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TREASURE ISLAND
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Final

Record of Decision/Remedial Action Plan for Installation Restoration Site 6

Naval Station Treasure Island
San Francisco, California

December 2014

Prepared by:
Department of the Navy
Base Realignment and Closure
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A Administrative Record Index (*Provided on CD*)

B References (*Provided on CD*)

C Applicable or Relevant and Appropriate Requirements

D Public Meeting Notice and Public Meeting Transcript (*Provided on CD*)

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ACRONYMS AND ABBREVIATIONS

µg/L	Microgram per liter
µg/m^3	Micrograms per cubic meter
§	Section
ARAR	Applicable or relevant and appropriate requirement
AST	Aboveground storage tank
bgs	Below ground surface
BRAC	Base Realignment and Closure
BTEX	Benzene, toluene, ethylbenzene, and xylenes
Cal.	California
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
COC	Chemical of concern
COEC	Chemicals of ecological concern
COPC	Chemical of potential concern
COPEC	Chemical of potential ecological concern
CRUP	Covenant to Restrict the Use of Property
DTSC	Department of Toxic Substances Control
EIR	Environmental impact report
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FFS	Focused feasibility study
FS	Feasibility study
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
IC	Institutional control
IR	Installation Restoration
ISB	In situ bioremediation
MCPP	Methylchlorophenoxypropionic acid
MNA	Monitored natural attenuation
NAVSTA TI	Naval Station Treasure Island

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NBAR	Nonbinding Allocation of Responsibility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOE	Notice of Exemption
ORC	Oxygen release compound
OWS	Oil-water separator
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PRP	Potential responsible party
RAB	Restoration Advisory Board
RAO	Remedial action objective
RAP	Remedial action plan
RD	Remedial design
RG	Remedial goal
RI	Remedial investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SLERA	Screening-level ecological risk assessment
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
TEQ	Toxicity equivalence
TI	Treasure Island
TIDA	Treasure Island Development Authority
TPH	Total petroleum hydrocarbons
UST	Underground storage tank
VOC	Volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board
YBI	Yerba Buena Island

1. DECLARATION

This Record of Decision/Final Remedial Action Plan (ROD/Final RAP) presents the remedies selected by the Navy for soil and groundwater at Installation Restoration Site 6, the former fire training school and parking and storage area, at the former Naval Station Treasure Island (NAVSTA TI), in San Francisco, California (Figure 1). There are other sites at NAVSTA TI; however, this ROD/Final RAP does not address any of these other sites.

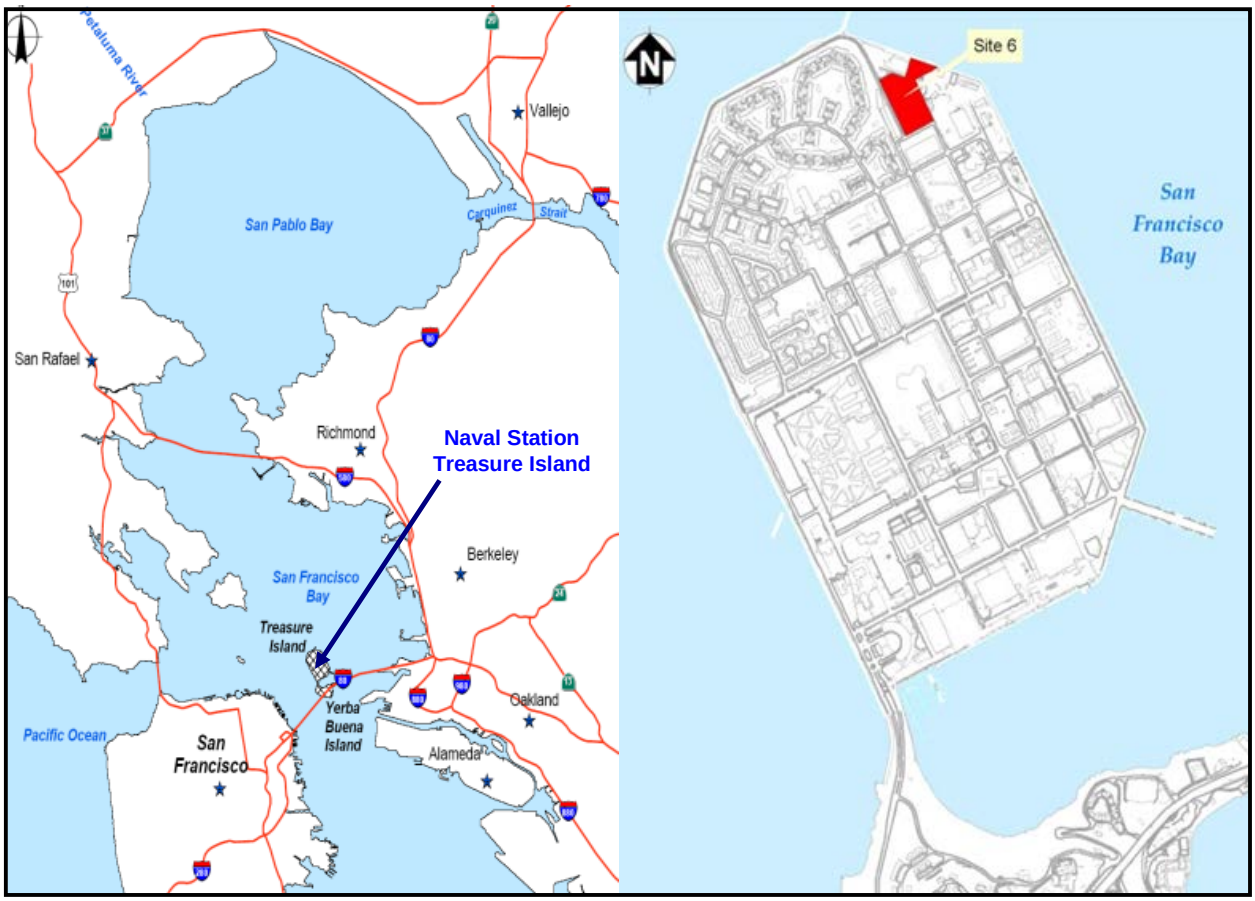

Figure 1. Location of Former Naval Station Treasure Island and Site 6

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, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 *Code of Federal Regulations* [CFR] Part 300). NAVSTA TI has not been placed on the CERCLA National Priorities List. The CERCLA Information System identification number for NAVSTA TI is CA7170023330.

The Department of the Navy is the lead agency under CERCLA for NAVSTA TI and has selected the remedies for Site 6. The California Environmental Protection Agency (Department of Toxic Substances Control [DTSC] and the San Francisco Bay Regional Water Quality Control Board

[Water Board]) concur with the selected remedies. The decision documented in this ROD/Final RAP is based on and relies on the Administrative Record[1] file (Attachment A). Information that is not specifically summarized in this ROD/Final RAP or its references but that is contained in the Administrative Record has been considered and is relevant to the selection of the remedy at Site 6.

The Navy provides funding for site remediation at Former NAVSTA TI under the Base Realignment and Closure (BRAC) program. The Federal Facility Site Remediation Agreement for Former NAVSTA TI documents how the Navy intends to meet and implement the requirements of CERCLA in partnership with DTSC and the Water Board. Although not a signatory agency, the U.S. Environmental Protection Agency (EPA) has reviewed this ROD and concurs with the selected remedies.

Investigations into the release of hazardous substances, hazardous waste petroleum constituents, and other regulated substances began at Site 6 NAVSTA TI in 1986 and documented the releases of CERCLA hazardous substances and collocated petroleum constituents. In general, CERCLA is not intended to address petroleum releases because CERCLA Section (§) 120(14) excludes petroleum from the definition of a CERCLA hazardous substance. CERCLA, however, can be used to address petroleum if the petroleum is collocated with CERCLA hazardous substances. This ROD documents the selection of remedial action for CERCLA hazardous substances and petroleum free product and its constituents.

The investigations completed at Site 6 were used to prepare the remedial investigation (RI), report, which includes a human health risk assessment (HHRA) and a screening-level ecological risk assessment (SLERA). The RI report also identified the presence of dioxins and furans, benzene[2], and manganese as chemicals of concern (COC) in soil, and methylchlorophenoxypropionic acid (MCPP), petroleum constituents, total petroleum hydrocarbons (TPH), and metals as COCs in groundwater that must be addressed to protect human health and the environment. The SLERA identified petroleum and ethylbenzene as chemicals of ecological concern (COEC) for aquatic receptors and no COECs were identified for terrestrial receptors based on the present lack of quality habitat observed at the site and anticipated in the future. In addition, the 2007 SLERA estimated the risks to plants, and to invertebrates and vertebrate receptors, and identified little or no risk is indicated for terrestrial receptors when hazard quotients were adjusted to remove risk associated with ambient concentrations of COPECs. After the SLERA and the RI/FS were completed, a revised reuse plan identified the possibility of the **construction of wildlife habitat(1)** in the future at Site 6, thus necessitating the inclusion of Institutional Controls (IC) to address that possibility. In addition to the RI/FS there have also been **several cleanup actions(2)** including underground storage tank (UST) removals and petroleum and polychlorinated biphenyl (PCB) removal actions.

1 **Bold blue text** identifies detailed site information available in the Administrative Record (Attachment A) and listed in the References table (Attachment B). This ROD/Final RAP is also provided on CD, whereby **bold blue text** serves as a hyperlink to reference information. 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 inconsistencies between the referenced information attached to the ROD/Final RAP via hyperlinks and the information in the ROD/Final RAP itself, the language in this ROD/Final RAP controls.

2 Benzene was subsequently removed as a COC in soils, as discussed in Section 2.10.5.

Site 6 is located in the northern portion of the base, adjacent to the San Francisco Bay. **Historically**(3), most of Site 6 was used for firefighting training at the "Former Fire Training School" between 1944 and 1992. Site 6 has been divided into three subareas, consisting of two subareas in the location of the former firefighting training facilities and an adjacent wedge-shaped subarea in the northeast portion of the site that was used for parking and storage only. During the fire training exercises performed at Site 6, petroleum-, magnesium-, and wood-fueled fires were set to simulate real fires at the Former Fire Training School Area and then extinguished using foam comprised of a mixture of water and biodegradable emulsifiers. There were 10 buildings, six USTs, one aboveground storage tank (AST), a central concrete-paved training pad, and a collector trench surrounding the central training area that were associated with the Former Fire Training School at Site 6 (Figure 2). All USTs, the AST, and the buildings were demolished and removed from the site by 2002. The concrete pad and trench remain at the site.

The contamination at Site 6 is believed to have resulted from fire training activities by the Navy and spills or leaks from USTs, ASTs, and associated piping and structures. Although the Former Parking and Storage Area was not used for fire training, it is included in Site 6 to address dioxins and furans originating from the fire training activities that were transported by prevailing winds and deposited on surface soil.

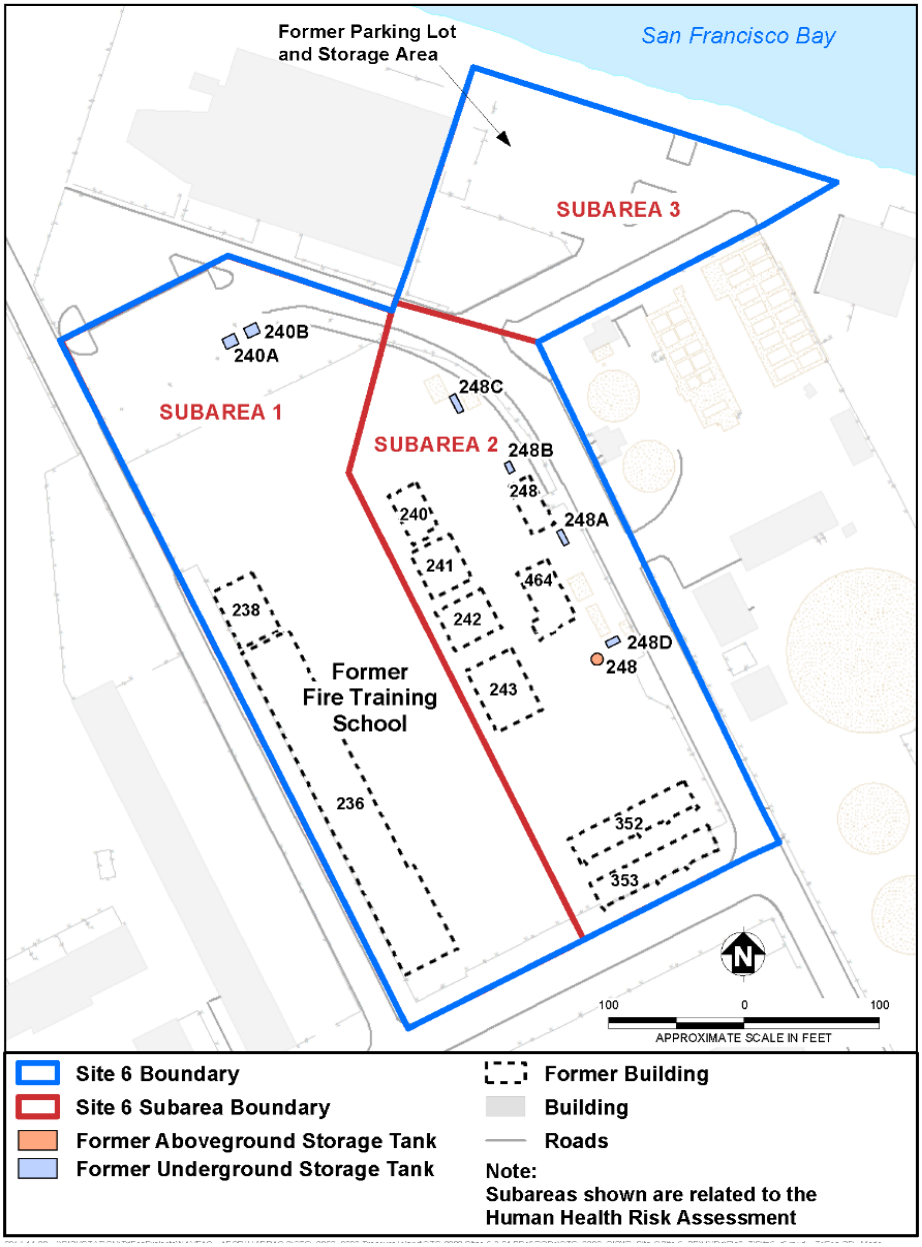

Figure 2. Site 6 Former Facilities

1.1 SELECTED REMEDIES

The remedies selected in this ROD/Final RAP are necessary to protect public health, welfare, and the environment from actual or potential releases of CERCLA hazardous substances and collocated petroleum constituents at the site. The HHRA for Site 6 was conducted separately for each of the subareas shown on Figure 2. The site is not currently used, though it was recently used as a temporary staging area by environmental workers to support the ongoing removal action for low-level radiological waste (LLRW) at Site 12. The HHRA considered all receptors anticipated to be associated with future land uses at Site 6 (such as a recreational user, occupational user, and construction worker), including a hypothetical future resident, who is not expected to be associated

with the site in the future but was included for risk management decision purposes. A SLERA conducted in 2007 considered risk to terrestrial receptors (such as plants, invertebrates, birds, and mammals) and found that no quality terrestrial habitat is present on Site 6. A more recent SLERA conducted as part of the RI and feasibility study (FS) report considered potential effects to aquatic receptors only. Section 2.5 of this report provides additional details about these human health and ecological risks.

The RI/FS provided for remedial actions addressing soil, soil gas, and groundwater. After the RI/FS was completed in 2012, a petroleum source removal action in the UST 240 area ultimately addressed the source of soil gas in this area. The selected remedial actions for Site 6 include actions to verify that COCs have been adequately addressed for soil gas and target COCs in soil and groundwater to protect human receptors and COECs in groundwater to protect aquatic ecological receptors. The remedies for soil and groundwater were developed to meet remedial action objectives (RAO) to prevent or minimize exposure to chemicals in soil and groundwater at concentrations greater than the remediation goals (RG) established for the different anticipated users.

The **remedy for soil(4)** consists of:

- Excavation of unsaturated zone soil (assumed to include soil to a maximum depth of 5.5 feet below ground surface [bgs]) in Subareas 1, 2, and 3 with concentrations of COCs above RGs and off-site disposal at a permitted disposal facility. The depth and lateral extent of excavations would be based on existing data as further refined by pre-remedial design (RD) sampling and confirmed by sampling after the excavations are complete.

- Possible addition of oxygen release compound (ORC) to excavations in select areas (if deemed appropriate during the RD) where groundwater contamination could re-contaminate the clean backfill.

- ICs, as described in Section 2.10.2.1, to prohibit residential uses of Site 6 (residential uses include constructing a residence, hospital for humans, or day care facility for children, and growing produce for human consumption); to require implementation of a contaminated soil management plan when excavation is planned at Site 6; to require an evaluation of potential risk to aquatic wildlife receptors if wetland habitat is constructed at Site 6[3]; and to prohibit the alteration, disturbance, or removal of any component of the remedial action. IC boundaries are shown on Figure 3 and will be further refined during the RD.

3 The IC protective of potential aquatic ecological receptors is necessary because there was no quality habitat at Site 6.at the time of the RI/FS and there were no plans to develop any quality habitats. However, since the RI/FS was completed, the reuse plan changed to include potential wetland habitat for aquatic receptors. As a result, if wetland habitat is created in the future at Site 6, the specific development plans must be reviewed to determine if the habitat will be protective of aquatic receptors.

The **remedy for groundwater**(5) includes:

- ICs, as described in Section 2.10.2.2, to prohibit residential uses of Site 6 (residential uses include constructing a residence, hospital for humans, or day care facility for children and growing produce for human consumption); to prevent construction worker exposure to COCs in groundwater at Subareas 1 and 2 encountered in trenching activities by requiring the implementation of a contaminated groundwater management plan when excavation is planned; and to prohibit the alteration, disturbance, or removal of any component of the remedial action. IC boundaries are shown on Figure 3 and will be further refined during the RD.

- Groundwater monitoring to provide information on the size and behavior of the plumes and to verify that COECs do not discharge to San Francisco Bay at concentrations that pose potential risks to aquatic receptors. The groundwater monitoring wells for the UST 240 area are shown on Figure 3.

The remedy for soil gas consists of:

- Collection of additional soil gas data for naphthalene at the location of soil gas sample 06-SG08 as shown on Figure 3, and as described in Section 2.10.2.3. The data will be evaluated to verify that past source removal actions have reduced the level of naphthalene in soil gas to acceptable levels before the property is transferred. This additional investigation will address one soil gas sample location (06-SG08) that was collected during a 2010 data gaps investigation. The analytical results for that sample estimated the concentration of the semivolatile organic compound (SVOC) naphthalene at 34 micrograms per cubic meter ($\mu g/m^3$), which exceeded the screening level of 31.9 $\mu g/m^3$. The soil gas sample was collected east of the former UST 248 Area excavation.

- ICs to require the construction of enclosed structures at Subarea 1 include vapor mitigation measures or the completion of a vapor intrusion evaluation that demonstrates potential vapor intrusion risks are acceptable.

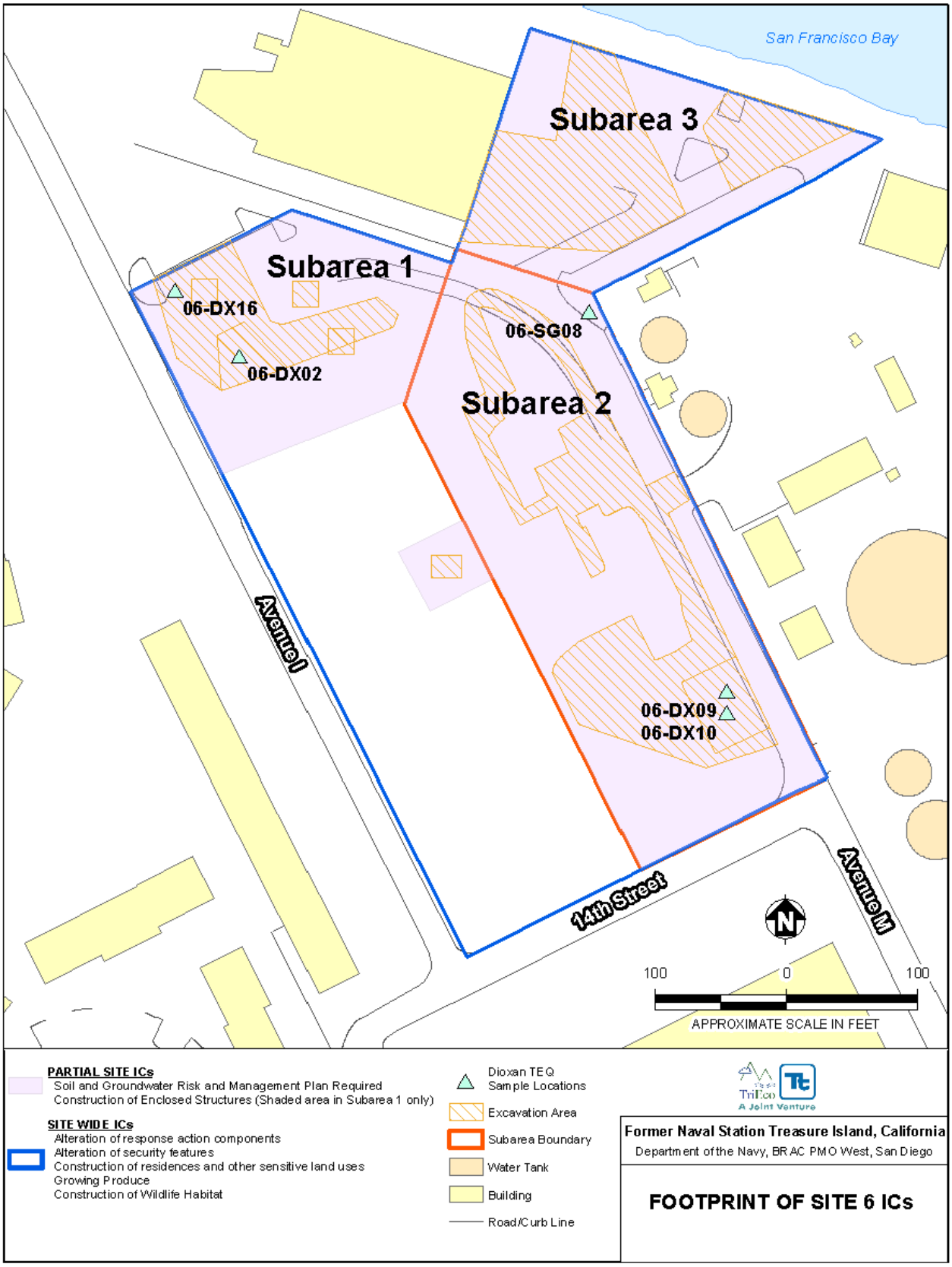

Figure 3. Institutional Control Footprints

The selected remedies are protective of human health and the environment, comply with federal and state statutes and regulations that are determined to be applicable or relevant and appropriate (ARAR), and are cost-effective. No source materials that constitute principal threat waste are present at Site 6. The selected remedial actions use permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The remedies for soil and soil gas do not satisfy the statutory preference for treatment that reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element. The Navy addressed soil gas contamination during a removal action completed in 2012. As a result, the remedy for soil gas will confirm that concentrations are acceptable for the planned reuse. Treatment options were eliminated for soil based on cost and effectiveness and difficulty of implementation considerations.

The remedy for groundwater may satisfy the statutory preference for treatment because it includes the addition of an ORC to excavations if concentrations of contaminated groundwater are encountered that would trigger this possibility to treat the groundwater.

This remedy will result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure. CERCLA § 121 requires 5-year statutory reviews at sites where the remedial action does not achieve concentrations of hazardous substances acceptable for unlimited use and unrestricted exposure. The Navy will complete CERCLA 5-year reviews of the remedies at Site 6 as long as concentrations of COCs and COECs remain on site at levels that do not allow for unlimited use and unrestricted exposure.

1.2 DATA CERTIFICATION CHECKLIST

The following information is included in Section 2 of this ROD/Final RAP. Additional information can be found in the Administrative Record file for this site, Attachment A.

COCs and COECs	Section 2.5
Baseline risk represented by the COCs	Section 2.5
Remediation goals established for COCs and the basis for these goals	Section 2.8
Principal threat wastes	Section 2.7
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater	Section 2.4
Potential land and groundwater use that will be available at the site as a result of the selected remedy	Section 2.9.2

Estimated capital costs, annual operation and maintenance, and total present-worth costs; discount rate; and the number of years over which the remedy cost estimate is projected	Table 5
Key factors that led to selecting the remedy (for example, a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)	Section 2.10.1

If contamination posing an unacceptable risk to human health or the environment is discovered after execution of this ROD/RAP, the Navy will undertake all necessary actions to ensure continued protection of human health and the environment.

1.3 AUTHORIZING SIGNATURES

This signature sheet documents the Navy's selection of the remedy in this ROD/Final RAP. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this ROD/Final RAP. The parties may sign this sheet in counterparts.

12/08/2014

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Bruce H. Wolfe
Executive Officer
San Francisco Bay Regional Water Quality Control Board

Date

2. DECISION SUMMARY

2.1 SITE DESCRIPTION AND HISTORY

NAVSTA TI is located in San Francisco Bay within the City and County of San Francisco. The naval station consists of two contiguous islands connected by a causeway. The northern island, Treasure Island (TI), encompasses about 403 acres, and the southern island, Yerba Buena Island (YBI), encompasses about 147 acres (Figure 1). TI was constructed on the shoals of YBI with San Francisco Bay fill between 1936 and 1937 for use as an airport for the City of San Francisco. It was also the site of the 1939 Golden Gate International Exposition. Navy operations at TI began in 1941, primarily for training, administration, housing, and other support services to the U.S. Pacific Fleet. In 1993, the Defense Base Realignment and Closure Commission recommended closure of NAVSTA TI, and the facility was subsequently closed on September 30, 1997.

Site 6 is the Former Fire Training School and covers approximately 4.54 acres of open space in the northeastern portion of NAVSTA TI (Figure 1). It consists of a larger rectangular area where the Former Fire Training School was located and a smaller, wedge-shaped area of the northeastern portion of the site that was used for parking and storage. Most of Site 6 was used for firefighting training between 1944 and 1992. During the fire training exercises performed at Site 6, petroleum-, magnesium-, and wood-fueled fires were set to simulate real fires at the Former Fire Training School Area and then extinguished using a mixture of water and biodegradable emulsifiers. Based on the westerly prevailing wind direction, dioxins and furans were deposited primarily at the eastern and northeastern portions of the site. The Former Fire Training School consisted of 10 buildings, six USTs, one AST, and a central training yard, known as the central training area. The central training area included an L-shaped concrete training yard with a concrete pad. Discussions with personnel who participated in these activities indicate that the class of foam used was protein based. Liquid fuels used for fire training were stored in two USTs located in the northern portion of the site, designated as 240A and B, and in the east-central portion of the site, designated as UST 248A and 248D, as shown in Figure 2. The UST 248 area also contained an oil-water separator system, an AST (AST 248), and several sumps. Wastewater runoff from training exercises was collected in the trenches and conveyed to sumps and surge pits along the eastern side of Site 6. Figure 4 presents the conceptual site model for Site 6.

Some of the 10 buildings formerly on Site 6 in the central training yard were used to simulate fires by the Former Fire Training School as mockups for boiler rooms, forecastles, engine rooms, and flight decks. The other buildings were used as classrooms and support spaces. Although the former parking and storage area of Site 6 was not associated with the Former Fire Training School, this area was added to Site 6 to account for dioxins and furans detected in soil in this parking and storage area. All 10 buildings associated with the former fire training school were demolished in 1993; the main portion of Site 6 is secured by chain-link fencing and is currently used as a temporary staging area to support cleanups in other areas of NAVSTA TI. The four 1,500-gallon USTs (240A, 240B, 248A, and 248B) that contained gasoline and diesel for firefighting training and were present in the northern and eastern portions of the training yard have been removed. USTs 240A and 240B were removed in 1992, and USTs 248A and 248B were removed in 1995. Two 1,000-gallon USTs (248C and 248D) previously used to store waste fuel were removed in 2002. One AST (248), located near UST 248D, was removed prior to 1995. In 2013, the Navy

completed a petroleum corrective action at the UST 240 area that included excavation and off-site disposal of petroleum-impacted soil, as shown on Figure 6, removal of groundwater mixed with residual free product, backfilling with clean import fill, and application of in situ bioremediation (ISB) amendments. The objective of the corrective action was to perform source removal activities necessary to comply with the guidelines in Water Board interim guidance on cleanup of low-risk fuel sites and the State Water Resources Control Board's low-threat UST closure policy.

The wedge-shaped area located on the eastern side of Site 6, Subarea 3, was partially located in an area where scrap metal was recycled during WWII and was a parking and storage area associated with a Damage Control School complex from the 1960s until closure in the mid-1990s. The Damage Control School complex included Buildings 461 and 463, the training ship mockup (USS Pandemonium), and the fire training school. The fire training was organized as a separate school under the Damage Control School.

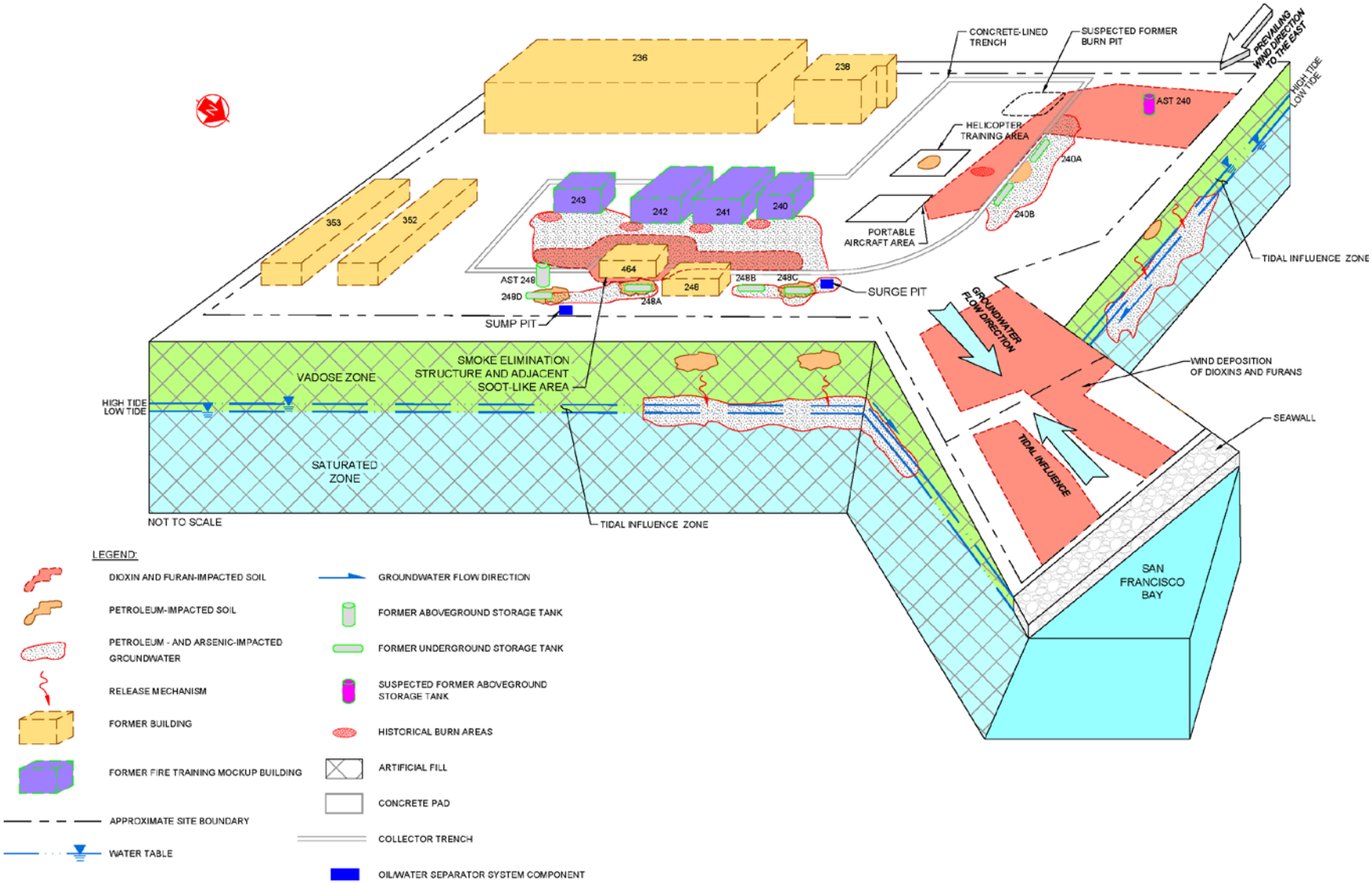

Figure 4. Conceptual Site Model for Site 6

2.2 SITE CHARACTERISTICS

The topography at TI is flat, consisting primarily of sand dredged from the San Francisco Bay and topsoil from the Sacramento-San Joaquin Delta; TI is retained by a perimeter of rock and sand dikes. All land above sea level and extending to depths between approximately 10 and 50 feet below sea level is composed of fill. Ground surface elevations at Site 6 range from approximately 10 to 12 feet above mean sea level, based on the National Geodetic Vertical Datum of 1929. Surface cover at Site 6 is a combination of concrete and asphalt and unpaved areas. Surface runoff on paved areas flows into on-site storm catch basins and drains directly into San Francisco Bay. Runoff on unpaved areas infiltrates through the soil. There are no perennial surface water bodies located at Site 6. Active and abandoned utility lines are present at Site 6.

The average annual temperature at TI is 59.5ºF. The average annual precipitation is about 23 inches. Approximately 90 percent of the annual precipitation occurs from November to April. The prevailing wind direction for the Bay Area is from the northwest. Wind speed is less than 6 miles per hour for more than 50 percent of the time and exceeds 12 miles per hour approximately 10 percent of the time.

TI is underlain by dredged fill and shoal deposits predominantly consisting of fine- to coarse-grained sand, with varying proportions of shell fragments, silt, and clay. The dredged fill was emplaced on top of the shoal sand during construction of TI. Underlying the shoal sand is a soft bay mud deposit, which overlies a former channel of Temescal Creek. The estimated depth of the former channel is 95 feet below mean sea level

Generally, the artificial and disturbed nature of Site 6 does not provide **wildlife habitat(6)** and limits exposure of site soil to opportunistic species that can adapt to high disturbance regimes. Vegetated parts of NAVSTA TI are made up of lawns and landscaped areas planted with largely non-native species. Disturbances from vehicular traffic and widespread human presence also reduce the quality of the habitat for wildlife species.

