and groundwater COCs at IR Site 23	Section 2.5.1.5	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Appendix B, Section 8.5.4, Page 32. Oneida Total Integrated Enterprises LLC 2011.

8.5.4 IR Site 23 Summary

The total cancer risk estimates by exposure group are presented in Table 8-16. The total cancer risk estimates for the Exposure Group 2 (i.e., reasonable current and future use exposure, which includes residential development with the current municipal water supply) is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 1 scenario (i.e., residential development and use of site groundwater for domestic use), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens. Under the Exposure Group 3 scenario (i.e., domestic use of groundwater only), the total USEPA risk is within the risk management range of 10^{-4} to 10^{-6} for carcinogens.

For soil, a majority of the risk contribution is associated with the ingestion of soil pathway with arsenic and PAHs expressed as B(a)P equivalents contributing a significant percent of the estimated risk. The EPC for arsenic in soil is less than the background value for OU-2A; therefore, the risk due to arsenic in soil is attributable to background risk. The EPCs for B(a)P equivalent concentrations were estimated to be 0.23 mg/kg (0 – 2 feet bgs) and 0.17 mg/kg (0 – 8 feet bgs), which are less than the Alameda Point screening level of 0.62 mg/kg.

For groundwater, the majority of the cancer risk is attributable to arsenic and 1,2-dibromo-3-chloropropane. The majority of the HI is attributable to arsenic, manganese, and 1,2-dibromo-3-chloropropane. The frequency of detection of 1,2-dibromo-3-chloropropane in the groundwater risk dataset is less than 1 percent with a maximum reported concentration of 2 µg/L. 1,2-dibromo-3-chloropropane was reported in only one groundwater sample collected at well MW530-2 in 2006.

Similar to other sites, metals, in particular, arsenic is a significant contributor to the carcinogenic risk. This risk is based on the ingestion of groundwater is assumed to be extracted from groundwater beneath the site. The reported concentrations of arsenic at IR Site 23 are within the range observed in the background dataset. In addition, other metals such as manganese, and thallium that contribute to the elevated hazard index were also within ambient ranges found at Alameda Point.

No COCs requiring CERCLA response action were selected for further evaluation in the revised FS for soil or groundwater at IR Site 23.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
59	the nine NCP evaluation criteria	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.6.1, Pages 5-19 through 5-22. Oneida Total Integrated Enterprises LLC 2011.

Similar to Alternatives G13-2 and G13-3, Alternative G13-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of in-situ bioremediation and MNA. The ICs and access restrictions implemented for Alternative G13-4 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

5.6 Detailed Analysis of Alternatives

The NCP (40 C.F.R. § 300.430 [e][9][i] and [ii]) requires that a detailed analysis of remedial alternatives be conducted during the FS based on the nine evaluation criteria identified in 40 C.F.R. § 300.430 (e)(9)(iii). The results of the detailed analysis provide the basis for identifying a preferred alternative and preparing the proposed plan.

Because of the difference in the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) compared to IR Site 13 (petroleum hydrocarbon VOCs), the detailed analysis of remedial alternatives was carried out separately for IR Sites 9 and 19, and for IR Site 13 Section 5.6.1 provides a brief description of each of the nine evaluation criteria. Sections 5.6.2 and 5.6.3 provide an assessment and a summary profile of each alternative against the evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively. Sections 5.6.3 and 5.6.4 present comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively.

5.6.1 Evaluation Criteria

The nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied by each alternative and relate directly to statutory findings that must ultimately be made in the ROD. The two threshold criteria include:

- Overall protection of human-health and the environment, and
- Compliance with ARARs

The primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

The modifying criteria are taken into account following comment on the FS Report and proposed plan, and are addressed once a final decision is being made and the ROD is being prepared. The modifying criteria include:

- State acceptance, and
- Community acceptance

Each of the nine evaluation criteria is summarized in the following sections.

5.6.1.1 Overall Protection of Human-Health and the Environment

Under this criterion, the alternatives are assessed to determine whether they can adequately protect human-health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of remediation goals. Overall protection of human-health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.6.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Under this criterion, the alternatives are assessed to determine whether they attain ARARs under Federal environmental laws and State environmental or facility siting laws or provide grounds for invoking a waiver.

5.6.1.3 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. Factors that are considered, as appropriate, include the following:

- Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities.
- Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste.

5.6.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion evaluates alternatives based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. This includes how treatment is used to address the principal threats posed by the site. Factors that are considered include the following:

- The treatment or recycling processes the alternatives employ and materials they will treat
- The amount of constituents that will be destroyed, treated, or recycled
- The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reductions are occurring
- The degree to which the treatment is irreversible
- The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their constituents
- The degree to which treatment reduces the inherent hazards posed by principal threats at the site

5.6.1.5 Short-Term Effectiveness

Under this criterion, alternatives are evaluated with respect to their effects on human-health and the environment during implementation of the remedial action. The short-term impacts of alternatives are assessed considering the following:

- Short-term risks that might be posed to the community during implementation of an alternative
- Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures
- Potential environmental impacts with respect to sustainability metrics (i.e., emission of pollutants and greenhouse gases) of the remedial action and the effectiveness and reliability of mitigative measures during implementation
- Time until protection is achieved

5.6.1.6 IMPLEMENTABILITY

The assessment for implementability of the alternatives is based on the following factors:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.
- Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).
- Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

5.6.1.7 COST

The types of costs that are assessed include the following:

- Capital costs, including both direct and indirect costs
- Annual O&M costs
- Net present value of capital and O&M costs

Cost estimates for remedial alternatives for impacted groundwater at IR Sites 9, 13 and 19 were generated using RACER™ 2010 (version 10.3.0). The cost backup including underlying assumptions and quantities for cost estimates, and an individual cost summary for each remedial action alternative considered for detailed analysis in this FS are presented in Appendix D. The cost estimates were generated for remedial action alternatives based on the conceptual design conducted using the available site characterization, pilot studies, and removal action data, as appropriate. The cost estimates generated in this FS are for comparison purposes only and are of sufficient level of accuracy to conduct comparative analysis of remedial alternatives based on costs.

5.6.1.8 STATE ACCEPTANCE

This criterion assesses the State acceptance by considering the following:

- The State's position and key concerns related to the preferred alternative and other alternatives
- State comments on ARARs or the proposed use of waivers

5.6.1.9 COMMUNITY ACCEPTANCE

This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

5.6.2 Individual Analysis of Alternatives – IR Sites 9 and 19

5.6.2.1 ALTERNATIVE G-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IR Sites 9 and 19. Natural attenuation processes such as dilution, dispersion, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater In addition, under the No Action Alternative there would be no way to assess the fate of COCs in groundwater. Alternative G-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G-1 would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-1 would have no short-term impact on risks at IR Sites 9 and 19. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G-1 includes no remedial action, sustainable environmental remediation (SER) analysis was not conducted for this alternative.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
60	IR Sites 9 and 19	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.5.1, pages 5-10 through 5-13. Oneida Total Integrated Enterprises LLC 2011.

In the third step, the technically implementable process options were evaluated based on effectiveness, implementability, and cost, to select representative process options for alternative development.

The effectiveness evaluation focused on ability of the process option to handle estimated areas and volumes of groundwater (i.e., to reduce volume, toxicity, and mobility of COCs in groundwater), potential impacts to human-health and the environmental during implementation of the process option, and whether the process is reliable and proven for remediation of COCs.

The implementability evaluation focused on technical as well as institutional aspects of implementability, such as the ability to obtain necessary regulatory approvals, availability of equipment and skilled workers, extensiveness of knowledge required to implement the process option, and the need for treatment or disposal of process waste.

The cost evaluation included semi-quantitative analysis based on engineering judgment. Relative capital and operation and maintenance (O&M) costs were used rather than detailed estimates.

Due to the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) as compared to IR Site 13 (petroleum hydrocarbon VOCs), identification and screening of technology types and process options was carried out separately for IR Sites 9 and 19, and IR Site 13. Tables 5-3 and 5-4 present identification and screening of technology types and process options for the impacted groundwater at IR Sites 9 and 19, and IR Site 13, respectively. Process options selected during the screening process were carried forward in the FS in the development and evaluation of remedial alternatives in later sections; those process options that are screened out were not carried forward.

5.5 Development of Remedial Alternatives

5.5.1 IR Sites 9 and 19

The remedial action alternatives for impacted groundwater at IR Sites 9 and 19 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process ensured the development of a range of alternatives from those involving active restoration of the plumes to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

Alternative G-1: No Action

Alternative G-2: Monitored Natural Attenuation (MNA) and ICs

Alternative G-3: ISCO, MNA, and ICs

Alternative G-4: In-Situ Bioremediation, MNA, and ICs

5.5.1.1 Alternative G-1: No Action

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Sites 9 and 19. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.1.2 ALTERNATIVE G-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G-2 would rely on natural attenuation processes and monitoring for remediation of COC-impacted groundwater at IR Sites 9 and 19. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

Based on the analysis of concentration trends of VOCs from Summer 2002 to Spring 2008, the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) concluded that chlorinated hydrocarbons (COCs) have been reported consistently in groundwater at OU-2A since monitoring was initiated in Summer 2002. The report further concludes that general overall trends of the time-series plots indicate a general decrease in concentrations over time for the analytes and plume boundaries appear to be generally stable. The time-series plots presented in the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) show a general decrease in VC concentrations in monitoring well, MW410-2 at Site 9 (see Appendix F). At Site 19, the concentrations of PCE appear to show a stable to decreasing trend based on the time-series plots for monitoring well, MWD13-4. These observations are based primarily on monitoring results for shallow/FWBZ wells near the leading edges of groundwater plumes. However, it should be noted that the decreases in VOC concentrations at IR Site 9 may also be due to pilot studies and removal actions conducted using ISCO in 2006 that led to decreases in concentrations of VC.

The concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. In addition, groundwater geochemistry parameters indicate reducing conditions in most wells that are likely to favor anaerobic biodegradation of chlorinated COCs such as PCE, TCE, cis-1,2-DCE, and VC (see Section 3.4 for details). Therefore, natural attenuation appears to be occurring in groundwater at IR Sites 9 and 19.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Sites 9 and 19. This estimate was based on groundwater flow and transport modeling for representative COCs (VC; 1,1-DCA; and 1,2,3-TCP). The groundwater flow (MODFLOW 2000) and transport models (MT3D Version 4b) developed as part of OU-2B FS were used for performing simulations. The model hydraulic parameters were left unchanged. The dispersivity values were adjusted based on the plume lengths of COCs modeled. The initial concentrations of COCs were based on the plume maps presented in Figures 3-9 through 3-13, and no biodegradation was assumed.

The predicted remediation time frames for VC, 1,1-DCA, and 1,2,3-TCP were estimated to be 21 years, 22.5 years, and 22 years, respectively.

With the exception of VC, the EPC (95 percent upper confidence limit [UCL] of the reported concentrations based on the data from 2002 to 2008) of all the COCs are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs

Protect site security features such as fences, and signs

Preserve access to the areas requiring institutional controls (ARICs) for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plumes at IR Sites 9 and 19:

The prohibition on domestic use of groundwater.

The prohibition on drilling wells of any kind.

The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.3 Alternative G-3: In-Situ Chemical Oxidation, MNA, and ICs

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Sites 9 and 19. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of plumes shown on Figures 3-9 through 3-13. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 50 feet bgs. An alternative strategy for emplacement of oxidant is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO such as Fenton's reagent, activated persulfate or ozone. The removal actions conducted at IR Site 9 in 2006 used modified Fenton's

reagent-based oxidation chemistry. The removal action results indicate that several oxidant injection events may be required to treat the COCs in FWBZ and SWBZ. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

To ensure protection of human-health and attainment of RAOs, Alternative G-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-3 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.4 Alternative G-4: In-Situ Bioremediation, MNA, and ICs

Alternative G-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Sites 9 and 19. The details of the implementation of in-situ bioremediation at IR Sites 9 and 19 are presented in the following sections. Bioremediation would be implemented to treat COCs present in groundwater at IR Sites 9 and 19 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

Similar to Alternatives G-2 and G-3, Alternative G-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-4 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-4 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
61	IR Site 13	Section 2.8	Final Feasibility Study Report, Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Section 5.5.2, Pages 5-14 through 5-19. Oneida Total Integrated Enterprises LLC 2011.

BIOREMEDIATION AT IR SITE 9

The COCs at IR Site 9 include VC, 1,1-DCA, cis-1,2-DCE, benzene, methyl tert-butyl ether, 1,1-DCE, and 1,2,3-TCP. Based on this, aerobic bioremediation may be implemented for the FWBZ and SWBZ at IR Site 9 because of the following reasons:

- The major COCs at IR Site 9 include VC and 1,1-DCA, which are amenable to aerobic biodegradation (USEPA 2000).
- Cis-1,2-DCE has been shown to biodegrade under aerobic conditions in the presence of VC.
- Benzene and methyl tert-butyl ether are amenable to aerobic biodegradation.
- Although 1,1-DCE is more amenable to degradation under anaerobic conditions, it was reported at only one isolated location at a low concentration (12 µg/L) during the Data Gap Study (Tetra Tech EC 2009).