Groundwater at Site 6(7) is encountered from 3 to 8 feet bgs. Levels are higher during the rainy season (November to April) and lower during the dry months (May to October). The direction of groundwater flow is generally north to northeast, toward the San Francisco Bay. Groundwater at NAVSTA TI is not a potential source of drinking water. Groundwater recharge at NAVSTA TI occurs primarily from infiltration of precipitation, with some contribution from landscape irrigation. Perched groundwater conditions may exist locally above the shallow water table because of the presence of relatively impermeable silt and clay lenses. The groundwater elevations at TI are tidally influenced and fluctuate by approximately 1.81 feet at near-shore locations (30 feet from the bay), and by approximately 0.12 foot at inland locations (250 feet from the bay). The use of groundwater for municipal and domestic supply at TI is limited by the following factors:

1. The small volume of fresh groundwater available;
2. The likelihood of saltwater intrusion; and
3. Potential future ground improvements for stability (stone columns and dynamic compaction).

2.3 PREVIOUS INVESTIGATIONS

Chemicals potentially released at Site 6 are primarily attributed to fire training activities by the Navy and spill or leaks from USTs, ASTs, and associated piping and structures. Identified contamination is associated with dioxins and furans, TPH and petroleum constituents, volatile organic compounds (VOC), SVOCs, PCBs, MCPP, and metals. Table 1 summarizes the previous studies and investigations of potential contamination conducted at Site 6.

No industrial sources of the COCs arsenic or manganese are known or suspected at the site. The elevated concentrations of these metals in groundwater are attributed to naturally occurring, insoluble arsenic and manganese in soil transforming to a more soluble form that migrates to groundwater as a result of local reducing conditions caused by site petroleum releases. Releases of MCPP probably occurred as a result of a localized spill of herbicide during routine weed control at Subarea 1, as Site 6 was reportedly never used as a pesticide/herbicide storage area. No source of the 1,1,2-trichloroethane detections has been identified.

TABLE 1. CHRONOLOGICAL SUMMARY OF PREVIOUS STUDIES AND INVESTIGATIVE ACTIVITIES*

Previous Study / Investigation	Date	Purpose
Tank Testing	1986	Evaluate tank integrity
Initial UST Investigation	1987	Evaluate possible contamination from leaking USTs
Initial Hazardous Material Investigation	1987	Evaluate the nature and extent of hazardous substances
Floating Product Removal Study	1991	Evaluate the viability of wells for floating product removal Evaluate permeability of soils on site
Hazardous Waste Testing of Building Materials	1992	Evaluate potential presence of hazardous metals prior to building demolition
UST 240A and 240B Removal	1992	Remove USTs and collect additional data through soil and groundwater sampling
Phase I RI	1992	Further define the extent of chemicals in soil near wells 06-MW05 and 06-MW08
Phase IIA RI	1996	Conduct quarterly sampling to monitor impacts from floating product on site
AST 248 and UST 248A and 248B Removal	1995	Evaluate impacts from leaking AST and USTs Remove AST 248 and UST 248A and 248B
Phase IIB RI	1996	Collect samples to define the limits of chemical releases Identify type of fuel contamination present Assess the presence of VOCs in the vadose zone Install upgradient, cross-gradient, and downgradient wells to characterize groundwater contamination
Environmental Baseline Survey Sampling	1997	Evaluate potential contaminant pathways present on site
Groundwater Monitoring	1998	Perform further groundwater monitoring and sampling in support of ongoing remedial activities
Bioventing and Biosparging Pilot Test	2000	Evaluate biosparging/bioventing as potential remedial alternatives
Focused Site Characterization Sampling	2000	Further characterize the extent of petroleum contamination in soil and groundwater

Previous Study / Investigation	Date	Purpose
PAH Sampling	2001	Evaluate the association (if any) between TPH and PAH at the site
Petroleum Remedial Excavation Program	2002	Two 1,000-gallon USTs (248C and 248D) previously used to store waste fuel were removed
Petroleum Remedial Excavation Program	2003	Remove TPH-contaminated soil in the UST 240 Area, Former Helicopter Training Area, and UST 248 Area
Environmental Baseline Survey Data Gaps Investigation	2003	Further define the extent of dioxin- and furan-contaminated soil within Site 6 and area east of Site 6
Soil Gas Sampling	2004	Evaluate the presence and distribution of BTEX in the vadose zone within the UST 240 Area
Phase II PCB Investigation	2006	Determine if PCB-contaminated soil and building materials were present at current or former locations of transformers and electrical devices
PCB Removal Action	2007	Trenching was performed to remove PCB-contaminated soil.
Data Gaps Investigation	2010	Further define the nature and extent of contaminants of concern on site
Remedial Investigation/Feasibility Study	2012	Summarize and evaluate the nature and extent of contamination at Site 6. Identify remedial action objectives (RAOs), and develop remedial alternatives
Post Construction Summary Report for Underground Storage Tank and Aboveground Storage Tank 240 Area	2013	Source removal activities necessary to address petroleum-based compounds to the point that closure may be proposed

Notes:
* The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Site 6.

bgs	Below ground surface	PRC	PRC Environmental Management, Inc.
BTEX	Benzene, toluene, ethylbenzene, and xylenes	RI	Remedial Investigation
ERM-West	Environmental Resources Management West, Inc.	SFPUC	San Francisco Public Utilities Commission
ERRG	Engineering/Remediation Resources Group, Inc.	Shaw	Shaw Environmental, Inc.
HLA	Harding Lawson Associates	SVOCs	Semivolatile organic compounds
IR	Installation Restoration	TPH	Total petroleum hydrocarbons
MNA	Monitored natural attenuation	TtEMI	Tetra Tech EM Inc.
MTBE	Methyl tert-butyl ether	UST	Underground storage tank
PAHs	Polycyclic aromatic hydrocarbons	VOCs	Volatile organic compounds
PCB	Polychlorinated biphenyl	WWTP	Wastewater treatment plant

Petroleum remedial activities were conducted at Site 6 between May 2002 and January 2003. Remedial activities included excavation of USTs and excavation of petroleum-contaminated soils near the USTs, pipelines, and oil-water separator (OWS) components throughout the site, including evaluation and excavation of free product near USTs 240A and 240B and the UST 248 Area. Approximately 5,700 tons of soil (4,317 tons of TPH-contaminated soil and 1,390 tons of dioxin- and furan-contaminated soil) was excavated during the removal actions at Site 6 during this period.

In October 2002, burn surfaces were identified near the former Building 464 foundation shown on Figure 2, during petroleum remedial excavation activities at the UST 248 area. Building 464 was previously used as a smoke elimination structure as part of the firefighting training school. Results from shallow soil samples collected in this area included dioxins and furans above the soil screening levels. The excavation was subsequently expanded to include removal of burn debris and soot discolored areas. Results from confirmation samples included dioxins and furans above the screening levels, causing Site 6 to be transferred to the CERCLA program in 2003.

Further investigation and delineation of dioxins and furans detected in soil was conducted under the CERCLA Program as part of the environmental baseline survey (EBS) data gaps investigation in 2003. A soil gas sampling program was completed in October 2004 to evaluate VOCs in soil gas near former USTs 240A and 240B. Groundwater at Site 6 continues to be monitored semi-annually under the Basewide Petroleum Sites Groundwater Monitoring Program.

A basewide PCB investigation was conducted to evaluate the presence of PCBs at various transformers, capacitors, and switch locations. The investigation consisted of collecting samples from concrete pads and vaults, asphalt, and wood associated with pole-mounted transformers and soil, where present. Two pad-mounted transformers at Site 6 were identified for assessment: (1) Transformer TX-151, located north of former UST 248C in the east-central portion of Site 6, and (2) Transformer TX-152(2), located near the northeast corner of Building 461. At Transformer TX-151, four rounds of step-out trenching and sampling were conducted to remove PCB-contaminated soil. Analytical results indicated that PCB concentrations were less than the high occupancy screening level of 1 mg/kg in all confirmation soil samples. Three soil samples reported the high-risk PCB congener Aroclor-1260 at concentrations exceeding the EPA residential-based RSL of 0.22 mg/kg. At Transformer TX-152(2), trenching and sampling were conducted to remove PCB contaminated soil. Analytical results indicated that PCB concentrations were less than the high occupancy screening level of 1 mg/kg in all samples. One soil sample reported the high-risk PCB congener Aroclor-1260 at concentrations exceeding the EPA residential-based RSL of 0.22 mg/kg.

In 2010, the Navy completed a CERCLA data gap investigation to further evaluate the nature and extent of chemicals in soil, soil gas, and groundwater. After an RI/FS was completed in 2012, the Navy implemented a removal action to further address petroleum-contaminated soil. During the removal action, approximately 800 cubic yards of soil was removed and ISB amendments were applied as part of the backfilling process to mitigate the potential for groundwater contamination to re-contaminate clean backfill. This removal action is anticipated to have eliminated the source of soil gas in the UST 240 area. The remedy includes collection of additional soil gas data for naphthalene at the location of former soil gas sample 06-SG08 as shown on Figure 3. The data will be evaluated to determine whether naphthalene in soil gas is present at levels requiring additional action to be protective of human health and the environment before the property is transferred.

In 2013, after the final RI/FS, the Navy completed a petroleum corrective action in the UST 240 area. Approximately 800 cubic yards of petroleum-impacted soil was excavated and approximately 525 gallons of residual product mixed with groundwater was removed. In addition, ISB amendments were applied as an incidental treatment measure to the excavation as part of the backfilling process. While this removal action was focused on petroleum and petroleum-related compounds, MCPP-contaminated soil was also removed, allowing MCPP to be removed as a COC in soil as further discussed in Section 2.10.5.1.a. MCPP remains a COC for groundwater in Subarea 1.

Uncertainties exist regarding extents of dioxins and furans, naphthalene, and VOCs in soil and in soil gas at four specific areas of the site. The following areas have been identified where further data may help refine the extent of these chemicals in soil:

- Based on the elevated dioxin toxicity equivalence (TEQ) concentration (415 nanograms per kilogram) reported at sampling location 06-DX16, the extent of dioxins and furans in soil has not been fully delineated at the northwest boundary of Site 6. Although data from Site 12 suggest that dioxins and furans are not present to the west, additional data should be collected north of the 06-DX16 sampling location. In addition, the vertical extent (greater than 2.5 feet bgs) of dioxins and furans in soil has not been delineated in the area of sampling location 06-DX02.

- Based on dioxin TEQ concentrations reported at sampling locations 06-DX09 and 06-DX10, the vertical extent (greater than 2.5 feet bgs) of dioxins and furans in soil has not been delineated at the southeast boundary of Site 6.

- The extent of VOCs and naphthalene in deep soil (greater than or equal to 5.5 feet bgs) had not been adequately delineated around former USTs 240A and 240B and suspected former AST 240. However, additional VOC and naphthalene data were collected as part of the corrective action for the UST/AST 240 Area for confirmation purposes. These data will be evaluated during the RD to determine if the data gap has been adequately addressed.

- Uncertainties exist regarding occurrence of naphthalene in soil gas. The DTSC soil gas advisory lists EPA Method TO-17 as the preferred method for naphthalene evaluation in soil gas. All soil gas samples for naphthalene analysis were analyzed using the EPA TO-15 method for sample collection and analysis. The RI/FS concluded that additional data should be collected using the EPA Method TO-17 to evaluate naphthalene concentrations in soil gas to address this potential data gap at Site 6. Additional data collected for naphthalene will target the areas of Site 6 where naphthalene may cause a potential risk to future building occupants (the 0.9-acre area at the southeastern portion of Site 6 planned for institutional use).

- Collection of additional soil gas data for naphthalene is needed at the location of soil gas sample 06-SG08, as shown on Figure 3. The data will be evaluated to verify that past source removal actions have reduced presence of naphthalene in soil gas to acceptable levels before the property is transferred.

2.4 CURRENT AND POTENTIAL FUTURE SITE USES

Site 6 is located within the northeast quadrant of TI that is currently used for mixed purposes. In 1992, the Navy terminated its use of Site 6 as a Fire Training School, resulting in the removal of all buildings (except the foundations), structures, ASTs, and USTs. The main portion of the site is secured by chain-link fencing and is being used as a temporary staging area for roll-off bins to support the ongoing non-time critical removal action for Site 12. This part of Site 6 is a radiologically controlled area, and is used as a temporary staging area for roll-off bins to support the ongoing response actions at other sites on TI. The portion of Site 6 that was the Former Parking and Storage Area has been used as a stockpiling area for clean soil as well as to support other removal activities at TI.

Planning for the future use of Site 6 began in 1994 when the City of San Francisco and a Citizen's Reuse Committee developed the draft reuse plan for all of NAVSTA TI, including Site 6. This reuse plan was further refined in compliance with the California Environmental Quality Act (CEQA). The refined plan presented in the **Final Environmental Impact Report (EIR)(8)** was certified by the San Francisco Planning Commission in 2011. The EIR lists the proposed future uses of Site 6 as public open space for public services and for civic and institutional uses. The EIR lists the proposed future uses of Site 6 as public open space for public services, and for civic and institutional uses. The area around Site 6 is planned for open space, parklands, and institutional uses, including a new wastewater treatment and recycled water plant, and a 4- to 6-acre parcel that the San Francisco Public Utilities Commission would use for renewable energy projects and above and below-ground public infrastructure and utility systems as shown on Figure 5. Improvements to the open space that surrounds and includes Site 6 could include new roads, hiking and walking trails, picnic areas, playgrounds, sports fields, a café and snack bar, and other public-park outdoor areas and recreational spaces. There are no perennial surface water bodies located at Site 6. Future plans for lands adjacent to Site 6 may include development of wetlands. Groundwater at Site 6 is not a potential source of drinking water, and no other uses of groundwater are planned at Site 6.

2.5 SUMMARY OF SITE RISKS

The source of chemicals potentially released at Site 6 (including dioxins and furans, TPH, VOCs, benzo(a)pyrene, naphthalene, MCPP, arsenic, and manganese) is mostly attributed to fire training activities by the Navy. A conceptual site model (CSM) showing historical activities at Site 6 is provided in Figure 4. Most of the site contamination is believed to be from wastewater discharge and burn residues from firefighting training activities and from USTs and ASTs associated with the fire training facility. The 2012 final RI/FS report identified the likely source of the release of MCPP as being from a localized spill of herbicide during routine weed control.

Potential future risks to human health were evaluated in a baseline HHRA in the 2012 final RI/FS report. The baseline HHRA supersedes previous risk evaluations included in the **2002 CAP(9)** and **2005 petroleum closure request(10)**. Results of the baseline HHRA are presented below in Section 2.5.1.

The potential risks to terrestrial ecological receptors were evaluated in a tier 1 SLERA in 2007 for select upland sites on TI, including Site 6. The 2012 RI/FS Report included an evaluation of potential risks to aquatic wildlife in San Francisco Bay via the groundwater discharge to surface water pathway. Results of the 2007 SLERA and 2012 ecological risk evaluation for Site 6 are presented in Section 2.5.2.

2.5.1 Human Health Risk Assessment

A quantitative **baseline HHRA(11)** was completed in 2012 for potential exposure to soil, soil gas, and groundwater at Site 6. Based on the historical use of Site 6 and an evaluation of the data, the site was subdivided into three subareas (1, 2, and 3) for the baseline HHRA. Subarea 1 consists of the western portion of the site, including the UST 240 Area. Subarea 2 consists of the eastern portion of the site, including the UST 248 Area and the 0.9-acre portion designated for institutional

use. Subarea 3 consists of the Former Parking and Storage Area, located at the northeastern portion of the site.

Figure 5. Redevelopment Land Use Map

Access to Site 6 is limited to occasional visits by authorized environmental workers. However, potential exposure by the environmental workers to residual contamination at Site 6 is considered minimal because pavement, concrete, and gravel at Site 6 prevent direct contact with chemicals remaining in soil and act as a barrier to prevent the release of particulates and VOCs into ambient

air. Therefore, no current receptors were quantitatively evaluated in the baseline HHRA. Receptors quantitatively evaluated in the baseline HHRA for the three subareas were based on anticipated future uses and hypothetical future uses of Site 6 that were considered to provide alternative risk estimates for unrestricted reuse. The following text describes the receptors considered for each type of future use:

- Anticipated future use:
  - Recreational User (Subareas 1, 2, and 3), based on the redevelopment plan for publicly accessible open space and recreational facilities
  - Occupational Worker (Subarea 2), based on the proximity to the proposed wastewater treatment plant
  - Construction Worker (Subareas 1, 2, and 3), based on the potential for future development and site maintenance that could include excavation or trenching
- Hypothetical Future Use[4]:
  - Occupational Worker (Subareas 1 and 3), based on the possibility of commercial buildings or other ancillary facilities being constructed elsewhere at Site 6
  - Resident (Subareas 1, 2, and 3), though residential is not a planned land use, a hypothetical resident was included solely for purposes of supporting risk management decisions for the site

The following exposure pathways were quantified in the baseline HHRA for all receptors, unless noted below:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemical vapors in ambient (outdoor) air from soil
- Inhalation of chemicals adsorbed to windblown soils
- Inhalation of chemical vapors in indoor air from soil (as soil gas) (occupational worker and hypothetical resident only)
- Dermal contact with chemicals in a construction trench from groundwater (construction worker only)
- Inhalation of chemical vapors in a construction trench from groundwater (construction worker only)

4 RGs were developed for hypothetical future uses in the RI/FS but they are not included in Table 4 as those hypothetical uses have been restricted by an IC.

Soil, soil gas, and groundwater were evaluated separately for each of the three subareas. The HHRA assumed that soil exposure would be limited to surface soil (0 to 2 feet bgs) if redevelopment involved only removal of paving and other shallow features, or could include subsurface soil (0 to 8 feet bgs) if redevelopment involved disturbance of deeper soil by trenching or excavation work. Receptors may be indirectly exposed to chemicals in groundwater as a result of vapor migration into buildings and to outdoor air in a construction trench, as well as direct exposure (dermal contact) to groundwater within a trench. Receptors are not likely to be otherwise exposed to groundwater because the groundwater at the site is not currently used for any purpose (e.g., drinking, showering, cooking, or irrigation) and groundwater at NAVSTA TI is **not a potential source of drinking water(12)**. For purposes of this baseline HHRA, the risk evaluation for vapor intrusion of volatile chemicals in groundwater into a building were provided in the RI/FS report for informational purposes; thus, the risk results were summed based on the results of the evaluation of vapor intrusion of soil gas into indoor air.

Potential cancer risks and noncancer hazards were calculated based on reasonable maximum exposure (RME) assumptions recommended by EPA and DTSC. These assumptions are based on a reasonable maximum exposure rather than an average or medium-range exposure assumption and provide a conservative and protective approach that estimates the highest health risks that are reasonably expected to occur at a site. Actual risks from exposures to chemicals in soil and groundwater at Site 6 are likely to be lower.

An HHRA estimates the risks posed if no action is taken. The HHRA provides the basis for determining when remedial action is necessary and identifies the contaminants and exposure pathways that need to be addressed to prevent potential risk to human health. Cancer risks and noncancer health hazards are **characterized(13)** separately. Cancer risks are expressed as the incremental probability that an individual will develop cancer as a direct result of exposure over a lifetime to the carcinogenic chemical. Potential cancer risks less than 1 person in 1,000,000 (expressed as 10^{-6}) are considered insignificant and do not usually warrant a cleanup action. Cancer risks exceeding 1 person in 10,000 (expressed as 10^{-4}) are considered significant and usually require a cleanup action. When risks are between 1 in 1,000,000 and 1 in 10,000, the lead agency, in consultation with the support agencies, makes a decision about the need for a cleanup action based on site-specific circumstances. Noncancer hazards are expressed as a hazard index (HI). An estimated HI at or below 1 does not warrant a cleanup action and an HI greater than 1 generally warrants a cleanup action.

The **results(14)** of the baseline HHRA are summarized in Table 2. COCs identified in the HHRA are summarized in Table 3.

TABLE 2. ESTIMATED INCREMENTAL CANCER RISKS AND NONCANCER HAZARDS

Receptor	Exposure Pathway	Cancer Risk	Hazard Index
Subarea 1 – Western Half of the Former Fire Training School			
Future Recreational User	Surface Soil (0 to 2 feet bgs)	5×10^{-5}	4
	Subsurface Soil (0 to 8 feet bgs)	3×10^{-5}	8
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs), Groundwater, and Trench Vapors	2×10^{-5}	20
Hypothetical Future Occupational Worker	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	1×10^{-3}	18
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	1×10^{-3}	19
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	2×10^{-3}	31
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	2×10^{-3}	37
Subarea 2 – Eastern Half of the Former Fire Training School			
Future Recreational User	Surface Soil (0 to 2 feet bgs)	8×10^{-5}	7
	Subsurface Soil (0 to 8 feet bgs)	5×10^{-5}	5
Future Occupational Worker	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	3×10^{-5}	1
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	2×10^{-5}	0.7
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs), Groundwater, and Trench Vapors	5×10^{-6}	5
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	1×10^{-4}	10
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	8×10^{-5}	8
Subarea 3 – Former Parking and Storage Area			
Future Recreational User	Surface Soil (0 to 2 feet bgs)	2×10^{-5}	1
	Subsurface Soil (0 to 8 feet bgs)	7×10^{-6}	2
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs), Groundwater, and Trench Vapors	5×10^{-7}	6
Hypothetical Future Occupational Worker	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	7×10^{-6}	0.2
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	3×10^{-6}	0.2
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs) and Indoor Vapor Intrusion	2×10^{-5}	2
	Subsurface Soil (0 to 8 feet bgs) and Indoor Vapor Intrusion	1×10^{-5}	3

Notes:

Results shown above are based on EPA-preferred toxicity values. In addition, risks include contribution of inhalation of chemicals in indoor air from soil gas, but do not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater.

bgs Below ground surface

TABLE 3. CHEMICALS OF CONCERN AT SUBAREAS 1, 2, AND 3 BY RECEPTOR AND MEDIUM

Receptor	Exposure Medium	Chemicals of Concern
Subarea 1 – Western Half of the Former Fire Training School		
Future Recreational User	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ, benzene*, MCPP***
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ, MCPP***
	Groundwater and Trench Vapor	1,1,2-TCA**, benzene, ethylbenzene, manganese, MCPP, naphthalene
Hypothetical Future Occupational Worker	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ, benzene*
	Indoor Vapor Intrusion (Soil Gas)	Benzene, ethylbenzene, toluene*, xylenes
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	1,2,4-TMB, 1,3,5-TMB*, benzene, chloroform**, Dioxin TEQ, ethylbenzene, MCPP***, naphthalene
	Indoor Vapor Intrusion (Soil Gas)	Benzene, chloroform**, ethylbenzene, toluene*, xylenes
Subarea 2 – Eastern Half of the Former Fire Training School		
Future Recreational User	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ
Future Occupational Worker	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ
	Indoor Vapor Intrusion (Soil Gas)	--
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ
	Groundwater and Trench Vapor	Arsenic, manganese
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Benzo(a)pyrene*, Dioxin TEQ, 1-methylnaphthalene*
	Indoor Vapor Intrusion (Soil Gas)	--
Subarea 3 – Former Parking and Storage Area		
Future Recreational User	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ
Future Construction Worker	Subsurface Soil (0 to 8 feet bgs)	Manganese
	Groundwater and Trench Vapor	--
Hypothetical Future Occupational Worker	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ
	Indoor Vapor Intrusion (Soil Gas)	--
Hypothetical Future Resident	Surface Soil (0 to 2 feet bgs)	Dioxin TEQ, Aroclor-1260
	Subsurface Soil (0 to 8 feet bgs)	Dioxin TEQ, Thallium
	Indoor Vapor Intrusion (Soil Gas)	--

Notes: The sources of these COCs are described in Section 2.3.

COCs shown are from the HHRA in the final RI/FS and were identified in both the EPA and Cal/EPA risk evaluations, unless otherwise noted.

* Benzene was subsequently removed as a COC in soils, as discussed in Section 2.10.5

** Based on the EPA risk evaluation only.

*** MCPP was subsequently removed as a COC in soil as discussed in Section 2.10.5.1.a.

bgs Below ground surface
COC Chemicals of concern
MCPP Methylchlorophenoxypropionic acid
TCA Trichloroethane
TEQ Toxic equivalent quotient (includes both dioxins and furans)
TMB Trimethylbenzene
-- Not applicable, no COC was identified for this medium

The HHRA specifies the **assumptions and uncertainties**(15) inherent in the risk assessment process based on the number of samples collected, their location, the literature-based exposure and toxicity values used to calculate risk, and risk characterization across multiple media and exposure pathways. The effects of uncertainties are overestimation or underestimation of the actual cancer risk or HI. In general, the risk assessment process is based on the use of conservative (health-protective) assumptions that, when combined, are intended to overestimate the actual risk.

The risk assessment also considered hypothetical uses for the purpose of informing the decision-making process. A hypothetical use is one for which there is no plan to take place in the future based on existing community plans. Those hypothetical uses at Site 6 are residential use site-wide and occupational use in Subareas 1 and 3. The selected remedies for Site 6 are protective of these hypothetical uses. The remedies include ICs to prohibit residential uses at Site 6 and the occupational use in Subarea 1. Excavation at Subareas 1 and 3 will achieve a remediation goal for dioxins (the only COC identified for hypothetical future occupational receptors in Subareas 1 and 3) that is also protective of hypothetical future occupational receptors. The ICs will be in the form of deed restrictions for the transfer of property within Site 6. Pursuant to the terms of the March 2000 Memorandum of Agreement between the Navy and DTSC for the use of Covenants to Restrict Use of Property (CRUP), the Navy agrees to convey a separate power to enforce such deed restrictions to DTSC.

2.5.2 Ecological Risk Assessment

Terrestrial habitat on TI(16) at Site 6 was initially characterized during a 1994 site walk as manmade, poor quality, with large areas of pavement, gravel, or buildings restricting use of the site by ecological receptors. During a **1996 special-status plant survey**(17) and habitat assessment of Site 6, no state or federally-listed endangered, threatened or rare plant species were found.. In 2005, the regulatory agencies requested an evaluation of risk to resident species, including plants, invertebrates, birds, and mammals be documented in a SLERA. During a 2006 site visit, Site 6 was noted as a vacant area consisting of about 95 percent pavement, with only small sporadic strips of vegetation inside the fence along the perimeter. These strips of vegetation contained acacia trees, coyote bushes, and ruderal species.

The **2007 SLERA**(18) evaluated potential exposure of terrestrial receptors, including plants, invertebrates, birds, and mammals, to contaminated soil. Based on the artificial and disturbed nature of the site it does not provide wildlife habitat, and limits exposure of site soil to opportunistic species that can adapt to high disturbance regimes. In addition, considering the planned reuse at the time the SLERA was conducted, the 2007 **SLERA recommended** (19) no further action or evaluation of ecological risk. .

Since the 2007 SLERA was completed, the Treasure Island Development Authority (TIDA) has finalized a new redevelopment plan for TI, which includes construction of wildlife habitat at Site 6. Construction of habitat for terrestrial receptors requires no restrictions, but construction of habitat for aquatic receptors does. Construction of habitat for terrestrial receptors is unrestricted because the 2007 SLERA estimated the risks to plants, and to invertebrates and vertebrate receptors, and identified little or no risk is indicated for terrestrial receptors when hazard quotients were adjusted to remove risk associated with ambient concentrations of COPECs. An IC will be included as a component of the selected remedial action for Site 6 to ensure that unacceptable risk to potential

ecological aquatic receptors does not occur in the future. This IC is described in Section 2.9.1. The IC defines wildlife habitat as aquatic habitat (wetlands) that would support valuable ecological receptors.

The Navy and the regulatory agencies have already signed and published a no action ROD for offshore sediments (evaluated as Site 13) at NAVSTA TI following the determination that **sediments do not pose unacceptable risk(20)** to human health or the environment. Therefore, the 2012 RI/FS report considered only **potential impacts to aquatic wildlife(21)** in San Francisco Bay from contaminants discharging from the site via groundwater. In general, the model results indicated chemicals in groundwater from the UST 240 Area pose a potentially unacceptable risk only under very conservatively assumed conditions. The conservative assumptions and input parameters used in the **BIOSCREEN model(22)** indicate that a low potential exists that contaminants from the UST 240 Area could migrate and eventually impact aquatic wildlife. Based on this evaluation, total TPH and ethylbenzene were considered chemicals of ecological concern (COEC) in groundwater at Site 6. Analytical results for TPH and ethylbenzene in the UST 240 area have consistently demonstrated for the last 10 years that concentrations of these COECs have been below the maximum concentration of the analytes required to achieve compliance with the groundwater screening criteria for aquatic receptors at the point of groundwater discharge to San Francisco Bay.

2.6 BASIS FOR RESPONSE ACTION

The remedial action selected in this ROD/Final RAP is necessary to protect public health, welfare, and the environment from actual or potential releases of hazardous substances. The Navy, in partnership with DTSC and the Water Board, considered all pertinent factors in accordance with CERCLA and NCP remedy selection criteria and concluded that remedial action is necessary to address contaminated soil, soil gas, and groundwater at Site 6. This determination was made because of the potential for receptors to be exposed to contaminated soil, groundwater in a trench, and indoor air (via vapor intrusion of soil gas).

Protection of public health and welfare: The basis for remedial action regarding human health associated with each subarea is as follows:

- **Subarea 1:** (1) Recreational User - exposure to dioxins and furans in soil; (2) Construction Worker - exposure to dioxins and furans in soil and exposure to 1,1,2-trichloroethane, benzene, ethylbenzene, manganese, MCPP, and naphthalene in groundwater; (3) Hypothetical Future Occupational Worker - exposure to dioxins and furans and benzene in soil, and benzene, toluene, ethylbenzene, xylenes (BTEX) in indoor air (via vapor intrusion of soil gas); and (4) Hypothetical Future Residents - exposure to 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, chloroform, dioxins and furans, ethylbenzene, and naphthalene in soil, and BTEX and chloroform in indoor air (via vapor intrusion of soil gas).

- **Subarea 2:** (1) Recreational User - exposure to dioxins and furans in soil; (2) Occupational Worker - exposure to dioxins and furans in soil; (3) Construction Worker - exposure to dioxins and furans in soil, and exposure to arsenic and manganese in groundwater; and (4) Hypothetical Future Residents - exposure to benzo(a)pyrene, dioxins and furans, and 1-methylnaphthalene in soil.

- **Subarea 3:** (1) Recreational User - exposure to dioxins and furans in soil; (2) Construction Worker - exposure to manganese in soil; (3) Hypothetical Future Occupational Worker - exposure to dioxins and furans in soil; and (4) Hypothetical Future Residents - exposure to Aroclor-1260, dioxins and furans, and thallium in soil.

Protection of the environment: The basis for the remedial action regarding the environment are (1) protection of the aquatic receptors from potential risk associated with discharge of ethylbenzene and TPH contaminated groundwater to surface water in the San Francisco Bay and (2) protection for aquatic receptors if new wetland habitat is constructed in the future.

2.7 PRINCIPAL THREAT WASTE

When a remedy is selected, the NCP establishes the expectation that the remedy should use treatment to address the principal threats posed by a site if practicable. "Principal threat" is a concept applied to characterization of source materials at a site. Principal threats are generally considered highly toxic or highly mobile source materials that cannot be contained in a reliable manner, or source materials that would pose significant risk to human health and the environment if exposure would occur. No source materials that constitute principal threat waste are present at Site 6.

2.8 REMEDIAL ACTION OBJECTIVES

Upon determination that remedial action is necessary, RAOs are established to address potential risks posed by a site and to assess the ability of a technology to address those risks. RAOs are environmental, medium-specific goals that will protect human health and the environment.

The Navy developed the following RAOs to address exposures to future commercial/industrial and future construction workers under the reasonably anticipated future use of the property:

- Soil RAOs:

  1. Prevent or minimize ingestion of, dermal exposure to, and outdoor inhalation of chemicals at concentrations exceeding RGs in soil from 0 to 2 feet bgs by future recreational users and future occupational workers.
  2. Prevent or minimize ingestion of, dermal exposure to, and outdoor inhalation of chemicals at concentrations exceeding RGs in soil from 0 to 8 feet bgs by construction workers and future occupational workers.

- Groundwater RAOs:

    1. Prevent or minimize dermal exposure to chemicals in groundwater at concentrations exceeding RGs by construction workers.
    2. Prevent or minimize aquatic receptor exposure to chemicals in groundwater that may discharge to surface water in the San Francisco Bay at concentrations exceeding RGs.

The Navy developed RGs for receptors exposed to contaminants in soil and groundwater. COCs in soil gas at the UST-240 area have already been addressed by a cleanup action for petroleum that occurred in 2012 after the RI/FS was finalized. During the removal action, approximately 800 cubic yards of soil was removed and ISB amendments were applied as part of the backfilling process to mitigate the potential for groundwater contamination to re-contaminate clean backfill. Additional soil gas data for naphthalene will be collected at the location of soil gas sample 06-SG08 in Subarea 2 to investigate the screening level that was exceeded for naphthalene in soil gas before the property is transferred. Table 4 summarizes the RGs for Site 6.

TABLE 4. SUMMARY OF REMEDIATION GOALS

Land Use and Future Receptors by Subarea	COC / COEC	Remediation Goals	
		Soil (mg/kg)	Groundwater (µg/L)
SUBAREA 1 *Open Space* • Recreational, and/or • Construction Worker	1,1,2-Trichloroethane	--	17
	Benzene	--	94
	Dioxin TEQ	1.2×10^{-5}	--
	Ethylbenzene	--	540
	Manganese	--	5,200
	MCPP	--	300
	Naphthalene	--	180
SUBAREA 2 *Public Services, Civic and Institutional* • Recreational, • Occupational, and/or • Construction Worker	Arsenic	--	250
	Dioxin TEQ	1.2×10^{-5}	--
	Manganese	--	5,200
SUBAREA 3 *Open Space* • Recreational, • Hypothetical Occupational, and/or • Construction Worker	Dioxin TEQ	1.2×10^{-5}	--
	Manganese	550	--
SAN FRANCISCO BAY Aquatic Receptors	Ethylbenzene		
	San Francisco Bay (Point of Compliance)	--	43
	Source Area (UST 240 Area)	--	1,393
	TPH		
	San Francisco Bay (Point of Compliance)	--	1,400
	Source Area (UST 240 Area)	--	45,500

Notes:

The "--" indicates that this compound does not have a remediation goal for either soil or groundwater because it does not occur at concentrations that could present unacceptable risk to human or ecological receptors.

µg/L Microgram per liter
COC Chemical of concern
COEC Chemical of ecological concern
TEQ Toxic equivalent quotient (includes both dioxins and furans)

2.9 DESCRIPTION AND COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

The Navy identified the following general response actions (GRA) in the RI to address: (1) direct contact with soil; (2) inhalation of subsurface soil vapors that could migrate into buildings or

trenches; and (3) direct contact with groundwater. The technologies and associated process options identified for each GRA were screened using three criteria: (1) effectiveness, (2) implementability, and (3) cost. Four remedial alternatives were developed to address COCs in Site 6 soil, and five remedial alternatives were developed to address COCs in Site 6 groundwater. The alternatives for soil are:

1. Alternative S-1, no action;
2. Alternative S-2, covers and ICs;
3. Alternative S-3, excavation and off-site disposal of top 2 feet of soil and ICs; and
4. Alternative S-4, excavation and off-site disposal of contamination in the unsaturated zone soil and ICs which also addresses soil vapors by removing the source.

The alternatives for groundwater are:

5. Alternative GW-1, no action;
6. Alternative GW-2, ICs and groundwater monitoring;
7. Alternative GW-3, soil vapor extraction (SVE) with air sparging, bioventing, and biosparging, monitored natural attenuation (MNA), and ICs;
8. Alternative GW-4, ISB with amendments, MNA, and ICs;
9. Alternative GW-5, excavation of saturated zone soil, MNA, and ICs.

2.9.1 Description of Remedial Alternatives

Table 5 provides the major components, details, and cost of each remedial alternative identified in the RI/FS for soil and groundwater.

TABLE 5. SUMMARY OF REMEDIAL ALTERNATIVES

Remedial Alternative	Components	Details	Cost
Soil			
S-1: No Action	None	No actions or costs; this alternative is required by CERCLA as a baseline for comparison with other alternatives. Under this alternative, no further remediation would be performed.	Capital Cost: $0 Annual O&M Cost: $0 Periodic Cost: $0 **Present-Worth Cost: $0** Discount Rate: NA Timeframe: NA
S-2: Covers and Institutional Controls (IC)	− ICs − Engineering Controls	− ICs that would be implemented to maintain the integrity of the covers and to prevent exposure to COCs and COECs in soil and groundwater. − Engineering controls consisting of barriers and signs and in conjunction with ICs. − Construction of covers to allow the planned open space and institutional reuse. Soil covers would primarily be used to facilitate future landscaping to accommodate the open space reuse for most of the site. In select areas, asphalt or concrete covers would be used, as appropriate, where paving is required.	Capital Cost: $500,889 Annual O&M Cost: $12,167 Periodic Cost: $255,097 **Present-Worth Cost: $963,055** Discount Rate: 2.0% Timeframe: 30 years
S-3: Excavation and Off-Site Disposal of Top 2 Feet of Soil and ICs	− Removal − ICs − Engineering Controls	− Excavation of contaminated soil to a maximum depth of 2 feet bgs with off-site disposal of contaminated soil at a permitted disposal facility. − ICs that would be implemented to prevent exposure to COCs and COECs in remaining contaminated soil below 2 feet bgs and groundwater. − Engineering Controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs.	Capital Cost: $1,586,984 Annual O&M Cost: $33,300 Periodic Cost: $822,376 **Present-Worth Cost: $2,936,108** Discount Rate: 2.0% Timeframe: 30 years
S4: **Excavation and Off-Site Disposal of Unsaturated Zone Soil and ICs**	− Removal − ICs − Engineering Controls − Treatment	− Excavation of contaminated unsaturated zone soil (assumed to include soil to an approximate depth of 5.5 feet bgs with off-site disposal at a permitted disposal facility. The depth and lateral extent of excavations would be based on existing data as further refined by pre-design sampling and confirmed by sampling when the excavations are complete. − ICs that would be implemented to prevent exposure to COCs and COECs potentially remaining in soil below 5.5 feet bgs and groundwater. ICs would be implemented during active remediation and would remain in effect for as long as COC and COEC concentrations exceed levels that allow for unlimited land use and unrestricted exposure. − Engineering controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs. − Possible addition of oxygen release compound (ORC) to excavations during backfilling (if deemed appropriate during the remedial design) in select areas where groundwater contamination could re-contaminate the clean backfill.	Capital Cost: $1,909,830 Annual O&M Cost: $39,612 Periodic Cost: $991,002 **Present-Worth Cost: $3,523,270** Discount Rate: 2.0% Timeframe: 30 years

Remedial Alternative	Components	Details	Cost
Groundwater			
GW-1: No Action	None	No actions or costs; this alternative is required by CERCLA as a baseline for comparison with other alternatives. Under this alternative, no further remediation would be performed.	Capital Cost: $0 Annual O&M Cost: $0 Periodic Cost: $0 **Present-Worth Cost: $0** Discount Rate: NA Timeframe: NA
GW-2: **ICs and Groundwater Monitoring**	– ICs – Engineering Controls – Monitoring	– ICs that would be implemented to prevent exposure to COCs and COECs in soil and groundwater. – Engineering controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs. – Groundwater monitoring would serve a two-fold purpose. It would (1) provide awareness of the size and behavior of **COC plumes**(23), and (2) provide additional information on the size and behavior of plumes to be used in verifying that COCs and COECs in groundwater do not pose potential risks to humans and aquatic wildlife in San Francisco Bay. Future groundwater monitoring will be evaluated in 5-year reviews.	Capital Cost: $102,451 Annual O&M Cost: $31,385 Periodic Cost: $106,784 **Present-Worth Cost: $917,262** Discount Rate: 2.0% Timeframe: 30 years
GW-3: Soil Vapor Extraction (SVE) with Air Sparging, Bioventing and Biosparging, Monitored Natural Attenuation (MNA), and ICs	– In-Situ Treatment – ICs – Engineering Controls – Monitoring	– In situ treatment consisting of (1) SVE with air sparging, (2) bioventing and biosparging, and (3) MNA until concentrations of COCs in groundwater are at or below the groundwater remediation goals. – ICs would be implemented to prevent exposure to COCs and COECs in groundwater until remediation goals are met. – Engineering controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs. – Groundwater monitoring would serve a two-fold purpose. It would (1) provide awareness of the size and behavior of COC plumes, and (2) provide additional information on the size and behavior of plumes to be used in verifying that COCs and COECs in groundwater do not pose potential risks to humans and aquatic wildlife in San Francisco Bay. Termination of groundwater monitoring would be evaluated during the 5 year review.	Capital Cost: $477,984 Annual O&M Cost: $43,738 Periodic Cost: $106,784 **Present-Worth Cost: $1,646,339** Discount Rate: 2.0% Timeframe: 30 years
GW-4: In-Situ Bioremediation (ISB), MNA, and ICs	– In-Situ Treatment – ICs – Engineering Controls – Monitoring	– In situ treatment consisting of (1) ISB (aerobic), and (2) MNA until concentrations of COCs in groundwater are at or below the groundwater remediation goals. – ICs would be implemented to prevent exposure to COCs and COECs in groundwater until remediation goals are met. – Engineering controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs. – Groundwater would be monitored during the bioremediation and natural attenuation phases of this alternative.	Capital Cost: $255,890 Annual O&M Cost: $47,128 Periodic Cost: $151,403 **Present-Worth Cost: $1,473,204** Discount Rate: 2.0% Timeframe: 30 years

Remedial Alternative	Components	Details	Cost
GW-5: Excavation of Saturated Zone Soil, MNA, and ICs	– Removal – ICs – Engineering Controls – Monitoring	– Excavation of contaminated soil to a depth of 5.5 to 8 feet bgs with off-site disposal of contaminated soil at a permitted disposal facility. – ICs would be implemented to prevent exposure to COCs and COECs in groundwater until concentrations are at or below groundwater remediation goals. – Engineering controls consisting of fencing, barriers, and signs during remedy implementation and in conjunction with ICs. – Groundwater would be monitored during natural attenuation phases of this alternative.	Capital Cost: $1,235,681 Annual O&M Cost: $38,734 Periodic Cost: $281,428 **Present-Worth Cost: $2,348,017** Discount Rate: 2.0% Timeframe: 30 years

Bold underline indicates the selected alternatives for soil and groundwater remediation in this ROD/Final RAP.

2.9.2 Comparative Analysis of Alternatives

The Navy completed a comparative analysis of the remedial alternatives with respect to the **nine evaluation criteria**(24) that are required by the NCP. The no action alternative was included in the comparisons as required by the NCP. The following subsections present the results of this analysis, including the two threshold criteria, the five balancing criteria, and the two modifying criteria.

2.9.2.1 Threshold Criteria

Tables 6 and 7 present a summary of the results from analyses using the first seven of the nine evaluation criteria for soil and groundwater, respectively. These criteria were evaluated in the RI/FS report. This section addresses the first two of these criteria; overall protection of human health and the environment, and compliance with ARARs.

Overall Protection of Human Health and the Environment

As shown in Tables 6 and 7, Alternatives S-1 and GW-1 represent the no action alternatives for soil and groundwater; these no action alternatives do not address any of the risks at the site and do not provide protection to human health or the environment. The remaining alternatives for soil (Alternatives S-2, S-3, and S-4) and groundwater (Alternatives GW-2, GW-3, GW-4, and GW-5) protect human health and the environment under reasonably anticipated future land uses at Site 6. Thus, these alternatives were ranked equally based on this criterion.

Compliance with ARARs

No ARARs are associated with Alternative S-1 or GW-1. The remaining alternatives for soil (Alternatives S-2, S-3, and S-4) and groundwater (Alternatives GW-2, GW-3, GW-4, and GW-5) meet ARARs. ARARs for the selected remedial actions are identified in Attachment C.

TABLE 6. COMPARATIVE ANALYSIS OF SOIL REMEDIAL ALTERNATIVES

Remedial Alternatives	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness/ Permanence	Reduction of Mobility, Toxicity, or Volume through Treatment	Short-Term Effectiveness	Implement-ability	Cost ($Million)
Alternative S-1: No Action	No	NA	○	◐	NA	●	$0
Alternative S-2: Covers and ICs	Yes	Yes	◑	◐	◑	◑	$0.96
Alternative S-3: Excavation and Off-Site Disposal of Top 2 Feet of Soil and ICs	Yes	Yes	◑	◐	◑	◑	$2.94
Alternative S-4: Excavation and Off-Site Disposal of Unsaturated Zone Soil and ICs	Yes	Yes	◑	◐	◑	◑	$3.52

Notes: ○ Not acceptable ◐ Poor ◑ Good ◑ Very good ● Excellent

Bold Preferred alternative
ARAR Applicable or relevant and appropriate requirements
IC Institutional controls
NA Not applicable

TABLE 7. COMPARATIVE ANALYSIS OF GROUNDWATER REMEDIAL ALTERNATIVES

Remedial Alternatives	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness/ Permanence	Reduction of Mobility, Toxicity, or Volume through Treatment	Short-Term Effectiveness	Implement-ability	Cost ($Million)
Alternative GW-1: No Action	No	NA	○	◐	NA	●	$0
Alternative GW-2: ICs and Groundwater Monitoring	Yes	Yes	◑	◐	◑	●	$0.92
Alternative GW-3: SVE with Air Sparging, Bioventing/ Biosparging, MNA, and ICs	Yes	Yes	◑	◑	◐	◐	$1.65
Alternative GW-4: ISB with Amendments, MNA, and ICs	Yes	Yes	◑	◑	◑	◑	$1.47
Alternative GW-5: Excavation and Off-Site Disposal of Saturated Zone Soil, MNA, and ICs	Yes	Yes	◑	◐	◐	◐	$2.35

Notes: ○ Not acceptable ◐ Poor ◐ Good ◑ Very good ● Excellent

Bold Preferred alternative
ARAR Applicable or relevant and appropriate requirements
IC Institutional controls
ISB In situ bioremediation
MNA Monitored natural attenuation
NA Not applicable
SVE Soil vapor extraction

2.9.2.2 Primary Balancing Criteria

This section addresses five of the criteria shown in Tables 6 and 7. These five criteria include long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through transport; short-term effectiveness; implementability; and cost.

Long-Term Effectiveness and Permanence

Alternative S-1 is not acceptable because it does not provide any degree of long term effectiveness. Alternatives S-2, S-3, and S-4 would provide long-term effectiveness in meeting the RAOs through maintenance of clean soil covers and ICs. Alternative S-2 is rated good because direct exposure to contaminated soil would be prevented, but ICs are needed to ensure that the remedy remains effective. Alternatives S-3 and S-4 are rate as very good because contaminated soil would be removed.

Alternative GW-1 is not acceptable because it also does not provide any degree of long-term effectiveness. Alternative GW-2 is rated good because it prevents access to groundwater through ICs; it is a passive technology remedy with an unknown length of time needed to achieve RGs.

Alternatives GW-3, GW-4, and GW-5 are rated very good because active technologies would be implemented and COCs would be degraded or removed (Table 7). It is noted that these rankings of long-term effectiveness were prepared when the RI/FS was written and finalized and that subsequently a **petroleum corrective action**(25) took place at the UST 240 site. That corrective action involved excavation of source material and installation of amendments as envisioned in Alternative GW-4 (effectively making Alternatives GW-2 and GW-4 equivalent at this time; however, this equivalence is not shown in the table above).

Reduction in Toxicity, Mobility, or Volume through Treatment

Alternatives S-1 through S-4 are rated poor because they do not include treatment that would result in the destruction, transformation, or irreversible reduction in contaminant mobility treatment actions.

Alternatives GW-1, GW-2, and GW-5 were rated poor because none would reduce the mobility, toxicity, or volume of chemicals through treatment, other than through the natural recovery of the aquifer (Table 7). However, after the RI/FS was finalized, the Navy completed a petroleum corrective action at the UST 240 area, which both removed contaminated soil and the source of any continued groundwater contamination and installed ISB amendments in the excavation. This petroleum corrective action has improved the effectiveness of Alternatives GW-1, GW-2, and GW-5; however, Tables 6 and 7 above are based on the evaluation presented in the RI/FS and, therefore, the improvement is not reflected. Alternatives GW-3 and GW-4 were rated very good because they both use active treatment to reduce the toxicity, mobility, and volume of contaminants in groundwater at the site.

Short-Term Effectiveness

This criterion does not apply to Alternative S-1, since no action would be taken. Alternatives S-2, S-3, and S-4 are rated very good, as they would introduce minimal risk to the community, workers, and the environment (Table 6).

This criterion also does not apply to Alternative GW-1, since no action would be taken. Alternatives GW-2 and GW-4 are rated very good because safety procedures would be implemented to protect site workers installing and using these technologies, and because of the short implementation time. Alternative GW-3 is rated good because more resources would be required to implement the treatment system. Alternative GW-5 is also rated good because it would involve more aggressive field activities that pose greater risk to workers (Table 7).

Alternative GW-3 would have the least short-term effectiveness, because it involves a 1-month construction period, 1 year of operation, and 5 years of monitoring.

Implementability

Alternative S-1 is rated excellent only because it does not involve remedial technologies or ICs, and therefore is the easiest to implement. Alternatives S-2 through S-4 are rated very good because ICs and the remedial actions are not difficult to implement (Table 6).

Alternative GW-2 is rated excellent because its implementation requires minimal to no construction (Table 7). Alternative GW-3 is rated good because of permitting requirements, larger and more complex biosparging and biovent systems, and greater effort to operate and maintain the treatment system. Alternative GW-4 was rated very good because its system implementation is less difficult. Alternative GW-5 is rated good because of greater difficulty in implementing excavation of saturated zone soil.

Cost

Alternative S-2 would incur relatively low costs because it does not include off-site disposal. Alternatives S-3 and S-4 would incur higher costs because they both include excavation and off-site disposal of contaminated soil as process options. Alternative S-3 is less expensive because of the lower volume of soil removed.

No costs are associated with Alternative GW-1. Alternative GW-2 would incur low costs because it does not use active remediation systems (Table 7). Alternatives GW-3 and GW-4 would incur moderate costs because they both include construction and implementation of specialized treatment technologies. Alternative GW-5 would be the most expensive of all alternatives because it includes costs for soil removal in the saturated zone using excavation shoring, and off-site disposal. The addition of an IC restricting construction of aquatic wildlife habitat in Alternatives S-2 through S-4 has no appreciable impact on the costs discussed in this ROD/RAP.

2.9.2.3 Modifying Criteria

This section addresses the two criteria that are not included in the RI/FS reports. They are state acceptance and community acceptance.

State Acceptance

The State of California concurs with the Navy's selected remedy for Site 6.

Community Acceptance

A Proposed Plan/Draft RAP describing the Navy's proposed soil and groundwater remedies was released to the public on February 28, 2014, and was presented to the community at a public meeting on March 12, 2014. In addition, a public comment period was held from February 28, 2014, to March 31, 2014. Based on the responses from the community to the Navy's proposed soil and groundwater remedies, the Navy has concluded that the community accepts and supports Alternative S-4 (excavation and off-site disposal of unsaturated zone soil and ICs) as the selected remedy for soil at Site 6 and Alternative GW-2 (ICs and groundwater monitoring) as the selected remedy for groundwater at Site 6.

2.10 SELECTED REMEDIES

The Navy's preferred remedial alternative for soil is Alternative S-4: Excavation and Off-Site Disposal of Unsaturated Zone Soil and ICs. The preferred remedial alternative for groundwater is Alternative GW-2, ICs and Groundwater Monitoring.

2.10.1 Rationale for Selected Remedy

Key factors in selecting the remedy are that it would:

- Protect human health and the environment, and comply with ARARs (Attachment C identifies the ARARs for the selected remedy)
- Provide the best level of protection of human health and the environment proportionate to costs, taking into consideration the poor quality of the groundwater
- Allow use of the site in a manner consistent with the community's reuse plan[4]
- Be readily implemented

2.10.2 Description of Selected Remedies

2.10.2.1 Soil

As shown in Figure 6, Alternative S-4 would include excavation of up to approximately 6,500 cubic yards of soil from the north, eastern half, and northeast portions of Site 6 with concentrations above the remediation goals for soil, Table 4, including any areas identified during characterization of data gaps during the RD. Alternative S-4 would remove contamination within the unsaturated zone to limit exposure and reduce the potential for COCs in soil to contaminate groundwater. Excavation of COCs in soil to a depth of 2 feet with isolated areas of an approximate depth of 5.5 feet bgs would (1) ensure that exposure pathways would be eliminated for future recreational users, construction workers, and occupational workers at Site 6, and (2) reduce the potential for COCs in soil to migrate into groundwater.

In addition, ORC may be added to certain excavations, if deemed appropriate during the remedial design, to prevent groundwater contamination from re-contaminating the clean backfill.

ICs will be implemented as a component of the soil remedy to:

- Prohibit the residential use of Site 6 (residential uses include constructing a residence, hospital for humans, or day care facility for children and growing produce for human consumption)
- Require the implementation of an approved contaminated soil management plan for any future excavations at Site 6
- Require an evaluation of potential risk to aquatic receptors if wetland habitat is constructed at Site 6[5]
- Prohibit the alternation, disturbance, or removal of any component of the remedial action.

5 It is unknown whether wildlife habitat will be constructed in the future. There was no documentation of such plans throughout the course of the CERCLA process until the most recent TIDA development plan. That development plan identified that the construction of wildlife habitat at Site 6 is now being considered. As a result of the absence of such plans during the period when the ecological risk assessment was prepared for Site 6, the assessment did not anticipate construction of wildlife habitat. The Proposed Plan/Draft RAP and this ROD/Final RAP include additional ICs to require that the transferee or developer conduct an ecological risk assessment and any additional remedial action determined to be necessary based on the updated ecological risk assessment, to address potential risks to future aquatic ecological receptors if the transferee or developer constructs wetland habitat (wetlands) on Site 6.

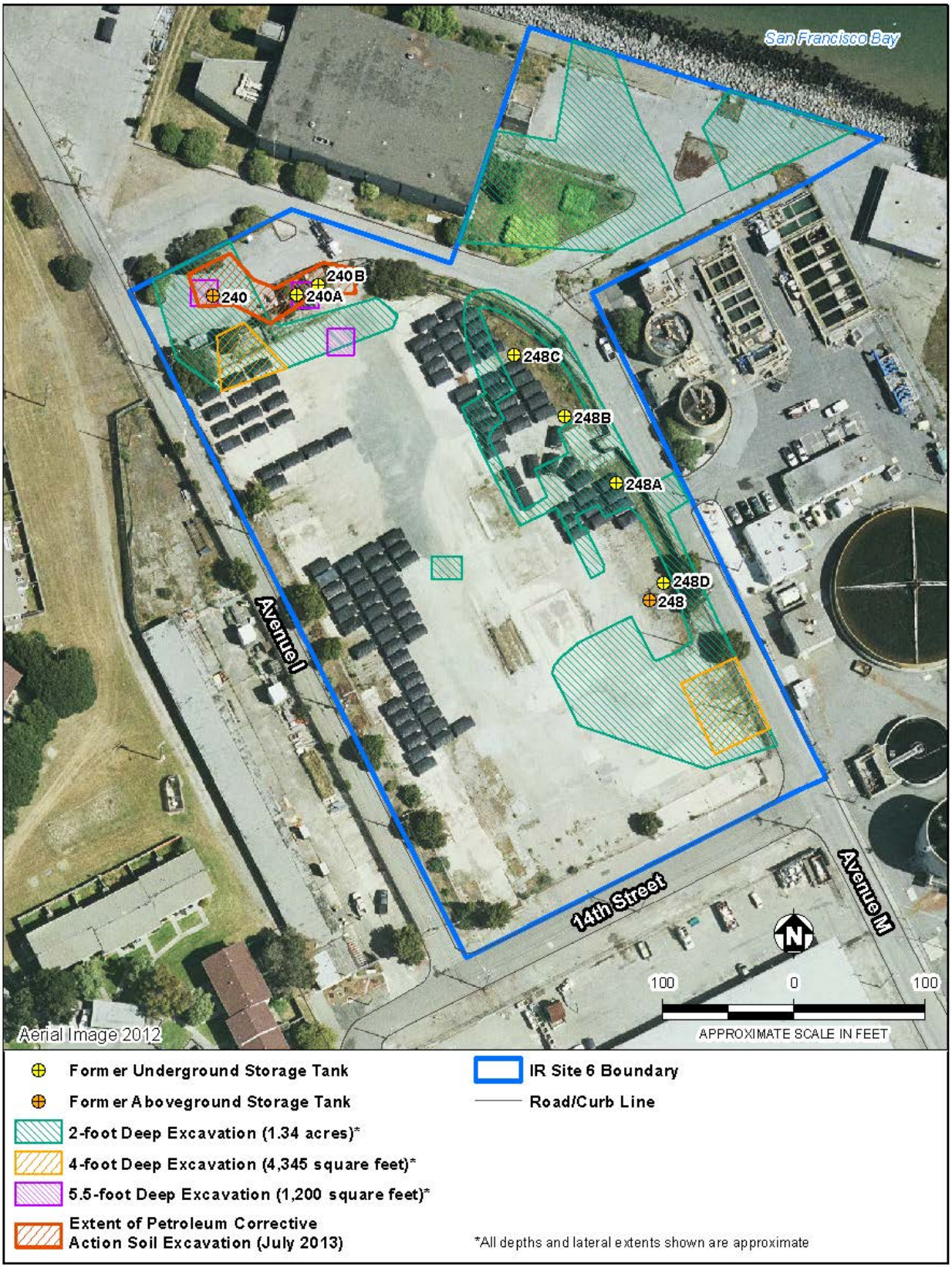

Figure 6. Alternative S-4 – Excavation and Off-Site Disposal of Unsaturated Zone Soil

2.10.2.2 Groundwater

The preferred alternative for groundwater is Alternative GW-2: ICs and Groundwater Monitoring. The ICs will be implemented to:

- Prohibit the residential use of Site 6 (residential uses include constructing a residence, hospital for humans, or day care facility for children and growing produce for human consumption)
- Prevent construction worker exposure to COCs in groundwater at Subareas 1 and 2 encountered in trenching activities by requiring the implementation of an approved contaminated groundwater management plan when excavation is conducted
- Prohibit the alteration, disturbance, or removal of any component of the remedial action

In addition, the Navy will monitor the groundwater to provide information on the size and behavior of the plumes at Site 6 and to verify that COECs do not discharge to San Francisco Bay at concentrations that pose potential risks to aquatic receptors. Future monitoring wells will be revised in the RD, and termination of groundwater monitoring will be based on either groundwater COC or COEC concentrations that achieve RGs or a risk evaluation which demonstrates that remaining COC and COEC concentrations are protective of human health and the environment. The evaluation of future monitoring will be presented in 5-year reviews. Analytical results have consistently demonstrated for the last 10 years that concentrations of COECs have been below the remediation goals for aquatic receptors at the point of groundwater discharge to San Francisco Bay. The alternative could be implemented with minimal effect to the community. Like soil Alternative S-4, groundwater Alternative GW-2 would also allow Site 6 to be redeveloped in a manner consistent with the local redevelopment plan. (This plan was published by the Office of Military Base Conversion, Planning Department; the City and County of San Francisco; and the San Francisco Redevelopment Agency in July 1996 and was updated by TIDA on June 28, 2011.)

2.10.2.3 Soil Gas

The remedy for soil gas consists of confirmation testing and ICs that will ensure that future occupational workers are not exposed to chemicals in soil gas as follows:

- Collection of additional soil gas data for naphthalene at the location of soil gas sample 06-SG08, as shown on Figure 3. This additional investigation will address one soil gas sample location that was collected after the RI/FS was finalized during a 2010 data gaps investigation. That sample exhibited the semivolatile organic compound (SVOC) naphthalene at a concentration of 34 $\mu g/m^3$, which exceeded the screening level of 31.9 $\mu g/m^3$. The soil gas sample was collected east of the former UST 248 Area excavation.

- ICs to require the construction of enclosed structures within the shaded portion of Subarea 1, as shown on Figure 3, include vapor mitigation measures or the completion of a vapor intrusion evaluation that demonstrates potential vapor intrusion risks are acceptable. The boundaries of this IC will be further refined based on sampling during the RD.

2.10.3 Expected Outcomes of the Selected Remedies

Alternative S-4 and GW-2 would allow Site 6 to be redeveloped and used in a manner consistent with the approved local reuse plan. (This reuse plan was published by the Office of Military Base Conversion, Planning Department; the City and County of San Francisco; and the San Francisco Redevelopment Agency, in July 1996. The reuse plan was modified in 2011 and now considers construction of wildlife habitat on Site 6.)

The selected remedies will require approximately 1 year to implement and will be followed by groundwater monitoring until analytical results allow for termination of further groundwater monitoring.

2.10.4 Statutory Determinations

In accordance with the NCP, the selected remedies meet the following statutory determinations, except as noted in the fifth bullet below.

- **Protection of Human Health and the Environment** – The selected remedies will protect human health and the environment by preventing exposure to COCs in soil and COCs and COECs in groundwater through a combination of excavation and off-site disposal, institutional controls, and groundwater monitoring.

- **Compliance with ARARs** – The selected remedies will meet all ARARs. The ARARs that will be met by the selected remedies are summarized in Attachment C.

- **Cost-Effectiveness –** The selected remedies would provide overall protectiveness proportional to their costs and are considered cost-effective.

- **Utilization of Permanent Solution and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The selected remedies represent the maximum extent to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner at Site 6.

- **Preference for Treatment as a Principal Element –** The selected remedies for Site 6 do not satisfy the statutory preference for treatment as a principal element of the remedies unless the use of ORC is elected.

- **Five-Year Review Requirements –** Because the selected remedies will potentially result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will follow the schedule of the on-going base-wide 5-year review to ensure the remedy is protective of human health and the environment.

2.10.5 Documentation of Significant Changes

The Proposed Plan/Draft RAP for Site 6 was released for public comment in February 2014. The Proposed Plan/Draft RAP identified Alternative S-4 for soil (excavation and off-site disposal of unsaturated zone soil and ICs) and Alternative GW-2 for groundwater (ICs and groundwater monitoring) as the preferred alternatives for remediation of Site 6. The Navy reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy based on the comments received from the public were necessary or appropriate.

The Navy has determined that several changes from the RI/FS and Proposed Plan/Draft RAP are necessary and appropriate and therefore are being documented in this ROD/Final RAP as follows:

1. The RG table presented in the proposed plan showed the COCs and corresponding RGs for combined Subareas 1 and 3 and separately for Subarea 2 based on future reuses. The RG table in this ROD/Final RAP (Table 4) presents the RGs for each subarea separately, with the differences from the proposed plan noted below.

    a. MCPP was removed as a COC for soil for Subarea 1. As noted in the RI/FS, one soil sample (boring 06-077 at 3 feet bgs) exceeded the soil screening level for MCPP at Site 6 in Subarea 1. However, approximately 800 cubic yards of soil surrounding the location of this sample was subsequently removed at, around, and below the soil sample during the UST 240 corrective action (excavation depth down to 5.5 feet bgs), as discussed in Section 2.3. The sample was considered an isolated sample as no data gaps were identified in the RI/FS for the nature and extent of MCPP in soil.

    b. Benzene was removed as a COC for soil in Subarea 1 because the actual risk calculated in the HHRA did not justify including it. The RI/FS identified benzene in soil as a COC based on a determination that the risk from cancer was within the risk management range. The calculated cancer risk presented in the RI/FS using Cal EPA toxicity values was presented as 1×10^{-6}. However, the actual risk was less than 1×10^{-6} (the actual value is determined by adding the calculated adult and child receptor risks together which results in a total risk value of 8.21×10^{-7} which is less than the risk management range and does not warrant identifying benzene as a COC). Neither of the other human health risk calculations presented in the HHRA warranted identifying benzene as a COC in soil (calculation of cancer risk using EPA toxicity values and noncancer hazard risk calculations). In addition, as documented in the Post-Construction Summary Report for UST/AST 240 Area, approximately 800 cubic yards of petroleum-impacted soil was excavated in 2013. This excavation included all historical benzene detections in

unsaturated soil and all but one detection of benzene in deep soil. Furthermore, benzene was not detected above the screening level in any confirmation soil sample during the UST/AST 240 Area Correction Action (ERRG 2013).

c. The following two chemicals in groundwater were removed from the list of COCs for both Subareas 1 and 3: arsenic (only a COC for the construction worker in groundwater at Subarea 2) and xylenes (not identified as a COC for the construction worker in groundwater at any subarea).

d. The following six chemicals were removed from the RG table for Subarea 2 because the chemicals were not identified as COCs in the RI/FS HHRA for Subarea 2 in either soil or groundwater: 1,1,2-trichloroethane, benzene, ethylbenzene, MCPP, naphthalene, and xylenes.

2. Following the UST 240 corrective action, groundwater monitoring data have trended downward to meet RGs indicating that the existing wells are adequate to support ongoing monitoring in this area. Figure 3 shows the existing groundwater monitoring wells planned for the groundwater remedy in Subarea 1. Groundwater monitoring for Subarea 2 will be detailed in the RD.

3. The Navy has added soil gas sample collection as part of the remedy as this was a data gap that was described in the RI/FS. The Navy will collect soil gas samples in the area east of the former UST 248 Area excavation to investigate the potential for naphthalene to occur in soil gas. In addition, the remedy includes an IC requiring that construction of new enclosed buildings at Subarea 1 includes vapor mitigation measures or a vapor intrusion evaluation to demonstrate that potential vapor intrusion risks are acceptable.

4. The Navy has revised the ICs presented in the Proposed Plan/Draft RAP. The Proposed Plan/Draft RAP stipulated the following restriction site-wide:

> "Land disturbing activity," which includes but is not limited to (1) excavation of soil; (2) construction of roads, utilities, facilities, structures, and associated equipment of any kind; (3) demolition or removal of "hardscape" (such as concrete roadways, parking lots, foundations, and sidewalks); (4) any activity that involves movement of soil to the surface from below the surface of the land; and (5) any other activity that causes or facilitates the movement of groundwater known to be contaminated with hazardous substances.

However, this ROD/Final RAP specifies a requirement for a soil and groundwater management plan approved by the Navy and the DTSC instead of the restriction on "land disturbing activity". This requirement will ensure that excavated soils and groundwater are properly managed and it will protect future construction workers from any residual COCs that remain in soil or groundwater.

2.11 COMMUNITY PARTICIPATION

In accordance with CERCLA §§ 113 and 117, the Navy provided a public comment period from February 28, 2014, to March 31, 2014, for the proposed remedial action described in the Proposed

Plan/Draft RAP for Site 6. A public meeting to present the Proposed Plan/Draft RAP was held from 6:30 to 8:30 p.m. on March 12, 2014. Public notice of the meeting and availability of documents appeared in the *San Francisco Chronicle* on February 23, 2014. Attachment D includes the public meeting notice and the transcript of the public meeting, which includes a list of attendees.

Community acceptance of the preferred alternatives for soil and groundwater was evaluated after the public meeting and the public comment period. Comments received from the public are addressed in a responsiveness summary that is attached to this ROD/Final RAP for Site 6 as Attachment E, which is further discussed below. After this final ROD/Final RAP has been signed and published, the Navy will publish a public notice of the availability of the ROD/Final RAP in a major local newspaper of general circulation, and will make the ROD/Final RAP available for public inspection and copying before any remedial action begins.

2.12 NON-BINDING ALLOCATION OF RESPONSIBILITY

The sole purpose of the Nonbinding Allocation of Responsibility (NBAR) is to establish which potentially responsible parties (PRP) will have an aggregate allocation in excess of 50 percent and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to DTSC, is not binding on anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are *de novo* and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in California (Cal.) Health and Safety Code § 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation, or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to Cal. Health and Safety Code § 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary nonbinding allocation of responsibility for the former NAVSTA TI: The Department of the Navy is allocated 100 percent responsibility.

3. RESPONSIVENESS SUMMARY

The purpose of the responsiveness summary is to summarize information about the views of the public and support agencies on both the remedial alternatives and general concerns about the site submitted during the public comment period. The responsiveness summary documents in the public record how public comments were integrated into the decision-making process.

The participants in the public meeting held on March 12, 2014, included community members, Restoration Advisory Board (RAB) members, and representatives of the Navy, DTSC, and the Water Board. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript (Attachment D). Responses to comments provided at the meeting and received during the public comment period are included in the responsiveness summary (Attachment E).

In compliance with the California Environmental Quality Act, DTSC prepared a Notice of Exemption (NOE), having determined that the proposed project has no potential for a significant impact on the environment. The NOE was made available for review and comment during the public comment period on the Proposed Plan/Draft RAP. No comments were received on the NOE.