Aerobic bioremediation would include emplacement of the source of molecular oxygen into the subsurface. Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figures 3-9 through 3-12). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 40 feet bgs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

The bioremediation design including bioremediation strategy, anaerobic versus aerobic, and injection strategy, direct injection versus groundwater recirculation loop would be finalized during the remediation design stage.

BIOREMEDIATION AT IR SITE 19

The primary COCs at IR Site 19 include PCE and TCE. These COCs are readily amenable to anaerobic reductive dechlorination. VC is also amenable to anaerobic bioremediation. Therefore, bioremediation at IR Site 19 would include emplacement of an electron donor into the subsurface to promote more strongly reducing conditions in the aquifer and to serve as a source of electron donor for the microorganisms that degrade PCE and TCE. Some common electron donors include molasses, vegetable oil, methanol, and lactate. These electron donors can also serve as a source of carbon for the microorganisms.

The emplacement strategies for an electron donor are the same as those for an oxygen release compound and are discussed in Section 5.5.4.1.

5.5.2 IR Site 13

The remedial action alternatives for impacted groundwater at IR Site 13 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process

ensured the development of a range of alternatives from those involving active restoration of the plume to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

- Alternative G13-1: No Action
- Alternative G13-2: MNA and ICs
- Alternative G13-3: ISCO, MNA, and ICs
- Alternative G13-4: In-Situ Bioremediation, MNA, and ICs

5.5.2.1 ALTERNATIVE G13-1: NO ACTION

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Site 13. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.2.2 ALTERNATIVE G13-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G13-2 would rely on natural attenuation processes and monitoring for remediation of COCs (i.e. benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G13-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

The results of groundwater sampling conducted from May 2000 through September 2009, indicate that COCs in IR Site 13 groundwater (benzene, ethylbenzene, toluene, and xylene) are localized in extent and plume boundaries are relatively stable. The comparison of May/June 2000 benzene concentrations with concentrations observed during September 2009 does not indicate significant reduction in concentrations or migration. Benzene, ethylbenzene, toluene, and xylene are readily biodegraded under aerobic conditions, however as summarized in Section 3.4, groundwater at most locations within OU-2A is indicative of reducing conditions. The reducing conditions in groundwater may be responsible for relatively slow biodegradation of COCs in IR Site 13 groundwater. Therefore, although MNA may be effective in reducing potential migration of COCs in IR Site 13 groundwater, natural attenuation processes may take relatively long time to reduce COC concentrations below their respective TCGs.

As part of implementation of MNA, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs including benzene, ethylbenzene, and toluene in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analysis.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Site 13. This estimate was based on assuming the first-order decay and using the following equation:

$$\log C - \log C_o = - kt$$

where:

C = Final COC concentration at time t

C_o = Initial COC concentration at time zero

k = First-order decay rate constant for the COC

T = Time for COC concentration to decrease from C_o to C.

To ensure development of a representative estimate for natural attenuation time-frames, the following methodology was used:

- Benzene was used as a representative COC.
- The minimum value of anaerobic biodegradation rate constant (0.0015 per day) for benzene presented in the USEPA document "Anaerobic Biodegradation Rates of Organic Chemicals in Groundwater: A Summary of Field and Laboratory Studies" (U.S. EPA 1999b) was used.
- The maximum concentration of benzene of 1,500 µg/L reported the Supplemental DGI was used as the initial concentration value.

Based on the above methodology, the total time required for COCs in groundwater at IR Site 13 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 14 years.

With the exception of benzene, the EPC (95 percent UCL of the reported concentrations based on the data from 2002 to 2008) of all the COCs at IR Site 13 are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

- Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs
- Protect site security features such as fences, and signs
- Preserve access to the ARICs for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plume at IR Site 13:

- The prohibition on domestic use of groundwater.
- The prohibition on drilling wells of any kind.
- The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

- The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G13-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.3 Alternative G13-3: In-Situ Chemical Oxidation, MNA and ICs

Alternative G13-3 would include implementation of ISCO to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extent of plume shown on Figure 3-14. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. The lateral and vertical extents of COCs in IR Site 13 groundwater would be refined as part of pre-design investigations. These investigations would include installation of monitoring wells and groundwater sampling and analyses for the COCs.

An alternative strategy for emplacement of oxidant in the subsurface that uses groundwater recirculation could also be used at IR Site 13 for the implementation of ISCO. This strategy uses groundwater extraction and injection wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO of COCs at IR Site 13 such as Fenton's reagent, activated persulfate or ozone. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

To ensure protection of human-health and attainment of RAOs, Alternative G13-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA.

The ICs and access restrictions implemented for Alternative G13-3 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

If Alternative G13-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.4 ALTERNATIVE G13-4: IN-SITU BIOREMEDIATION, MNA, AND ICS

Alternative G13-4 would include implementation of in-situ bioremediation to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The COCs at IR Site 13 are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. The 1998 Intrinsic Bioremediation Treatability Study indicates that oxygen is a limiting factor in biodegradation of COCs at IR Site 13. Therefore, implementation of bioremediation at IR Site 13 would include delivery of the source of molecular oxygen into the subsurface.

As part of implementation of Alternative G13-4, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analyses for COCs.

Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plume with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figure 3-13). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

Oxygen may also be delivered into the subsurface at IR Site 13 using biosparging. Biosparging would include injection of air or oxygen into the subsurface using wells. The pilot studies and petroleum corrective action conducted west of Building 530 would provide useful data to design biosparging at IR Site 13. Although, the VOC mass removal due to biosparging was not established during the pilot studies and petroleum corrective action, an effective radius of influence of 20 feet was recommended based on these studies.

Bioremediation would be implemented to treat COCs present in groundwater at IR Site 13 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

Similar to Alternatives G13-2 and G13-3, Alternative G13-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of in-situ bioremediation and MNA. The ICs and access restrictions implemented for Alternative G13-4 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

5.6 Detailed Analysis of Alternatives

The NCP (40 C.F.R. § 300.430 [e][9][i] and [ii]) requires that a detailed analysis of remedial alternatives be conducted during the FS based on the nine evaluation criteria identified in 40 C.F.R. § 300.430 (e)(9)(iii). The results of the detailed analysis provide the basis for identifying a preferred alternative and preparing the proposed plan.

Because of the difference in the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) compared to IR Site 13 (petroleum hydrocarbon VOCs), the detailed analysis of remedial alternatives was carried out separately for IR Sites 9 and 19, and for IR Site 13 Section 5.6.1 provides a brief description of each of the nine evaluation criteria. Sections 5.6.2 and 5.6.3 provide an assessment and a summary profile of each alternative against the evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively. Sections 5.6.3 and 5.6.4 present comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively.

5.6.1 Evaluation Criteria

The nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied by each alternative and relate directly to statutory findings that must ultimately be made in the ROD. The two threshold criteria include:

- Overall protection of human-health and the environment, and
- Compliance with ARARs

The primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

The modifying criteria are taken into account following comment on the FS Report and proposed plan, and are addressed once a final decision is being made and the ROD is being prepared. The modifying criteria include:

- State acceptance, and
- Community acceptance

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
62	Feasibility Study Report	Section 2.8.2	Final Feasibility Study Report Operable Unit 2A, Sites 9, 13, 19, 22 and 23. Sections 5.5 and 5.6, Pages 5-10 through 5-39. Oneida Total Integrated Enterprises LLC 2011.

In the third step, the technically implementable process options were evaluated based on effectiveness, implementability, and cost, to select representative process options for alternative development.

The effectiveness evaluation focused on ability of the process option to handle estimated areas and volumes of groundwater (i.e., to reduce volume, toxicity, and mobility of COCs in groundwater), potential impacts to human-health and the environmental during implementation of the process option, and whether the process is reliable and proven for remediation of COCs.

The implementability evaluation focused on technical as well as institutional aspects of implementability, such as the ability to obtain necessary regulatory approvals, availability of equipment and skilled workers, extensiveness of knowledge required to implement the process option, and the need for treatment or disposal of process waste.

The cost evaluation included semi-quantitative analysis based on engineering judgment. Relative capital and operation and maintenance (O&M) costs were used rather than detailed estimates.

Due to the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) as compared to IR Site 13 (petroleum hydrocarbon VOCs), identification and screening of technology types and process options was carried out separately for IR Sites 9 and 19, and IR Site 13. Tables 5-3 and 5-4 present identification and screening of technology types and process options for the impacted groundwater at IR Sites 9 and 19, and IR Site 13, respectively. Process options selected during the screening process were carried forward in the FS in the development and evaluation of remedial alternatives in later sections; those process options that are screened out were not carried forward.

5.5 Development of Remedial Alternatives

5.5.1 IR Sites 9 and 19

The remedial action alternatives for impacted groundwater at IR Sites 9 and 19 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process ensured the development of a range of alternatives from those involving active restoration of the plumes to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

Alternative G-1: No Action

Alternative G-2: Monitored Natural Attenuation (MNA) and ICs

Alternative G-3: ISCO, MNA, and ICs

Alternative G-4: In-Situ Bioremediation, MNA, and ICs

5.5.1.1 Alternative G-1: No Action

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Sites 9 and 19. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.1.2 ALTERNATIVE G-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G-2 would rely on natural attenuation processes and monitoring for remediation of COC-impacted groundwater at IR Sites 9 and 19. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

Based on the analysis of concentration trends of VOCs from Summer 2002 to Spring 2008, the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) concluded that chlorinated hydrocarbons (COCs) have been reported consistently in groundwater at OU-2A since monitoring was initiated in Summer 2002. The report further concludes that general overall trends of the time-series plots indicate a general decrease in concentrations over time for the analytes and plume boundaries appear to be generally stable. The time-series plots presented in the 2008 Basewide Annual Groundwater Monitoring Report (ITSI 2009a) show a general decrease in VC concentrations in monitoring well, MW410-2 at Site 9 (see Appendix F). At Site 19, the concentrations of PCE appear to show a stable to decreasing trend based on the time-series plots for monitoring well, MWD13-4. These observations are based primarily on monitoring results for shallow/FWBZ wells near the leading edges of groundwater plumes. However, it should be noted that the decreases in VOC concentrations at IR Site 9 may also be due to pilot studies and removal actions conducted using ISCO in 2006 that led to decreases in concentrations of VC.

The concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. In addition, groundwater geochemistry parameters indicate reducing conditions in most wells that are likely to favor anaerobic biodegradation of chlorinated COCs such as PCE, TCE, cis-1,2-DCE, and VC (see Section 3.4 for details). Therefore, natural attenuation appears to be occurring in groundwater at IR Sites 9 and 19.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Sites 9 and 19. This estimate was based on groundwater flow and transport modeling for representative COCs (VC; 1,1-DCA; and 1,2,3-TCP). The groundwater flow (MODFLOW 2000) and transport models (MT3D Version 4b) developed as part of OU-2B FS were used for performing simulations. The model hydraulic parameters were left unchanged. The dispersivity values were adjusted based on the plume lengths of COCs modeled. The initial concentrations of COCs were based on the plume maps presented in Figures 3-9 through 3-13, and no biodegradation was assumed.

The predicted remediation time frames for VC, 1,1-DCA, and 1,2,3-TCP were estimated to be 21 years, 22.5 years, and 22 years, respectively.

With the exception of VC, the EPC (95 percent upper confidence limit [UCL] of the reported concentrations based on the data from 2002 to 2008) of all the COCs are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs

Protect site security features such as fences, and signs

Preserve access to the areas requiring institutional controls (ARICs) for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plumes at IR Sites 9 and 19:

The prohibition on domestic use of groundwater.

The prohibition on drilling wells of any kind.

The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.3 Alternative G-3: In-Situ Chemical Oxidation, MNA, and ICs

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Sites 9 and 19. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of plumes shown on Figures 3-9 through 3-13. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 50 feet bgs. An alternative strategy for emplacement of oxidant is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO such as Fenton's reagent, activated persulfate or ozone. The removal actions conducted at IR Site 9 in 2006 used modified Fenton's

reagent-based oxidation chemistry. The removal action results indicate that several oxidant injection events may be required to treat the COCs in FWBZ and SWBZ. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

To ensure protection of human-health and attainment of RAOs, Alternative G-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-3 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.1.4 Alternative G-4: In-Situ Bioremediation, MNA, and ICs

Alternative G-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Sites 9 and 19. The details of the implementation of in-situ bioremediation at IR Sites 9 and 19 are presented in the following sections. Bioremediation would be implemented to treat COCs present in groundwater at IR Sites 9 and 19 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of this data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs (including 1,2,3-TCP) to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations. MNA would also be used to reduce localized concentrations of 1,2,3-TCP exceeding its TCG in the vicinity of Building 166.