ATTACHMENT A
ADMINISTRATIVE RECORD INDEX

(*Provided on CD*)

TREASURE ISLAND

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX FOR SITES 6 AND 6A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000022 CORRESPONDENCE 4	**03-12-1991**	DEPARTMENT OF HEALTH SERVICES - VERIFY AFFILIATION	TRANSMITTAL OF THE DRAFT SITE SUMMARY FOR SITE VISITS AND RECORD FILE SEARCH (W/ ENCLOSURE)	YES	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

Attachment A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000027 CORRESPONDENCE 2	**06-21-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) DRAFT FINAL QUALITY ASSURANCE PROJECT PLAN; AND 2) DRAFT HEALTH AND SAFETY PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY (ENCLOSURE 1) IS RECORD # 2, AND 2) IS RECORD # 3)	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000033 CORRESPONDENCE 2	**07-16-1991**	NAVY	TRANSMITTAL OF THE DRAFT FIELD WORK PLAN FEASIBILITY STUDY FLOATING PRODUCT REMOVAL (SEE RECORD # 1 - DRAFT FIELD WORK PLAN FEASIBILITY STUDY OF FLOATING PRODUCT REMOVAL)	YES	SITE 00006 SITE 00014

Attachment A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000036 CORRESPONDENCE 4	**08-21-1991**	DTSC - BERKELEY, CA	TRANSMITTAL OF THE REVIEW AND COMMENTS ON THE DRAFT FIELD WORK PLAN, FEASIBILITY STUDY OF FLOATING PRODUCT REMOVAL (W/ ENCLOSURE) [SEE RECORD # 1 - DRAFT FIELD WORK PLAN FEASIBILITY STUDY OF FLOATING PRODUCT REMOVAL]	YES	SITE 00006 SITE 00012 SITE 00014
AR_N60028_000037 CORRESPONDENCE 27	**09-04-1991**	DTSC - BERKELEY, CA	TRANSMITTAL OF REVIEW AND COMMENTS ON DRAFT FINAL WORK PLAN AND DRAFT FINAL FIELD SAMPLING PLAN (W/ ENCLOSURE) [SEE RECORD # 4 - DRAFT FINAL WORK PLAN, AND # 5 - DRAFT FINAL FIELD SAMPLING PLAN]	YES	SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00020

Attachment A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000008 REPORT 64	**09-08-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL QUALITY ASSURANCE PROJECT PLAN	YES	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

Attachment A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000009 REPORT 411	**09-09-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL HEALTH AND SAFETY PLAN	YES	AST 0000003 AST 0000103 AST 0000104 BLDG 0000002 BLDG 0000003 BLDG 0000040 BLDG 0000041 BLDG 0000089 BLDG 0000092 BLDG 0000102 BLDG 0000180 BLDG 0000193 BLDG 0000225 BLDG 0000257 BLDG 0000264 BLDG 0000292 BLDG 0000293 BLDG 0000330 BLDG 0000335 BLDG 0000342 BLDG 0000343 BLDG 0000370 BLDG 0000455 BLDG 0000461 SITE 00001 SITE 00003 SITE 00004 SITE 00005

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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AR_N60028_002064 CORRESPONDENCE 6	**09-18-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	RESPONSES TO COMMENTS ON THE DRAFT FIELD WORK PLAN, FEASIBILITY STUDY OF FLOATING PRODUCT REMOVAL (SEE RECORD # 36 - COMMENTS BY DTSC)	YES	SITE 00006 SITE 00012 SITE 00014

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000006 REPORT 62	**09-19-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL FIELD WORK PLAN SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL - VOLUME 1 OF 2 (SEE RECORD # 45 - NAVFAC WDIV TRANSMITTAL LETTER; AND RECORD # 7 - HEALTH AND SAFETY PLAN, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL VOLUME 2 OF 2)	YES	AST 0000001 AST 0000002 AST 0000003 AST 0000004 AST 0000005 AST 0000006 AST 0000007 AST 0000456 BLDG 0000085 BLDG 0000236 BLDG 0000238 BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000248 BLDG 0000352 BLDG 0000353 BLDG 0000464 SITE 00006 SITE 00014 UST A UST B UST C UST D WELL 00006-EW-001 WELL 00006-EW-002

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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AR_N60028_000007 REPORT 89	**09-20-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	HEALTH AND SAFETY PLAN, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL, VOLUME 2 OF 2 (SEE RECORD # 45 - NAVFAC WDIV TRANSMITTAL LETTER; AND RECORD # 6 - FINAL FIELD WORK PLAN, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL)	YES	AST 0000004 AST 0000005 BLDG 0000085 BLDG 0000236 BLDG 0000335 SITE 00006 SITE 00014

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000040 CORRESPONDENCE 2	**09-20-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) FINAL QUALITY ASSURANCE PROJECT PLAN; AND 2) FINAL HEALTH AND SAFETY PLAN (ENCLOSURES ARE 1) RECORD # 8; AND 2) RECORD # 9)	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000045 CORRESPONDENCE 2	**09-24-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) FINAL FIELD WORK PLAN, VOLUME I; AND 2) HEALTH AND SAFETY PLAN, VOLUME II SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL (ENCLOSURES ARE 1) RECORD # 6 AND 2) RECORD # 7)	YES	SITE 00006 SITE 00014

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000010 REPORT 201	**10-22-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL WORK PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN (SEE RECORD # 14 - FINAL WORK PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY, REVISION 1)	YES	BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000089 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000257 BLDG 0000258 BLDG 0000262 BLDG 0000264 BLDG 0000267 BLDG 0000292 BLDG 0000330 BLDG 0000335 BLDG 0000342 BLDG 0000343 BLDG 0000370 BLDG 0000461 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					WELL 00006-MW-04

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000011 REPORT 192	**10-22-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY FIELD SAMPLING PLAN (SEE RECORD # 49 - NAVFAC WDIV TRANSMITTAL LETTER; AND RECORD # 15 - FINAL FIELD SAMPLING PLAN, REVISION 1)	YES	AST 0000004 AST 0000005 AST 0000103 AST 0000465 BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000084 BLDG 0000089 BLDG 0000099 BLDG 0000109 BLDG 0000111 BLDG 0000112 BLDG 0000113 BLDG 0000114 BLDG 0000136 BLDG 0000157 BLDG 0000180 BLDG 0000184 BLDG 0000205 BLDG 0000224 BLDG 0000225 BLDG 0000233 BLDG 0000236 BLDG 0000257 BLDG 0000258 BLDG 0000262

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					WELL MW-008-001
					WELL MW-008-002
					WELL MW-008-003
					WELL MW-011-001
					WELL MW-011-002
					WELL MW-012-001
					WELL MW-012-002

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL MW-025-003
AR_N60028_000048 CORRESPONDENCE 11	**10-23-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF 1) 24 SEPTEMBER 1991 TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES; AND 03 OCTOBER 1991 FEDERAL FACILITY SITE REMEDIATION AGREEMENT MEETING MINUTES (W/ ENCLOSURES)	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00020
AR_N60028_000204 CORRESPONDENCE 8	**10-25-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	RESPONSES TO COMMENTS ON THE DRAFT FINAL FIELD SAMPLING PLAN (SEE RECORD # 5 - DRAFT FINAL FIELD SAMPLING PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY)	YES	BLDG 0000225 PIER 00001 SITE 00006 SITE 00007 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00020 SITE 00022 SITE 00024 SITE 00025
AR_N60028_002101 CORRESPONDENCE 6	**10-25-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	RESPONSES TO COMMENTS ON THE DRAFT FINAL WORK PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 4 - DRAFT FINAL WORK PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY)	NO	SITE 00006 SITE 00012 SITE 00014 SITE 00020

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000049 CORRESPONDENCE 2	**11-04-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) FINAL WORK PLAN REMEDIAL INVESTIGATION/FEASIBILITY STUDY; AND 2) FINAL FIELD SAMPLING PLAN REMEDIAL INVESTIGATION/FEASIBILITY STUDY (ENCLOSURES ARE 1) RECORD # 10 AND 2) RECORD # 11)	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000053 CORRESPONDENCE 2	**11-06-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE DRAFT SUMMARY REPORT, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL (ENCLOSURE IS RECORD # 12)	YES	SITE 00006 SITE 00014

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000058 CORRESPONDENCE 2	**11-26-1991**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE DRAFT FINAL COMMUNITY RELATIONS PLAN (ENCLOSURE IS RECORD # 13)	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000059 CORRESPONDENCE 4	**12-03-1991**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT SUMMARY REPORT SUITABILITY STUDY FLOATING PRODUCT REMOVAL (SEE RECORD # 12 - DRAFT SUMMARY REPORT SUITABILITY STUDY FLOATING PRODUCT REMOVAL)	YES	SITE 00006 SITE 00014 WELL 00006-MW-06

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000060 CORRESPONDENCE 2	**12-06-1991**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE 1) FINAL WORK PLAN, AND 2) SAMPLING PLAN FOR THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 10 - FINAL WORK PLAN; AND # 11 - FINAL FIELD SAMPLING PLAN)	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00020
AR_N60028_000061 CORRESPONDENCE 8	**12-18-1991**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT SUMMARY REPORT, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL (SEE RECORD # 12 - DRAFT SUMMARY REPORT, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL)	YES	SITE 00006 SITE 00014 UST A UST B UST C UST D

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000014 REPORT 191	**12-26-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL WORK PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN, REVISION 1	YES	BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000089 BLDG 0000102 BLDG 0000180 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000257 BLDG 0000258 BLDG 0000262 BLDG 0000264 BLDG 0000267 BLDG 0000292 BLDG 0000330 BLDG 0000335 BLDG 0000342 BLDG 0000343 BLDG 0000370 BLDG 0000461 SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00014-MW-02 WELL 00017-MW-01 WELL 00020-MW-01 WELL 00020-MW-02 WELL 00020-MW-03 WELL 00022-MW-01 WELL 00022-MW-02 WELL 00022-MW-03 WELL 00024-MW-01 WELL 00024-MW-02 WELL 00024-MW-03 WELL 00024-MW-04

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000015 REPORT 266	**12-26-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY FIELD SAMPLING PLAN, REVISION 1	YES	AST 0000004 AST 0000005 AST 0000103 AST 0000104 AST 0000465 BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000084 BLDG 0000085 BLDG 0000089 BLDG 0000099 BLDG 0000109 BLDG 0000111 BLDG 0000112 BLDG 0000113 BLDG 0000114 BLDG 0000136 BLDG 0000157 BLDG 0000180 BLDG 0000184 BLDG 0000205 BLDG 0000224 BLDG 0000225 BLDG 0000233 BLDG 0000236 BLDG 0000257

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					SITE 00013

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002069 CORRESPONDENCE 6	**12-26-1991**	PRC ENVIRONMENTAL MANAGEMENT, INC.	RESPONSES TO COMMENTS ON THE FINAL WORK PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN	YES	SITE 00001 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 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000016 REPORT 94	**02-10-1992**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL SUMMARY REPORT, SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL (SEE RECORD # 74 - NAVFAC WDIV TRANSMITTAL LETTER)	YES	AST 0000004 AST 0000005 AST 0000456 BLDG 0000024B BLDG 0000085 BLDG 0000236 BLDG 0000238 BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000248 BLDG 0000335 BLDG 0000352 BLDG 0000353 BLDG 0000464 SITE 00006 SITE 00014 UST A UST B UST C UST D WELL 00001 WELL 00002 WELL 00003 WELL 00004 WELL 00005 WELL 00006

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00007 WELL 00008 WELL 00009 WELL 00010 WELL 00011 WELL 00012 WELL 00013 WELL B1 WELL B2 WELL B3 WELL B4 WELL B5 WELL M1 WELL M4 WELL M5 WELL M6 WELL W-03
AR_N60028_000074 CORRESPONDENCE 2	**02-13-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE FINAL SUMMARY REPORT FOR SUITABILITY STUDY OF FLOATING PRODUCT REMOVAL (ENCLOSURE IS RECORD # 16)	YES	SITE 00006 SITE 00014

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000017 REPORT 101	**02-14-1992**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL COMMUNITY RELATIONS PLAN, REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 76 - NAVFAC WDIV TRANSMITTAL LETTER; AND RECORD # 84 - REVISED FINAL COMMUNITY RELATIONS PLAN) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	AST 0000103 AST 0000104 BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000089 BLDG 0000102 BLDG 0000180 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000257 BLDG 0000267 BLDG 0000330 BLDG 0000335 BLDG 0000342 BLDG 0000370 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000076 CORRESPONDENCE 2	**02-20-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE FINAL COMMUNITY RELATIONS PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY (ENCLOSURE IS RECORD # 17)	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000080 CORRESPONDENCE 5	**03-11-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 14 FEBRUARY 1992 MEETING MINUTES REGARDING UNDERGROUND AND ABOVEGROUND STORAGE TANKS (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000116 CORRESPONDENCE 2	**09-11-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE DRAFT ECOLOGICAL ASSESSMENT WORK PLAN (ENCLOSURE IS RECORD # 20)	YES	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000223 REPORT 108	**11-20-1992**	PRC ENVIRONMENTAL MANAGEMENT, INC.	INVESTIGATION DERIVED WASTE MANAGEMENT PLAN REMEDIAL INVESTIGATION/FEASIBILITY STUDY (SEE RECORD # 224 - NAVFAC WDIV TRANSMITTAL LETTER)	YES	BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000102 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000257 BLDG 0000262 BLDG 0000264 BLDG 0000267 BLDG 0000292 BLDG 0000330 BLDG 0000342 BLDG 0000343 BLDG 0000461 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000232 CORRESPONDENCE 3	**12-17-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE PRELIMINARY SUMMARY TABLES OF ANALYTICAL RESULTS, REMEDIAL INVESTIGATION/FEASIBILITY STUDY	YES	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 00015 SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000233 CORRESPONDENCE 21	**12-22-1992**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 01 DECEMBER 1992 TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES (W/ ENCLOSURE)	YES	AST 0000103 AST 0000104 BLDG 0000002 BLDG 0000003 BLDG 0000031 BLDG 0000041 BLDG 0000062 BLDG 0000102 BLDG 0000180 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000230 BLDG 0000267 BLDG 0000335 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000234 CORRESPONDENCE 21	**01-05-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) 17 DECEMBER 1992 SPECIAL TECHNICAL MEETING MINUTES; 2) PROPOSED DRAFT SITE CHARACTERIZATION SUMMARY REPORT OUTLINE; AND NOVEMBER 1992 MONTHLY STATUS REPORT (W/ ENCLOSURES)	YES	AST 0000103 AST 0000104 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000245 CORRESPONDENCE 9	**03-09-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) JANUARY 1993 MONTHLY STATUS REPORT; AND 2) 10 FEBRUARY 1993 SPECIAL TECHNICAL MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000248 CORRESPONDENCE 3	**03-24-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE FEBRUARY 1993 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000251 CORRESPONDENCE 2	**04-27-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE MARCH 1993 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014
AR_N60028_000170 CORRESPONDENCE 7	**05-05-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 30 MARCH 1993 MONTHLY PROGRESS REVIEW MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000173 CORRESPONDENCE 7	**05-19-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 11 MAY 1993 MONTHLY PROGRESS REVIEW MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00014 SITE 00017 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000177 CORRESPONDENCE 7	**07-20-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 21 JUNE 1993 MONTHLY PROGRESS REVIEW MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014
AR_N60028_001579 MINUTES 6	**07-20-1993**	NAVFAC - WESTERN DIVISION	20 JULY 1993 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY PROGRESS MEETING MINUTES (SEE RECORD # 1578 - NAVFAC WDIV TRANSMITTAL LETTER)	YES	SITE 00003 SITE 00005 SITE 00006 SITE 00009 SITE 00014 SITE 00022 SITE 00024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000178 CORRESPONDENCE 24	**07-22-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 21 JUNE 1993 TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES (W/ ENCLOSURE) [INCLUDES LIST OF COMMUNITY QUESTIONS AND CONCERNS DATED 10 JUNE 1993] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	YES	SITE 00001 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 00024 SITE 00025
AR_N60028_000179 CORRESPONDENCE 4	**07-30-1993**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DATA QUALITY SUMMARY REPORT FOR THE REMEDIAL INVESTIGATION PHASE I	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00011 SITE 00017

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000180 CORRESPONDENCE 5	**08-03-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) APRIL 1993 MONTHLY STATUS REPORT; AND 2) MAY 1993 MONTHLY STATUS REPORT (W/ ENCLOSURES)	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00014 SITE 00022
AR_N60028_000184 CORRESPONDENCE 6	**09-11-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 17 AUGUST 1993 ECOLOGICAL ASSESSMENT SCOPING MEETING MINUTES (W/ ENCLOSURE)	YES	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 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000186 CORRESPONDENCE 2	**09-30-1993**	DTSC - BERKELEY, CA	PROPOSED REMOVAL ACTION	YES	SITE 00006 SITE 00014 SITE 00022
AR_N60028_000187 CORRESPONDENCE 10	**10-01-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) RESPONSES TO DTSC COMMENTS; AND 2) RESPONSES TO CRWQCB COMMENTS ON THE DATA QUALITY SUMMARY REPORT FOR THE REMEDIAL INVESTIGATION PHASE I (W/ ENCLOSURES) [SEE RECORD # 179 - COMMENTS BY DTSC]	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00011 SITE 00017
AR_N60028_000302 CORRESPONDENCE 7	**10-12-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 21 SEPTEMBER 1993 TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES (W/ ENCLOSURES)	YES	SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000188 CORRESPONDENCE 2	**10-20-1993**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE 21 SEPTEMBER 1993 TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES (SEE RECORD # 302 - 21 SEPTEMBER 1993 TECHNICAL REVIEW AND COMMITTEE (TRC) MEETING MINUTES)	YES	SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000189 CORRESPONDENCE 3	**10-25-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE SEPTEMBER 1993 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000163 CORRESPONDENCE 2	**11-15-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF DRAFT ECOLOGICAL RISK ASSESSMENT REPORT (ENCLOSURE IS RECORD # 162)	YES	SITE 00001 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 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000164 CORRESPONDENCE 7	**11-16-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 20 OCTOBER 1993 MONTHLY PROGRESS MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00027 SITE 00028 SITE 00029 WELL 00002 WELL 00003 WELL 00004 WELL 00006 WELL W-03
AR_N60028_000169 CORRESPONDENCE 3	**12-02-1993**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE OCTOBER 1993 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00009 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000196 CORRESPONDENCE 54	**01-18-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) 14 DECEMBER 1993 MONTHLY PROGRESS MEETING MINUTES; AND 2) 14 DECEMBER 1993 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURES)	YES	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000197 CORRESPONDENCE 4	**02-04-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) NOVEMBER/DECEMBER 1993 MONTHLY STATUS REPORT; AND 2) DATA QUALITY SUMMARY REPORT FOR NEW FUEL FARM AREA (W/ ENCLOSURE 1)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00009 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000198 CORRESPONDENCE 81	**02-04-1994**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT, PHASE I AND DRAFT ECOLOGICAL RISK ASSESSMENT (INCLUDES CRWQCB COMMENTS) [SEE RECORD # 279 - DRAFT PHASE I REMEDIAL INVESTIGATION REPORT	YES	BLDG 0000062 SITE 00002 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00024 UST 0000002C UST 0000240A UST 0000240B UST 0000330C WELL 00001 WELL 00011

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000200 CORRESPONDENCE 18	**02-22-1994**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP PLAN (BCP) [INCLUDES COMMENTS BY D. PEEBLER WITH DTSC; AND G. KATHURIA WITH CRWQCB DATED 18 FEBRUARY 1994]	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00011 SITE 00014 SITE 00017 SITE 00020 SITE 00024 SITE 00028 SITE 00029 UST 0000001 UST 0000003 UST 0000010 UST 0000011 UST 0000012
AR_N60028_000207 CORRESPONDENCE 3	**03-02-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE JANUARY 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00009 SITE 00014 SITE 00022
AR_N60028_000272 CORRESPONDENCE 3	**03-25-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE FEBRUARY 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000287 CORRESPONDENCE 4	**05-12-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE MARCH 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00014 SITE 00022
AR_N60028_000288 CORRESPONDENCE 4	**06-01-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE APRIL 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000301 CORRESPONDENCE 3	**07-06-1994**	NAVFAC - WESTERN DIVISION	IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY	YES	SITE 00001 SITE 00004 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 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000305 CORRESPONDENCE 8	**08-02-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE ECOLOGICAL RISK ASSESSMENT SITE WALK SUMMARY (W/ ENCLOSURE)	YES	BLDG 0000001 BLDG 0000262 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 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00028

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000308 CORRESPONDENCE 5	**08-05-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE JUNE 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000317 REPORT 79	**08-26-1994**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL PHASE IIA REMEDIAL INVESTIGATION FIELD WORK PLAN ADDENDUM	YES	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000318 CORRESPONDENCE 4	**08-26-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE JULY 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000321 CORRESPONDENCE 12	**09-07-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) SUMMARY OF KEY QUESTIONS, ANSWERS, AND COMMENTS DISCUSSED DURING THE SITE TOUR; 2) COPY OF THE SLIDE PRESENTATION SCRIPT; AND 3) RESTORATION ADVISORY BOARD (RAB) SITE TOUR ATTENDANCE LIST (W/ ENCLOSURES)	YES	BLDG 0000099 SITE 00001 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00022 SITE 00024
AR_N60028_000322 CORRESPONDENCE 15	**09-12-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 23 AUGUST 1994 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURES)	YES	BLDG 0000002 BLDG 0000180 SITE 00006 SITE 00011 SITE 00014

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000324 CORRESPONDENCE 12	**09-21-1994**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN ADDENDUM, PHASE IIB REMEDIAL INVESTIGATION (INCLUDES COMMENTS BY M. BESSETTE W/ CRWQCB) [SEE RECORD # 300 - DRAFT WORK PLAN ADDENDUM, PHASE II REMEDIAL INVESTIGATION]	YES	BLDG 0000034 BLDG 0000091 BLDG 0000244 BLDG 0000335 BLDG 0000342 PIER 00001 SITE 00006 SITE 00007 SITE 00008 SITE 00010 SITE 00011 SITE 00012 SITE 00015 SITE 00028 SITE 00029 UST 0000204A UST 0000204B
AR_N60028_000328 CORRESPONDENCE 4	**09-26-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE AUGUST 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000336 CORRESPONDENCE 12	**10-13-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 1) SUMMARY OF RESTORATION ADVISORY BOARD (RAB) WORKSHOP KEY QUESTIONS, ANSWERS, AND COMMENTS ON THE CLEANUP PROCESS; 2) WORKSHOP AGENDA; AND 3) WORKSHOP ATTENDANCE LIST (W/ ENCLOSURES)	YES	BLDG 0000001 BLDG 0000002 BLDG 0000003 BLDG 0000180 SITE 00006 SITE 00019 SITE 00028 SITE 00029
AR_N60028_000341 CORRESPONDENCE 3	**11-04-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE SEPTEMBER 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000343 CORRESPONDENCE 47	**11-14-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE 25 OCTOBER 1994 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000344 CORRESPONDENCE 3	**11-18-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE OCTOBER 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000356 CORRESPONDENCE 4	**12-19-1994**	NAVFAC - WESTERN DIVISION	TRANSMITTAL OF THE NOVEMBER 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000359 CORRESPONDENCE 64	**01-03-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 06 DECEMBER 1994 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	AREA AA AREA BB AREA CC AREA DD BLDG 0000001 BLDG 0000002 BLDG 0000003 SITE 00001 SITE 00003 SITE 00004 SITE 00006 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025 SITE 00028 SITE 00029 UST 0000002C UST 0000180B UST 0000180D UST 0000240A UST 0000240B

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					UST 0000240C UST 0000240D WELL MW-03
AR_N60028_000362 CORRESPONDENCE 4	**01-09-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DECEMBER 1994 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000366 CORRESPONDENCE 9	**01-26-1995**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM (SEE RECORD # 361 - DRAFT FINAL PHASE 11B REMEDIAL INVESTIGATION WORK PLAN ADDENDUM)	YES	BLDG 0000041 BLDG 0000225 BLDG 0000342 SITE 00006 SITE 00007 SITE 00010 SITE 00017 SITE 00020

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000374 CORRESPONDENCE 14	**02-02-1995**	ARC ECOLOGY	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM (SEE RECORD # 361 - DRAFT FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM)	YES	BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000085 BLDG 0000089 BLDG 0000112 BLDG 0000335 BLDG 0000342 BLDG 0000343 BLDG 0000345 BLDG 0000361 BLDG 0000384 BLDG 0000455 BLDG 0000458 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00021 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000370 CORRESPONDENCE 3	**02-03-1995**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM (INCLUDES COMMENTS BY CRWQCB) [SEE RECORD # 361-DRAFT FINAL PHASE 11B REMEDIAL INVESTIGATION WORK PLAN ADDENDUM]	YES	SITE 00005 SITE 00006 SITE 00011 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000387 REPORT 55	**03-07-1995**	PRC ENVIRONMENTAL MANAGEMENT, INC.	SUMMARY OF RESULTS, PHASE IIA REMEDIAL INVESTIGATION, AQUIFER TESTING (SEE RECORD # 386 - NAVFAC EFA WEST TRANSMITTAL LETTER; AND RECORD # 475 - REVISED SUMMARY OF RESULTS)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025 WELL 00001-MW-01 WELL 00004-MW-01 WELL 00006-MW-02 WELL 00006-MW-03 WELL 00011-MW-03 WELL 00011-MW-04 WELL 00012-MW-01 WELL 00012-MW-03 WELL 00017-MW-01

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00019-MW-01 WELL 00020-MW-01 WELL 00020-MW-03 WELL 00022-MW-01 WELL 00022-MW-03 WELL 00024-MW-02 WELL 00024-MW-03 WELL 00025-MW-01 WELL 00025-MW-03
AR_N60028_000383 CORRESPONDENCE 4	**03-08-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JANUARY 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000390 CORRESPONDENCE 4	**03-22-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FEBRUARY 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000393 REPORT 459	**04-04-1995**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS)	YES	AST 0000004 AST 0000103 AST 0000104 BLDG 0000002 BLDG 0000003 BLDG 0000034 BLDG 0000041 BLDG 0000062 BLDG 0000081 BLDG 0000082 BLDG 0000083 BLDG 0000084 BLDG 0000085 BLDG 0000086 BLDG 0000089 BLDG 0000099 BLDG 0000111 BLDG 0000113 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000262 BLDG 0000267 BLDG 0000289 BLDG 0000290 BLDG 0000325 BLDG 0000335 BLDG 0000342

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					UST 0000240A
					UST 0000240B
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					UST 0000240D
					UST 0000270
					WELL 00004/19-MW-03
					WELL 00011-MW-01
					WELL 00011-MW-02
					WELL 00011-MW-03
					WELL 00011-MW-04

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00012-MW-03 WELL 00020-MW-03 WELL 00024-MW-04 WELL 00025-MW-02 WELL 00025-MW-03
AR_N60028_000394 CORRESPONDENCE 29	**04-12-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 28 MARCH 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NO. 8 (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00022
AR_N60028_000396 CORRESPONDENCE 4	**04-12-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MARCH 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000398 CORRESPONDENCE 3	**04-21-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTION FOR PETROLEUM CONTAMINATED SOIL AND FLOATING PRODUCT REMOVAL (ENCLOSURE IS RECORD # 399)	YES	SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000405 MINUTES 109	**04-25-1995**	MARY HILLABRAND, INC.	25 APRIL 1995 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 9 TRANSCRIPT	YES	PARCEL T-005 PARCEL T-006 PARCEL T-007 SITE 00006 SITE 00014 SITE 00022 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000403 REPORT 129	**05-01-1995**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FEBRUARY 1995 QUARTERLY GROUNDWATER SAMPLING REPORT (SEE RECORD # 402 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00020 SITE 00022 SITE 00024 SITE 00025 WELL 00001-MW-01 WELL 00004/19-MW-01 WELL 00004/19-MW-02 WELL 00004/19-MW-03 WELL 00006-MW-01 WELL 00006-MW-02 WELL 00006-MW-03 WELL 00006-MW-04 WELL 00006-MW-06 WELL 00006-MW-07

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					WELL 00006-MW-09
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					WELL 00006-MW-11
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					WELL 00006-MW-13
					WELL 00011-MW-02
					WELL 00011-MW-03
					WELL 00011-MW-04
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					WELL 00012-MW-04
					WELL 00014-CW-01
					WELL 00014-CW-02
					WELL 00014-CW-03
					WELL 00014-MW-01

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					WELL 00017-MW-01
					WELL 00020-MW-01
					WELL 00020-MW-02
					WELL 00020-MW-03
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					WELL 00025-MW-02
					WELL 00025-MW-03

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000401 CORRESPONDENCE 18	**05-11-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 25 APRIL 1995 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 9 MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	BLDG 0000180 PARCEL T-005 PARCEL T-006 SITE 00003 SITE 00006 SITE 00009 SITE 00014 SITE 00022 SITE 00025 UST 0000180C
AR_N60028_000402 CORRESPONDENCE 3	**05-11-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FEBRUARY 1995 QUARTERLY GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 403)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00020 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000505 CORRESPONDENCE 3	**05-15-1995**	ARC ECOLOGY	TRANSMITTAL OF THE RESTORATION ADVISORY BOARD (RAB) CONCERNS REGARDING THE VALIDITY OF THE METHODOLOGY PROPOSED FOR THE PHASE II B REMEDIAL INVESTIGATION (W/ ENCLOSURE) [SEE RECORD # 393 - FINAL PHASE IIB REMEDIAL INVESTIGATION WORK PLAN ADDENDUM]	YES	SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000407 MINUTES 117	**05-23-1995**	MARY HILLABRAND, INC.	23 MAY 1995 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 10 TRANSCRIPT	YES	BLDG 0000002 BLDG 0000003 BLDG 0000180 PARCEL T-005 PARCEL T-006 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000408 CORRESPONDENCE 4	**05-30-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE APRIL 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000412 CORRESPONDENCE 26	**06-14-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 23 MAY 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	AST 0000103 AST 0000104 BLDG 0000002 BLDG 0000180 SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00019 SITE 00022 WELL 00006-MW-01 WELL 00006-MW-02 WELL 00006-MW-03 WELL 00006-MW-06 WELL 00006-MW-07 WELL 00006-MW-11 WELL 00006-MW-12 WELL 00006-MW-13 WELL 00011-MW-02

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00011-MW-04 WELL 00014-CW-01 WELL 00014-CW-02 WELL 00014-CW-03 WELL 00014-MW-01 WELL 00014-MW-02 WELL 00020-MW-01 WELL 00020-MW-03 WELL 00022-MW-01 WELL 00022-MW-02 WELL 00024-MW-01 WELL 00024-MW-04 WELL 00025-MW-02 WELL 00025-MW-03

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000506 CORRESPONDENCE 10	**06-15-1995**	RESTORATION ADVISORY BOARD MEMBER	TRANSMITTAL OF THE SUGGESTIONS AND RECOMMENDATIONS TO IMPROVE THE QUARTERLY GROUNDWATER MONITORING AND SAMPLING REPORTS (W/ ENCLOSURE)	YES	SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00017 SITE 00019 SITE 00020 SITE 00024 WELL 00006-MW-01 WELL 00006-MW-04 WELL 00011-MW-04 WELL 00012-MW-01 WELL 00017-MW-01 WELL 00020-MW-01 WELL 00024-MW-02 WELL 00024-MW-04 WELL AP-01 WELL AP-03 WELL AP-05 WELL AP-06 WELL AP-07 WELL MW-24 WELL MW-25

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					WELL MW-28 WELL MW-34 WELL MW-35 WELL MW-45 WELL MW-59 WELL MW-60
AR_N60028_000418 CORRESPONDENCE 3	**06-26-1995**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTION FOR PETROLEUM CONTAMINATED SOIL AND FLOATING PRODUCT (SEE RECORD # 399 - DRAFT ENGINEERING EVALUATION)	YES	SITE 00006 SITE 00014 SITE 00022
AR_N60028_000417 CORRESPONDENCE 4	**06-28-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MAY 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000421 CORRESPONDENCE 37	**07-13-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 27 JUNE 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	AST 0000004 AST 0000004M AST 0000005 AST 0000005M AST 0000006A AST 0000006B AST 0000006C AST 0000006D AST 0000006E AST 0000006F AST 0000006G AST 0000006M AST 0000007 AST 0000012A AST 0000012B AST 0000012C AST 0000012D AST 0000012E AST 0000034 AST 0000066 AST 0000103 AST 0000104 AST 0000117 AST 0000133 AST 0000134 AST 0000169 AST 0000170 AST 0000181

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					UST FF-08

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000422 CORRESPONDENCE 4	**07-24-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JUNE 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00010 SITE 00014 SITE 00019 SITE 00021 SITE 00022 SITE 00025 SITE 00029
AR_N60028_000423 CORRESPONDENCE 43	**07-25-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE SUMMARY OF KEY QUESTIONS AND ANSWERS FOR RESTORATION ADVISORY BOARD (RAB) SITE TOUR NO. 3 HELD ON 15 JULY 1995 (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	SITE 00006 UST 0000240A UST 0000240B
AR_N60028_000426 CORRESPONDENCE 5	**08-09-1995**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT ENGINEERING EVALUATION/COST ANALYSIS, REMOVAL ACTION FOR PETROLEUM CONTAMINATED SOIL AND FLOATING PRODUCT (SEE RECORD # 399 - DRAFT ENGINEERING EVALUATION/COST ANALYSIS)	YES	SITE 00006 SITE 00014 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000425 CORRESPONDENCE 36	**08-10-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 25 JULY 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	BLDG 0000002 BLDG 0000180 PARCEL 0005 PARCEL 0006 SITE 00003 SITE 00006 SITE 00009 SITE 00025
AR_N60028_000436 MINUTES 119	**08-22-1995**	MARY HILLABRAND, INC.	22 AUGUST 1995 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 13	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00025
AR_N60028_001911 MINUTES 27	**08-22-1995**	NAVFAC - EFA WEST	22 AUGUST 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS) [SEE RECORD # 435 - NAVFAC EFA WEST TRANSMITTAL LETTER]	YES	BLDG 0000002 BLDG 0000003 BLDG 0000180 SITE 00006 SITE 00020 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000433 REPORT 149	**08-25-1995**	PRC ENVIRONMENTAL MANAGEMENT, INC.	MAY 1995 QUARTERLY GROUNDWATER SAMPLING REPORT (SEE RECORD # 432 - NAVFAC EFA WEST TRANSMITTAL LETTER)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00020 SITE 00022 SITE 00024 SITE 00025 WELL 00001-MW-01 WELL 00004-MW-01 WELL 00004-MW-02 WELL 00004-MW-03 WELL 00006-MW-01 WELL 00006-MW-02 WELL 00006-MW-03 WELL 00006-MW-04 WELL 00006-MW-06 WELL 00006-MW-07

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00025-MW-02 WELL 00025-MW-03
AR_N60028_000431 CORRESPONDENCE 4	**08-29-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JULY 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00005 SITE 00006 SITE 00007 SITE 00010 SITE 00014 SITE 00015 SITE 00019 SITE 00021 SITE 00022 SITE 00024 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000444 MINUTES 127	**09-26-1995**	MARY HILLABRAND, INC.	26 SEPTEMBER 1995 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPTS	YES	BLDG 0000002 BLDG 0000003 BLDG 0000180 DRY DOCK 0004 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00028 SITE 00029

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000438 CORRESPONDENCE 4	**10-02-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE AUGUST 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00021 SITE 00022 SITE 00024

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000443 CORRESPONDENCE 35	**10-17-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 26 SEPTEMBER 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	BLDG 0000001 BLDG 0000002 BLDG 0000003 BLDG 0000041 BLDG 0000099 BLDG 0000180 BLDG 0000342 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00028 SITE 00029

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000445 CORRESPONDENCE 18	**10-31-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE SEPTEMBER 1995 MONTHLY STATUS REPORT, AND RESTORATION ADVISORY BOARD (RAB) SITE TOUR SUMMARY OF KEY QUESTIONS AND ANSWERS (W/ ENCLOSURES)	YES	BLDG 0000062 BLDG 0000099 SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00013A SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 WELL W-03

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000457 MINUTES 43	**11-28-1995**	MARY HILLABRAND, INC.	28 NOVEMBER 1995 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 16 TRANSCRIPT	YES	BLDG 0000201 SITE 00006 SITE 00014 SITE 00022
AR_N60028_000454 REPORT 41	**12-06-1995**	PRC ENVIRONMENTAL MANAGEMENT, INC.	TIDAL INFLUENCE STUDY, SUMMARY OF RESULTS (SEE RECORD # 453 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00019 SITE 00024 SITE 00025 WELL 00011-MW-03

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000453 CORRESPONDENCE 5	**12-08-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) OCTOBER 1995 MONTHLY STATUS REPORT; AND 2) TIDAL INFLUENCE STUDY, SUMMARY OF RESULTS (W/ ENCLOSURE 1; AND ENCLOSURE 2 IS RECORD # 454)	YES	SITE 00001 SITE 00005 SITE 00006 SITE 00007 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 WELL W-03

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000455 CORRESPONDENCE 4	**12-12-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF THE NOVEMBER 1995 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 WELL W-03
AR_N60028_000464 REPORT 19	**01-15-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	APPROACH TO DEVELOPMENT OF PETROLEUM CLEANUP GOALS PROTECTIVE OF THE SAN FRANCISCO BAY (SEE RECORD # 465 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00025

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AR_N60028_000465 CORRESPONDENCE 2	**01-17-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE APPROACH TO DEVELOPMENT OF PETROLEUM CLEANUP GOALS PROTECTIVE OF THE SAN FRANCISCO BAY (ENCLOSURE IS RECORD # 464)	YES	SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00025

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AR_N60028_000475 REPORT 60	**02-06-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	REVISED SUMMARY OF RESULTS PHASE IIA REMEDIAL INVESTIGATION, AQUIFER TESTING (SEE RECORD # 474 - NAVFAC EFAW TRANSMITTAL LETTER; AND RECORD # 387 - SUMMARY OF RESULTS, PHASE IIA REMEDIAL INVESTIGATION, AQUIFER TESTING)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025 WELL 00001-MW-01 WELL 00004/19-MW-01 WELL 00006-MW-02 WELL 00006-MW-03 WELL 00011-MW-03 WELL 00011-MW-04 WELL 00012-MW-01 WELL 00012-MW-03 WELL 00017-MW-01

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AR_N60028_000471 CORRESPONDENCE 5	**02-15-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JANUARY 1996 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00024 WELL W-03
AR_N60028_000488 CORRESPONDENCE 5	**03-22-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FEBRUARY 1996 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022

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AR_N60028_000490 CORRESPONDENCE 34	**04-01-1996**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (INCLUDES U.S. GUIDE FOR CORRECTIVE ACTION PLAN REVIEWERS) [SEE RECORD # 487 - DRAFT WORK PLAN, BENCH SCALE SOIL REMEDIATION TREATABILITY STUDY]	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000498 REPORT 245	**04-10-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL WORK PLAN AND FIELD SAMPLING PLAN, PHASE II ECOLOGICAL RISK ASSESSMENT (INCLUDES CORRECTION PAGE DATED 07 MAY 1996) [SEE RECORDS # 497 AND # 511 - NAVFAC EFAW TRANSMITTAL LETTERS]	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00015 SITE 00025 SITE 00028
AR_N60028_000495 CORRESPONDENCE 3	**04-12-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT AIR SAMPLING WORK PLAN (ENCLOSURE IS RECORD # 496)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000497 CORRESPONDENCE 3	**04-12-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FINAL WORK PLAN AND FIELD SAMPLING PLAN, PHASE II ECOLOGICAL RISK ASSESSMENT (ENCLOSURE IS RECORD # 498)	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00015 SITE 00025 SITE 00028

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AR_N60028_000499 CORRESPONDENCE 38	**04-15-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 26 MARCH 1996 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000501 CORRESPONDENCE 2	**04-16-1996**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (SEE RECORD # 487 - DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY)	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000509 CORRESPONDENCE 5	**04-19-1996**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (SEE RECORD # 487 - DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY)	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000510 CORRESPONDENCE 2	**04-23-1996**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (SEE RECORD # 487 - DRAFT WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY)	YES	SITE 00004 SITE 00006 SITE 00010 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000513 MINUTES 45	**04-23-1996**	MARY HILLABRAND, INC.	23 APRIL 1996 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00025 UST 0000234
AR_N60028_000503 CORRESPONDENCE 4	**04-30-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MARCH 1996 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006
AR_N60028_000511 CORRESPONDENCE 2	**05-07-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE REVISED COVER PAGE FOR THE FINAL WORK PLAN AND FIELD SAMPLING PLAN, PHASE II ECOLOGICAL RISK ASSESSMENT (ENCLOSURE IS RECORD # 498)	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00015 SITE 00025 SITE 00028

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AR_N60028_000514 CORRESPONDENCE 2	**05-08-1996**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT AIR SAMPLING WORK PLAN (SEE RECORD # 496 - DRAFT AIR SAMPLING WORK PLAN)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000515 CORRESPONDENCE 2	**05-08-1996**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT AIR SAMPLING WORK PLAN (SEE RECORD # 496 - DRAFT AIR SAMPLING WORK PLAN)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000512 CORRESPONDENCE 24	**05-14-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 23 APRIL 1996 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00014 SITE 00022
AR_N60028_000529 MINUTES 138	**05-21-1996**	MARY HILLABRAND, INC.	21 MAY 1996 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 22 TRANSCRIPT	YES	BLDG 0000002 BLDG 0000003 BLDG 0000580 PARCEL T-077 PARCEL T-078 PARCEL T-079 PARCEL T-080 SITE 00006 SITE 00007 SITE 00010 SITE 00014 SITE 00017 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000519 CORRESPONDENCE 2	**05-22-1996**	NAVFAC - EFA WEST	SITES NOT TO BE INCLUDED IN THE REMEDIAL INVESTIGATION REPORT AND TRANSFER FROM THE CERCLA PROGRAM (SEE RECORD # 518 - 15 APRIL 1996 REMEDIAL PROJECT MANAGERS (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025

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AR_N60028_000523 REPORT 839	**05-30-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	REMEDIAL INVESTIGATION PHASE IIB SUMMARY OF VALIDATED DATA, VOLUMES I AND II OF II (SEE RECORD # 522 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000526 REPORT 370	**05-31-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	GROUNDWATER STATUS REPORT: SUMMARY OF GROUNDWATER MONITORING FROM NOVEMBER 1994 TO NOVEMBER 1995 (SEE RECORD # 525 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	AST 0000004 AST 0000005 AST 0000006A AST 0000006B AST 0000006C AST 0000006D AST 0000006E AST 0000006F AST 0000006G AST 0000456 AST 0000672 BLDG 0000002 BLDG 0000003 BLDG 0000085 BLDG 0000089 BLDG 0000099 BLDG 0000111 BLDG 0000194 BLDG 0000224 BLDG 0000225 BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000267 BLDG 0000289 BLDG 0000290 BLDG 0000325

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					WELL 00021-MW-06
					WELL 00022-MW-01
					WELL 00022-MW-02

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00022-MW-03
					WELL 00022-MW-04
					WELL 00022-MW-05
					WELL 00024-MW-01
					WELL 00024-MW-02
					WELL 00024-MW-03
					WELL 00024-MW-04
					WELL 00024-MW-05A
					WELL 00024-MW-05B
					WELL 00024-MW-05C
					WELL 00024-MW-06A
					WELL 00024-MW-06B
					WELL 00024-MW-06C
					WELL 00024-MW-07A
					WELL 00024-MW-07B
					WELL 00024-MW-07C

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00025-MW-01 WELL 00025-MW-02 WELL 00025-MW-03
AR_N60028_000522 CORRESPONDENCE 3	**06-03-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE REMEDIAL INVESTIGATION PHASE IIB SUMMARY OF VALIDATED DATA (ENCLOSURE IS RECORD # 523)	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00024 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000525 CORRESPONDENCE 3	**06-03-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE GROUNDWATER STATUS REPORT: SUMMARY OF GROUNDWATER MONITORING FROM NOVEMBER 1994 TO NOVEMBER 1995 (ENCLOSURE IS RECORD # 526)	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000527 CORRESPONDENCE 4	**06-07-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MAY 1996 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 WELL 00006-W-03
AR_N60028_000535 MINUTES 117	**06-25-1996**	MARY HILLABRAND, INC.	25 JUNE 1996 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 23 TRANSCRIPT	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00020 SITE 00022 SITE 00025 UST 0000103 UST 0000104

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000536 CORRESPONDENCE 3	**07-02-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT INTERIM GROUNDWATER MONITORING WORK PLAN (ENCLOSURE IS RECORD # 537)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00021 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000538 CORRESPONDENCE 46	**07-10-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 25 JUNE 1996 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000547 REPORT 156	**07-15-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FEBRUARY 1996 QUARTERLY GROUNDWATER SAMPLING REPORT (SEE RECORD # 546 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 WELL 00006-MW-14 WELL 00006-MW-15 WELL 00006-MW-16 WELL 00006-MW-17 WELL 00006-MW-18 WELL 00006-MW-19 WELL 00006-MW-20 WELL 00007-MW-01 WELL 00009-MW-01

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					WELL 00010-MW-01
					WELL 00011-MW-05
					WELL 00011-MW-06
					WELL 00011-MW-07
					WELL 00012-MW-05
					WELL 00012-MW-06
					WELL 00012-MW-07
					WELL 00012-MW-08
					WELL 00012-MW-09
					WELL 00012-MW-10
					WELL 00012-MW-11
					WELL 00012-MW-12
					WELL 00012-MW-13
					WELL 00012-MW-14
					WELL 00012-MW-15
					WELL 00012-MW-16

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					WELL 00014-MW-03
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					WELL 00015-MW-02
					WELL 00015-MW-03
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					WELL 00021-MW-04A
					WELL 00021-MW-04B
					WELL 00021-MW-06
					WELL 00022-MW-04

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					WELL 00022-MW-05 WELL 00024-MW-05A WELL 00024-MW-05B WELL 00024-MW-05C WELL 00024-MW-06A WELL 00024-MW-06B WELL 00024-MW-06C WELL 00024-MW-07A WELL 00024-MW-07B WELL 00024-MW-07C
AR_N60028_000546 CORRESPONDENCE 3	**07-17-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FEBRUARY 1996 QUARTERLY GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 547)	YES	SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000551 REPORT 121	**07-19-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (INCLUDES FINAL FIELD SAMPLING PLAN ADDENDUM; AND FINAL QUALITY ASSURANCE PROJECT PLAN ADDENDUM)	YES	SITE 00006 SITE 00014 SITE 00015 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000550 CORRESPONDENCE 3	**07-23-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FINAL WORK PLAN, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (ENCLOSURE IS RECORD # 551)	YES	SITE 00006 SITE 00014 SITE 00015 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000554 REPORT 31	**07-25-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL AIR SAMPLING WORK PLAN (SEE RECORD # 553 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000553 CORRESPONDENCE 3	**07-26-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FINAL AIR SAMPLING WORK PLAN (ENCLOSURE IS RECORD # 554)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000555 CORRESPONDENCE 4	**08-09-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JULY 1996 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 WELL 00006-W-03

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AR_N60028_000566 CORRESPONDENCE 14	**08-19-1996**	NAVFAC - EFA WEST	NOTICE OF EXTENSION OF THE DRAFT REMEDIAL INVESTIGATION REPORT (INCLUDES REVIEW AND COMMENTS ON THE DRAFT INTERIM GROUNDWATER MONITORING PLAN; AND DRAFT FINAL QUALITY ASSURANCE PROJECT PLAN, PHASE II ECOLOGICAL RISK ASSESSMENT)	YES	SITE 00006 SITE 00020 SITE 00024 WELL 00012-MW-01 WELL 00012-MW-05 WELL 00012-MW-06 WELL 00012-MW-07 WELL 00012-MW-08 WELL 00012-MW-09 WELL 00012-MW-10 WELL 00012-MW-11 WELL 00012-MW-12 WELL 00012-MW-13 WELL 00012-MW-14 WELL 00012-MW-15 WELL 00012-MW-16 WELL 00014-CW-03 WELL 00014-MW-01

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					WELL 00014-MW-02 WELL 00014-MW-03 WELL 00014-MW-04 WELL 00022-MW-02 WELL 00025-MW-02 WELL MW-01 WELL MW-11
AR_N60028_000563 CORRESPONDENCE 3	**08-23-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS (ENCLOSURE IS RECORD # 564)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022
AR_N60028_000564 REPORT 80	**08-23-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS (SEE RECORD # 563 - NAVFAC EFAW TRANSMITTAL LETTER; AND RECORD # 595 - ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN ADDENDUM)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022
AR_N60028_000568 CORRESPONDENCE 3	**09-06-1996**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS (SEE RECORD # 564 - ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022

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AR_N60028_000569 CORRESPONDENCE 8	**09-10-1996**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE 1) PHASE IIB REMEDIAL INVESTIGATION ADDITIONAL CHARACTERIZATION; AND 2) ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS	YES	BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000246 BLDG 0000248 BLDG 0000464 SITE 00006 SITE 00012 SITE 00017 SITE 00024 UST 0000240A UST 0000240B UST 0000240C UST 0000240D WELL 00017-MW-01

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000574 CORRESPONDENCE 3	**09-24-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JUNE 1996 QUARTERLY GROUNDWATER SAMPLING REPORT (ENCLOSURE IS RECORD # 575)	YES	SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024

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AR_N60028_000575 REPORT 154	**09-24-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	JUNE 1996 QUARTERLY GROUNDWATER SAMPLING REPORT (SEE RECORD # 574 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 WELL 00006-MW-14 WELL 00006-MW-15 WELL 00006-MW-16 WELL 00006-MW-17 WELL 00006-MW-18 WELL 00006-MW-19 WELL 00006-MW-20 WELL 00007-MW-01 WELL 00009-MW-01

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					WELL 00010-MW-01
					WELL 00011-MW-05
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					WELL 00012-MW-05
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					WELL 00012-MW-14
					WELL 00012-MW-15
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					WELL 00015-MW-01
					WELL 00015-MW-02
					WELL 00015-MW-03
					WELL 00020-MW-04
					WELL 00020-MW-05
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					WELL 00021-MW-02A
					WELL 00021-MW-02B
					WELL 00021-MW-03A
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					WELL 00021-MW-04A
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					WELL 00021-MW-06
					WELL 00022-MW-04

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					WELL 00022-MW-05 WELL 00024-MW-05A WELL 00024-MW-05B WELL 00024-MW-05C WELL 00024-MW-06A WELL 00024-MW-06B WELL 00024-MW-06C WELL 00024-MW-07A WELL 00024-MW-07B WELL 00024-MW-07C
AR_N60028_000577 MINUTES 101	**09-24-1996**	MARY HILLABRAND, INC.	24 SEPTEMBER 1996 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 26 TRANSCRIPT	YES	BLDG 0000001 SITE 00006 SITE 00012 SITE 00019
AR_N60028_000587 CORRESPONDENCE 7	**10-11-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) AUGUST 1996 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY STATUS REPORT; AND 2) SEPTEMBER 1996 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY STATUS REPORT (W/ ENCLOSURES 1 AND 2)	YES	SITE 00001 SITE 00003 SITE 00006 SITE 00012 SITE 00017 WELL W-03

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AR_N60028_000578 CORRESPONDENCE 32	**10-15-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 24 SEPTEMBER 1996 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000591 MINUTES 106	**10-22-1996**	MARY HILLABRAND, INC.	22 OCTOBER 1996 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00017 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 UST 0000103 UST 0000104
AR_N60028_000594 CORRESPONDENCE 4	**11-14-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE OCTOBER 1996 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 WELL W-03
AR_N60028_000595 REPORT 16	**11-18-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	ADDENDUM TO ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS (INCLUDES RESPONSES TO COMMENTS)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000601 CORRESPONDENCE 126	**11-19-1996**	MARY HILLABRAND, INC.	19 NOVEMBER 1996 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT	YES	BLDG 0000461 BLDG 0000462 BLDG 0000463 PARCEL T-081 PARCEL T-082 PARCEL T-083 PARCEL T-109 PARCEL T-110 PARCEL T-111 SITE 00006 SITE 00012 SITE 00017
AR_N60028_002118 CORRESPONDENCE 1	**11-19-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE ADDENDUM TO ECOTOXICOLOGICAL TESTING SAMPLING AND ANALYSIS PLAN FOR DEVELOPMENT OF PETROLEUM CLEANUP GOALS (ENCLOSURE IS RECORD # 595)	NO	SITE 00006 SITE 00012 SITE 00015 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000598 CORRESPONDENCE 8	**11-20-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE CONSENSUS STATEMENT FOR THE DRAFT PHASE I REMEDIAL INVESTIGATION REPORT (W/ ENCLOSURE) [SEE RECORD # 279 - DRAFT PHASE 1 REMEDIAL INVESTIGATION REPORT]	YES	SITE 00004 SITE 00006 SITE 00007 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000602 CORRESPONDENCE 42	**12-09-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 19 NOVEMBER 1996 RESTORATION ADVISORY BOARD (RAB) REMEDIAL INVESTIGATION/FEASIBILITY STUDY MEETING MINUTES (W/ ENCLOSURE)	YES	BLDG 0000461 BLDG 0000462 BLDG 0000463 PARCEL T-109 PARCEL YB-019 SITE 00006 SITE 00007 SITE 00010 SITE 00012 SITE 00017 SITE 00029
AR_N60028_000603 CORRESPONDENCE 4	**12-09-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF THE NOVEMBER 1996 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 WELL W-03

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AR_N60028_000614 CORRESPONDENCE 11	**01-17-1997**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (SEE RECORD # 581 - DRAFT REMEDIAL INVESTIGATION REPORT)	YES	SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00011 SITE 00012 SITE 00015 SITE 00017 SITE 00019 SITE 00022 SITE 00024 SITE 00025 WELL 00012-MW-18 WELL 00017-MW-01
AR_N60028_000619 MINUTES 142	**01-21-1997**	MARY HILLABRAND, INC.	21 JANUARY 1997 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 29 TRANSCRIPT	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00013 SITE 00017 SITE 00027

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000620 CORRESPONDENCE 5	**01-22-1997**	ARC ECOLOGY	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (SEE RECORD # 581 - DRAFT REMEDIAL INVESTIGATION REPORT)	YES	SITE 00003 SITE 00005 SITE 00006 SITE 00009 SITE 00012 SITE 00017 SITE 00021
AR_N60028_000618 CORRESPONDENCE 4	**01-28-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DECEMBER 1996 REMEDIAL INVESTIGATION/FEASIBILITY STUDY MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00012 SITE 00014 SITE 00015 SITE 00022 SITE 00024 WELL W-03
AR_N60028_000629 REPORT 59	**02-04-1997**	PRC ENVIRONMENTAL MANAGEMENT, INC.	TECHNICAL MEMORANDUM AIR SAMPLING (SEE RECORD # 628 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00022 SITE 00024
AR_N60028_000628 CORRESPONDENCE 3	**02-06-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE AIR SAMPLING TECHNICAL MEMORANDUM (ENCLOSURE IS RECORD # 629)	YES	SITE 00006 SITE 00022 SITE 00024

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ADMINISTRATIVE RECORD INDEX FOR SITES 6 AND 6A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000631 CORRESPONDENCE 4	**02-12-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JANUARY 1997 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00012 SITE 00017 SITE 00022 SITE 00024
AR_N60028_000639 MINUTES 90	**02-18-1997**	MARY HILLABRAND, INC.	18 FEBRUARY 1997 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 30 TRANSCRIPT	YES	SITE 00006 SITE 00012 SITE 00017
AR_N60028_000634 CORRESPONDENCE 4	**03-10-1997**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE TECHNICAL MEMORANDUM AIR SAMPLING (SEE RECORD # 629 - TECHNICAL MEMORANDUM AIR SAMPLING)	YES	SITE 00006 SITE 00022

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000635 CORRESPONDENCE 42	**03-13-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 18 FEBRUARY 1997 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	AST 0000169 AST 0000170 BLDG 0000201 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00020 SITE 00022 SITE 00025 UST 0000001A UST 0000001B UST 0000001C UST 0000001D UST 0000001E UST 0000001F UST 0000002A UST 0000002D UST 0000085 UST 0000180A UST 0000180B UST 0000180C UST 0000201 UST 0000227 UST 0000234

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					UST 0000368A UST 0000368B UST YBI-111 UST YBI-169 UST YBI-270
AR_N60028_000636 CORRESPONDENCE 4	**03-13-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FEBRUARY 1997 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00006 SITE 00012 SITE 00017 SITE 00022 SITE 00024
AR_N60028_000675 CORRESPONDENCE 3	**04-10-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT, CONTAMINANT FATE AND TRANSPORT MODELING, ADDENDUM 1 (ENCLOSURE IS RECORD # 676)	YES	SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00021 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000681 CORRESPONDENCE 4	**04-17-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT, ECOTOXICOLOGICAL TESTING FOR THE DEVELOPMENT OF PETROLEUM SCREENING LEVELS, ADDENDUM NO. 3 (INCLUDES SYNOPSIS)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022
AR_N60028_000683 CORRESPONDENCE 4	**04-17-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN (INCLUDES SYNOPSIS) [ENCLOSURE IS RECORD # 684]	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00021 SITE 00024 SITE 00025
AR_N60028_000698 CORRESPONDENCE 3	**05-19-1997**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN (SEE RECORD # 684 - DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN)	YES	SITE 00001 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00012 SITE 00014 SITE 00020 SITE 00021 SITE 00022

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000702 CORRESPONDENCE 5	**05-20-1997**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT, ADDENDUM 3, ECOTOXICOLOGICAL TESTING FOR THE DEVELOPMENT OF PETROLEUM SCREENING LEVELS (INCLUDES COMMENTS BY CRWQCB) [SEE RECORD # 682 - DRAFT ADDENDUM 3]	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000714 CORRESPONDENCE 3	**05-23-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE GROUNDWATER STATUS REPORT: SUMMARY OF GROUNDWATER MONITORING FROM NOVEMBER 1995 TO SEPTEMBER 1996 (ENCLOSURE IS RECORD # 715)	YES	SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000715 REPORT 273	**05-23-1997**	PRC ENVIRONMENTAL MANAGEMENT, INC.	GROUNDWATER STATUS REPORT: SUMMARY OF GROUNDWATER MONITORING FROM NOVEMBER 1995 TO SEPTEMBER 1996 (SEE RECORD # 714 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024
AR_N60028_000744 CORRESPONDENCE 2	**05-27-1997**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT, ADDENDUM 1, CONTAMINANT FATE AND TRANSPORT MODELING; AND ADDENDUM 4, REVISED REMEDIAL INVESTIGATION CONCLUSIONS AND RECOMMENDATIONS	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00017 SITE 00019 SITE 00020 SITE 00024

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000718 CORRESPONDENCE 2	**06-20-1997**	DTSC - BERKELEY, CA	ANALYSIS OF COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) CONSTITUENT ANALYSIS AT SITES DESIGNATED PETROLEUM-ONLY	YES	SITE 00004 SITE 00006 SITE 00011 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00025
AR_N60028_000723 CORRESPONDENCE 4	**07-08-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT REPORT, BENCH-SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (INCLUDES REPORT SYNOPSIS) [ENCLOSURE IS RECORD # 725]	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000726 CORRESPONDENCE 33	**07-21-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 17 JUNE 1997 RESTORATION ADVISORY BOARD (RAB) DRAFT MEETING MINUTES (W/ ENCLOSURE)	YES	PARCEL T-093 PARCEL T-096 PARCEL T-097 PARCEL T-104 PARCEL T-105 PARCEL T-106 PARCEL YB-001 PARCEL YB-002 PARCEL YB-003 PARCEL YB-004 PARCEL YB-005 PARCEL YB-006 PARCEL YB-007 PARCEL YB-008 PARCEL YB-009 PARCEL YB-010 PARCEL YB-011 PARCEL YB-012 PARCEL YB-013 PARCEL YB-015 PARCEL YB-016 PARCEL YB-017 PARCEL YB-019 PARCEL YB-020 PARCEL YB-021 PARCEL YB-022 PARCEL YB-023 SITE 00006

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00007 SITE 00012 SITE 00016 SITE 00020 SITE 00028 SITE 00029
AR_N60028_000727 CORRESPONDENCE 7	**07-22-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE RESPONSES TO COMMENTS ON THE TECHNICAL MEMORANDUM, AIR SAMPLING (W/ ENCLOSURE) [SEE RECORD # 634 - REVIEW AND COMMENTS]	YES	SITE 00006 SITE 00022

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000728 MINUTES 47	**07-22-1997**	MARY HILLABRAND, INC.	22 JULY 1997 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 35	YES	AST 0000034A BLDG 0000001 BLDG 0000180 BLDG 0000201 BLDG 0000227 BLDG 0000368 BLDG 0000449 PARCEL T-002 PARCEL T-003 PARCEL T-018 PARCEL T-020 PARCEL T-029 PARCEL T-096 PARCEL T-097 PARCEL T-100 PARCEL T-101 PARCEL T-102 PARCEL T-103 PARCEL T-107 SITE 00001 SITE 00006 SITE 00012 SITE 00020 UST 0000270

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000729 CORRESPONDENCE 3	**07-29-1997**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN (SEE RECORD # 684 - DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN)	YES	SITE 00004 SITE 00006 SITE 00011 SITE 00012 SITE 00019 SITE 00020 SITE 00024
AR_N60028_000732 CORRESPONDENCE 3	**08-12-1997**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT REPORT, BENCH SCALE SOIL BIOREMEDIATION TREATABILITY STUDY (SEE RECORD # 725 - DRAFT REPORT)	YES	SITE 00006 SITE 00014 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000737 CORRESPONDENCE 34	**08-12-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 22 JULY 1997 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	AST 0000034A BLDG 0000001 BLDG 0000201 BLDG 0000368 PARCEL T-096 PARCEL T-097 PARCEL T-100 PARCEL T-101 PARCEL T-102 PARCEL T-103 PARCEL T-107 SITE 00006 SITE 00012 SITE 00020 UST 0000001A UST 0000001E UST 0000180C UST 0000201 UST 0000227 UST 0000270 UST 0000368A UST 0000368B

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000750 REPORT 199	**09-02-1997**	PRC ENVIRONMENTAL MANAGEMENT, INC.	FINAL INTERIM GROUNDWATER MONITORING PLAN (SEE RECORD # 748 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00021 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000746 CORRESPONDENCE 35	**09-04-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) 20 MAY 1997 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES; 2) 17 JUNE 1997 FINAL RAB MEETING MINUTES; AND 3) 22 JULY 1997 FINAL RAB MEETING MINUTES (W/ ENCLOSURES)	YES	AST 0000034A BLDG 0000099 BLDG 0000227 PARCEL T-011 PARCEL T-012 PARCEL T-013 PARCEL T-015 PARCEL T-017 PARCEL T-018 PARCEL T-023 PARCEL T-025 PARCEL T-026 PARCEL T-097 PARCEL T-105 PARCEL T-106 PARCEL T-119 PARCEL YB-001 PARCEL YB-002 PARCEL YB-010 PARCEL YB-017 PIER 00001 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00012 SITE 00015

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					SITE 00016 SITE 00017 SITE 00020 SITE 00021 SITE 00024 SITE 00028 SITE 00029 UST 0000001A UST 0000001E UST 0000180C UST 0000201 UST 0000270 UST 0000368A UST 0000368B
AR_N60028_000748 CORRESPONDENCE 12	**09-04-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) FINAL INTERIM GROUNDWATER MONITORING PLAN; AND 2) RESPONSE TO COMMENTS ON THE DRAFT FINAL INTERIM GROUNDWATER MONITORING PLAN (W/ ENCLOSURE 2; AND ENCLOSURE 1 IS RECORD # 750)	YES	SITE 00004 SITE 00006 SITE 00007 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000755 CORRESPONDENCE 64	**09-08-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 19 AUGUST 1997 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	BLDG 0000461 SITE 00001 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00024
AR_N60028_000764 CORRESPONDENCE 3	**09-17-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE FINAL BENCH-SCALE SOIL BIOREMEDIATION TREATABILITY STUDY REPORT (ENCLOSURE IS RECORD # 765)	YES	SITE 00006 SITE 00014 SITE 00015 SITE 00022 SITE 00025
AR_N60028_000765 REPORT 51	**09-17-1997**	TETRA TECH EM, INC.	FINAL BENCH-SCALE SOIL BIOREMEDIATION TREATABILITY STUDY REPORT (SEE RECORD # 764 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00014 SITE 00015 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000781 MINUTES 46	**10-21-1997**	MARY HILLABRAND, INC.	21 OCTOBER 1997 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT	YES	BLDG 0000225 SITE 00006 SITE 00012 SITE 00020
AR_N60028_000778 CORRESPONDENCE 23	**10-27-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) 19 AUGUST 1997 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES; AND 2) 16 SEPTEMBER 1997 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00001 SITE 00003 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00017 SITE 00020 SITE 00021 SITE 00024 SITE 00028 SITE 00029
AR_N60028_000782 CORRESPONDENCE 36	**11-10-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 21 OCTOBER 1997 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [INCLUDES RESPONSE TO COMMENTS ON THE DRAFT SITE SPECIFIC ENVIRONMENTAL BASELINE SURVEY AND DRAFT FINDING OF SUITABILITY TO LEASE FOR REUSE ZONE 4]	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00019 SITE 00020 SITE 00022

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000785 CORRESPONDENCE 52	**11-18-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE RESPONSES TO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT; AND THE DRAFT REMEDIAL INVESTIGATION REPORT, ADDENDA 1 THROUGH 4 (W/ ENCLOSURE)	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00024 SITE 00025 UST 0000270
AR_N60028_000796 CORRESPONDENCE 14	**12-04-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 21 OCTOBER 1997 RESTORATION ADVISORY BOARD (RAB) FINAL MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012 SITE 00020 SITE 00024
AR_N60028_000804 CORRESPONDENCE 9	**12-16-1997**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT (SEE RECORD # 757 - DRAFT FINAL ONSHORE REMEDIAL INVESTIGATION REPORT)	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00017 SITE 00019 SITE 00024

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000800 CORRESPONDENCE 4	**12-30-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE RESPONSES TO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT, ADDENDUM NO. 2 (W/ ENCLOSURE) [DTSC REVIEW AND COMMENTS WERE NOT RECEIVED IN THE RESTORATION RECORDS FILE]	YES	SITE 00005 SITE 00006 SITE 00012 SITE 00017 SITE 00022 SITE 00024
AR_N60028_000809 CORRESPONDENCE 7	**01-06-1998**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT FINAL ONSHORE REMEDIAL INVESTIGATION REPORT (SEE RECORD # 757 - DRAFT FINAL ONSHORE REMEDIAL INVESTIGATION REPORT)	YES	SITE 00006 SITE 00008 SITE 00022 SITE 00024
AR_N60028_000817 CORRESPONDENCE 7	**01-20-1998**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT CORRECTIVE ACTION PLAN REPORT (SEE RECORD # 787 - DRAFT CORRECTIVE ACTION PLAN)	YES	SITE 00004 SITE 00005 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000828 MINUTES 47	**01-20-1998**	MARY HILLABRAND, INC.	20 JANUARY 1998 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT	YES	BLDG 0000208 BLDG 0000230 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00019 SITE 00024 SITE 00028 SITE 00029

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000824 CORRESPONDENCE 18	**01-23-1998**	RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE DRAFT CORRECTIVE ACTION PLAN (SEE RECORD # 787 - DRAFT CORRECTIVE ACTION PLAN)	YES	BLDG 0000089 BLDG 0000099 BLDG 0000194 BLDG 0000224 BLDG 0000267 SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025 UST 0000240A UST 0000240B UST 0000240C UST 0000240D
AR_N60028_000822 CORRESPONDENCE 6	**01-28-1998**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON APPENDIX N OF THE DRAFT FINAL ONSHORE REMEDIAL INVESTIGATION REPORT (SEE RECORD # 757 - DRAFT FINAL ONSHORE REMEDIAL INVESTIGATION)	YES	SITE 00006 SITE 00012 SITE 00015 SITE 00022

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000823 CORRESPONDENCE 11	**01-28-1998**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT CORRECTIVE ACTION PLAN (SEE RECORD # 787 - DRAFT CORRECTIVE ACTION PLAN)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025 UST 0000330A UST 0000330B UST 0000330E UST 0000330F
AR_N60028_000827 CORRESPONDENCE 62	**02-09-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 20 JANUARY 1998 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	BLDG 0000230 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00027 SITE 00028 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000832 MINUTES 47	**02-17-1998**	MARY HILLABRAND, INC.	17 FEBRUARY 1998 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 42	YES	BLDG 0000330 SITE 00006 SITE 00007 SITE 00010 SITE 00012 SITE 00014 SITE 00022 SITE 00024 SITE 00027
AR_N60028_000835 CORRESPONDENCE 36	**03-10-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 17 FEBRUARY 1998 RESTORATION ADVISORY BOARD (RAB) DRAFT MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012 SITE 00027
AR_N60028_000838 MINUTES 48	**03-17-1998**	MARY HILLABRAND, INC.	17 MARCH 1998 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 43	YES	BLDG 0000083 BLDG 0000205 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00029

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000839 CORRESPONDENCE 2	**03-30-1998**	CRWQCB - OAKLAND, CA	LETTER REQUESTING INTEGRATION OF MEASUREMENT OF BIOLOGICAL DEGRADATION PARAMETERS IN THE UPCOMING APRIL GROUNDWATER MONITORING EVENT, AND PROVIDE DOCUMENTATION OF RESPONSES ON THE DRAFT CORRECTIVE ACTION PLAN	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000842 CORRESPONDENCE 50	**04-13-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 17 MARCH 1998 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS) [W/ ENCLOSURE]	YES	BLDG 0000083 BLDG 0000205 SITE 00006 SITE 00012
AR_N60028_000848 MINUTES 54	**04-21-1998**	MARY HILLABRAND, INC.	21 APRIL 1998 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 44	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00020 SITE 00022 SITE 00025 UST 0000270

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000844 CORRESPONDENCE 17	**04-23-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 17 MARCH 1998 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES REMEDIAL INVESTIGATION/FEASIBILITY STUDY (W/ ENCLOSURE)	YES	BLDG 0000083 BLDG 0000205 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00029
AR_N60028_000914 CORRESPONDENCE 2	**10-09-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE QUARTERLY GROUNDWATER SAMPLING REPORT - MAY 1998 (ENCLOSURE IS RECORD # 915)	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000915 REPORT 316	**10-09-1998**	TETRA TECH EM, INC.	QUARTERLY GROUNDWATER SAMPLING REPORT - MAY 1998 (SEE RECORD # 914 - NAVFAC EFAW TRANSMITTAL LETTER)	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025
AR_N60028_000928 MINUTES 39	**11-17-1998**	MARY HILLABRAND, INC.	17 NOVEMBER 1998 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 51 TRANSCRIPT	YES	BLDG 0000003 BLDG 0000029 BLDG 0000143 BLDG 0000180 BLDG 0000270 BLDG 0001207 BLDG 0001209 BLDG 0001244 SITE 00001 SITE 00003 SITE 00006 SITE 00012 SITE 00024 SITE 00025

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000942 CORRESPONDENCE 38	**12-21-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 17 NOVEMBER 1998 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	BLDG 0000003 BLDG 0000180 BLDG 0000183 BLDG 0001207 BLDG 0001209 SITE 00001 SITE 00003 SITE 00006 SITE 00012
AR_N60028_000958 MINUTES 37	**02-16-1999**	MARY HILLABRAND, INC.	16 FEBRUARY 1999 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 53 TRANSCRIPT	YES	BLDG 0001207 BLDG 0001209 BLDG 0001311 SITE 00006 SITE 00011 SITE 00012 SITE 00015 SITE 00021 SITE 00024 SITE 00025 UST 0000227 UST 0000270