Similar to Alternatives G-2 and G-3, Alternative G-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA. The ICs and access restrictions implemented for Alternative G-4 would be similar to Alternative G-2 and are discussed in Section 5.5.2.

If Alternative G-4 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

BIOREMEDIATION AT IR SITE 9

The COCs at IR Site 9 include VC, 1,1-DCA, cis-1,2-DCE, benzene, methyl tert-butyl ether, 1,1-DCE, and 1,2,3-TCP. Based on this, aerobic bioremediation may be implemented for the FWBZ and SWBZ at IR Site 9 because of the following reasons:

The major COCs at IR Site 9 include VC and 1,1-DCA, which are amenable to aerobic biodegradation (USEPA 2000).

Cis-1,2-DCE has been shown to biodegrade under aerobic conditions in the presence of VC.

Benzene and methyl tert-butyl ether are amenable to aerobic biodegradation.

Although 1,1-DCE is more amenable to degradation under anaerobic conditions, it was reported at only one isolated location at a low concentration (12 µg/L) during the Data Gap Study (Tetra Tech EC 2009).

Aerobic bioremediation would include emplacement of the source of molecular oxygen into the subsurface. Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figures 3-9 through 3-12). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. This may require injection across multiple depth intervals to ensure relatively uniform delivery of oxidant across the estimated vertical extent of the plumes at IR Site 9 where COCs extend to at least 40 feet bgs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

The bioremediation design including bioremediation strategy, anaerobic versus aerobic, and injection strategy, direct injection versus groundwater recirculation loop would be finalized during the remediation design stage.

BIOREMEDIATION AT IR SITE 19

The primary COCs at IR Site 19 include PCE and TCE. These COCs are readily amenable to anaerobic reductive dechlorination. VC is also amenable to anaerobic bioremediation. Therefore, bioremediation at IR Site 19 would include emplacement of an electron donor into the subsurface to promote more strongly reducing conditions in the aquifer and to serve as a source of electron donor for the microorganisms that degrade PCE and TCE. Some common electron donors include molasses, vegetable oil, methanol, and lactate. These electron donors can also serve as a source of carbon for the microorganisms.

The emplacement strategies for an electron donor are the same as those for an oxygen release compound and are discussed in Section 5.5.4.1.

5.5.2 IR Site 13

The remedial action alternatives for impacted groundwater at IR Site 13 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 5.2. The target remediation areas were also considered while developing the alternatives. This process

ensured the development of a range of alternatives from those involving active restoration of the plume to those involving limited action but providing protection of human-health by minimizing the potential for unacceptable exposure. The following remedial alternatives were developed for the impacted groundwater:

Alternative G13-1: No Action

Alternative G13-2: MNA and ICs

Alternative G13-3: ISCO, MNA, and ICs

Alternative G13-4: In-Situ Bioremediation, MNA, and ICs

5.5.2.1 ALTERNATIVE G13-1: NO ACTION

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No Action Alternative, none of the GRAs, including ICs/access restrictions, containment, and in-situ or ex-situ treatment would be implemented for the COC-impacted groundwater at IR Site 13. Alternative G-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G-1, natural attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.5.2.2 ALTERNATIVE G13-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G13-2 would rely on natural attenuation processes and monitoring for remediation of COCs (i.e. benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of COCs in groundwater. In accordance with the USEPA Directive on MNA (USEPA 1999a), Alternative G13-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to verify that VOCs are not migrating off-site at concentrations posing unacceptable risk.

The results of groundwater sampling conducted from May 2000 through September 2009, indicate that COCs in IR Site 13 groundwater (benzene, ethylbenzene, toluene, and xylene) are localized in extent and plume boundaries are relatively stable. The comparison of May/June 2000 benzene concentrations with concentrations observed during September 2009 does not indicate significant reduction in concentrations or migration. Benzene, ethylbenzene, toluene, and xylene are readily biodegraded under aerobic conditions, however as summarized in Section 3.4, groundwater at most locations within OU-2A is indicative of reducing conditions. The reducing conditions in groundwater may be responsible for relatively slow biodegradation of COCs in IR Site 13 groundwater. Therefore, although MNA may be effective in reducing potential migration of COCs in IR Site 13 groundwater, natural attenuation processes may take relatively long time to reduce COC concentrations below their respective TCGs.

As part of implementation of MNA, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs including benzene, ethylbenzene, and toluene in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analysis.

The time required for COCs in groundwater to naturally attenuate to concentrations less than their respective target cleanup goals was estimated for IR Site 13. This estimate was based on assuming the first-order decay and using the following equation:

$$\log C - \log C_o = - kt$$

where:

C = Final COC concentration at time t

C_o = Initial COC concentration at time zero

k = First-order decay rate constant for the COC

T = Time for COC concentration to decrease from C_o to C.

To ensure development of a representative estimate for natural attenuation time-frames, the following methodology was used:

Benzene was used as a representative COC.

The minimum value of anaerobic biodegradation rate constant (0.0015 per day) for benzene presented in the USEPA document "Anaerobic Biodegradation Rates of Organic Chemicals in Groundwater: A Summary of Field and Laboratory Studies" (U.S. EPA 1999b) was used.

The maximum concentration of benzene of 1,500 µg/L reported the Supplemental DGI was used as the initial concentration value.

Based on the above methodology, the total time required for COCs in groundwater at IR Site 13 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 14 years.

With the exception of benzene, the EPC (95 percent UCL of the reported concentrations based on the data from 2002 to 2008) of all the COCs at IR Site 13 are less than their respective RBCs for indoor air exposure. Therefore, to ensure protection of human-health and attainment of RAOs, MNA would be combined with ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through natural attenuation mechanisms. The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions would achieve the following objectives:

Prevent land use that presents unacceptable hazard to human-health due to the existence of residual COCs

Protect site security features such as fences, and signs

Preserve access to the ARICs for the relevant regulatory agencies

The land-use restrictions in general would include the following within the areas overlying the COC plume at IR Site 13:

The prohibition on domestic use of groundwater.

The prohibition on drilling wells of any kind.

The requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

The prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow the DON, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

The ICs would be supplemented with warning signs and physical barriers such as locks on monitoring wells to restrict access to the site and/or monitoring equipment, and warn members of the public of the potential hazards. Physical barriers/warning signs do not reduce volume, toxicity, or mobility of COCs in groundwater. However, these restrictions are effective in warning the public of potential hazards and reduce the potential for exposure due to direct contact with impacted groundwater.

If Alternative G13-2 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.3 ALTERNATIVE G13-3: IN-SITU CHEMICAL OXIDATION, MNA AND ICS

Alternative G13-3 would include implementation of ISCO to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extent of plume shown on Figure 3-14. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs. The lateral and vertical extents of COCs in IR Site 13 groundwater would be refined as part of pre-design investigations. These investigations would include installation of monitoring wells and groundwater sampling and analyses for the COCs.

An alternative strategy for emplacement of oxidant in the subsurface that uses groundwater recirculation could also be used at IR Site 13 for the implementation of ISCO. This strategy uses groundwater extraction and injection wells. The extracted groundwater is amended with oxidant aboveground and reinjected into the aquifer using injection wells.

Several commercially available oxidants may be used for ISCO of COCs at IR Site 13 such as Fenton's reagent, activated persulfate or ozone. Performance monitoring would be conducted periodically to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active ISCO treatment may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the ISCO performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

To ensure protection of human-health and attainment of RAOs, Alternative G13-3 would include implementation of ICs and access restrictions. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of ISCO and MNA.

The ICs and access restrictions implemented for Alternative G13-3 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

If Alternative G13-3 requires more than five years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of five-year review. This five-year review would include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human-health and the environment.

5.5.2.4 ALTERNATIVE G13-4: IN-SITU BIOREMEDIATION, MNA, AND ICS

Alternative G13-4 would include implementation of in-situ bioremediation to treat COCs (benzene, ethylbenzene, toluene, and xylene) in groundwater at IR Site 13. The COCs at IR Site 13 are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. The 1998 Intrinsic Bioremediation Treatability Study indicates that oxygen is a limiting factor in biodegradation of COCs at IR Site 13. Therefore, implementation of bioremediation at IR Site 13 would include delivery of the source of molecular oxygen into the subsurface.

As part of implementation of Alternative G13-4, pre-design investigations would be conducted to better define the lateral and vertical extents of COCs in IR Site 13 groundwater. These investigations would include installation of monitoring wells and groundwater sampling and analyses for COCs.

Several commercially available oxygen release compounds are available for bioremediation applications such as ORC™, EHC-O™, and calcium-based compounds. These compounds may be injected into the subsurface using temporary direct push injection points or injection wells. Under this scenario, the injection locations would cover the lateral extents of the plume with concentrations of COCs greater than the TCGs listed in Table 5-2 (see Figure 3-13). The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

An alternative strategy for emplacement of oxygen release compounds is through groundwater recirculation using injection and extraction wells. The extracted groundwater is amended with oxygen release compound aboveground and reinjected into the aquifer using injection wells. This strategy may lead to better distribution of bioremediation amendments compared to direct injection using temporary points or injection wells.

Oxygen may also be delivered into the subsurface at IR Site 13 using biosparging. Biosparging would include injection of air or oxygen into the subsurface using wells. The pilot studies and petroleum corrective action conducted west of Building 530 would provide useful data to design biosparging at IR Site 13. Although, the VOC mass removal due to biosparging was not established during the pilot studies and petroleum corrective action, an effective radius of influence of 20 feet was recommended based on these studies.

Bioremediation would be implemented to treat COCs present in groundwater at IR Site 13 into innocuous products such as carbon dioxide and water. Performance monitoring would be conducted periodically as part of implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface. Based on the analysis of these data and with the approval of the regulatory agencies, active implementation of bioremediation may be stopped before the concentrations of COCs are reduced to levels below the TCGs to allow natural attenuation mechanisms to act to reduce the remaining COCs to concentrations below TCGs. An example of this scenario is if the bioremediation performance monitoring data indicates that COCs are reduced to below the TCGs over the major portion of plumes with the exception of a few isolated locations that are difficult to treat due to technical considerations.

Similar to Alternatives G13-2 and G13-3, Alternative G13-4 would include implementation of ICs and access restrictions to ensure protection of human-health and attainment of RAOs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs through implementation of in-situ bioremediation and MNA. The ICs and access restrictions implemented for Alternative G13-4 would be similar to Alternative G13-2 and are discussed in Section 5.5.4.2.

5.6 DETAILED ANALYSIS OF ALTERNATIVES

The NCP (40 C.F.R. § 300.430 [e][9][i] and [ii]) requires that a detailed analysis of remedial alternatives be conducted during the FS based on the nine evaluation criteria identified in 40 C.F.R. § 300.430 (e)(9)(iii). The results of the detailed analysis provide the basis for identifying a preferred alternative and preparing the proposed plan.

Because of the difference in the nature of COCs found at IR Sites 9 and 19 (chlorinated VOCs) compared to IR Site 13 (petroleum hydrocarbon VOCs), the detailed analysis of remedial alternatives was carried out separately for IR Sites 9 and 19, and for IR Site 13 Section 5.6.1 provides a brief description of each of the nine evaluation criteria. Sections 5.6.2 and 5.6.3 provide an assessment and a summary profile of each alternative against the evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively. Sections 5.6.3 and 5.6.4 present comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criteria for IR Sites 9 and 19, and for IR Site 13, respectively.

5.6.1 Evaluation Criteria

The nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied by each alternative and relate directly to statutory findings that must ultimately be made in the ROD. The two threshold criteria include:

Overall protection of human-health and the environment, and

Compliance with ARARs

The primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

Long-term effectiveness and permanence

Reduction of toxicity, mobility, or volume through treatment

Short-term effectiveness

Implementability

Cost

The modifying criteria are taken into account following comment on the FS Report and proposed plan, and are addressed once a final decision is being made and the ROD is being prepared. The modifying criteria include:

State acceptance, and

Community acceptance

Each of the nine evaluation criteria is summarized in the following sections.

5.6.1.1 Overall Protection of Human-Health and the Environment

Under this criterion, the alternatives are assessed to determine whether they can adequately protect human-health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of remediation goals. Overall protection of human-health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.6.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Under this criterion, the alternatives are assessed to determine whether they attain ARARs under Federal environmental laws and State environmental or facility siting laws or provide grounds for invoking a waiver.

5.6.1.3 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. Factors that are considered, as appropriate, include the following:

Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities.

Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste.

5.6.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion evaluates alternatives based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. This includes how treatment is used to address the principal threats posed by the site. Factors that are considered include the following:

The treatment or recycling processes the alternatives employ and materials they will treat

The amount of constituents that will be destroyed, treated, or recycled

The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reductions are occurring

The degree to which the treatment is irreversible

The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their constituents

The degree to which treatment reduces the inherent hazards posed by principal threats at the site

5.6.1.5 Short-Term Effectiveness

Under this criterion, alternatives are evaluated with respect to their effects on human-health and the environment during implementation of the remedial action. The short-term impacts of alternatives are assessed considering the following:

Short-term risks that might be posed to the community during implementation of an alternative

Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures

Potential environmental impacts with respect to sustainability metrics (i.e., emission of pollutants and greenhouse gases) of the remedial action and the effectiveness and reliability of mitigative measures during implementation

Time until protection is achieved

5.6.1.6 IMPLEMENTABILITY

The assessment for implementability of the alternatives is based on the following factors:

Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).

Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

5.6.1.7 COST

The types of costs that are assessed include the following:

Capital costs, including both direct and indirect costs

Annual O&M costs

Net present value of capital and O&M costs

Cost estimates for remedial alternatives for impacted groundwater at IR Sites 9, 13 and 19 were generated using RACER™ 2010 (version 10.3.0). The cost backup including underlying assumptions and quantities for cost estimates, and an individual cost summary for each remedial action alternative considered for detailed analysis in this FS are presented in Appendix D. The cost estimates were generated for remedial action alternatives based on the conceptual design conducted using the available site characterization, pilot studies, and removal action data, as appropriate. The cost estimates generated in this FS are for comparison purposes only and are of sufficient level of accuracy to conduct comparative analysis of remedial alternatives based on costs.

5.6.1.8 STATE ACCEPTANCE

This criterion assesses the State acceptance by considering the following:

The State's position and key concerns related to the preferred alternative and other alternatives

State comments on ARARs or the proposed use of waivers

5.6.1.9 COMMUNITY ACCEPTANCE

This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

5.6.2 Individual Analysis of Alternatives – IR Sites 9 and 19

5.6.2.1 ALTERNATIVE G-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IR Sites 9 and 19. Natural attenuation processes such as dilution, dispersion, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater In addition, under the No Action Alternative there would be no way to assess the fate of COCs in groundwater. Alternative G-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G-1 would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-1 would have no short-term impact on risks at IR Sites 9 and 19. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G-1 includes no remedial action, sustainable environmental remediation (SER) analysis was not conducted for this alternative.

Implementability

Alternative G-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.

Cost

There are no direct costs associated with Alternative G-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-1 will be assessed following the public review process.

5.6.2.2 ALTERNATIVE G-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G-2 consists of natural attenuation monitoring and land/groundwater use restrictions to ensure that the RAOs for groundwater at IR Sites 9 and 19 are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce COC concentrations in groundwater.

ICs under Alternative G-2 would include non-engineered controls to limit human exposure to impacted groundwater. Restrictions on future land and groundwater use would be to ensure protection of potential receptors, and protect the MNA system components. A complete description of Alternative G-2 is presented in Section 5.5.2.

Overall Protection of Human-Health and the Environment

Alternative G-2 provides protection of human-health and the environment. This alternative restricts use of groundwater, thereby protecting human-health by minimizing the potential for exposure to impacted groundwater. In addition, to ensure protection against potential unacceptable risks due to vapor intrusion pathway, ICs may include a requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs, as presented in Section 5.1.5. Effective implementation of ICs would be necessary for Alternative G-2 to be protective of human-health. ICs would have to be implemented until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

Compliance with ARARs

Alternative G-2 complies with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

Alternative G-2 would provide long-term effectiveness in minimizing the potential for exposure to impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for impacted groundwater can be accomplished relatively easily.

ICs may have to be implemented for a relatively long period of time for groundwater at IR Sites 9 and 19 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are

not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. At IR Site 19, higher chlorinated alkenes (TCE and PCE) may get anaerobically biodegraded to VC which is more toxic than the parent compounds. However, other natural attenuation processes such as dilution and dispersion would eventually reduce concentrations of VC (if formed). The groundwater monitoring results to date have shown that concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. Therefore natural attenuation appears to be occurring to reduce mobility of COCs.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-2 would have short-term impact on risks at IR Sites 9 and 19 if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G-2 would require longer time-frames for remediation of COCs in groundwater to concentrations less than their TCGs compared to alternatives involving active remediation. However, Alternative G-2 would rely on ICs that require land/groundwater use restrictions to minimize the potential for exposure to COC concentrations posing unacceptable risk.

Alternative G-2 would have a low degree of environmental impact as evaluated through the SER analysis (see Appendix C). The impacts to the environment for Alternative G-2 are primarily due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and green house gas (GHG) emissions, and energy use are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

The total time required for VOCs in groundwater at IR Sites 9 and 19 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 15 years. The detailed methodology for estimation of remediation time frame for Alternative G-2 is presented in Section 5.5.1.2.

Implementability

MNA is relatively easily implementable. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-2. The detailed costs for implementation of Alternative G-2 are presented in Appendix D. The estimated net present-worth of Alternative G-2 is $2,789,000. The present-worth analysis assumed the construction and O&M period of 15 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-2 will be assessed following the public review process.

5.6.2.3 Alternative G-3: In-Situ Chemical Oxidation, MNA, and ICs

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Sites 9 and 19. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than their respective TCGs. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

To ensure protection of human-health and attainment of RAOs, Alternative G-3 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landownwer(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs.

Overall Protection of Human-Health and the Environment

Alternative G-3 would be protective of human-health and the environment. ISCO would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G-3 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19. Therefore, Alternative G-3 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G-3 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

ISCO is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of ISCO treatments would be required to reduce concentrations of COCs across the entire lateral and vertical extents of VOC plumes.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

ISCO implemented as part of Alternative G-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water (ITRC 2005). Therefore, Alternative G-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-3 would have a short-term impact on risks at IR Sites 9 and 19 since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G-3 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G-3 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Sites 9 and 19 to concentrations less than their respective target cleanup goals using Alternative G-3.

Implementability

Injection of reagents using direct push and or injection wells as part of ISCO is a mature, well-known technology. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19. These tests have shown that injection of reagents in the FWBZ is relatively easy compared to injection into deeper groundwater/SWBZ.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the ISCO performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-3. The detailed costs for implementation of Alternative G-3 are presented in Appendix D. The estimated net present-worth of Alternative G-3 is $4,611,000. The present-worth analysis assumed an O&M period of five years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-3 will be assessed following the public review process.

5.6.2.4 ALTERNATIVE G-4: IN-SITU BIOREMEDIATION, MNA, AND ICS

Alternative G-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Sites 9 and 19. Based on the nature of COCs present in groundwater, aerobic bioremediation may be implemented at IR Site 9 and anaerobic bioremediation may be implemented at IR Site 19 (see Section 5.5.4 for details). Both aerobic and anaerobic bioremediation would require injection of amendments to the subsurface to stimulate bacteria capable of biodegrading the COCs.

To ensure protection of human-health and attainment of RAOs, Alternative G-4 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below their respective TCGs.

Overall Protection of Human-Health and the Environment

Alternative G-4 would be protective of human-health and the environment. In-situ bioremediation would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G-4 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19. Therefore, Alternative G-4 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G-4 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

In-situ bioremediation is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of bioremediation amendment injections would be required to reduce concentrations of COCs across the entire lateral and vertical extents of the VOC plumes.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Bioremediation implemented as part of Alternative G-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. The anaerobic degradation of TCE and PCE at IR Site 19 may lead to generation of VC which is more toxic than the parent compounds. However, VC may eventually degrade to ethene under anaerobic conditions. If further anaerobic biodegradation of VC does not occur, the geochemical conditions may be changed to aerobic by injection of oxygen releasing compounds or oxygen gas since VC biodegrades more readily under aerobic conditions. Therefore, Alternative G-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G-4 would have a short-term impact on risks at IR Sites 9 and 19 since subsurface injection of amendments such as emulsified vegetable oil or oxygen releasing chemical compounds would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G-4 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Sites 9 and 19 to concentrations less than their respective target cleanup goals using Alternative G-4.

Implementability

Injection of reagents using direct push and or injection wells as part of bioremediation is a mature, well-known technology. Materials and vendors for implementation of bioremediation are readily available. However, bench/pilot tests may be required to assess the feasibility of bioremediation for treatment of COCs at IR Site 9 and 19. These tests would evaluate the feasibility of complete dechlorination of TCE and PCE or if implementation of anaerobic and aerobic bioremediation in sequential fashion would be required at IR Site 19.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G-4. The detailed costs for implementation of Alternative G-4 are presented in Appendix D. The estimated net present-worth of Alternative G-4 is $7,014,000. The present-worth analysis assumed an O&M period of 5 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G-4 will be assessed following the public review process.

5.6.3 IR Site 13 - Analysis of Alternatives

5.6.3.1 ALTERNATIVE G13-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IR Site 13. Natural attenuation processes such as dilution, dispersion, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater In addition, under the No Action Alternative there would be no way to assess the fate of COCs in groundwater. Alternative G13-1 does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G13-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G13-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution, dispersion, and biodegradation would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G13-1 would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-1 would have no short-term impact on risks at IR Site 13. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G13-1 includes no remedial action, SER analysis was not conducted for this alternative.

Implementability

Alternative G13-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.

Cost

There are no direct costs associated with Alternative G13-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-1 will be assessed following the public review process.

5.6.3.2 ALTERNATIVE G13-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G13-2 consists of natural attenuation monitoring and land/groundwater use restrictions to ensure that the RAOs for groundwater at IR Site 13 are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce COC concentrations in groundwater.

ICs under Alternative G13-2 would include non-engineered controls to limit human exposure to impacted groundwater. Restrictions on future land and groundwater use would be to ensure protection of potential receptors, and protect the MNA system components. A complete description of Alternative G-2 is presented in Section 5.5.2.

Overall Protection of Human-Health and the Environment

Alternative G13-2 provides protection of human-health and the environment. This alternative restricts use of groundwater, thereby protecting human-health by minimizing the potential for exposure to impacted groundwater. In addition, to ensure protection against potential unacceptable risks due to vapor intrusion pathway, ICs may include a requirement that any building constructed on the area overlying the impacted groundwater install an engineered vapor intrusion mitigation technology/system until COC concentrations in groundwater are reduced to levels less than their respective TCGs, as presented in Section 5.1.5. Effective implementation of ICs would be necessary for Alternative G13-2 to be protective of human-health. ICs would have to be implemented until COC concentrations in groundwater are reduced to levels less than their respective TCGs.

Compliance with ARARs

Alternative G13-2 complies with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

Alternative G13-2 would provide long-term effectiveness in minimizing the potential for exposure to impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for impacted groundwater can be accomplished relatively easily.

ICs may have to be implemented for a relatively long period of time for groundwater at IR Site 13 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results and the 1998 Intrinsic Bioremediation Study indicate that hydrocarbon biodegradation rates at IR Site 13 are slow presumably

due to reducing conditions in groundwater. However, monitoring results also indicate relatively stable plume boundaries for benzene (primary COC). Therefore, natural attenuation processes appear to be occurring to reduce mobility of COCs at IR Site 13.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-2 would have short-term impact on risks at IR Site 13 if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G13-2 would require longer time-frames for remediation of COCs in groundwater to concentrations less than their TCGs compared to alternatives involving active remediation. However, Alternative G13-2 would rely on ICs that require land/groundwater use restrictions to minimize the potential for exposure to COC concentrations posing unacceptable risk.

Alternative G13-2 would have a low degree of environmental impact as evaluated through the SER analysis (see Appendix C). The impacts to the environment for Alternative G13-2 are primarily due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant emissions are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The GHG emissions and energy use are estimated to be the highest for disposal of groundwater generated during sampling of wells. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

The total time required for VOCs in groundwater at IR Site 13 to naturally attenuate to concentrations less than their respective target cleanup goals was estimated to be 14 years. The detailed methodology for estimation of remediation time frame for Alternative G13-2 is presented in Section 5.5.2.2.

Implementability

MNA is relatively easily implementable. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-2. The detailed costs for implementation of Alternative G13-2 are presented in Appendix D. The estimated net present-worth of Alternative G13-2 is $2,435,000. The present-worth analysis assumed a construction and O&M period of 14 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-2 will be assessed following the public review process.

5.6.3.3 ALTERNATIVE G13-3: IN-SITU CHEMICAL OXIDATION, MNA, AND ICS

Alternative G-3 would include implementation of ISCO to treat COCs in groundwater at IR Site 13. As part of ISCO, oxidant would be injected into the subsurface using temporary direct push injection points or injection wells. The injection locations would cover the lateral extents of the plumes with concentrations of COCs greater than their respective TCGs. The depth interval for injection would cover the estimated vertical extent of the COCs exceeding TCGs.

To ensure protection of human-health and attainment of RAOs, Alternative G13-3 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of future landownwer(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below TCGs.

Overall Protection of Human-Health and the Environment

Alternative G13-3 would be protective of human-health and the environment. ISCO would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G13-3 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13. Therefore, Alternative G13-3 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G13-3 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

ISCO is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of ISCO treatments would be required to reduce concentrations of COCs across the entire lateral and vertical extents of impacted groundwater.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

ISCO implemented as part of Alternative G13-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water (ITRC 2005). Therefore, Alternative G13-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-3 would have a short-term impact on risks at IR Site 13 since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to

work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G13-3 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G13-3 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Site 13 to concentrations less than their respective target cleanup goals using Alternative G13-3.