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AR_N60028_000962 CORRESPONDENCE 2	**03-02-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT FIELD SAMPLING AND ANALYSIS PLAN FOR ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES (ENCLOSURE IS RECORD # 963)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000970 CORRESPONDENCE 48	**03-10-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 16 FEBRUARY 1999 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NO. 53 (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS) [W/ ENCLOSURE]	YES	BLDG 0001207 BLDG 0001209 BLDG 0001311 SITE 00006 SITE 00012 SITE 00024
AR_N60028_000976 CORRESPONDENCE 5	**03-16-1999**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT FIELD SAMPLING AND ANALYSIS PLAN, ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES (SEE RECORD # 963 - DRAFT FIELD SAMPLING AND ANALYSIS PLAN, ADDITIONAL SAMPLING)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000983 MINUTES 45	**03-16-1999**	MARY HILLABRAND, INC.	16 MARCH 1999 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 54	YES	BLDG 0001207 BLDG 0001209 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_000986 CORRESPONDENCE 3	**04-02-1999**	GEOMATRIX CONSULTANTS, INC.	REVIEW AND COMMENTS ON BEHALF OF THE CITY AND COUNTY OF SAN FRANCISCO, MAYOR'S OFFICE, TREASURE ISLAND PROJECT, OF THE DRAFT FIELD SAMPLING AND ANALYSIS PLAN, ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000987 CORRESPONDENCE 3	**04-07-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MARCH 1999 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025 SITE 00027

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000990 CORRESPONDENCE 63	**04-14-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 16 MARCH 1999 DRAFT RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	BLDG 0000062 BLDG 0001207 BLDG 0001209 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00022 SITE 00024 SITE 00025 UST 0000225A UST 0000225B UST 0000225C UST 0000225D

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002160 CORRESPONDENCE 1	**05-07-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT GROUNDWATER STATUS REPORT, SUMMARY OF GROUNDWATER MONITORING FROM JANUARY TO NOVEMBER 1998 (ENCLOSURE IS RECORD # 1005)	NO	SITE 00001 SITE 00004 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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AR_N60028_001002 CORRESPONDENCE 3	**05-11-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE APRIL 1999 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	BLDG 0001207 BLDG 0001209 OU 0000012 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_001028 MINUTES 46	**05-18-1999**	MARY HILLABRAND, INC.	18 MAY 1999 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 56	YES	BLDG 0000570 BLDG 0001311 SITE 00006 SITE 00011 SITE 00012 SITE 00020 SITE 00025
AR_N60028_001037 CORRESPONDENCE 3	**06-09-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE MAY 1999 MONTHLY STATUS REPORT, INSTALLATION RESTORATION PROGRAM (W/ ENCLOSURE)	YES	BLDG 0001207 BLDG 0001209 BLDG 0001311 SITE 00006 SITE 00012

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AR_N60028_001043 CORRESPONDENCE 44	**06-28-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 1) 16 FEBRUARY 1999 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES; 2) 16 MARCH 1999 FINAL RAB MEETING MINUTES; AND 3) 20 APRIL 1999 FINAL RAB MEETING MINUTES (W/ ENCLOSURES)	YES	BLDG 0000062 BLDG 0001207 BLDG 0001209 BLDG 0001311 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000180 UST 0000225A UST 0000225B UST 0000225C UST 0000225D UST 0000227 UST 0000270

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AR_N60028_001048 CORRESPONDENCE 13	**07-02-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 18 MAY 1999 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	BLDG 0001207 BLDG 0001209 BLDG 0001311 SITE 00006 SITE 00012 SITE 00020 SITE 00025
AR_N60028_001049 CORRESPONDENCE 3	**07-02-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JUNE 1999 MONTHLY STATUS REPORT, INSTALLATION RESTORATION PROGRAM (W/ ENCLOSURE)	YES	SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_001056 CORRESPONDENCE 3	**08-04-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE JULY 1999 MONTHLY STATUS REPORT, INSTALLATION RESTORATION PROGRAM (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012

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AR_N60028_001063 CORRESPONDENCE 2	**08-26-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT FINAL FIELD SAMPLING AND ANALYSIS PLAN FOR ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES (ENCLOSURE IS RECORD # 1064)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025
AR_N60028_001085 CORRESPONDENCE 35	**10-14-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT 21 SEPTEMBER 1999 RESTORATION ADVISORY BOARD (RAB) DRAFT MEETING MINUTES, MEETING NO. 60 (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS) [W/ ENCLOSURE]	YES	BLDG 0001133 BLDG 0001207 BLDG 0001209 BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 SITE 00021 SITE 00024
AR_N60028_000019 MINUTES 38	**10-19-1999**	MARY HILLABRAND, INC..	19 OCTOBER 1999 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT, MEETING NO. 60	YES	SITE 00001 SITE 00003 SITE 00006 SITE 00012

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AR_N60028_000025 CORRESPONDENCE 7	**10-27-1999**	CRWQCB - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE 1) DRAFT FINAL FIELD SAMPLING AND ANALYSIS PLAN FOR ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES; AND	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00020 SITE 00022 SITE 00025 UST 0000227
AR_N60028_000032 CORRESPONDENCE 3	**11-04-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE OCTOBER 1999 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012
AR_N60028_000042 CORRESPONDENCE 37	**11-12-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT 19 OCTOBER 1999 RESTORATION ADVISORY BOARD (RAB) MEETING NO. 60 MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024
AR_N60028_000063 CORRESPONDENCE 3	**12-08-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE NOVEMBER 1999 MONTHLY STATUS REPORT (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012
AR_N60028_000064 CORRESPONDENCE 11	**12-08-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF THE 19 OCTOBER 1999 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (W/ ENCLOSURE)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 WELL 00023 WELL 00024

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AR_N60028_002166 CORRESPONDENCE 1	**02-11-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE 1) DRAFT FIELD SAMPLING PLAN FOR FACILITYWIDE GROUNDWATER MONITORING; AND 2) DRAFT QUALITY ASSURANCE PROJECT PLAN FOR FACILITYWIDE GROUNDWATER MONITORING (ENCLOSURE 1 IS RECORD # 1113 AND ENCLOSURE 2 IS RECORD # 1114)	NO	SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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AR_N60028_001102 REPORT 172	**02-15-2000**	TETRA TECH EM, INC.	FINAL QUALITY ASSURANCE PROJECT PLAN, ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES (SEE RECORD # 1614 - NAVFAC SWDIV TRANSMITTAL LETTER)	YES	AOC 000004/19-S1 AOC 000004/19-S2 AOC 000004/19-S3 AOC 000004/19-S4 AOC 000006-GW-1 AOC 000006-GW-2 AOC 000006-S1 AOC 000006-S2 AOC 000006-S3 AOC 000006-S4 AOC 000006-S5 AOC 000006-S6 AOC 000014/22-GW-1 AOC 000014/22-S1 AOC 000014/22-S2 AOC 000014/22-S3 AOC 000014/22-S4 AOC 000014/22-S5 AOC 000014/22-S6

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					AOC 000015-S1
					AOC 000015-S2
					AOC 000015-S3
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					AOC 000015-S6
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					AOC 000016-S3
					AOC 000016-S4
					AOC 000016-S5
					AOC 000020-GW-1
					AOC 000020-S1
					AOC 000020-S2
					AOC 000020-S3
					AOC 000020-S4
					AOC 000025-GW-1
					AOC 000025-S1
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					AST 0000004
					AST 0000005
					AST 0000006A
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					AST 0000006C
					AST 0000006D

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					AST 0000006E
					AST 0000006F
					AST 0000006G
					AST 0000456
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					BLDG 0000002
					BLDG 0000003
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					BLDG 0000081
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					SITE 00006
					SITE 00014
					SITE 00015
					SITE 00016
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					SITE 00020
					SITE 00022
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					UST 0000002A
					UST 0000002C
					UST 0000002D
					UST 0000085
					UST 0000143
					UST 0000180B
					UST 0000180C
					UST 0000225A
					UST 0000225B
					UST 0000225C
					UST 0000225D
					UST 0000248A
					UST 0000248B
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					UST 0000330B
					UST 0000330C
					UST 0000330D
					UST 0000330E
					UST 0000330F

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AR_N60028_001614 CORRESPONDENCE 3	**02-15-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE 1) FINAL FIELD SAMPLING PLAN ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES, AND 2) FINAL QUALITY ASSURANCE PROJECT PLAN ADDITIONAL SAMPLING AT CORRECTIVE ACTION PLAN SITES (ENCLOSURE 2 IS RECORD # 1102)	YES	SITE 00004 SITE 00006 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025

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AR_N60028_001103 CORRESPONDENCE 6	**03-10-2000**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT FIELD SAMPLING PLAN AND DRAFT QUALITY ASSURANCE PROJECT PLAN FOR FACILITY-WIDE GROUNDWATER MONITORING (SEE RECORD # 1113 - DRAFT FIELD SAMPLING AND ANALYSIS PLAN; AND RECORD # 1114 - DRAFT QUALITY ASSURANCE PROJECT PLAN)	YES	SITE 00001 SITE 00005 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00022 SITE 00025 WELL 00017-MW-01 WELL 00024-MW-03 WELL MW-03 WELL MW-05 WELL MW-06 WELL MW-07 WELL MW-20 WELL MW-21 WELL MW-22 WELL MW-23 WELL MW-24

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AR_N60028_001117 CORRESPONDENCE 34	**03-28-2000**	TETRA TECH EM, INC.	RESPONSES TO COMMENTS ON THE DRAFT FIELD SAMPLING PLAN AND DRAFT QUALITY ASSURANCE PROJECT PLAN FOR THE FACILITYWIDE GROUNDWATER MONITORING PROGRAM	YES	SITE 00001 SITE 00005 SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00022 SITE 00024 SITE 00025 WELL 00001-MW-01 WELL 00017-MW-01 WELL 00024-MW-03 WELL MW-03 WELL MW-05 WELL MW-06 WELL MW-07 WELL MW-20 WELL MW-21 WELL MW-22 WELL MW-23 WELL MW-24

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AR_N60028_001123 CORRESPONDENCE 19	**06-30-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE RESPONSES TO COMMENTS ON THE PHASE 2 SAMPLING FOR CORRECTIVE ACTION PLAN SITES (W/ ENCLOSURE)	YES	BLDG 0000225 BLDG 0000461 SITE 00004 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00022 SITE 00025 WELL 00006-MW-01 WELL 00006-MW-03 WELL 00006-MW-05 WELL 00006-MW-08 WELL 00006-MW-11 WELL 00006-MW-17 WELL 00006-MW-18 WELL 00006-MW-21 WELL 00006-MW-22

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					WELL 00012-MW-07 WELL 00014-MW-05 WELL 00022-MW-06 WELL 00022-MW-07 WELL 00143-MW-02

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AR_N60028_000089 REPORT 105	**08-31-2000**	TETRA TECH EM, INC.	FINAL TECHNICAL MEMORANDUM - BIOVENTING/BIOSPARGING PILOT-SCALE TEST	YES	SITE 00006 UST 0000240A UST 0000240B WELL 00006-C-11 WELL 00006-D-12 WELL 00006-MP-01 WELL 00006-MP-01A WELL 00006-MP-01B WELL 00006-MP-01C WELL 00006-MP-02 WELL 00006-MP-02A WELL 00006-MP-02B WELL 00006-MP-02C WELL 00006-MP-03 WELL 00006-MP-03A WELL 00006-MP-03B WELL 00006-MP-04 WELL 00006-MP-04A

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AR_N60028_000094 CORRESPONDENCE 1	**09-27-2000**	DTSC - BERKELEY, CA	LETTER DEFERRING TO CRWQCB FOR FINAL DETERMINATION ON THE FINAL TECHNICAL MEMORANDUM BIOVENTING/ BIOSPARGING PILOT-SCALE TEST (SEE RECORD # 95 - CONCURRENCE FROM CRWQCB)	YES	SITE 00006 UST 0000240A UST 0000240B
AR_N60028_000095 CORRESPONDENCE 1	**09-27-2000**	CRWQCB - OAKLAND, CA	REVIEW AND CONCURRENCE WITH THE FINAL TECHNICAL MEMORANDUM BIOVENTING/ BIOSPARGING PILOT-SCALE TEST (SEE RECORD # 89 - FINAL TECHNICAL MEMORANDUM BIOVENTING/ BIOSPARGING PILOT-SCALE TEST)	YES	SITE 00006 UST 0000240A UST 0000240B

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AR_N60028_000120 MINUTES 84	**12-19-2000**	MARY HILLABRAND, INC.	19 DECEMBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES TRANSCRIPT	YES	BLDG 0000002 BLDG 0001133 BLDG 0001207 BLDG 0001209 BLDG 0001211 BLDG 0001231 BLDG 0001233 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00022 SITE 00025

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AR_N60028_000167 REPORT 76	**05-29-2001**	TETRA TECH EM, INC.	FINAL FIELD SAMPLING PLAN FOR FACILITYWIDE GROUNDWATER MONITORING	YES	BLDG 0000570 SITE 00001 SITE 00004 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000180C UST 0000201 UST 0000227 UST 0000368B

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AR_N60028_000168 REPORT 86	**05-29-2001**	TETRA TECH EM, INC.	FINAL QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR FACILITYWIDE GROUNDWATER MONITORING	YES	BLDG 0000014 BLDG 0000020 BLDG 0000029 BLDG 0000040 BLDG 0000047 BLDG 0000057 BLDG 0000070A BLDG 0000092 BLDG 0000096 BLDG 0000099 BLDG 0000213 BLDG 0000230 BLDG 0000238 BLDG 0000270 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024

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AR_N60028_002092 CORRESPONDENCE 2	**05-29-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE 1) FINAL FIELD SAMPLING PLAN FOR FACILITYWIDE GROUNDWATER MONITORING, AND 2) FINAL QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR FACILITYWIDE GROUNDWATER MONITORING (ENCLOSURE 1 IS RECORD # 167 AND ENCLOSURE 2 IS RECORD # 168)	YES	SITE 00001 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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AR_N60028_000647 REPORT 24	**10-16-2001**	TETRA TECH EM, INC.	FINAL TOTAL DISSOLVED AND SUSPENDED SOLIDS ADDENDUM TO THE FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN FOR FACILITYWIDE GROUNDWATER MONITORING	YES	AST 0000103 AST 0000104 SITE 00004 SITE 00006 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000001A UST 0000001E UST 0000180C UST 0000201 UST 0000227 UST 0000368A UST 0000368B

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AR_N60028_000642 REPORT 48	**11-13-2001**	TETRA TECH EM, INC.	FINAL TECHNICAL MEMORANDUM, PRELIMINARY REMEDIATION CRITERIA FOR PETROLEUM AND PETROLEUM CONSTITUENTS (SEE RECORD # 2121 - NAVFAC SWDIV TRANSMITTAL LETTER)	YES	SITE 00006 WELL 00006-MW-06 WELL 00006-MW-12 WELL 00006-MW-18 WELL 00006-MW-22
AR_N60028_002121 CORRESPONDENCE 1	**11-13-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE FINAL TECHNICAL MEMORANDUM PRELIMINARY REMEDIATION CRITERIA FOR PETROLEUM AND PETROLEUM CONSTITUENTS (ENCLOSURE IS RECORD # 642)	NO	SITE 00006
AR_N60028_000874 REPORT 487	**03-27-2002**	TETRA TECH EM, INC.	FINAL INTERIM GROUNDWATER MONITORING REPORT - GROUNDWATER MONITORING FROM MAY TO AUGUST 2001	YES	SITE 00006 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000180C UST 0000201 UST 0000227 UST 0000368B

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AR_N60028_000885 REPORT 149	**05-14-2002**	TETRA TECH EM, INC.	FINAL FIELD SAMPLING PLAN FOR THE FACILITYWIDE GROUNDWATER MONITORING PROGRAM (INCLUDES FINAL QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR THE FACILITYWIDE GROUNDWATER MONITORING PROGRAM)	YES	SITE 00001 SITE 00001A SITE 00001E SITE 00004 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00180C SITE 00201 SITE 00227 SITE 00368A SITE 00368B SITE D-1B SITE D-4B SITE F-2A SITE F-2B SITE USCG UST 0000001A

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AR_N60028_002175 CORRESPONDENCE 2	**08-29-2002**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE DRAFT ENVIRONMENTAL CLOSEOUT STRATEGY/SCHEDULES (ENCLOSURE IS RECORD # 1131)	NO	SITE 00001 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 00024 SITE 00025

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AR_N60028_002183 CORRESPONDENCE 1	**02-19-2003**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE DRAFT GROUNDWATER STATUS REPORT SUMMARY OF GROUNDWATER MONITORING MAY 2001 THROUGH AUGUST 2002 (ENCLOSURE IS RECORD # 1148)	NO	SITE 00001 SITE 00001A SITE 00001E SITE 00004 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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AR_N60028_001155 REPORT 204	**06-10-2003**	TETRA TECH EM, INC.	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FACILITYWIDE GROUNDWATER MONITORING PROGRAM	YES	SITE 00004 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000180C UST 0000201 UST 0000227 UST 0000368B

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AR_N60028_001164 REPORT 2062	**08-18-2003**	TETRA TECH EM, INC.	FINAL GROUNDWATER STATUS REPORT SUMMARY OF GROUNDWATER MONITORING MAY 2001 THROUGH AUGUST 2002 (CD COPY OF APPENDICES ENCLOSED)	YES	SITE 00001 SITE 00004 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 UST 0000001A UST 0000001E UST 0000180C UST 0000201 UST 0000227 UST 0000368B

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AR_N60028_001171 REPORT 1485	**11-14-2003**	TETRA TECH EM, INC.	FINAL GROUNDWATER STATUS REPORT SUMMARY OF GROUNDWATER MONITORING MAY THROUGH DECEMBER 2002, VOLUMES I AND II OF II (CD COPY ENCLOSED) [SEE RECORD # 1718 - SWDIV TRANSMITTAL LETTER]	YES	AST 0000213 BLDG 0000020 BLDG 0000040 BLDG 0000047 BLDG 0000213 SITE 00004 SITE 00006 SITE 00010 SITE 00011 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00180C SITE 00201 SITE 00227 SITE 00368B UST 0000180C UST 0000201 UST 0000204A UST 0000204B UST 0000204C UST 0000204D UST 0000213

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					UST 0000227 UST 0000237 UST 0000238 UST 0000270 UST 0000368B WELL 00020-MW-01 WELL 00020-MW-03 WELL 00020-MW-04 WELL 00020-MW-05 WELL 00020-MW-06 WELL 00020-MW-07
AR_N60028_001297 CORRESPONDENCE 7	**03-01-2005**	NAVFAC - SOUTHWEST	TRANSMITTAL OF BOUNDARY MAPS REDEFINING SITE BOUNDARIES FOR THE FORMER FIRE TRAINING SCHOOL AND FORMER TRAINING AND STORAGE AREA (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS) [W/ ENCLOSURE]	YES	PARCEL T-111 PARCEL T-112 SITE 00006 SITE 00032

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001302 CORRESPONDENCE 18	**10-03-2005**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF SUMMARY OF INVESTIGATIVE ACTIONS LETTER REPORT AND REQUESTING NO FURTHER ACTION AND CLOSURE FOR PESTICIDE STORAGE AREA (W/ ENCLOSURE)	YES	BLDG 0000032 BLDG 0000062 BLDG 0000462 BLDG 0000463 PARCEL T-111 PARCEL T-112 SITE 00006 SITE 00007 SITE 00014 SITE 00022
AR_N60028_002282 CORRESPONDENCE 10	**05-22-2006**	TETRA TECH EM, INC.	TRANSMITTAL OF THE COMPARISON OF HABITAT ON TREASURE ISLAND AND YERBA BUENA ISLAND (W/ ENCLOSURE)	NO	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001361 REPORT 33	**06-06-2006**	PACIFIC TREATMENT ENVIORNMENTAL SERVICES, INC.	FINAL SAMPLING AND ANALYSIS PLAN ADDENDUM 02 (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FACILITYWIDE GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED)	YES	SITE 00006 SITE 00012 SITE 00025
AR_N60028_001362 CORRESPONDENCE 4	**06-09-2006**	BRAC PMO WEST	TRANSMITTAL OF FINAL SAMPLING AND ANALYSIS PLAN ADDENDUM 02 (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FACILITYWIDE GROUNDWATER MONITORING PROGRAM (ENCLOSURE IS RECORD # 1361)	YES	SITE 00006 SITE 00012 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001537 CORRESPONDENCE 4	**06-09-2006**	DTSC - GLENDALE, CA	REVIEW AND COMMENTS ON THE COMPARISON OF HABITAT ON TREASURE ISLAND AND YERBA BUENA ISLAND (SEE RECORD # 2282 - COMPARISON OF HABITAT ON TREASURE ISLAND AND YERBA BUENA ISLAND)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001377 CORRESPONDENCE 2	**08-14-2006**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (ENCLOSURE IS RECORD # 1378)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001860 CORRESPONDENCE 6	**09-22-2006**	DTSC - GLENDALE, CA	REVIEW AND COMMENTS ON THE DRAFT SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (SEE RECORD # 1378 - DRAFT SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001595 MINUTES 35	**12-19-2006**	TETRA TECH EM, INC.	19 DECEMBER 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 127) [INCLUDES VARIOUS HANDOUTS AND CD COPY]	YES	BLDG 0000001 BLDG 0000040 BLDG 0000061 BLDG 0000083 BLDG 0000099 BLDG 0000107 BLDG 0000233 BLDG 0000240 BLDG 0000271 BLDG 0000293 BLDG 0000355 BLDG 0000425 BLDG 0000530 BLDG 0000570 BLDG 0001229 BLDG 0001231 BLDG 0001311 BLDG 0001313 BLDG 0001325 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027

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					SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001461 CORRESPONDENCE 3	**12-27-2006**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT ACTION MEMORANDUM / INTERIM REMEDIAL ACTION PLAN: NON -TIME CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREAS OLD BUNKER AREA (ENCLOSURE IS RECORD # 1462)	YES	SITE 00006 SITE 00012 SITE 00025
AR_N60028_001470 CORRESPONDENCE 3	**01-22-2007**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL POINT PAPER FOR REDEFINING INSTALLATION RESTORATION SITE, FORMER FIRE TRAINING SCHOOL (ENCLOSURE IS RECORD # 1436)	YES	SITE 00006

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AR_N60028_001436 REPORT 22	**01-24-2007**	SULTECH	FINAL POINT PAPER FOR REDEFINING INSTALLATION RESTORATION SITE, FORMER FIRE TRAINING SCHOOL (SEE RECORD # 1470 - BRAC PMO WEST TRANSMITTAL LETTER)	YES	BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 PARCEL T-109 PARCEL T-111 PARCEL T-112 SITE 00006 UST 0000240A UST 0000240B UST 0000248A UST 0000248B UST 0000248C UST 0000248D
AR_N60028_001434 CORRESPONDENCE 3	**03-23-2007**	BRAC PMO WEST	TRANSMITTAL OF FINAL SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (ENCLOSURE IS RECORD # 1435)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001435 REPORT 840	**03-23-2007**	SULTECH	FINAL SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (SEE RECORD # 1434 - BRAC PMO WEST TRANSMITTAL LETTER)	YES	BLDG 0000040 BLDG 0000092 BLDG 0000107 BLDG 0000502 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001866 CORRESPONDENCE 7	**04-05-2007**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE FINAL SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (INCLUDES HUMAN AND ECOLOGICAL RISK DIVISION COMMENTS, DATED 21 MARCH 2007) [SEE RECORD # 1435 - FINAL SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT]	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001455 CORRESPONDENCE 11	**04-19-2007**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON POINT PAPER FOR REDEFINING SITE BOUNDARIES OF THE FORMER FIRE TRAINING SCHOOL	YES	SITE 00006

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001873 CORRESPONDENCE 11	**04-19-2007**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE POINT PAPER FOR REDEFINING SITE BOUNDARIES FOR FORMER FIRE TRAINING SCHOOL(INCLUDES GEOLOGIC SERVICES UNIT COMMENTS, DATED 19 APRIL 2007)	YES	AST 0000248 AST 0000446 BLDG 0000292 BLDG 0000446 BLDG 0000461 BLDG 0000462 BLDG 0000463 SITE 00006 SITE 00006A SITE 00012 SITE 00032 UST 0000240A UST 0000240B UST 0000240C UST 0000240D UST 0000248A UST 0000248B UST 0000248C UST 0000248D UST 0000446 UST M
AR_N60028_001447 CORRESPONDENCE 4	**06-11-2007**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2006 ANNUAL GROUNDWATER STATUS REPORT: GROUNDWATER MONITORING AT PETROLEUM SITES (ENCLOSURE IS RECORD # 1448)	YES	SITE 00006 SITE 00025

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AR_N60028_001598 MINUTES 32	**06-19-2007**	TETRA TECH EM, INC.	19 JUNE 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 130) [INCLUDES AGENDA, VARIOUS HANDOUTS AND CD COPY]	YES	BLDG 0000001 BLDG 0000003 BLDG 0000180 BLDG 0000233 BLDG 0000240 BLDG 0000271 BLDG 0000343 BLDG 0000344 SITE 00006 SITE 00006A SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029
AR_N60028_001530 CORRESPONDENCE 3	**08-02-2007**	GEOMATRIX CONSULTANTS, INC.	REVIEW AND COMMENTS ON THE DRAFT 2006 ANNUAL GROUNDWATER STATUS REPORT: GROUNDWATER MONITORING AT PETROLEUM SITES (SEE RECORD # 1448 - DRAFT 2006 ANNUAL GROUNDWATER STATUS REPORT)	YES	SITE 00006 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001599 MINUTES 34	**08-21-2007**	TETRA TECH EM, INC.	21 AUGUST 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 131) [INCLUDES AGENDA, VARIOUS HANDOUTS AND CD COPY]	YES	BLDG 0000096 BLDG 0000099 BLDG 0000260 BLDG 0000271 BLDG 0000570 BLDG 0001205 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00033

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AR_N60028_001602 MINUTES 61	**02-05-2008**	TETRA TECH EM, INC.	05 FEBRUARY 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 134) [INCLUDES AGENDA, VARIOUS HANDOUTS AND CD COPY]	YES	BLDG 0000003 BLDG 00000271 BLDG 0000180 BLDG 0000233 BLDG 0000240 BLDG 0000343 BLDG 0000344 SITE 00006A SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029
AR_N60028_001484 CORRESPONDENCE 3	**04-01-2008**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL RESPONSE TO COMMENTS ON THE DRAFT 2006 ANNUAL GROUNDWATER STATUS REPORT (ENCLOSURE IS RECORD # 1485)	YES	SITE 00006 SITE 00025
AR_N60028_001485 CORRESPONDENCE 27	**04-02-2008**	SULLIVAN INTERNATIONAL GROUP, INC.	RESPONSE TO COMMENTS ON THE DRAFT 2006 ANNUAL GROUNDWATER STATUS REPORT (CD COPY ENCLOSED) [SEE RECORD # RECORD # 1484 - BRAC PMOW TRANSMITTAL LETTER]	YES	SITE 00006 SITE 00025

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001490 REPORT 237	**04-22-2008**	SULLIVAN INTERNATIONAL GROUP, INC.	FINAL 2006 ANNUAL GROUNDWATER STATUS REPORT: GROUNDWATER MONITORING AT PETROLEUM SITES (CD COPY ENCLOSED) [SEE RECORD # 1489 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	SITE 00006 SITE 00025 UST 0000002B UST 0000143A UST 0000143B UST 0000143C UST 0000143D UST 0000143E UST 0000143F UST 0000143G UST 0000143H UST 0000143I UST 0000240A UST 0000240B
AR_N60028_001489 CORRESPONDENCE 3	**04-24-2008**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2006 ANNUAL GROUNDWATER STATUS REPORT: GROUNDWATER MONITORING AT PETROLEUM SITES (ENCLOSURE IS RECORD # 1490)	YES	SITE 00006 SITE 00025

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AR_N60028_001604 MINUTES 28	**06-17-2008**	TETRA TECH EM, INC.	17 JUNE 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 136) (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG 0000001 BLDG 0000233 BLDG 0000271 BLDG 0000461 BLDG 0001211 BLDG 0001213 BLDG 0001237 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00030 SITE 00031 SITE 00032 SITE 00033

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AR_N60028_001767 MINUTES 31	**08-19-2008**	TETRA TECH EM, INC.	19 AUGUST 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NUMBER 137 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000099 BLDG 0001123 BLDG 0001133 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001540 CORRESPONDENCE 3	**09-05-2008**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2007 ANNUAL GROUNDWATER STATUS REPORT: GROUNDWATER MONITORING AT PETROLEUM SITES (ENCLOSURE IS RECORD # 1541)	YES	SITE 00006 SITE 00025
AR_N60028_001546 CORRESPONDENCE 3	**10-03-2008**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) GROUNDWATER MONITORING PROGRAM (ENCLOSURE IS RECORD # 1547)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001547 REPORT 121	**10-03-2008**	TREVET, INC.	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) GROUNDWATER MONITORING PROGRAM (CD COPY ENCLOSED) [SEE RECORD # 1546 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012
AR_N60028_001841 CORRESPONDENCE 3	**10-15-2008**	DTSC - BERKELEY, CA	REVIEW AND NO COMMENTS ON THE FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) GROUNDWATER MONITORING PROGRAM	YES	SITE 00006 SITE 00012

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AR_N60028_001888 REPORT 2370	**10-15-2008**	SULTECH	FINAL REMEDIAL INVESTIGATION REPORT FOR FORMER TRAINING AND STORAGE AREA, VOLUMES I THROUGH III OF III (CD COPY ENCLOSED)	YES	BLDG 0000042 BLDG 0000056 BLDG 0000057 BLDG 0000058 BLDG 0000059 BLDG 0000060 BLDG 0000327 BLDG 0000337 BLDG 0000371 BLDG 0000403 BLDG 0000404 BLDG 0000445 BLDG 0000462 BLDG 0000463 PARCEL T-115 SITE 00001 SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00017 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00030 SITE 00031

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					SITE 00032 SITE 00033 SITE 00180C SITE 00201 SITE 00227 SITE 00368A SITE 00368B
AR_N60028_001768 MINUTES 120	**10-21-2008**	TETRA TECH EM, INC.	21 OCTOBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING #138 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000001 BLDG 0000003 BLDG 0000099 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00030 SITE 00031 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001769 MINUTES 46	**12-16-2008**	TETRA TECH EM, INC.	16 DECEMBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NUMBER 139 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000461 BLDG 0001123 BLDG 0001228 BLDG 0001311 BLDG 0001413 SITE 00006 SITE 00008 SITE 00012 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00032 SITE 00033

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AR_N60028_001689 MINUTES 40	**02-17-2009**	TETRA TECH EM, INC.	17 FEBRUARY 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 140) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	YES	BLDG 0000003 BLDG 0000233 BLDG 0000343 BLDG 0000344 BLDG 0000461 BLDG 0000463 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00031 SITE 00032 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001690 MINUTES 38	**04-21-2009**	TETRA TECH EM, INC.	21 APRIL 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 141) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000099 BLDG 0000371 BLDG 0000461 BLDG 0000570 BLDG 0001321 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00029 SITE 00032
AR_N60028_001652 REPORT 112	**05-21-2009**	SHAW ENVIRONMENTAL, INC.	RADIATION PROTECTION PLAN, FINAL REMOVAL ACTION WORK PLAN/REMEDIAL DESIGN (ADDENDUM TO HEALTH AND SAFETY PLAN), REVISION 3 (CD COPY ENCLOSED)	YES	BLDG 0001321A SITE 00006 SITE 00012

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AR_N60028_001692 MINUTES 53	**08-18-2009**	TETRA TECH EM, INC.	18 AUGUST 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NO. 143 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG 0000096 BLDG 0000099 BLDG 0000502 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00013 SITE 00021 SITE 00024 SITE 00030 SITE 00031 SITE 00032 SITE 00033 UST 0000240 UST 0000248

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AR_N60028_001683 CORRESPONDENCE 3	**09-28-2009**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL SITE MANAGEMENT PLAN (ENCLOSURE IS RECORD # 1684)	YES	SITE 00001 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033

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AR_N60028_001684 REPORT 150	**09-28-2009**	TETRA TECH EM, INC.	FINAL 2009 SITE MANAGEMENT PLAN (CD COPY ENCLOSED) [SEE RECORD # 1683 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	AST 0000240 AST 0000248 BLDG 0000066 BLDG 0000180 BLDG 0000201 BLDG 0000227 BLDG 0000530 PARCEL T-086 SITE 00001 SITE 00003 SITE 00004 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 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025

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					UST 0000026
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					UST 0000368B
					UST 0000469

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001710 CORRESPONDENCE 2	**09-30-2009**	CRWQCB - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (CD COPY ENCLOSED) [SEE RECORD # 1654 - DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL]	YES	BLDG 0000464 SITE 00006 UST 0000248A UST 0000248B UST 0000248C UST 0000248D WELL 00006-MW-01
AR_N60028_001709 CORRESPONDENCE 6	**10-01-2009**	AMEC GEOMATRIX, INC.	REVIEW AND COMMENTS ON BEHALF OF THE TREASURE ISLAND DEVELOPMENT AUTHORITY OF THE DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (CD COPY ENCLOSED)	YES	BLDG 0000461 SITE 00006 UST 0000240 WELL 00006-MW-18
AR_N60028_001711 CORRESPONDENCE 1	**10-02-2009**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (CD COPY ENCLOSED) [SEE RECORD # 1654 - DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL]	YES	SITE 00006
AR_N60028_001706 CORRESPONDENCE 5	**10-05-2009**	DTSC - BERKELEY, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (CD COPY ENCLOSED) [SEE RECORD # 1654 - DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL]	YES	BLDG 0000236 BLDG 0000238 SITE 00006 SITE 00012 UST 0000248 WELL 00006-MW-18

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AR_N60028_001693 MINUTES 48	**10-20-2009**	TETRA TECH EM, INC.	20 OCTOBER 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NO. 144 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG 0000099 BLDG 0000260 BLDG 0000271 BLDG 0001311 BLDG 0001313 BLDG 0001325 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00028 SITE 00032

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AR_N60028_001694 MINUTES 40	**12-15-2009**	TETRA TECH EM, INC.	15 DECEMBER 2009 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (MEETING NO. 145) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000099 BLDG 0000201 BLDG 0000260 BLDG 0000269 BLDG 0000273 BLDG 0000445 BLDG 0001123 BLDG 0001205 BLDG 0001215 BLDG 0001224 BLDG 0001226 BLDG 0001227 BLDG 0001237 BLDG 0001238 BLDG 0001239 BLDG 0001240 BLDG 0001244 BLDG 0001246 BLDG 0001312 BLDG 0001313 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00029 SITE 00030 SITE 00031 SITE 00032 WELL MW-38
AR_N60028_001670 CORRESPONDENCE 3	**03-01-2010**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2008 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1671)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001671 REPORT 482	**03-02-2010**	TREVET, INC.	FINAL 2008 ANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED) [DOCUMENT ALSO CONTAINS CONFIDENTIAL TRADE SECRETS] {SEE RECORD # 1670 - BRAC PMO WEST TRANSMITTAL LETTER}	YES	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 WELL 00012-MW-01 WELL 00012-MW-05 WELL 00012-MW-08 WELL 00012-MW-09 WELL 00012-MW-15 WELL 00012-MW-16 WELL 00012-MW-17 WELL 00012-MW-19 WELL 00012-MW-22 WELL 00012-MW-23 WELL 00012-MW-29 WELL 00012-MW-31 WELL 00012-MW-34