Implementability

Injection of reagents using direct push and or injection wells as part of ISCO is a mature, well-known technology. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide data to optimize the design of the full-scale ISCO implementation at IR Site 13. These tests have shown that injection of reagents in shallow groundwater is relatively easy. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the ISCO performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-3. The detailed costs for implementation of Alternative G13-3 are presented in Appendix D. The estimated net present-worth of Alternative G13-3 is $2,103,000. The present-worth analysis assumed an O&M period of five years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-3 will be assessed following the public review process.

5.6.3.4 Alternative G13-4: In-Situ Bioremediation, MNA, and ICs

Alternative G13-4 would include implementation of in-situ bioremediation to treat COCs in groundwater at IR Site 13. Based on the nature of COCs present in groundwater, aerobic bioremediation may be implemented at IR Site 13 using direct injection, groundwater recirculation or biosparging.

To ensure protection of human-health and attainment of RAOs, Alternative G13-4 would include implementation of ICs. The ICs will include land/groundwater-use restrictions to limit exposure of

future landowner(s) and/or user(s) to COC-impacted groundwater until the concentrations of COCs are reduced to levels below their respective TCGs.

Overall Protection of Human-Health and the Environment

Alternative G13-4 would be protective of human-health and the environment. In-situ bioremediation would be implemented to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. Alternative G13-4 would also include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13. Therefore, Alternative G13-4 would minimize the potential for exposure of potential receptors to COC concentrations exceeding TCGs or that could pose unacceptable risk.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G13-4 would comply with all identified ARARs (see Appendix A for details).

Long-Term Effectiveness and Permanence

In-situ bioremediation is expected to be effective in a long-term by reducing concentrations of COCs in groundwater. COCs would be completely destroyed to innocuous end products such as carbon dioxide and water. It is likely that multiple rounds of bioremediation amendment injections would be required to reduce concentrations of COCs across the entire lateral and vertical extents of impacted groundwater.

ICs including groundwater use restrictions would be required to ensure protection of potential receptors until the time the COCs are remediated to concentrations less than their respective TCGs. Effective implementation of ICs through proper monitoring and inspection would ensure effectiveness of this alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The COCs at IR Site 13 including benzene, ethylbenzene, and toluene are readily amenable to biodegradation under aerobic conditions. The aerobic biodegradation would lead to complete destruction of these COCs into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers or the environment and time required to achieve protectiveness. Alternative G13-4 would have a short-term impact on risks at IR Site 13 since subsurface injection of amendments such as oxygen releasing chemical compounds would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The environmental impacts associated with Alternative G13-4 including emissions of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases.

It is estimated that it would take less than 5 years to remediate the COCs in groundwater at IR Site 13 to concentrations less than their respective target cleanup goals using Alternative G13-4.

Implementability

Injection of reagents using direct push and or injection wells as part of bioremediation is a mature, well-known technology. Materials and vendors for implementation of bioremediation are readily available. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data analysis required for the bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs may require significant administrative effort and careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G13-4. The detailed costs for implementation of Alternative G13-4 are presented in Appendix D. The estimated net present-worth of Alternative G13-4 is $2,364,000. The present-worth analysis assumed an O&M period of 5 years and a discount rate of 2.7 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G13-4 will be assessed following the public review process.

5.6.4 Comparative Analysis of Alternatives – IR Sites 9 and 19

The comparative analysis of alternatives constitutes evaluation of alternatives in relation to one another for each of the nine NCP evaluation criteria. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

The comparative analysis of remedial alternatives developed for VOCs-impacted groundwater at IR Sites 9 and 19 is presented in the following sections. A ranking of poor, fair, or good is assigned to each alternative as a result of the evaluation. Table 5-5 presents a summary of individual and comparative analysis.

5.6.4.1 Overall Protection of Human-Health and the Environment

All alternatives, except Alternative G-1 (No Action) provide adequate protection of human-health and the environment. Under Alternative G-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective TCGs. Alternative G-2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative G-2 provides protection by implementation of land/groundwater use restrictions to minimize the potential for exposure to COCs above their respective TCGs.

Alternatives G-3 and G-4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives G-3 and G-4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective TCGs.

5.6.4.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Since Alternative G-1 entails no remedial action, ARARs would not be triggered. Alternatives G-2 through G-4 would comply with all identified ARARs.

5.6.4.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Under Alternative G-2, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. The natural attenuation is also expected to reduce further migration of COCs.

Under Alternatives G-3 and G-4, concentrations of COCs in groundwater would be permanently reduced through active in-situ treatment methods such as ISCO and bioremediation.

ICs would be required under Alternatives G-2, G-3, and G-4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective TCGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

5.6.4.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative G-2 relies on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Alternatives G-3 and G-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternatives G-3 includes implementation of ISCO and Alternative G-4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective TCGs.

5.6.4.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness includes risks to workers/community or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative G-1 since no remedial action would be implemented. Alternative G-2 would include limited remedial construction operations including installation of additional monitoring wells. Alternatives G-3 and G-4 would include handling and injection of reagents into the subsurface and drilling. The reagents involved under Alternative G-3 may include hazardous oxidants. Therefore, risks to site workers under Alternatives G-3 and G-4 are greater compared to Alternative G-2.

Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are higher for Alternatives G-3 and G-4 compared to Alternative G-2. This is due to higher estimated pollutant and GHG emissions, energy use, and injury and fatality risks for workers during implementation of Alternative G-2 compared to Alternatives G-3 and G-4.

Alternative G-2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long time to achieve TCGs compared to Alternatives G-3 and G-4.

5.6.4.6 IMPLEMENTABILITY

There are no implementability concerns associated with Alternative G-1 since no action will be taken. Alternative G-2 would be the simplest to construct and operate. The implementation of Alternative G-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well

drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.

Alternative G-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at IR Sites 9 and 19.

The implementation of bioremediation under Alternative G-4 may require bench/pilot tests to assess the feasibility of bioremediation for treatment of COCs at IR Site 9 and 19. Therefore, technical implementation of bioremediation at IR Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.

5.6.4.7 COST

There are no costs associated with Alternative G-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G-2 is least expensive and Alternative G-4 is most expensive.

5.6.4.8 STATE ACCEPTANCE

The State comments will be formally presented in the Proposed Plan and documented in the ROD..

5.6.4.9 COMMUNITY ACCEPTANCE

Community acceptance of one or more of the remedial alternatives proposed for impacted groundwater would be assessed following the public review process.

5.6.5 Comparative Analysis of Alternatives – IR Site 13

The comparative analysis of remedial alternatives developed for VOCs-impacted groundwater at IR Site 13 is presented in the following sections. A ranking of poor, fair, or good is assigned to each alternative as a result of the evaluation. Table 5-6 presents a summary of individual and comparative analysis.

5.6.5.1 OVERALL PROTECTION OF HUMAN-HEALTH AND THE ENVIRONMENT

All alternatives, except Alternative G13-1 (No Action) provide adequate protection of human-health and the environment. Under Alternative G13-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective TCGs. Alternative G13-2 would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. Alternative G13-2 provides protection by implementation of land/groundwater use restrictions to minimize the potential for exposure to COCs above their respective TCGs.

Alternatives G13-3 and G13-4 include implementation of ISCO and bioremediation, respectively, to treat COCs in groundwater. ICs implemented as part of Alternatives G13-3 and G13-4 would minimize the potential for exposure to COCs until these are reduced to concentrations below their respective TCGs.

5.6.5.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Since Alternative G13-1 entails no remedial action, ARARs would not be triggered. Alternatives G13-2 through G13-4 would comply with all identified ARARs.

5.6.5.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Under Alternative G13-2, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. The natural attenuation is also expected to reduce further migration of COCs.

Under Alternatives G13-3 and G13-4, concentrations of COCs in groundwater would be permanently reduced through active in-situ treatment methods such as ISCO and bioremediation.

ICs would be required under Alternatives G13-2, G13-3, and G13-4 to prohibit the use of impacted groundwater until concentrations of COCs are reduced below their respective TCGs. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

5.6.5.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative G13-2 relies on natural attenuation mechanisms for reduction in concentrations and toxicity of COCs in groundwater. Alternatives G13-3 and G13-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of COCs in groundwater. Alternatives G13-3 includes implementation of ISCO and Alternative G13-4 would involve implementation of bioremediation to reduce concentrations of COCs below their respective TCGs.

5.6.5.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness includes risks to workers/community or the environment and time required to achieve protectiveness. No short-term effectiveness is associated with Alternative G13-1 since no remedial action would be implemented. Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are estimated to be higher for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The estimated pollutant emissions for Alternative G13-2 are comparable to Alternatives G13-3 and G13-4. The estimated dust and GHG emissions, energy use, water use, and injury/fatality risks for Alternative G13-2 are higher compared to Alternatives G13-3 and G13-4.

Alternative G13-2 would rely entirely on natural attenuation processes for remediation of COCs in groundwater and would take a relatively long time to achieve TCGs compared to Alternatives G13-3 and G13-4.

5.6.5.6 IMPLEMENTABILITY

There are no implementability concerns associated with Alternative G13-1 since no action will be taken. Alternative G13-2 would be the simplest to construct and operate. The implementation of Alternative G13-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.

Alternative G13-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to design the full-scale ISCO implementation at IR Site 13. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.

Alternative G13-4 would include implementation of in-situ bioremediation. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective

action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.

5.6.5.7 COST

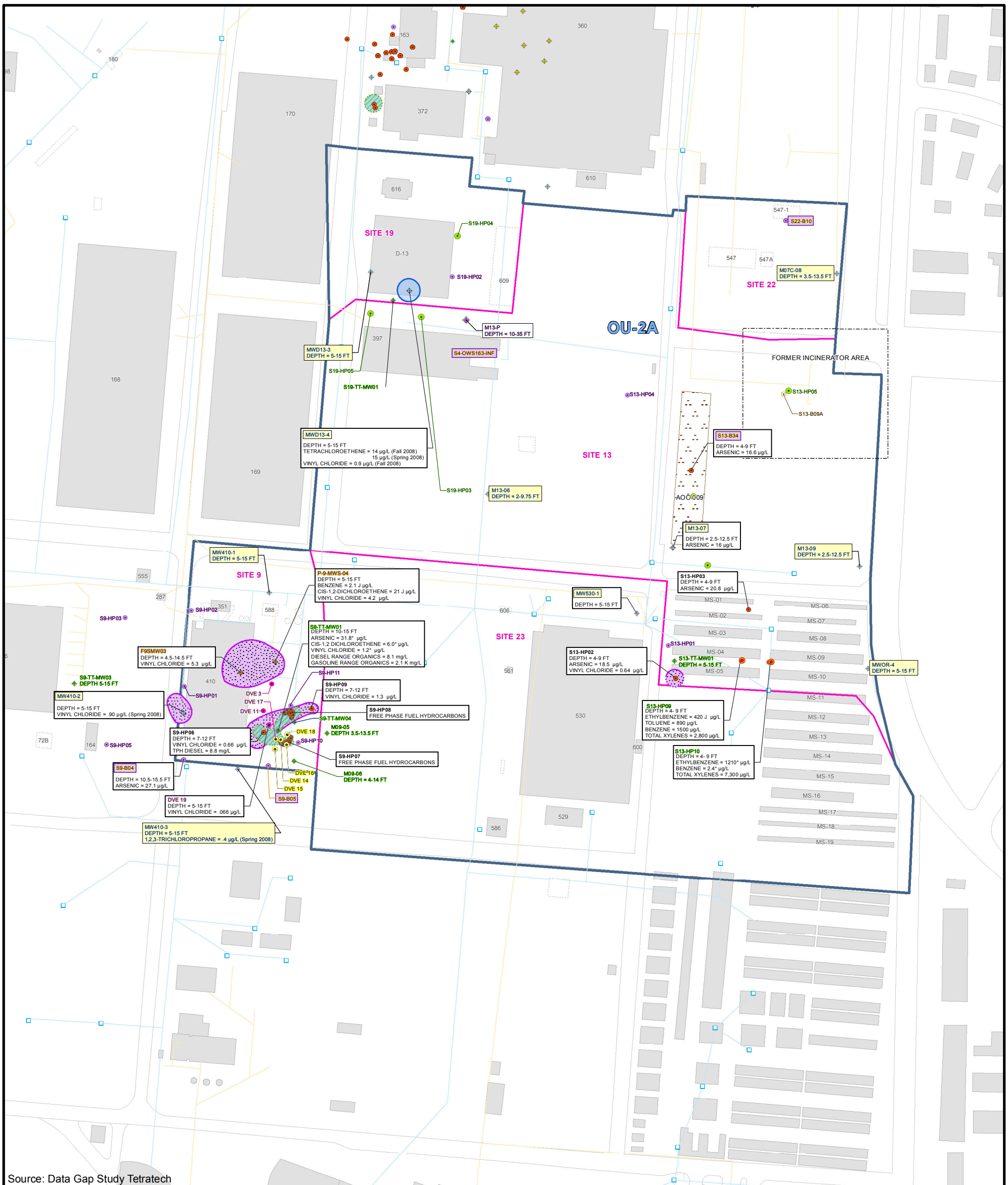
There are no costs associated with Alternative G13-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G13-3 is least expensive and Alternative G13-4 is most expensive.

5.6.5.8 STATE ACCEPTANCE

The State comments will be formally presented in the Proposed Plan and documented in the ROD..

5.6.5.9 COMMUNITY ACCEPTANCE

Community acceptance of one or more of the remedial alternatives proposed for impacted groundwater would be assessed following the public review process.



Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- DVE 15 — DUAL-VAPOR EXTRACTION LOCATION AND ID PROPOSED FOR SAMPLING
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- S9-HP09 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2009)
- S3-HP04 — DATA GAP STUDY HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2009)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P — EXISTING FWBZ GROUNDWATER MONITORING WELL AND ID PROPOSED FOR SAMPLING
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)
- DVE 11 — DUAL-PHASE VAPOR EXTRACTION SAMPLE LOCATION, AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

µg/L - MICROGRAMS PER LITER
BGS - BELOW GROUND SURFACE
DGI - DATA GAP STUDY INVESTIGATION
DVE - DUAL-PHASE VAPOR EXTRACTION
FS - FEASIBILITY STUDY
FT - FEET
FWBZ - FIRST WATER-BEARING ZONE (5-15 FT BGS)
ISCO - IN SITU CHEMICAL OXIDATION
IT - INTERNATIONAL TECHNICAL CORPORATION
ITSI - INNOVATIVE TECHNOLOGY SOLUTIONS, INC.
IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

Note:
* Result represents an average of normal and duplicate samples

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - FWBZ (5 - 15 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-9

OTIE Oneida Total Integrated Enterprises — AECOM

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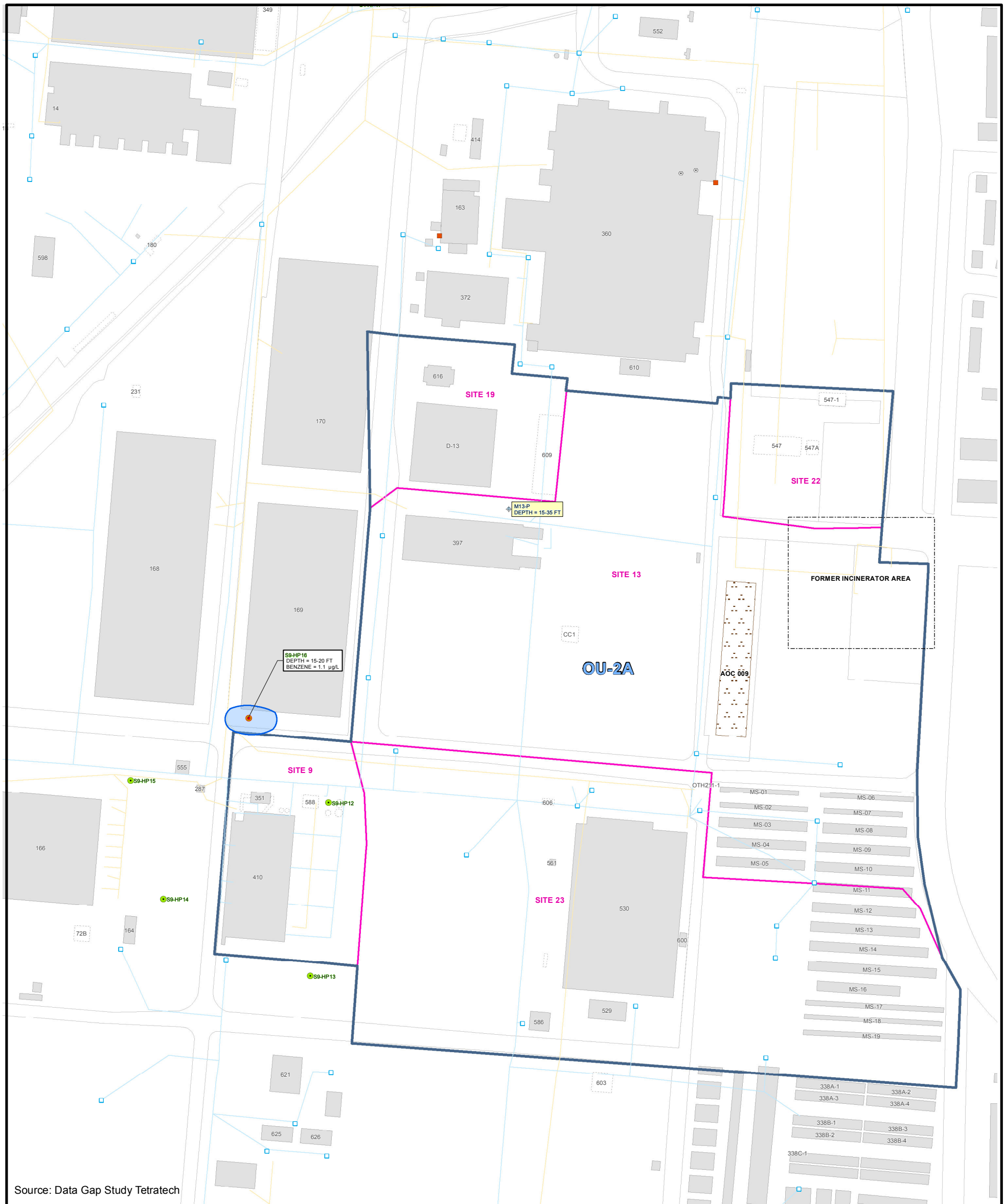

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (15 - 20 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-10

OTIE Oneida Total Integrated Enterprises

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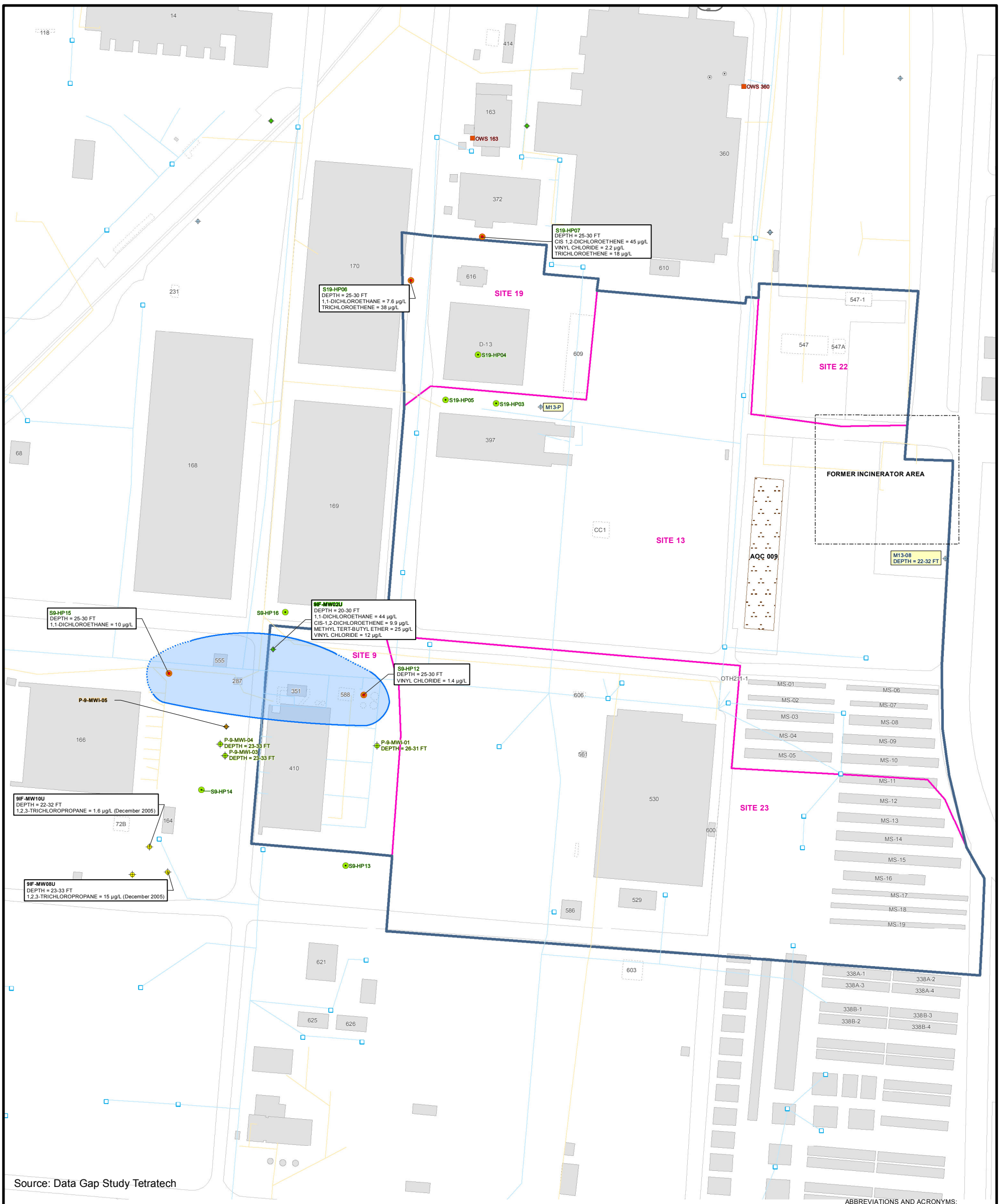

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-08 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (20 - 30 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-11

OTIE Oneida Total Integrated Enterprises

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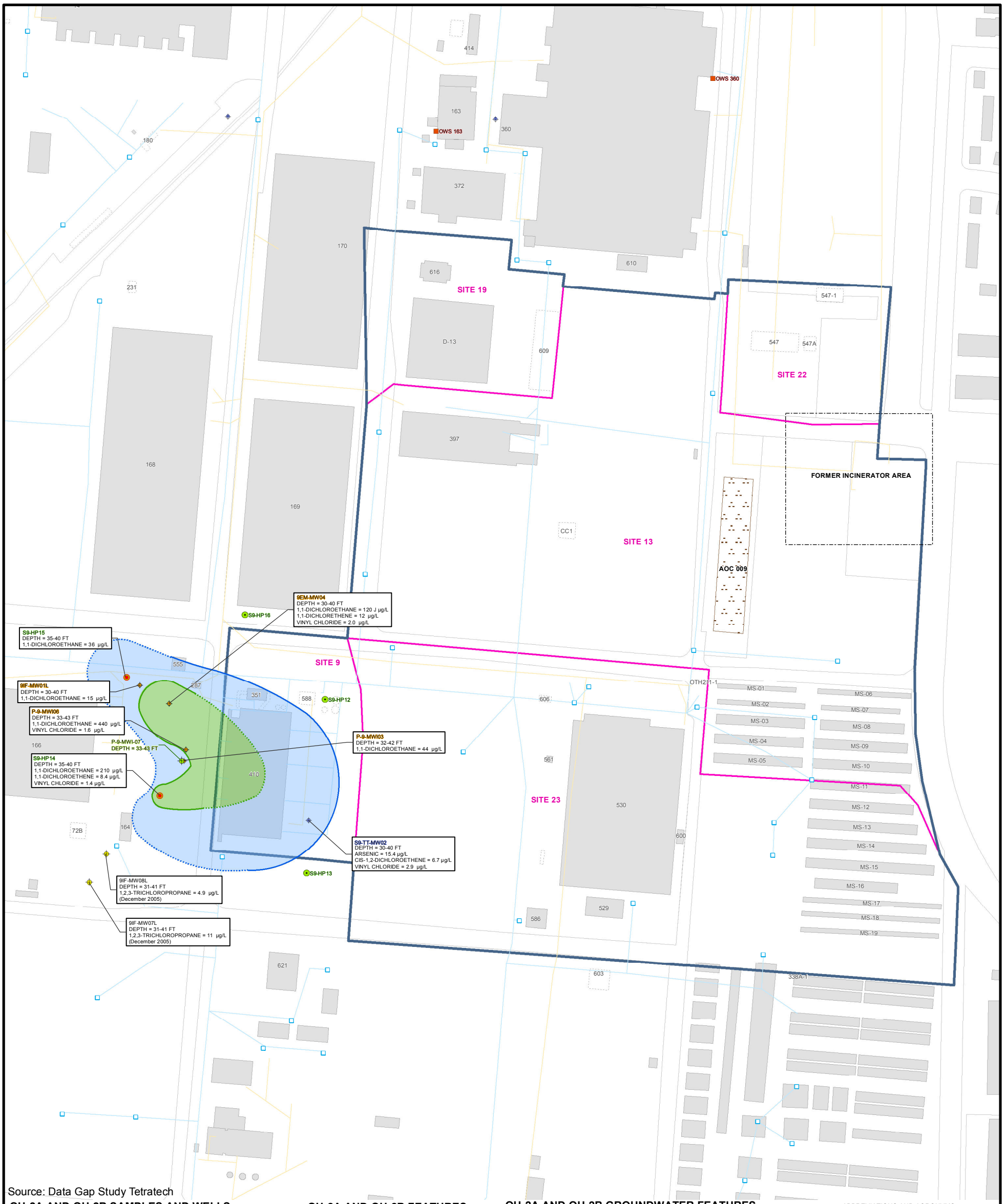