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001685 CORRESPONDENCE 3	**04-19-2010**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2010 SITE MANAGEMENT PLAN (ENCLOSURE IS RECORD # 1686)	YES	SITE 00004 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00032 SITE 00033

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AR_N60028_001765 MINUTES 41	**04-20-2010**	TETRA TECH EM, INC.	20 APRIL 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 147 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	YES	BLDG 0000099 BLDG 0000233 BLDG 0001121 BLDG 0001123 BLDG 0001233 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032
AR_N60028_001750 CORRESPONDENCE 3	**06-24-2010**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2009 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1751)	YES	SITE 00006 SITE 00012
AR_N60028_001838 CORRESPONDENCE 3	**08-05-2010**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE DRAFT 2009 ANNUAL GROUNDWATER MONITORING REPORT (SEE RECORD # 1751 - DRAFT 2009 ANNUAL GROUNDWATER MONITORING REPORT)	YES	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 WELL 00012-MW-20

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001704 CORRESPONDENCE 3	**08-17-2010**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (ENCLOSURE IS RECORD # 1705)	YES	SITE 00006
AR_N60028_001747 MINUTES 56	**08-17-2010**	TETRA TECH EM, INC.	17 AUGUST 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 149 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG 0000099 BLDG 0000233 BLDG 0000461 BLDG 0001123 BLDG 0001254 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00031 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001705 REPORT 848	**08-18-2010**	ENGINEERING/REMEDIATION RESOURCES GROUP, INC.	FINAL WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL (DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS) [CD COPY ENCLOSED] {SEE RECORD # 1704 - BRAC PMO WEST TRANSMITTAL LETTER}	YES	AST 0000248 BLDG 0000236 BLDG 0000238 BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000248 BLDG 0000352 BLDG 0000353 PARCEL T-107 PARCEL T-108 PARCEL T-109 PARCEL T-111 PARCEL T-112 SITE 00006 SITE 00014 SITE 00015 SITE 00022 SITE 00025 UST 0000240 UST 0000240A UST 0000240B UST 0000248 UST 0000248A UST 0000248B UST 0000248C UST 0000248D

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00006- MW-01
AR_N60028_001707 CORRESPONDENCE 29	**09-28-2010**	ENGINEERING/REMEDIATION RESOURCES GROUP, INC.	RESPONSES TO COMMENTS ON THE DRAFT WORK PLAN FOR DATA GAPS INVESTIGATION, FORMER FIRE TRAINING SCHOOL	YES	BLDG 0000236 BLDG 0000238 BLDG 0000461 BLDG 0000464 PARCEL T-107 PARCEL T-109 PARCEL T-112 SITE 00006 SITE 00012 SITE 00032 UST 0000248A UST 0000248B UST 0000248C UST 0000248D

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001796 REPORT 2023	**10-19-2010**	TREVET, INC.	FINAL 2009 ANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED)	YES	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 WELL 00006-MW-01 WELL 00012-MW-01 WELL 00012-MW-02 WELL 00012-MW-03 WELL 00012-MW-04 WELL 00012-MW-05 WELL 00012-MW-06 WELL 00012-MW-07 WELL 00012-MW-08 WELL 00012-MW-09 WELL 00012-MW-10 WELL 00012-MW-11 WELL 00012-MW-13 WELL 00012-MW-14

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					WELL 00012-MW-25B
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					WELL 00012-MW-26A
					WELL 00012-MW-26B
					WELL 00012-MW-26C

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AR_N60028_001795 CORRESPONDENCE 3	**10-21-2010**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2009 ANNUAL GROUNDWATER MONITORING PROGRAM REPORT (ENCLOSURE IS RECORD # 1796)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001772 REPORT 166	**10-29-2010**	TETRA TECH EM, INC.	FINAL 2010 SITE MANAGEMENT PLAN (CD COPY ENCLOSED) [SEE RECORD # 1771 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	BLDG 0000066 BLDG 0000180 BLDG 0000227 BLDG 0000233 BLDG 0000530 PARCEL T-086 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

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001984 CORRESPONDENCE 3	**04-27-2011**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2011 SITE MANAGEMENT PLAN (ENCLOSURE IS RECORD # 1985)	YES	SITE 00006 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001822 CORRESPONDENCE 3	**05-11-2011**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2010 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1823)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001943 MINUTES 43	**08-16-2011**	TREVET, INC.	16 AUGUST 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING 155 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG 0000233 BLDG 0001101 BLDG 0001103 BLDG 0001123 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00031 SITE 00032 SITE 00033
AR_N60028_001895 CORRESPONDENCE 3	**08-31-2011**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2010 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1896)	YES	SITE 00006 SITE 00012

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001896 REPORT 2131	**08-31-2011**	TREVET, INC.	FINAL 2010 ANNUAL GROUNDWATER MONITORING REPORT (INCLUDES REPLACEMENT PAGES FOR TABLES 9 AND 10; AND CD COPY) [SEE RECORD # 1895 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	AST 0000240 AST 0000248A BLDG 0001207 BLDG 0001209 BLDG 0001213 BLDG 0001233 BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00032 UST 0000240A UST 0000240B UST 0000248A UST 0000248B UST 0000248C UST 0000248D WELL 00006-MW-01 WELL 00012-MW-01 WELL 00012-MW-03 WELL 00012-MW-04 WELL 00012-MW-05

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					WELL 00012-MW-23

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00012-MW-24 WELL 00012-MW-28 WELL 00012-MW-29 WELL 00012-MW-30 WELL 00012-MW-31 WELL 00012-MW-32 WELL 00012-MW-33 WELL 00012-MW-34

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_001938 MINUTES 45	**10-18-2011**	TREVET, INC.	18 OCTOBER 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING 156 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	AST 0000240 BLDG 0000233 BLDG 0001123 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00028 SITE 00031 SITE 00032 SITE 00033 UST 0000240 UST 0000248
AR_N60028_001936 CORRESPONDENCE 3	**12-22-2011**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT FOR THE FORMER FIRE TRAINING SCHOOL (ENCLOSURE IS RECORD # 1937)	YES	SITE 00006

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AR_N60028_001928 REPORT 165	**12-28-2011**	TREVET, INC.	FINAL 2011 SITE MANAGEMENT PLAN (CD COPY ENCLOSED) [SEE RECORD # 1927 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	BLDG 0000066 BLDG 0000099 BLDG 0000180 BLDG 0000227 BLDG 0000233 BLDG 0000530 PARCEL T-086 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

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AR_N60028_001950 CORRESPONDENCE 3	**04-20-2012**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2011 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 1951)	YES	SITE 00006 SITE 00012
AR_N60028_001959 CORRESPONDENCE 2	**05-25-2012**	AMEC ENVIRONMENT AND INFRASTRUCTURE, INC.	REVIEW AND COMMENTS ON BEHALF OF THE TREASURE ISLAND DEVELOPMENT AUTHORITY OF THE DRAFT 2011 ANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED) [SEE RECORD # 1951 - DRAFT 2011 ANNUAL GROUNDWATER MONITORING REPORT]	YES	SITE 00006 SITE 00012 WELL 00012-MW-08 WELL 00012-MW-13 WELL 00012-MW-17

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AR_N60028_002014 REPORT 31758	**06-20-2012**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	FINAL REMEDIAL INVESTIGATION REPORT FOR OLD BUNKER AREA (CD COPY ENCLOSED) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS] {SEE RECORD # 2013 - BRAC PMO WEST TRANSMITTAL LETTER}	YES	AREA 01231 AREA 01233 BLDG 0000345 BLDG 0000461 BLDG 0001100 BLDG 0001101 BLDG 0001102 BLDG 0001103 BLDG 0001104 BLDG 0001105 BLDG 0001106 BLDG 0001107 BLDG 0001117 BLDG 0001143 BLDG 0001145 BLDG 0001205 BLDG 0001207 BLDG 0001209 BLDG 0001211 BLDG 0001217 BLDG 0001219 BLDG 0001227 BLDG 0001228 BLDG 0001231 BLDG 0001235 BLDG 0001237 BLDG 0001244 BLDG 0001246

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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AR_N60028_002006 MINUTES 165	**08-21-2012**	NICCOLI REPORTING	21 AUGUST 2012 RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT (INCLUDES COMMENTS BY RESTORATION ADVISORY BOARD (RAB) MEMBER DALE SMITH ON THE DRAFT HUMAN HEALTH RISK ASSESSMENT ADDENDUM; AND CD COPY)	YES	BLDG 0000003 BLDG 0000233 BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00031 SITE 00032 SITE 00033

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002019 REPORT 489	**08-30-2012**	TREVET, INC.	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN, LONG TERM MONITORING OF GROUNDWATER (CD COPY ENCLOSED) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	AST 0000240 AST 0000248 BLDG 0001207 BLDG 0001209 BLDG 0001231 BLDG 0001233 BLDG 0001246 BLDG 0001248 BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 UST 0000240A UST 0000240B UST 0000248A UST 0000248B UST 0000248C UST 0000248D UST 0000267 WELL 00012-MW-08 WELL 00012-MW-09 WELL 00012-MW-29

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AR_N60028_001986 CORRESPONDENCE 3	**09-11-2012**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2012 SITE MANAGEMENT PLAN (ENCLOSURE IS RECORD # 1987)	YES	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

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AR_N60028_001987 REPORT 169	**09-11-2012**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	FINAL 2012 SITE MANAGEMENT PLAN (CD COPY ENCLOSED) [SEE RECORD # 1986 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	AST 0000004 AST 0000004M AST 0000005 AST 0000005M AST 0000006A AST 0000006B AST 0000006C AST 0000006E AST 0000006F AST 0000006G AST 0000006M AST 0000034A AST 0000034B AST 0000103 AST 0000104 AST 0000240 AST 0000248 AST 0000456 BLDG 0000003 BLDG 0000034 BLDG 0000041 BLDG 0000062 BLDG 0000084 BLDG 0000085 BLDG 0000099 BLDG 0000102 BLDG 0000143 BLDG 0000194

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					UST 0000257
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					UST 0000368B
					UST 0000469
					UST QR08
					UST YF3

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002011 CORRESPONDENCE 3	**09-19-2012**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2011 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 2012)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002012 REPORT 2665	**09-19-2012**	TREVET, INC.	FINAL 2011 ANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED) [SEE RECORD # 2011 - BRAC PMO WEST TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	YES	BLDG 0001207 BLDG 0001209 BLDG 0001246 BLDG 0001248 BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 UST 0000240A UST 0000240B UST 0000267 WELL 00012-MW-01 WELL 00012-MW-03 WELL 00012-MW-04 WELL 00012-MW-05 WELL 00012-MW-06 WELL 00012-MW-07 WELL 00012-MW-08 WELL 00012-MW-09 WELL 00012-MW-11 WELL 00012-MW-13

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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					WELL 00012-MW-32

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AR_N60028_002035 CORRESPONDENCE 3	**10-25-2012**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT (ENCLOSURE IS RECORD # 2036)	YES	SITE 00006
AR_N60028_002036 REPORT 18882	**10-25-2012**	ENGINEERING/REMEDIATION RESOURCES GROUP, INC.	FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT (INCLUDES RESPONSES TO COMMENTS ON THE DRAFT AND CD COPY) [SEE RECORD # 2035 - BRAC PMO WEST TRANSMITTAL LETTER] {VOLUMES I AND II OF II}	YES	AST 0000248 BLDG 0000240 BLDG 0000241 BLDG 0000242 BLDG 0000243 BLDG 0000248 BLDG 0000464 SITE 00006 UST 0000240A UST 0000240B UST 0000248A UST 0000248B UST 0000248C UST 0000248D
AR_N60028_002049 REPORT 462	**11-06-2012**	ENGINEERING/REMEDIATION RESOURCES GROUP, INC.	FINAL ACCIDENT PREVENTION PLAN FOR CORRECTIVE ACTION PLAN FOR UNDERGROUND STORAGE TANK AND ABOVEGROUND STORAGE TANK AREA (CD COPY ENCLOSED) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	YES	AST 0000240 SITE 00006 UST 0000240

Attachment A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002018 CORRESPONDENCE 14	**03-06-2013**	CALIFORNIA DEPARTMENT OF PUBLIC HEALTH - SACRAMENTO, CA	REVIEW AND COMMENTS ON THE INTERNAL FINAL HISTORICAL RADIOLOGICAL ASSESSMENT - SUPPLEMENTAL TECHNICAL MEMORANDUM [INCLUDES ORIGINAL COPY W/ THE SAME DATE]	YES	BLDG 0000003 BLDG 0000233 BLDG 0000343 BLDG 0000433 BLDG 0000461 BLDG 0000570 BLDG 0001125 BLDG 0001133 BLDG 0001227 BLDG 0001229 BLDG 0001311 BLDG 0001325 SITE 00001 SITE 00006 SITE 00012
AR_N60028_002031 CORRESPONDENCE 4	**05-02-2013**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2012 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 2032)	YES	SITE 00006 SITE 00012
AR_N60028_001458 CORRESPONDENCE 3	**05-10-2013**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN); RADIOLOGICALLY IMPACTED AREAS (ENCLOSURE IS RECORD #1889)	YES	SITE 00006 SITE 00012 SITE 00030 SITE 00031 SITE 00032
AR_N60028_000500 CORRESPONDENCE 3	**08-05-2013**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL 2012 ANNUAL GROUNDWATER MONITORING REPORT (ENCLOSURE IS RECORD # 582)	YES	SITE 00006 SITE 00012

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_000582 REPORT 1754	**08-05-2013**	TREVET, INC.	FINAL 2012 ANNUAL GROUNDWATER MONITORING REPORT (CD COPY ENCLOSED) [SEE RECORD # 500 - BRAC PMO WEST TRANSMITTAL LETTER]	YES	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 UST 0000240A UST 0000240B WELL 00006-MW-01 WELL 00012-MW-01 WELL 00012-MW-03 WELL 00012-MW-04 WELL 00012-MW-05 WELL 00012-MW-06 WELL 00012-MW-07 WELL 00012-MW-09 WELL 00012-MW-11 WELL 00012-MW-13 WELL 00012-MW-14 WELL 00012-MW-15 WELL 00012-MW-16

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002315 CORRESPONDENCE 3	**08-05-2013**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2013 SITE MANAGEMENT PLAN (ENCLOSURE IS RECORD # 724)	NO	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

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033 SITE 00143
AR_N60028_002033 CORRESPONDENCE 3	**08-29-2013**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT WORK PLAN FOR GROUNDWATER AND SOIL GAS MONITORING (ENCLOSURE IS RECORD # 2034)	YES	SITE 00006 SITE 00012 SITE 00021 SITE 00024
AR_N60028_002057 CORRESPONDENCE 3	**10-11-2013**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT PROPOSED PLAN/REMEDIAL ACTION PLAN (ENCLOSURE IS RECORD # 2054)	YES	SITE 00006
AR_N60028_002292 CORRESPONDENCE 2	**12-04-2013**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL WORK PLAN FOR GROUNDWATER AND SOIL GAS MONITORING (ENCLOSURE IS RECORD # 2293)	NO	SITE 00006 SITE 00012 SITE 00021 SITE 00024

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002293 REPORT 994	**12-04-2013**	TREVET, INC.	FINAL WORK PLAN FOR GROUNDWATER AND SOIL GAS MONITORING (CD COPY ENCLOSED) [SEE RECORD # 2292 - BRAC PMO WEST TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	BLDG 0001311 BLDG 0001313 SITE 00006 SITE 00012 SITE 00021 SITE 00024 WELL 00024-BB-38 WELL 00024-BB-63 WELL 00024-BB-76 WELL 00024-BB-80 WELL 00024-BB-89 WELL 00024-EW-04 WELL 00024-EW-06 WELL 00024-EW-11 WELL 00024-EW-12 WELL 00024-EW-16 WELL 00024-EW-28 WELL 00024-EW-29 WELL 00024-EW-30

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL 00024-TW-37 WELL 00024-TW-41 WELL 00024-TW-42 WELL 00024-TW-43 WELL 00024-TW-47 WELL 00024-TW-48 WELL 00024-TW-49 WELL 00024-TW-50 WELL 00024-TW-53
AR_N60028_002286 REPORT 409	**01-01-2014**	TETRA TECH EC, INC.	FINAL ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN (CD COPY ENCLOSED)	NO	SITE 00006
AR_N60028_002096 CORRESPONDENCE 3	**01-07-2014**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT CHARACTERIZATION AND REMEDIAL SUPPORT SURVEY WORK PLAN, RADIOLOGICAL CHARACTERIZATION, REMEDIATION, AND FINAL STATUS SURVEYS (ENCLOSURE IS RECORD # 2097)	YES	SITE 00006
AR_N60028_002302 REPORT 18	**02-01-2014**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	FINAL PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN (CD COPY ENCLOSED)	NO	SITE 00006

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60028_002325 CORRESPONDENCE 2	**07-23-2014**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT RECORD OF DECISION/REMEDIAL ACTION WORK (ENCLOSURE IS RECORD # 2326)	NO	SITE 00006
AR_N60028_002329 CORRESPONDENCE 2	**08-08-2014**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL COMMUNITY RELATIONS PLAN 2014 UPDATE (ENCLOSURE IS RECORD # 2330)	NO	SITE 00006 SITE 00021 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_002330 REPORT 99	**08-08-2014**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	FINAL COMMUNITY RELATIONS PLAN 2014 UPDATE (CD COPY ENCLOSED) [SEE RECORD # 2329 - BRAC PMO WEST TRANSMITTAL LETTER]	NO	SITE 00006 SITE 00021 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033
AR_N60028_002331 CORRESPONDENCE 2	**08-15-2014**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT 2013 ANNUAL GROUNDWATER AND SOIL GAS MONITORING REPORT (ENCLOSURE IS RECORD # 2332)	NO	SITE 00006 SITE 00012 SITE 00021 SITE 00024

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites

Total Estimated Record Page Count: 83,563

Total Records: 373

No Keywords
Sites=SITE 00006;SITE 00006A
No Distribution
No FRC Box number
No Litigation Case Number

ATTACHMENT B
REFERENCES

(*Provided on CD*)

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
1	**construction of wildlife habitat**	Section 1	Treasure Island and Yerba Buena Island Design for Development. Treasure Island Development Authority. June 28, 2011. Section 2, Items T1.14 and T1.15.
2	**several cleanup actions**	Section 1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 4.4.
3	**Historically**	Section 1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 2.2.2.
4	**remedy for soil**	Section 1.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 13.2.4.
5	**remedy for groundwater**	Section 1.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 13.3.2.
6	**wildlife habitat**	Section 2.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 2.2.1.
7	**Groundwater at Site 6**	Section 2.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 3.3.4.
8	**Final Environmental Impact Report (EIR)**	Section 2.4	Final Environmental Impact Report, Treasure Island/Yerba Buena Island Redevelopment Project. City and County of San Francisco Planning Department. Vol. 1-6. Draft July 12, 2010; final certification date April 21, 2011. Volume I, Chapter II.
9	**2002 CAP**	Section 2.5	Final Corrective Action Plan for Sites 06, 14/22, 15, and 25, Naval Station Treasure Island, San Francisco, California. Tetra Tech EM Inc. June 28, 2002. Section 4.2 and Tables 4-4, 4-5, and 4-6.
10	**2005 petroleum closure request**	Section 2.5	Final Closure Report, Site 6, Request for No Further Action, Naval Station Treasure Island, San Francisco, California. Shaw Environmental, Inc. December 16, 2005. Section 4.0 and Tables 2 through 11.
11	**baseline HHRA**	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Cover page through Section 3.3.1.
12	**not a potential source of drinking water**	Section 2.5.1	Concurrence that Groundwater at the Naval Station Treasure Island, San Francisco Meets the Exemption Criteria in the SWRCB Source of Drinking Water Resolution 88-63. Letter from Curtis Scott, Division Chief, Groundwater Protection and Waste Containment Division, San Francisco Bay Region. To Ann Klimek, Environmental Business Line Team Leader, Naval Facilities Engineering Command, Southwest Division. San Francisco Bay Regional Water Quality Control Board. January 23, 2001.
13	**characterized**	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 3.4.
14	**results**	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Sections 4.0, 5.0 and 6.0, and Appendix D.
15	**assumptions and uncertainties**	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 7.0.
16	**Terrestrial habitat on TI**	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 2.2.1.
17	**1996 special-status plant survey**	Section 2.5.2	Final Special-Status Plan Survey and Habitat Assessment for Naval Station Treasure Island, Yerba Buena Island, California. Tetra Tech, Inc. and Michael Wood. November 1996. Summary.
18	**2007 SLERA**	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Sections 2.4 through 3.2.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
19	**SLERA recommended**	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 5.0.
20	**sediments do not pose unacceptable risk**	Section 2.5.2	Installation Restoration Site 13 Offshore Sediments Record of Decision, Naval Station Treasure Island, Treasure Island, San Francisco, California. Department of the Navy. April 7, 2005. Section 1.5.
21	**potential impacts to aquatic wildlife**	Section 2.5.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Cover through Section 4 of Appendix K.
22	**BIOSCREEN model**	Section 2.5.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section "9.2.2.2. BIOSCREEN Modeling Approach"
23	**COC plumes**	Section 2.9.1, Table 5	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Figures 5-21, 5-23, 5-27, 5-29 and 5-35.
24	**nine evaluation criteria**	Section 2.9.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 14.0.
25	**petroleum corrective action**	Section 2.9.2.2	Final Post-Construction Summary Report for Underground Storage Tank and Aboveground Storage Tank 240 Area Naval Station Treasure Island San Francisco, California. October 2013. Section 6.0.

Note:

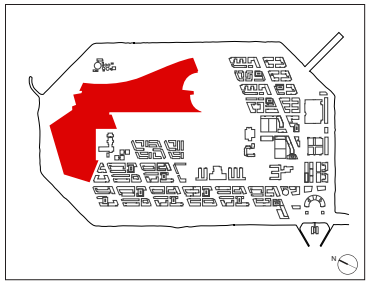
[1] **Bold blue** text indicates hyperlinks available on reference CD to detailed site information contained in the publicly available Administrative Record.

For access to information contained in the Administrative Record for Treasure Island, please contact:

Commanding Officer
Naval Facilities Engineering Command, Southwest
Attn: Ms. Diane Silva, Command Records Manager, Code EV33
1220 Pacific Highway (NBSD Building 3519)
San Diego, California 92132
Phone: (619) 556-1280
E-mail: diane.silva@navy.mil

T1.14 The Wilds

The Wilds are envisioned as being an ecologically valuable habitat area that recalls the once-predominant Bay Area shoreline ecosystems of dune swales and moist grassland. This constructed landscape will mimic a native landscape, supporting activities such as hiking, ecological education programs, habitat viewing and camping. Seasonal and/or perennial wetlands are planned as part of the stormwater treatment system. Amenities to support passive park uses and educational activities are called for in standards and guidelines.



1. Boardwalk
2. Trails
3. Primitive Camp Sites
4. Wetland
5. Windrows

Figure T1.o: Illustrative concept for The Wilds

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
1	construction of wildlife habitat	Section 1	Treasure Island and Yerba Buena Island Design for Development. Treasure Island Development Authority. June 28, 2011. Section 2, Items T1.14 and T1.15.

STANDARDS

PROGRAM & DESIGN

T1.14.1
Design emphasis shall be on habitat creation.

An example of a landscape conducive to bird migration

T1.14.2
A wetland with a stormwater treatment function shall be located within the park and integrated with a wastewater treatment facility near it.

T1.14.3
Educational amenities shall be provided and designed to fit within the native surroundings.

T1.14.4
Landform mounds and swales shall be incorporated into the basic structure of the park in order to create areas for ecological diversity.

T1.14.5
The following amenities shall be provided within the park: seating, bicycle parking, trash and recycling bins and restroom facilities.

T1.14.6
Windrow trees and alignment shall continue into the park.

T1.14.7
Maintenance storage facilities are permitted to be incorporated into building program areas. They shall only store items specific to the maintenance of Treasure Island open spaces.

T1.14.8
Lighting fixtures used in park areas shall adhere to standards in Section T5.12.

GUIDELINES

PAVING

T1.14.9
A network of universally accessible paths within the Wilds should consist of decomposed granite and wooden boardwalks.

T1.14.10
A secondary network of casual hiking paths should be integrated throughout the open space.

LIGHTING

T1.14.11
Lighting should be kept to a minimum within this park space.

PLANTING & EARTHWORK

T1.14.12
Other tree plantings should be limited to south and east edges, preserving middle and north edges of the park open to views.

T1.14.13
Planting along the perimeter of the wetland should be adaptable to fluctuating water levels and extended periods of wet/dry conditions.

T1.14.14
Native landscape planting should be used in all areas of the park.

An example of native planting and wetland areas with trail access.

FURNISHING

T1.14.15
Furnishings in the Wilds should be of a consistent style and character and constructed of durable materials.

T1.14.16
Bike parking should be placed towards the edges of the park to minimize riding in the park.

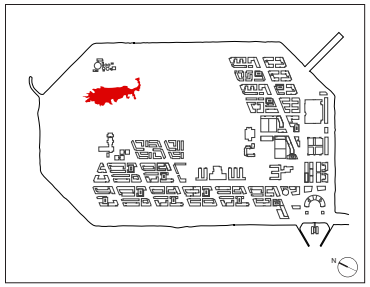
SPECIAL FEATURES

T1.14.17
Camping and pre-fab cabins with supporting amenities are encouraged. The use of solar electricity is encouraged.

An example of primitive campsites

T1.15 The Wetlands

The 'Wetlands', located within The Wilds, are planned as part of the stormwater treatment system for portions of the Treasure Island watershed. The wetlands may include both perennial pools and/or seasonal wetland areas to provide habitat for migrating birds and thereby attract birders and wildlife enthusiasts as well as the general public; turning a vital piece of island infrastructure into an aesthetic addition to the open northern edge park system. Design standards require integration of the stormwater wetlands with the Wilds landscape and adjacent wastewater treatment facility. The final design of the wetlands will be developed in conjunction with the wastewater treatment facility, stormwater infrastructure, and Wilds area.



1. Wastewater Treatment Plant
2. Boardwalk
3. Interpretive Overlook
4. Windrows

Figure T1.p: Illustrative concept for The Wetlands

0 400

STANDARDS

PROGRAM & DESIGN

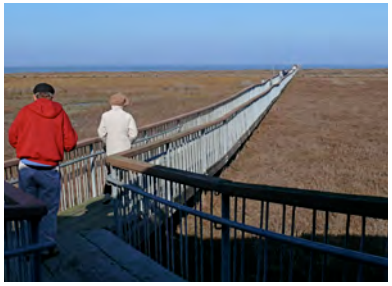
T1.15.1
A seasonal and/or perennial stormwater treatment wetland system shall be located in this area of the park and integrated with the Wilds.

An example of new habitat areas to be created with construction of The Wetlands

T1.15.2
The wetland shall be 10 - 15 acres in size.

T1.15.3
The Wetlands shall include retention and flow control structures as required to regulate stormwater flows and ensure slope stability and erosion control.

T1.15.4
Foundations for structures shall be constructed with inert durable materials that do not have any long term environmental effects on the wetland.



An example of boardwalks with minimal impact on the wetland

T1.15.5
No maintenance storage facilities are allowed within the park boundary.

T1.15.6
Lighting fixtures used in park areas shall adhere to standards in Section T5.12.

GUIDELINES

PAVING

T1.15.7
Limited public access paths should be allowed.

T1.15.8
Decomposed granite or other stabilized materials should be used for rustic paths.

T1.15.9
A publicly accessible pedestrian bridge or boardwalk should cross the wetland.

LIGHTING

T1.15.10
Lighting is permitted adjacent to any necessary infrastructure / support facilities.

PLANTING & EARTHWORK

T1.15.11
All landscaping around the wetland should be native plant material.

T1.15.12
Grading and planting should be integrated with adjacent Wilds landscaping.

FURNISHING

T1.15.13
Furnishings in the Wetlands should be of a consistent style and character and constructed of durable materials.

T1.15.14
Benches, trash and recycling bins should be located adjacent to interpretive areas.

SPECIAL FEATURES

T1.15.15
Interpretive signage should be used at important nodes and activity areas.

T1.15.16
Bird blinds should be located around the wetland and blend into the landscape.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
2	several cleanup actions	Section 1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 4.4.

4.4. INVESTIGATIONS AND CLEANUP UNDER PETROLEUM PROGRAM

On June 20, 1997, IR Site 6 qualified for exclusion from the CERCLA Program and was moved to the Petroleum Program, with the condition that CERCLA substances (metals and chlorinated solvents in particular) were adequately monitored to ensure that no commingling with petroleum plumes occurred (DTSC, 1997b). Additional information on the transfer of IR Site 6 to the Petroleum Program is presented in Section 1.1.1. This section summarizes the investigations and cleanup performed under the Petroleum Program.

4.4.1. Bioventing and Biosparging Pilot Test (1999–2000)

The Navy conducted bioventing and biosparging pilot tests in fall 1999 to evaluate if either approach was feasible for full-scale implementation to clean up petroleum contamination at IR Site 6. Two biovent/biosparge wells (06-BVW and 06-BSW) and seven observation wells (06-MP01 to 06-MP07) were installed to conduct the pilot-scale test. The observation wells included two screened intervals: one at 3.5 to 4 feet bgs, and a second at 9.5 to 10 feet bgs. In total, 20 soil samples and 16 groundwater samples (baseline and pilot test samples) were collected to evaluate both methods. Soil gas concentrations, vacuums, and flows were measured at the biovent wells during the extraction testing, and pressures and flows were monitored during biosparge testing.

Although the results of the bioventing pilot test showed that oxygen could be transported within soil to encourage microbial activity in the soil, the shallow groundwater table could potentially limit the radius of influence (ROI) at reasonably attainable flow rates (1 to 10 standard cubic feet per minute). Recommended alternatives to enhance bioventing performance included (1) paving surfaces to increase the ROI, (2) using horizontal biovent wells, and (3) bioventing under vacuum conditions instead of pressure (i.e., using low-flow soil vapor extraction [SVE]) (TtEMI, 2000).

Results of the biosparging pilot test suggested that it was a feasible technology for remediation of petroleum-contaminated soil and groundwater at IR Site 6. The pilot test report concluded that a design flow rate of 3 standard cubic feet per minute would produce a corresponding ROI of 20 feet. The biosparge pilot test resulted in an average reduction of TPH and BTEX concentrations in groundwater of 69 and 90 percent, respectively (TtEMI, 2000).

4.4.2. Polycyclic Aromatic Hydrocarbons Sampling (2001)

In early 2001, seven direct-push borings (06-HP094 through 06-HP100) were advanced at locations where elevated concentrations of extractable TPH had previously been detected in shallow soil. The purpose of the sampling event was to evaluate the association between PAHs and TPH at the site. One soil sample was

collected from each boring at depths up to 6 feet bgs. Samples were analyzed for TPH and PAHs (TtEMI, 2002c).

4.4.3. Corrective Action Plan (2002)

In 2002, the Navy prepared a CAP to provide cleanup recommendations for IR Site 6 and four other petroleum release sites at NAVSTA TI. For each of the sites, the CAP contained a description of the nature and extent of petroleum contamination, a screening evaluation of risk to human health and the environment, an evaluation of remedial alternatives, and a recommended remedial technology. Sites were subdivided into corrective action areas (CAAs) where chemical concentrations exceeded the screening levels. For IR Site 6, two CAAs were designated; 06-CAA-01 encompassed the area surrounding USTs 240A and 240B and extended northward into the Building 461 parking lot, and 06-CAA-02 encompassed USTs 248A to 248D, a large portion of the Former Fire Training School area, and an area extending northeast toward San Francisco Bay.

The recommended corrective action for 06-CAA-01 involved a combination of dual-phase vacuum extraction, air sparging/SVE, and biosparging/bioventing. The recommended corrective action for 06-CAA-02 was monitored natural attenuation (MNA). The CAP also recommended removing the two remaining USTs (USTs 248C and 248D) and associated OWS system components, and plugging the storm drain system to prevent potential migration of contamination. Based on burn areas identified in aerial photographs, the CAP recommended samples of excavated soil from the former burn areas be analyzed for dioxins (TtEMI, 2002c).

4.4.4. Petroleum Excavations (2002–2003)

From May 2002 to January 2003, the Navy conducted large-scale excavations of soil at IR Site 6. Activities included excavation of shallow petroleum-contaminated soil at the Former Helicopter Training Area; removal of tanks, pipelines, OWS components, and TPH-contaminated soil at the UST 248 Area; and evaluation and removal of free product at the UST 240 Area. During excavation activities at the UST 248 Area, a soot-like burn residue material was observed in the near-surface soil. Soil samples were collected of burn residue material, and analytical results indicated dioxins and furans were present at concentrations exceeding the EPA residential PRG of 3.9 ng/kg.

The excavations and other related activities are summarized below.

- **Excavation of Shallow TPH-Contaminated Soil:** In May 2002, a 40-by-40-foot area at the Former Helicopter Training Area, centered at borings 06-HP023 and 06-HP061, was excavated to approximately 3 feet bgs to remove shallow TPH-contaminated soil. Visible petroleum staining was observed in the northeast corner of the excavation, and a follow-up step-out excavation was completed to a depth of 3 to 4 feet bgs. A smaller shallow excavation centered at boring 06-HP096 along the eastern site boundary was also performed (Shaw, 2004b).

- **Removal of Waste Oil USTs 248C and 248 D and OWS Infrastructure:** USTs 248C and 248D and the associated OWS infrastructure were drained, cleaned, and removed. In May 2002, a 30-by-50-foot excavation was initiated around UST 248C and associated OWS infrastructure that extended to groundwater. Soil samples were collected and analyzed for TPH, VOCs, and lead. In May 2002, soil was excavated at UST 248D after surficial soot-like burn residue was identified following grubbing activities. The soot-like materials may have been associated with the adjacent former smoke elimination structure (Building 464). An initial sample of the soot-like material reported a dioxin TEQ concentration of 53.4 ng/kg, which exceeded both the EPA residential PRG of 3.9 ng/kg and the ambient level of 12 ng/kg that was later established for TI (discussed further in Section 5.1.1). Based on the elevated dioxin concentrations, petroleum excavation activities were subsequently suspended.
- **Investigation of Dioxins and Furans in Soil:** Based on the initial dioxin TEQ concentration, four shallow test pits were excavated in the vicinity of USTs 248A, B, C, and D to estimate the volume of dioxin-contaminated material to be removed during petroleum excavation activities. Four test pits were excavated at the locations of former Buildings 240, 241, 242, and 243, and soil samples were collected from directly underneath the building foundations. Soil sample results for dioxins from the four test pits were less than the EPA residential PRG of 3.9 ng/kg. In October 2002, two shallow areas (A and B) were excavated to 1 to 2 feet bgs to mitigate the potential for remobilization of dioxins exposed at the surface during ongoing excavation activities. The larger excavation was at UST 248D, and the smaller excavation was centered at UST 248C. Excavation boundaries correlated with discoloration from black soot-like material observed in surface soil. Following removal of the visible soot-like material, samples were collected to document dioxin concentrations that remained in place. A number of soil samples reported dioxin TEQ concentrations greater than the EPA residential PRG of 3.9 ng/kg and the ambient level of 12 ng/kg (Shaw, 2004b).
- **Expanded Excavation at UST 248D:** Following the dioxin investigation, petroleum removal activities, under the action specified in the CAP, resumed at the UST 248D Area. The UST and OWS components were removed in October 2002. In mid-November 2002, the initial UST 248D excavation was expanded and over-excavated because soil sample results exceeded screening levels for petroleum hydrocarbons. The southwest corner of the excavation was expanded to the west approximately 50 feet and resulted in the removal of a portion of the concrete slab in the central part of the site. Excavation depths in the UST 248 Area ranged from approximately 1 to 9 feet bgs (Shaw, 2004b).
- **Free Product Evaluation and Excavation at UST 240 Area:** In May and June 2002, 10 borehole interface tubes were installed to assess the extent of free product in the vicinity of USTs 240A and 240B. Measurable free product (up to 0.2 foot thick) was observed at two monitoring locations 06-W3 and BH-4 east of the former USTs. In August 2002, approximately 280 cubic yards of free product saturated soil was excavated. The excavation was completed to a depth of approximately 5 feet bgs. Free product that had accumulated on the groundwater surface within the excavation was removed using adsorbent pads. Sidewall samples were collected and analyzed for purgeable TPH, extractable TPH, and VOCs. One southern sidewall sample adjacent to former UST 240A (06-S-077) reported elevated concentrations of TPH-g (4,000 mg/kg), TPH-d (490 mg/kg), benzene (36 mg/kg), and ethylbenzene (368 mg/kg) (Shaw, 2004b).