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- ISCO REMOVAL ACTION PERFORMANCE MONITORING WELL
- S9-TT-MW04 — POST DATA GAP STUDY/SUPPLEMENTAL DGI FWBZ GROUNDWATER MONITORING WELL LOCATION AND ID
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- P-9-MWI-05 — ISCO REBOUND SAMPLE LOCATION AND ID (TTEC, 2008)

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

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TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (30 - 40 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-12

OTIE Oneida Total Integrated Enterprises

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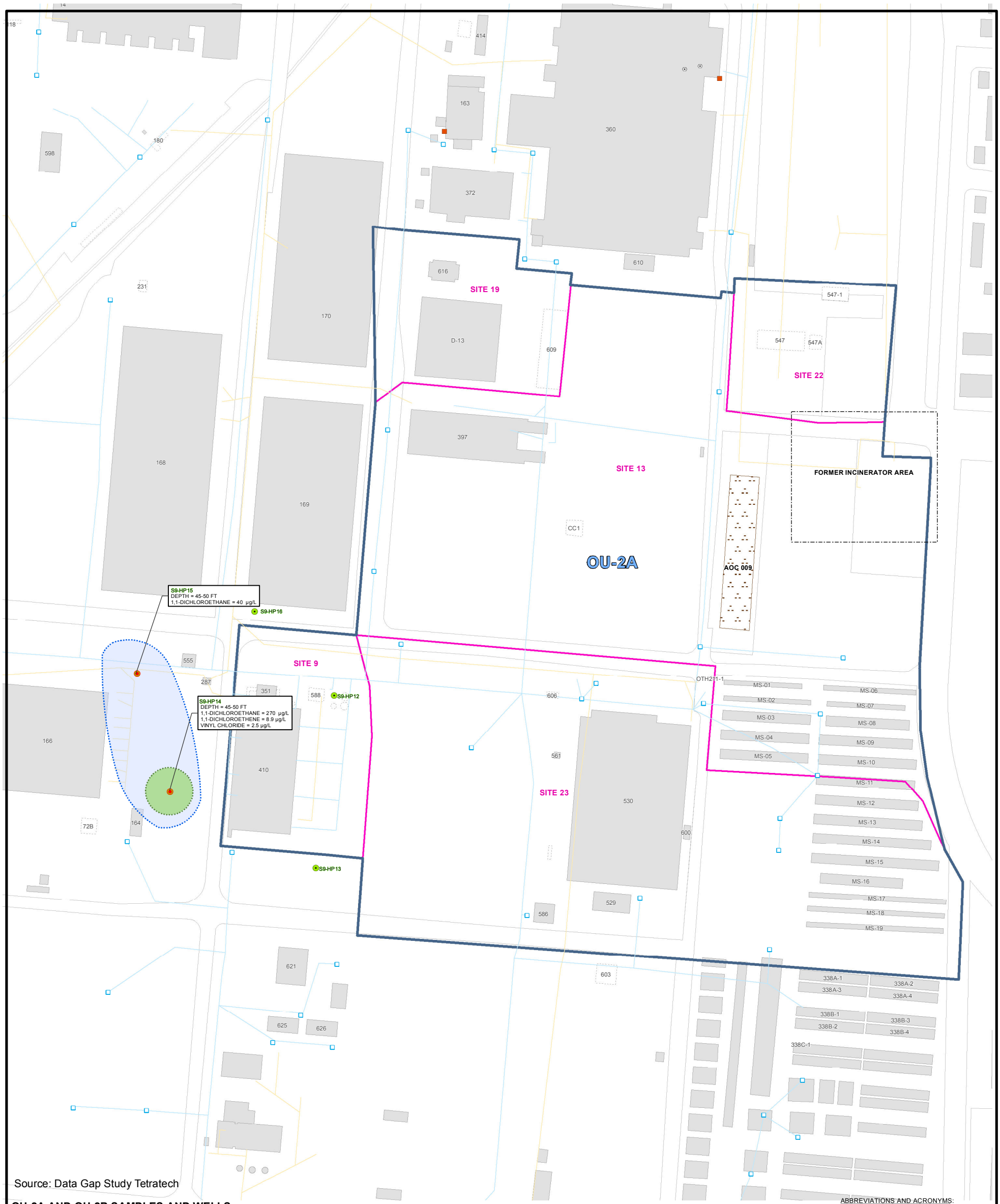

Source: Data Gap Study Tetratech

OU-2A AND OU-2B SAMPLES AND WELLS

- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVEL
- S4-HP16 — POST DATA GAP STUDY/SUPPLEMENTAL DGI HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVEL
- OWS 163 — SOLID WASTE MANAGEMENT UNIT AND ID SAMPLED DURING THE DATA GAPS INVESTIGATION

OU-2A AND OU-2B FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A AND OU-2B GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME ABOVE SCREENING LEVELS (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF COMPOSITE VOC PLUME 100 - 999 µg/L (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF VINYL CHLORIDE PLUME ABOVE SCREENING LEVELS
- APPROXIMATE EXTENT OF FREE PHASE FUEL HYDROCARBONS PLUME ABOVE SCREENING LEVELS
- INFERRED EXTENT OF TPH PLUME ABOVE SCREENING LEVELS

ABBREVIATIONS AND ACRONYMS:

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JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
VOC - VOLATILE ORGANIC COMPOUND

N

0 100 200 Feet

1 inch = 200 feet

OU-2A FS — Final

OU-2A Approximate Extent of Groundwater Impacted - SWBZ (40 - 50 ft BGS)

Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-13

OTIE Oneida Total Integrated Enterprises

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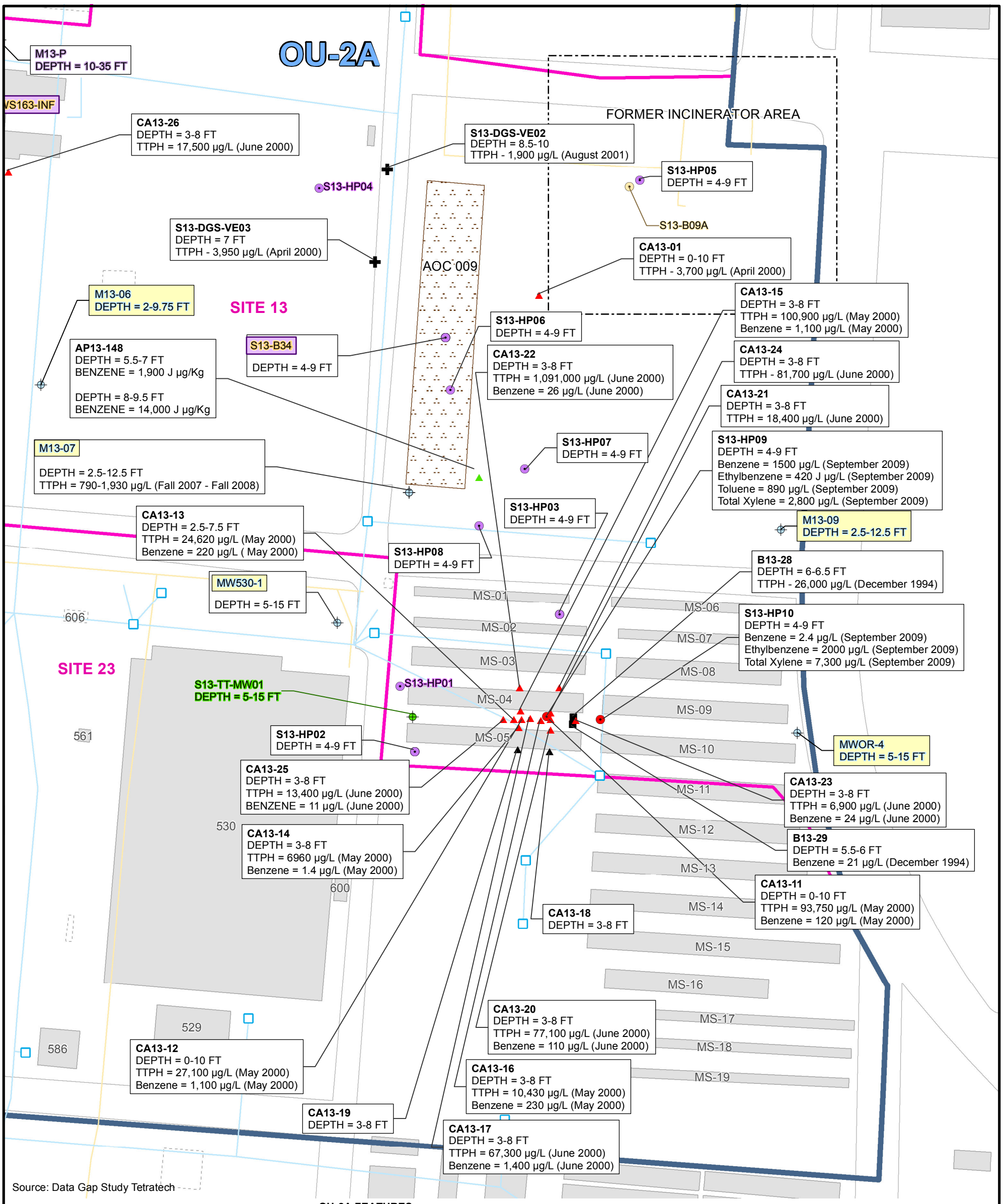

Source: Data Gap Study Tetratech

OU-2A SAMPLES AND WELLS

- S9-HP09 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS ABOVE SCREENING LEVELS (TTEC, 2010)
- S3-HP04 — HYDROPUNCH SAMPLE LOCATION AND ID WITH RESULTS BELOW SCREENING LEVELS (TTEC, 2010)
- S13-B09A — DATA GAP STUDY SOIL SAMPLE LOCATION AND ID (TTEC, 2009)
- M13-P DEPTH = 10-35 FT — EXISTING FWBZ GROUNDWATER MONITORING WELL, ID AND SCREEN INTERVAL (ITSI, 2008)
- M09-06 — FWBZ MONITORING WELL LOCATION AND ID (TTEC, 2008)
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE LESS THAN MCL AND TTPH LESS THAN 1400 µG/L (SULTECH 2005B)
- VACCUM EXTRACTION - APRIL 2000 THROUGH AUGUST 2001
- DIRECT PUSH LOCATION - MAY-JUNE 2000 WITH BENZENE GREATER THAN MCL AND/OR TTPH GREATER THAN 1400 µG/L (SULTECH 2005B)
- BORINGS - DECEMBER 1994
- SOIL SAMPLE LOCATIONS - TRW INVESTIGATION (RBA 2008)

OU-2A FEATURES

- CATCH BASIN
- ROAD
- SANITARY SEWER LINE (APPROX 8 FT BGS)
- STORM SEWER LINE (APPROX 3 FT BGS)
- IR SITE BOUNDARY
- OPERABLE UNIT-2A
- 530 — BUILDING AND BUILDING NUMBER
- 547-1 — FORMER BUILDING AND BUILDING NUMBER

OU-2A GROUNDWATER FEATURES

- APPROXIMATE EXTENT OF BENZENE ABOVE MCL (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF TTPH (SUM OF TPH-g, TPH-d, and TPH-mo) PLUME GREATER THAN 1,400 µg/L AS PRESENTED IN THE RI (DASHED WHERE INFERRED) (SULTECH 2005b)

N

0 100 200 Feet

1 inch = 100 feet

ABBREVIATIONS AND ACRONYMS:

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BGS - BELOW GROUND SURFACE
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IR - INSTALLATION RESTORATION
J - ESTIMATED VALUE
JP5 - JET PROPELLANT GRADE 5
OU - OPERABLE UNIT
OWS - OIL/WATER SEPARATOR
TPH - TOTAL PETROLEUM HYDROCARBONS
TPH-d - TPH AS DIESEL
TPH-g - TPH AS GASOLINE
TPH-mo - TPH AS MOTOR OIL
TRW - TARRY REFINERY WASTE
TTPH - Sum OF TPH-g, TPH-d, and TPH-mo
VOC - VOLATILE ORGANIC COMPOUND

OU-2A FS — Final

Benzene and TPH Results
IR Site 13
Alameda, CA

Date: 06-11	Project No. 106687	Figure 3-14

OTIE Oneida Total Integrated Enterprises — AECOM

Table 5-1: List of COCs – IRP Sites 9, 13, and 19 Groundwater

IR Site 9 Groundwater	IR Site 13 Groundwater	IR Site 19 Groundwater
∉ VC ∉ 1,1-DCA ∉ cis-1,2-DCE ∉ Benzene ∉ Methyl tert-butyl ether ∉ 1,1-DCE ∉ 1,2,3-Trichloropropane (1,2,3-TCP)	∉ Benzene ∉ Ethylbenzene ∉ Toluene ∉ Total Xylene	∉ TCE ∉ PCE ∉ VC

Table 5-2: Target Cleanup Goals – IR Sites 9, 13, and 19 Groundwater

Analyte	RBCs – Residential Use	Potential Chemical-Specific ARARs			
	Inhalation - Indoor Air (σg/L)	Federal MCL (σg/L)	Federal MCLG (σg/L)	California MCL (σg/L)	**Selected Target Cleanup Goal[a] (σg/L)**
IR Site 9					
VC	3.19	2	0	0.5	**0.5**
1,1-DCA	61.41	--	--	5	**5**
cis-1,2-DCE	2011.17	70	70	6	**6**
Benzene	11.26	5	0	1	**1**
Methyl tert-butyl Ether[b]	--	--	--	13	13
1,1-DCE	1526.96	7	7	6	**6**
1,2,3-TCP[b]	--	--	--	--	**0.5[c]**
IR Site 13					
Benzene	11.26	5	0	1	**1**
Ethylbenzene	33702.76	700	700	300	**300**
Toluene[b]	--	1,000	1,000	150	**150**
Total Xylene[b]	--	10,000	10,000	1,750	**1,750**
1IR Site 19			0		
TCE	27.15	5	0	5	**5**
PCE	5.91	5	0	5	**5**
VC	3.19		0	0.5	**0.5**

Notes:
[a]Least of the following values: RBCs, Federal MCL, non-zero Federal MCLG, and California MCL.
[b]Not a vapor intrusion COPC.
[C]RBC based on the level that can be reliably detected and quantified.

Table 5-5: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Sites 9 and 19

Criterion	Alternative G-1 – No Action	Alternative G-2 – MNA and ICs	Alternative G-3: ISCO, MNA, and ICs	Alternative G-4: In-situ Bioremediation, MNA, and ICs
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion Under this alternative, no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater. In addition, there would be no way to assess fate of COCs in groundwater. This alternative does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.	Meets the Criterion This alternative would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. In addition, ICs including land and groundwater use restrictions would be implemented as part of this alternative to minimize the potential for exposure to COCs above their respective TCGs. Effective implementation of ICs would be necessary for Alternative G-2 to be protective of human-health.	Meets the Criterion ISCO would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19.	Meets the Criterion In-situ bioremediation would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extents of VOC plumes at IR Sites 9 and 19.
Compliance with ARARs	Criterion does not Apply Since Alternative G-1 entails no remedial action, a discussion of compliance with ARARs is not appropriate for this alternative.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.
Long-Term Effectiveness	Poor This alternative affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.	Fair Under this alternative, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. ICs may have to be implemented for a relatively long period of time for groundwater at IR Sites 9 and 19 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through ISCO. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through in-situ bioremediation. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	Poor This alternative would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.	Fair Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results till date have shown that concentrations of COCs at IR Sites 9 and 19 are relatively low, and plume boundaries have remained relatively stable. Therefore natural attenuation appears to be occurring to reduce mobility of COCs	Good ISCO implemented as part of Alternative G-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.	Good Bioremediation implemented as part of Alternative G-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Sites 9 and 19. Since COCs are treated to innocuous end-products, their potential mobility is also reduced
Short-Term Effectiveness	Good No construction/implementation activity will be conducted to generate additional site risk. Therefore, no work crews would be exposed to risks, and there would be no sources of additional environmental impact. Since Alternative G-2 includes no remedial action, SER analysis was not conducted for this alternative.	Good This alternative would have short-term impact on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. Alternative G-2 would have a low degree of environmental impact as evaluated through the SER analysis compared to Alternatives G-3 and G-4 (see Appendix C). The pollutant and green house GHG emissions, and energy use are estimated to be the highest for drilling and installation/replacement of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-2 is 15 years (see Section 5.5.1.2 for details).	Fair Alternative G-3 would have a short-term impact on site risks since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. The environmental impacts associated with Alternative G-3 including emission of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-3 is less than 5 years.	Fair Alternative G-4 would have a short-term impact on site risks since subsurface injection of bioremediation amendments would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. The environmental impacts associated with Alternative G-4 including emission of pollutants and green house gases are evaluated in Appendix C as part of SER analysis. The pollutant and GHG emissions, and energy use are estimated to be the highest for direct push drilling and injection operations when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G-4 is less than 5 years.

Table 5-5: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Sites 9 and 19

Criterion	Alternative G-1 – No Action	Alternative G-2 – MNA and ICs	Alternative G-3: ISCO, MNA, and ICs	Alternative G-4: In-situ Bioremediation, MNA, and ICs
Implementability	Good Alternative G-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.	Good Alternative G-2 would be the simplest to construct and operate. The implementation of Alternative G-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.	Fair Alternative G-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at Site 9 in the past would provide valuable data to optimize the design of the full-scale ISCO implementation at Sites 9 and 19.	Poor The implementation of bioremediation under Alternative G-4 may require bench/pilot tests to assess the feasibility of bioremediation for treatment of COCs at Site 9 and 19. Therefore, technical implementation of bioremediation at Sites 9 and 19 is expected to be difficult compared to implementation of ISCO.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.
Community Acceptance	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.
Cost[a]	No Costs	Good $3,513,000[b]	Fair $4,611,000[c]	Poor $7,014,000[c]

Notes:
[a] Alternative that costs the least was rated as good.
[b] The present worth analysis was performed assuming an O&M period of 30 years and a discount rate of 2.8 percent.
[c] The present worth analysis was performed assuming an O&M period of 5 years and a discount rate of 2.8 percent.

Table 5-6: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Site 13

Criterion	Alternative G13-1 – No Action	Alternative G13-2 – MNA and ICs	Alternative G13-3: ISCO, MNA, and ICs	Alternative G13-4: In-situ Bioremediation, MNA, and ICs
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion Under this alternative, no remedial activities would be performed to contain, treat, or reduce exposure to COCs in groundwater. In addition, there would be no way to assess fate of COCs in groundwater. This alternative does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.	Meets the Criterion This alternative would rely on natural attenuation mechanisms such as dilution, dispersion, and biodegradation to reduce concentrations of COCs in groundwater. In addition, ICs including land and groundwater use restrictions would be implemented as part of this alternative to minimize the potential for exposure to COCs above their respective TCGs. Effective implementation of ICs would be necessary for Alternative G13-2 to be protective of human-health.	Meets the Criterion ISCO would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13.	Meets the Criterion In-situ bioremediation would be implemented as part of this alternative to reduce concentrations of COCs below their respective TCGs, resulting in protection of potential receptors. In addition, to ensure protection of human health, this alternative would include implementation of ICs until the time that COCs are reduced to concentrations less than or equal to the TCGs along the entire extent of VOC plume at IR Site 13.
Compliance with ARARs	Criterion does not Apply Since Alternative G13-1 entails no remedial action, a discussion of compliance with ARARs is not appropriate for this alternative.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.	Meets the Criterion Complies with all identified ARARs.
Long-Term Effectiveness	Poor This alternative affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce concentrations of COCs in groundwater. However, it would be difficult to assess the effectiveness of these mechanisms in reducing concentrations of COCs.	Fair Under this alternative, natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COC. ICs may have to be implemented for a relatively long period of time for groundwater at IR Site 13 until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once MNA reduces concentrations of COCs to less than their respective TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through ISCO. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	Good Under this alternative concentrations of COCs in groundwater would be permanently reduced through in-situ bioremediation. ICs may be required for relatively short duration until COC concentrations in groundwater are reduced to levels less than their respective TCGs. Once COC concentrations are reduced below TCGs, residual concentrations are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	Poor This alternative would not reduce toxicity, mobility and/or volume of COCs in groundwater through treatment. Natural processes such as dilution and dispersion would be the only processes acting to reduce concentrations of COCs in groundwater. However, since the no action alternative does not involve monitoring, natural attenuation processes cannot be evaluated.	Fair Natural processes such as dilution, dispersion, and biodegradation would reduce toxicity of groundwater by reducing concentrations of COCs. The groundwater monitoring results and the 1998 Intrinsic Bioremediation Study indicate that hydrocarbon biodegradation rates at IR Site 13 are slow presumably due to reducing conditions in groundwater. However, monitoring results also indicate relatively stable plume boundaries for benzene (primary COC). Therefore, natural attenuation processes appear to be occurring to reduce mobility of COCs at IR Site 13.	Good ISCO implemented as part of Alternative G13-3 would completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-3 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced.	Good Bioremediation implemented as part of Alternative G13-4 is expected to completely destroy the COCs by converting them into innocuous products such as carbon dioxide and water. Therefore, Alternative G13-4 would permanently reduce toxicity and volume of COCs in groundwater at IR Site 13. Since COCs are treated to innocuous end-products, their potential mobility is also reduced
Short-Term Effectiveness	Good No construction/implementation activity will be conducted to generate additional site risk. Therefore, no work crews would be exposed to risks, and there would be no sources of additional environmental impact. Since Alternative G13-2 includes no remedial action, SER analysis was not conducted for this alternative.	Fair This alternative would have short-term impact on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. Based on the SER analysis documented in Appendix C, the short-term impacts on site risks are estimated to be higher for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The GHG emissions, energy use, water use, and injury and fatality risks for workers during implementation of Alternative G13-2 are higher compared to Alternatives G13-3 and G13-4. This is due to longer time frames and greater scope of hollow-stem drilling (due to requirement for well replacement) for Alternative G13-2 compared to Alternatives G13-3 and G13-4. The estimated time to achieve RAOs using Alternative G13-2 is 14 years (see Section 5.5.2.2 for details).	Good Alternative G13-3 would have a short-term impact on site risks since subsurface injection of oxidant would be required as part of ISCO implementation. Handling of oxidants and drilling conducted as part of ISCO would present short-term health and safety risks to work crews. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells (see Appendix C). The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G13-3 is less than 5 years.	Good Alternative G13-4 would have a short-term impact on site risks since subsurface injection of bioremediation amendments would be required as part of bioremediation implementation. Drilling conducted as part of bioremediation implementation would present short-term health and safety risks to work crews. The impacts to the environment for Alternative G13-4 are primarily due to direct push drilling and injection operations, drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells (see Appendix C). The pollutant and GHG emissions, and energy use are estimated to be the highest for drilling and installation of wells when compared to other activities. The injury and fatality risks are estimated to be the highest for transportation of field personnel during construction and O&M phases. The estimated time to achieve RAOs using Alternative G13-4 is less than 5 years.

Table 5-6: Summary of Individual and Comparative Analysis of Groundwater Remedial Alternatives – IR Site 13

Criterion	Alternative G13-1 – No Action	Alternative G13-2 – MNA and ICs	Alternative G13-3: ISCO, MNA, and ICs	Alternative G13-4: In-situ Bioremediation, MNA, and ICs
Implementability	Good Alternative G13-1 requires no effort, services, supplies, or technology. The effectiveness of this alternative cannot be monitored.	Good Alternative G13-2 would be the simplest to construct and operate. The implementation of Alternative G13-2 would require installation of monitoring wells (if required) and periodic groundwater monitoring. Well drilling and construction present little or no technical difficulties. Services of experienced personnel and laboratory, equipment, and material/supplies for groundwater sampling and analysis are generally readily implementable.	Poor Alternative G13-3 would include implementation of ISCO. Materials and vendors for implementation of ISCO are readily available. Pilot tests and removal actions implemented at IR Site 9 in the past would provide valuable data to design of the full-scale ISCO implementation at IR Site 13. However, additional pilot tests may be required for ISCO at IR Site 13 due to the difference in the nature of COCs at IR Site 13 compared to IR Site 9.	Fair Alternative G13-4 would include implementation of in-situ bioremediation. The 1998 Intrinsic Bioremediation Treatability Study at IR Site13, biosparging conducted as part of petroleum corrective action west of Building 530, and ISCO removal actions conducted at IR Site 9 would provide valuable data to optimize the design of the full-scale in-situ bioremediation at IR Site 13.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.	The State comments will be formally presented in the Proposed Plan and documented in the ROD.
Community Acceptance	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.	Community acceptance of this alternative will be assessed following the public review process.
Cost[a]	No Costs	Fair $2,435,000[b]	Good $2,103,000[c]	Fair $2,364,000[c]

Notes:
[a] Alternative that costs the least was rated as good.
[b] The present worth analysis was performed assuming an O&M period of 30 years and a discount rate of 2.8 percent.
[c] The present worth analysis was performed assuming an O&M period of 5 years and a discount rate of 2.8 percent.