- **Pipeline Removal:** In October 2002, approximately 800 linear feet of piping associated with the OWS systems was removed. Trenches, ranging in depth from 3 to 4 feet bgs, were excavated along the entire eastern portion and part of the southern portion of the site. Sections of pipe that extended beneath thick concrete slabs from former building foundations were grouted in place. From November 2002 to January 2003, TPH-contaminated soil identified along the trenches was excavated. Over-excavation along the piping corridor resulted in the discovery of additional petroleum-contaminated soil in the vicinity of UST 248B. In this area, the excavation was expanded north and west and resulted in an excavation area of approximately 100 feet by 80 feet at its widest point (Shaw, 2004b).

Approximately 5,700 tons of soil (4,317 tons of TPH-contaminated soil and 1,390 tons of dioxin-contaminated soil) was excavated during the removal actions at IR Site 6. The soil was profiled and transported for disposal at a Class II landfill (Forward Landfill) in Manteca, California (Shaw, 2004b).

4.4.5. Soil Gas Sampling at Former UST 240 Area (2004)

In July, August, and October 2004, soil gas samples were collected in the UST 240 Area, based on historical benzene concentrations reported in well 06-MW01. On July 12, 2004, five soil gas samples (SV-01 to SV-05) were collected using direct-push methods and analyzed for BTEX and MTBE. The tracer compound isopropyl alcohol was used as a leak detection compound during soil gas sampling activities at the site. Because leaks during soil gas sampling may dilute samples with ambient air and produce data that underestimates actual soil gas concentrations, isopropyl alcohol was applied to the sampling train. Samples were then analyzed in the laboratory for the target VOCs and isopropyl alcohol to evaluate sample integrity.

High concentrations of isopropyl alcohol were reported in two samples (up to 86,000 micrograms per cubic meter [$\mu g/m^3$]). The detection of isopropyl alcohol at high concentrations indicated that leaks occurred during sampling. The high concentrations of isopropyl alcohol in the samples also elevated the LRLs for the target VOCs. As a result of the leaks, the Navy collected additional soil gas samples adjacent to the original samples. On August 9, 2004, additional soil gas samples (SV-01B to SV-05B) were collected approximately 3 feet away from the original samples. Isopropyl alcohol was detected at a maximum concentration of 510 $\mu g/m^3$. Analytical results indicated high BTEX concentrations in the SV-04B sample, located between former USTs 240A and 240B. In this sample, benzene, toluene, ethylbenzene and total xylenes were detected at concentrations of 310,000 $\mu g/m^3$, 350,000 $\mu g/m^3$, 140,000 $\mu g/m^3$, and 420,000 $\mu g/m^3$, respectively.

Two step-out soil gas samples (SV-06 and SV-07) were collected in October 2004. Isopropyl alcohol was reported in SV-06 and SV-07 at concentrations of 56,000 $\mu g/m^3$ and 180 $\mu g/m^3$, respectively. No BTEX or MTBE was reported in SV-06. Low BTEX concentrations were detected in SV-07 (Shaw, 2005c).

4.4.6. Supplemental Groundwater Monitoring (1998–Present)

This section describes the groundwater monitoring activities conducted at IR Site 6 since 1998.

4.4.6.1. Monitoring Frequency

Samples were collected semiannually from monitoring wells in 1998, 2000, and 2001. During excavation activities between May 2002 and January 2003, samples were collected from miscellaneous, accessible monitoring wells. From June 2003 to January 2004, four quarterly sampling events were conducted to monitor post-remediation groundwater conditions (Shaw, 2005a). In 2004, groundwater monitoring at the site was suspended while a closure report and request for no further action was prepared, as described in Section 4.4.7. With the exception of 06-MW01, all wells at IR Site 6 were abandoned in 2006. Samples continue to be collected from well 06-MW01 for analysis of purgeable TPH, extractable TPH and VOCs. Table 4-2 summarizes the groundwater monitoring performed at IR Site 6 since 1998.

4.4.6.2. Summary of Groundwater Data

Groundwater data from the monitoring wells identified TTPH as the primary COC. TPH-g was reported in samples collected from wells in the UST 240 Area, while TPH-d was reported in samples collected from wells associated with the former UST 248 Area. BTEX concentrations were reported in samples from wells associated with the UST 240 Area, but were generally nondetect in wells associated with the UST 248 Area. Based on water level measurements collected between June 2003 and January 2004, no evidence of free product was observed in any of the wells. A slight hydrocarbon sheen was reported in groundwater from well 06-MW01 during several monitoring events conducted from March 2004 to 2010. (Shaw, 2005c, Pacific Treatment Environmental Services, Inc., 2008 and 2009; TREVET, Inc., 2011).

Elevated concentrations of dissolved arsenic were identified in areas where TPH concentrations were elevated in groundwater. The highest detected arsenic concentrations in groundwater were generally in samples from wells 06-MW01, located in the UST 240 Area, and 06-MW22, located near the UST 248 Area (TtEMI, 2002c).

4.4.6.3. Abandonment of Monitoring Wells

In February 2006, IR Site 6 monitoring wells 06-MW02, 06-MW03, 06-MW07, 06-MW10, 06-MW14 through 06-MW19, and 06-MW21 through 06-MW24 were overdrilled and destroyed as part of the Petroleum Program. No well destruction documentation was available for wells 06-MW09 and 06-MW11 through 06-MW13. A report was prepared that summarized well destruction activities performed between 2002 and 2006 at IR Site 6 and numerous other sites at NAVSTA TI. In addition to providing information on the wells destroyed at IR Site 6 in 2006, the report included well destruction information for wells and monitoring locations installed as part of the biosparge/biovent pilot study (Shaw, 2006b).

4.4.7. Request for Closure (2005)

In December 2005, a Site Closure Report and No Further Action request was submitted to the Water Board. The objective was to attain closure for USTs 240A, 240B, 248A, 248B, 248C, and 248D. Closure was requested because residual shallow soil contamination left in place met the levels for closure of a low risk petroleum site (Shaw, 2005c).

In a letter dated May 15, 2006, the Water Board denied the request for no further action on the grounds that sources of contamination had not been entirely removed or remediated. The letter also stated that TPH concentrations in monitoring well 06-MW01 were potentially unstable. The Water Board did agree to the request to destroy all remaining groundwater monitoring wells at IR Site 6, except for well 06-MW01 (Water Board, 2006).

4.5. PCB-RELATED INVESTIGATIONS AND REMOVAL ACTIONS

This section summarizes PCB-related investigations and removal actions conducted at IR Site 6 between 1987 and 2006. This section is presented separately from the other investigations, because most PCB-related activities at IR Site 6 were conducted as part of basewide activities to address PCBs in accordance with the provisions of TSCA.

Beginning in 1987, the following PCB-related investigations and removal actions were conducted at IR Site 6:

- **1987 Hazardous Waste Investigation:** Several surface soil samples were collected from potential source areas that may have housed electrical equipment and analyzed for PCBs; however, no PCBs were detected (HLA, 1987).
- **1992 Demolition Debris Characterization:** An investigation was conducted to identify the requirements for disposal of debris to be generated during demolition of Buildings 240 through 243 and Building 464. Solvent wipe samples and brick chip samples were collected from fire-exposed, soot-covered surfaces of the buildings and analyzed for PCBs, but no PCBs were detected (PRC, 1992b).
- **2006 Phase II PCB Investigation:** A basewide PCB investigation was conducted to evaluate the presence of PCBs at various transformers, capacitors, and switch locations. The investigation consisted of collecting samples from concrete pads and vaults, asphalt, and wood associated with pole-mounted transformers and soil, where present. Two pad-mounted transformers at IR Site 6 were identified for assessment: (1) Transformer TX-151, located north of former UST 248C in the east-central portion of IR Site 6, and (2) Transformer TX-152(2), located near the northeast corner of Building 461. Transformer TX-151 was completely removed prior to sampling, and a field survey designation of EP-108-1, referencing an empty pad location in Parcel T108, was subsequently used to identify the transformer.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
3	Historically	Section 1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 2.2.2.

the Army until 1896, when the Navy assumed operations. YBI functioned as a naval receiving station until World War II, when naval operations were transferred to NAVSTA TI (Lee, 1969).

At the direction of the U.S. Army Corps of Engineers, construction of TI was performed from February 1936 to August 1937. The island was built to serve as the long-term site for the future San Francisco Airport and the short-term site for the 1939-1940 Golden Gate International Exposition. TI was built on Yerba Buena Shoals, a sand spit that extended north and northwest of YBI. A seawall of 287,00 tons of rock and 29,665,152 cubic yards of fill, primarily consisting of sand with lesser amounts of silt, clay, and gravel, were dredged from the San Francisco Bay and Sacramento-San Joaquin Delta and used to construct TI. Once the seawall was raised to a height of 13 feet above mean sea level, the fill was poured into the cavity via dredge lines. After filling the cavity, the fill material was desalinized by pumping in millions of gallons of fresh water and extracting the diluted saltwater. A 6-foot layer of topsoil, imported from the San Joaquin Valley, was used to surface the entire island (Lee, 1969; Mare Island Naval Shipyard [MINS], 1996).

In response to the Navy's request, the City and County of San Francisco leased TI to the Navy in 1941 for the duration of World War II. During World War II, the island became a major Navy base, processing approximately 12,000 military personnel per day for overseas deployment and returns from deployment. NAVSTA TI was used primarily for training, administration, housing, and other support services to the U.S. Pacific Fleet. TI would never serve as an airport, as originally intended. After World War II, the City and County of San Francisco agreed to trade the deed for NAVSTA TI to the Navy in exchange for government-owned land south of San Francisco, where the San Francisco International Airport was eventually built (MINS, 1996).

NAVSTA TI remained an active, fully operational Navy facility until the 1990s. In 1993, the BRAC Commission, pursuant to the Defense Base Closure and Realignment Act of 1990, recommended closure of NAVSTA TI. The base was closed on September 30, 1997, and is in the process of being transferred to the City and County of San Francisco.

2.2.2. Installation Restoration Site 6 History

This section describes the history of the two main areas of IR Site 6.

2.2.2.1. Former Fire Training School

The Former Fire Training School was used for nearly 50 years (1944 to 1992) for various firefighting activities. The training school formerly included 10 buildings, 6 USTs, 1 known AST, and a central training

yard (also known as the "central training area"), which consisted of an "L"-shaped concrete pad and a concrete collector trench (Figure 2-2). Training fires were ignited within a helicopter training area and a portable aircraft area, located along the northern portion of the concrete pad, as well as within four buildings (240 through 243) in the central training yard. Buildings 240 through 243 simulated fire-prone areas on Navy vessels and included mockups of a forecastle, boiler room, engine room, and flight deck. A pumphouse and smoke elimination structure (Buildings 248 and 464) were located along the east and south sides of the central training yard. Buildings 236 and 238, located at the southwestern portion of the site, and Buildings 352 and 353, located at the southeastern corner of the site, were classrooms and other support buildings. All buildings were demolished and removed from the site in 1993 (MINS, 1996), although many of the building foundations remain on site. Table 2-1 summarizes the historical buildings at IR Site 6. Figure 2-2 depicts the locations of the former buildings.

During fire training exercises, diesel-, gasoline-, magnesium-, and wood-fueled fires were set in various mockups and then extinguished using a mixture of water and biodegradable emulsifiers (Harding Lawson Associates, Inc. [HLA], 1987). Fuel was supplied from four 1,500-gallon steel USTs adjacent to the north (UST 240 Area) and east (UST 248 Area) sides of the L-shaped concrete pad. USTs 240B, 248A, and 248B reportedly stored diesel fuel, and UST 240A stored both gasoline and diesel. Fuels from USTs 248A and 248B were pumped through the pumphouse (Building 248) and into the training buildings for ignition (Radian Corporation, 1992). The four USTs were removed between 1992 and 1995 (Shaw, 2004b). Two additional steel 1,000-gallon USTs (248C and 248D) were associated with oil-water separators (OWS) and historically stored waste fuel. USTs 248C and 248D and the OWS components were removed in 2002 (Navy, 1997; Shaw, 2004b).

AST 248, a 3,500-gallon steel AST historically used to store waste fuel, was removed from IR Site 6 sometime prior to 1995. In addition, a suspected former AST (AST 240) may have been located near the northern boundary of IR Site 6; however, no historical records have been found with information on the construction, use, or removal of AST 240 (Navy, 1946). Table 2-2 summarizes information on the former USTs and ASTs at IR Site 6. Figure 2-3 depicts the locations of the former tanks.

The central training area was surrounded by a shallow, concrete-lined collection trench that historically conveyed wastewater runoff from the training area during training exercises. The wastewater and unburned fuels were conveyed to sumps and surge pits along the eastern side of the site. Wastewater from the sump pits passed through the OWSs associated with USTs 248C and 248D. The waste fuel was then pumped from the USTs through aboveground piping to the 3,500-gallon AST 248. The fluids were inspected and may have been cycled through the separators a number of times to increase the concentration of oil. The sludge was pumped into a 5,000-gallon tank truck for off-island disposal (Radian Corporation, 1992). Before 1973, wastewater that flowed to the concrete trench was discharged to San Francisco Bay without treatment (Navy, 1972).

Approximately 18,700 gallons of gasoline and 31,500 gallons of diesel fuel were used at IR Site 6 each year, and approximately 14,000 gallons of petroleum residue was generated on site (Dames and Moore, 1988). In addition, grease and paints stored in a portable locker may have been used in areas adjacent to the central training area on the "L"-shaped concrete pad (Radian Corporation, 1992). Chlorinated solvents may have also been used to degrease equipment in the training area (TtEMI, 2002c).

2.2.2.2. Former Parking and Storage Area

The Former Parking and Storage Area was originally part of Parcel T111 and was never associated with the Former Fire Training School. As documented in the Basewide Environmental Baseline Survey (EBS) Report, historical features and uses at Parcel T111 included a vehicle parking area, forklift parking area, hazardous materials storage area, hazardous waste storage area, and a storage area for former training structures (ERM-West, 1995). Although not originally part of IR Site 6, this subarea was added to IR Site 6 following the detection of dioxins and furans in soil and TPH in groundwater that had migrated from the Former Fire Training School (Navy, 2005a).

2.3. TOPOGRAPHY AND SITE FEATURES

Approximately 1.15 acres of IR Site 6 is covered with concrete, 1.34 acres is covered with asphalt, and 2.07 acres is currently unpaved (Figure 2-3). All buildings have been removed, and the site is currently closed to the public and secured with chain-link fencing. The topography at TI is flat, consisting primarily of sand dredged from the San Francisco Bay and the Sacramento-San Joaquin Delta and retained by a perimeter of rock and sand dikes. All land above sea level and extending to a depth of approximately 10 to 50 feet below sea level is composed of fill. Ground surface elevations at IR Site 6 range from approximately 10 to 12 feet above mean sea level, based on the National Geodetic Vertical Datum of 1929. Surface runoff on paved areas flows into on-site storm catch basins and drains directly into San Francisco Bay. Runoff on unpaved areas infiltrates through the soil. Figure 2-3 shows the surface topography and surface water discharge locations at IR Site 6.

Active and abandoned buried utility lines—including storm drains, sanitary sewers, steam lines, freshwater lines, and pressurized natural gas conduits—have been identified at IR Site 6. An active utility corridor, consisting of gas, steam, and water lines, is present along Avenue M that services the wastewater treatment plant (WWTP). Figure 2-4 shows the locations of known utility lines at IR Site 6.

2.4. CURRENT LAND USE AND PROPOSED REUSE

IR Site 6 is located within the northeast quadrant of TI that is currently used for industrial purposes. In 1992, the Navy terminated its use of IR Site 6 as a Fire Training School. The main portion of the site is secured by chain-link fencing and is being used as a temporary staging area for roll-off bins to support the ongoing non-time critical removal action for low-level radiological waste (LLRW) at IR Site 12. This part of IR Site 6 is a radiologically controlled area, where all activities within its boundaries must be performed

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
4	remedy for soil	Section 1.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 13.2.4.

13.2.3.4. Site Monitoring

As part of the remedial design, a maintenance and monitoring plan would be prepared to specify all monitoring requirements associated with this remedy. Backfilled areas over contaminated soil would be treated and maintained as soil covers. Monitoring of the soil cover would include periodic inspections of the site to verify that the cover is intact and functioning as intended. Monitoring would identify required repairs and maintenance to be performed.

13.2.4. Alternative S-4: Excavation and Off-Site Disposal of Unsaturated Zone Soil to 5.5 Feet and Institutional Controls

Alternative S-4 includes excavation of contaminated unsaturated zone soil (assumed to include soil to a maximum depth of 5.5 feet bgs) with off-site disposal of contaminated soil at a permitted disposal facility (Figure 13-3). Excavation of COCs in soil to 5.5 feet bgs would (1) ensure that exposure pathways would be eliminated for future recreational users and occupational workers at IR Site 6, (2) prevent exposure to chemicals in soil gas to future occupational workers, and (3) reduce the potential for COCs in soil to impact groundwater.

This alternative also provides institutional controls, engineering controls, and monitoring. Unsaturated zone soil (within 5.5 feet bgs) containing COCs at concentrations greater the remediation goals would be excavated under this remedy. Excavated areas would be backfilled to existing site grades with clean soil meeting stringent chemical and radiological acceptance criteria established in the remedial design. Radiological screening would be necessary to verify that the background radioactivity of the backfill is consistent with background conditions at TI. Overall, this alternative removes contamination within the unsaturated zone to limit exposure to contaminated soil and reduce the potential for COCs in soil impact groundwater.

13.2.4.1. Excavation

This alternative assumes that all unsaturated zone soil (within 5.5 feet bgs) containing COC concentrations that exceed remediation goals would be excavated and removed from IR Site 6. Excavated areas would be backfilled with clean soil. ORM would be added to excavations prior to backfilling in select areas with groundwater contamination (such as the footprint of the UST 240 excavation) that could recontaminate clean backfill following excavation. The application of ORM would be intended to serve as a cost-effective measure that could potentially reduce the risk of recontamination of backfill soil if a sustained rise in the water table (due to seasonal or annual variations) occurs. Its application would be considered to be incidental treatment and would not be meant to be a primary component of the remediation or to be relied

upon to meet remediation goals. The preliminary excavation design uses the following technical assumptions:

- Excavation depths would extend to a maximum depth of 5.5 feet bgs.
- Confirmation sampling would be performed along all sidewalls and excavation bottoms to confirm adequate remediation.
- Over-excavation to remove contamination found to extend laterally beyond known contaminated areas constitutes an increase in excavated volume of 25 percent.

Figure 13-3 shows the preliminary excavation design. For the purposes of estimating cost, it was assumed that approximately 6,500 cubic yards of soil would be excavated under this alternative, including 25 percent over-excavation beyond the excavation extents shown on Figure 13-3. The estimated excavation and backfill volumes are included in the cost tables in Appendix N. The excavation extents would be further developed and detailed in the remedial design if this alternative is selected. The lateral extent of excavations would be refined through pre-excavation characterization sampling to be performed during the remedial design or during initial phases of the remedial action. This characterization effort would be guided by specific DQOs to better delineate soil contamination. All material excavated under Alternative S-4 would be characterized and disposed of off site at an appropriately permitted off-site disposal facility.

The adequacy of the excavation process in removing contaminated soil would be verified through post-excavation confirmation sampling and, if necessary, additional lateral excavation. The post-excavation confirmation sampling procedures would be developed during the remedial design and would include specific DQOs to facilitate proper implementation. After receipt of acceptable post-excavation confirmation sampling results, excavations would be backfilled with clean soil meeting stringent chemical and radiological acceptance criteria.

13.2.4.2. Institutional Controls

Institutional controls, as discussed for Alternative S-2, would also be implemented for Alternative S-4.

13.2.4.3. Engineering Controls

Engineering controls, as discussed for Alternative S-2, would also be implemented for Alternative S-4.

13.2.4.4. Site Monitoring

Site monitoring, as discussed for Alternative S-3, would also be implemented for Alternative S-4.

13.3. DESCRIPTION OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

Groundwater at IR Site 6 presents a potential unacceptable risk to occupational workers within Subarea 2 and to construction workers, as discussed in the HHRA (Appendix I). In addition, the SLERA (Section 9.2)

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
5	remedy for groundwater	Section 1.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 13.3.2.

- Alternative GW-1: No Action
- Alternative GW-2: Institutional Controls and Long-Term Groundwater Monitoring
- Alternative GW-3: SVE with Air Sparging, Bioventing and Biosparging, MNA, and Institutional Controls
- Alternative GW-4: ISB, MNA, and Institutional Controls
- Alternative GW-5: Excavation of Saturated Zone Soil from 5.5 to 8 feet, MNA, and Institutional Controls

These alternatives are described in the following sections. Although not always mentioned in the titles, each of the action alternatives (GW-2 through GW-4) includes engineering controls and monitoring. Table 13-2 presents the major components of each alternative.

13.3.1. Alternative GW-1: No Action

Under Alternative GW-1, there would be no response action. Groundwater would be left as is without implementing any institutional controls, removal, treatment, monitoring, or other mitigating actions. The no-action alternative is retained throughout the evaluation process as required by the NCP to provide a baseline for comparison with other alternatives.

13.3.2. Alternative GW-2: Institutional Controls and Long-Term Groundwater Monitoring

Alternative GW-2 consists of institutional controls and long-term groundwater monitoring. Institutional controls would be implemented in areas where humans could be exposed to COCs at concentrations that pose a health risk. Long-term groundwater monitoring would serve a two-fold purpose. It would (1) provide awareness of the size and behavior of COC plumes, helping to ensure that contaminants do not migrate beyond controlled areas; and (2) provide additional information on the size and behavior of plumes to be used in verifying that COCs in groundwater do not pose potential risks to human and ecological receptors. Alternative GW-2 would meet RAOs by controlling the exposure pathways that pose potential risk. The following paragraphs describe this alternative.

13.3.2.1. Institutional Controls

Institutional controls, as discussed for Alternative S-2, would also be implemented for Alternative GW-2.

13.3.2.2. Engineering Controls

Engineering controls, as discussed for Alternative S-2, would also be implemented for Alternative GW-2.

13.3.2.3. Long-Term Groundwater Monitoring

Long-term groundwater monitoring would involve periodic groundwater sampling and analysis for (at a minimum) all of the groundwater COCs and COECs identified in Section 10.4. Groundwater monitoring results would be used to assess the migration of contaminants to verify that human health and aquatic wildlife in San Francisco Bay are adequately protected.

The long-term monitoring program would monitor the concentrations of COCs and COECs in groundwater over time. Initially, all COCs and COECs would be monitored at the locations where the HHRA or SLERA identified potential unacceptable risk. Groundwater monitoring would continue for as long as COC or COEC concentrations exceed their remediation goals or until a risk evaluation determines that no unacceptable risk to future users or aquatic wildlife exists.

The general objectives for groundwater monitoring for Alternative GW-2 are as follows:

- Monitoring for migration of COCs and COECs into previously uncontaminated areas and toward San Francisco Bay
- Monitoring for changes in concentrations within plumes
- Monitoring concentrations in and near individual wells where the HHRA or SLERA identified potential unacceptable risk

In total, eight wells (including one existing well and seven new wells) are proposed for monitoring under Alternative GW-2. Most of these wells would be upgradient, downgradient, cross-gradient, or within COC plumes to evaluate the migration of chemicals. For the purpose of the cost estimate, seven wells were added to the existing network of monitoring wells to improve spatial coverage at all plume areas; these would be new wells that do not currently exist at IR Site 6. Figure 13-4 presents the locations of the existing and proposed wells for monitoring the plume areas.

For cost-estimating purposes, it is assumed that monitoring would occur for 30 years. Groundwater would be monitored quarterly for the first 2 years, semiannually for the next 2 years, and annually thereafter. The rationale behind the proposed monitoring approach and the details of the monitoring program would be refined in the remedial design. More specifically, aspects of the long-term groundwater monitoring program (such as wells to be monitored, chemicals to be analyzed for, laboratory analytical methods, sample collection procedures, and quality control requirements) would be refined during preparation of the remedial design, if an alternative including long-term monitoring is selected. The analysis in the remedial design would include data evaluated for this FS Report and newer data (including data from newly installed wells).

The remedial design evaluation may include:

- Changes to the chemicals to be monitored for at each well

- Changes to the frequency of monitoring for each well
- Adding or removing wells from the proposed monitoring network

The results of these evaluations will be described in the remedial design and presented to the regulatory agencies for review.

Results derived from the long-term groundwater monitoring program would be used during 5-year reviews to assess the adequacy of the monitoring program, adjust the data collection and analysis requirements, and evaluate the potential need for additional response actions if COCs or COECs are reported at concentrations exceeding specific performance criteria (referred to as trigger levels) to be determined in the post-ROD monitoring plan. Trigger levels would be established for COCs and COECs at each well in the monitoring network and would account for the appropriate exposure pathway. For example, COECs that may affect aquatic wildlife would have trigger levels that account for attenuation (based primarily on advection and dispersion) as groundwater flows toward San Francisco Bay.

If trigger levels are exceeded, appropriate response actions may include:

- Increasing the monitoring frequency in the well where the trigger level was exceeded to evaluate whether the exceedance is persistent
- Monitoring groundwater at strategic locations downgradient to evaluate attenuation and potential groundwater impacts to potential receptors
- Using site-specific detailed information to more accurately estimate attenuation (including processes such as adsorption and degradation)
- Identifying and evaluating the need for an additional remedial action (such as, expanded source removal or groundwater treatment)

13.3.3. Alternative GW-3: SVE with Air Sparging, Bioventing and Biosparging, MNA, and Institutional Controls

Alternative GW-3 consists of four retained process options: (1) SVE with air sparging, (2) bioventing and biosparging, (3) MNA, and (4) institutional controls (Figure 13-5). SVE with air sparging and bioventing and biosparging are considered to primarily address saturated zone contamination (i.e., source contamination that produces soil gas and contributes contamination to groundwater) in the UST 240 area, with performance monitoring. Additionally, these process options were retained to address smear zone contamination above the water table. The contaminants to be addressed include VOCs and less volatile petroleum hydrocarbons. Under this alternative, all other areas of saturated zone contamination would be addressed by MNA and institutional controls. Figure 13-5 shows the area targeted for SVE with air sparging and bioventing and biosparging.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
6	wildlife habitat	Section 2.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 2.2.1.

2.2.1 Treasure Island

In the 1993 Phase I, the problem formulation was developed based on existing data, biotic surveys, and fate and transport analysis (PRC 1993). The terrestrial habitat on TI was characterized as manmade, poor quality, with large areas of pavement, gravel, or buildings restricting use of the sites by ecological receptors. The habitat on TI was characterized during a site tour on June 3, 1994, attended by the Navy and the regulatory agencies. Because higher-quality habitat existed nearby at YBI, the Navy and the regulatory agencies concluded (1) wildlife use of TI was infrequent, (2) the risk to terrestrial receptors was minimal, and (3) further assessment of the TI onshore sites was not necessary (EPA 1994). Based on that decision, risk to terrestrial receptors was not further evaluated for TI sites.

During a BCT meeting in September 2005, the regulatory agencies stated conclusions based on the Phase I report (PRC 1993) and 1994 site tour applied only to transient ecological species (Tetra Tech 2005). The regulatory agencies further stated that the documentation of ecological risk in the current site-specific RI reports is inadequate because it is based on previous investigations that were never documented in a final report. The regulatory agencies requested risk to resident species, including plants, invertebrates, birds, and mammals be documented in a SLERA. Based on these discussions, the Navy agreed to evaluate risk to terrestrial receptors from contaminated soil at IR Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.2.2 Yerba Buena Island

In Phase II, a SLERA was conducted for Sites 8, 11, 28, and 29 as part of the Draft Final Onshore Operable Unit RI Report (Tetra Tech 1997). The SLERA evaluated three representative species, the deer mouse (*Peromyscus maniculatus*), American kestrel (*Falco sparverius*), and American peregrine falcon (*Falco peregrinus anatum*). The deer mouse and American kestrel were selected to represent small mammals and raptors; the Peregrine falcon was selected because it is a state endangered species and two pairs were known to nest on the San Francisco-Oakland Bay Bridge. Potential risks posed by ingestion of chemicals in prey and soil were assessed using an exposure and effects model (food chain model [FCM]).

The results of the SLERA indicated potential risk to the peregrine falcon under conservative exposure and effects conditions at Sites 8, 11, 28, and 29. The regulatory agencies recommended a validation study using chemical concentrations in bird tissue collected at the site to further evaluate potential risk to the peregrine falcon. The SLERA also indicated possible risk to small mammals from the concentrations of chemicals at the site; however, based on the small total area of the sites compared to the total area of YBI and the historical and continuing disturbance of the sites, the Navy and regulatory agencies agreed that further evaluation of small mammals was not necessary (as stated in the comments [dated January 23, 1998] received by the DTSC on the Draft Final RI Report [PRC 1997]).

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
7	Groundwater at Site 6	Section 2.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 3.3.4.

from the shoreline. No tidal mixing was evident at well 06-MW09, located 500 feet from the bay (PRC, 1995). A table summarizing the mixing zone data for the IR Site 6 wells is included on Figure 3-6.

3.3.2.2. Tidal Mixing Zone Study

Between December 2000 and March 2001, a study was conducted that focused on estimating the extent and degree of physical mixing of surface water and groundwater within the tidal mixing zone at TI. The tidal mixing study measured tidal influence on water levels within approximately 100 feet of the shoreline to help understand the physical mixing processes; however, the study was not intended to duplicate the results of the 1995 tidal influence study (Section 3.3.2.1). The specific intent of the study was to evaluate the nature and extent of tidal mixing and influence on groundwater and possible chemical transport to San Francisco Bay. The information was used to develop tidal mixing zone factors for shoreline areas that account for the physical mixing processes of chemicals in groundwater (TtEMI, 2002b).

3.3.3. Groundwater Beneficial Use

Under the San Francisco Bay Basin Water Quality Control Plan (Basin Plan), all groundwater within the San Francisco Bay Basin that meets the levels of SWRCB Resolution No. 88-63, has a potential beneficial use for municipal or domestic supply (SWRCB, 1988). The Water Board, however, completed a Pilot Beneficial Use Designation Project for several groundwater basins in San Francisco and northern San Mateo Counties, including NAVSTA TI (Water Board, 1996). The report indicated that the use of groundwater for municipal and domestic supply at TI would be limited by the following factors:

1. the small volume of fresh groundwater available;
2. the likelihood of saltwater intrusion; and
3. potential future ground improvements for stability (stone columns and dynamic compaction).

Appendix C contains a Water Board letter providing concurrence that, pursuant to SWRCB Resolution No. 88-63 and Water Board Resolution No. 89-39, groundwater at NAVSTA TI is not a potential drinking water source (Water Board, 2001).

3.3.4. Installation Restoration Site 6 Hydrogeology

Groundwater data were collected at IR Site 6 from monitoring wells since 1994. Groundwater at IR Site 6 has been recorded at depths ranging from approximately 3 to 8 feet bgs. The shallowest groundwater has been observed at wells 06-MW01 and 06-MW15, where the ground elevation is relatively low. Generally, groundwater levels are higher during the rainy season (November to April) and lower during the dry months

(May to October). The direction of groundwater flow at IR Site 6 is generally north–northeast toward San Francisco Bay (TtEMI, 2002c; Shaw, 2004c and 2005a).

Based on groundwater elevation data collected during 18 monitoring events between December 1994 and January 2004, groundwater gradients at IR Site 6 ranged from approximately 0.0005 to 0.0035 foot per foot, and averaged about 0.002 foot per foot for all 18 monitoring events. Figure 3-7 shows the IR Site 6 groundwater contours based on four quarterly groundwater monitoring events conducted between June 2003 and January 2004. Hydraulic gradients vary across the site and depend on proximity to the shoreline and the extent of tidal influence; generally, steeper hydraulic gradients have been measured closer to the shoreline (Shaw, 2005c).

In 1991, bail tests and slug tests were performed in the UST 240 and UST 248 Areas of IR Site 6 to calculate hydraulic conductivities of the aquifer. Tests were performed on two monitoring wells (06-MW02 and 06-MW03) in the UST 240 Area and two monitoring wells (06-MW06 and 06-MW08) in the UST 248 Area. Hydraulic conductivities calculated from the tests ranged from 4.15 feet per day at well 06-MW 3 to 11.80 feet per day at 06-MW02 (PRC, 1992a).

Hydraulic conductivity values obtained from the slug tests and bail tests were used, in conjunction with the representative hydraulic gradient calculated using data from the 2002 and 2003 quarterly groundwater monitoring event, to estimate aquifer groundwater flow velocities using the following equation:

$$V = Ki / \eta_e$$

where:

v	=	Groundwater flow velocity (feet per day)
K	=	Hydraulic conductivity (feet per day)
i	=	Hydraulic gradient (dimensionless)
η_e	=	Effective porosity (dimensionless)

Using gradients from quarterly groundwater monitoring events and porosity values based on site-specific geotechnical data, groundwater velocities at IR Site 6 ranged from 0.03 to 0.08 foot per day. Hydraulic conductivities and groundwater velocities were slightly higher in the UST 248 Area compared with the UST 240 Area. The hydraulic conductivities and groundwater velocity values calculated at IR Site 6 are summarized below.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
8	Final Environmental Impact Report (EIR)	Section 2.4	Final Environmental Impact Report, Treasure Island/Yerba Buena Island Redevelopment Project. City and County of San Francisco Planning Department. Vol. 1-6. Draft July 12, 2010; final certification date April 21, 2011. Volume I, Chapter II.

II. PROJECT DESCRIPTION

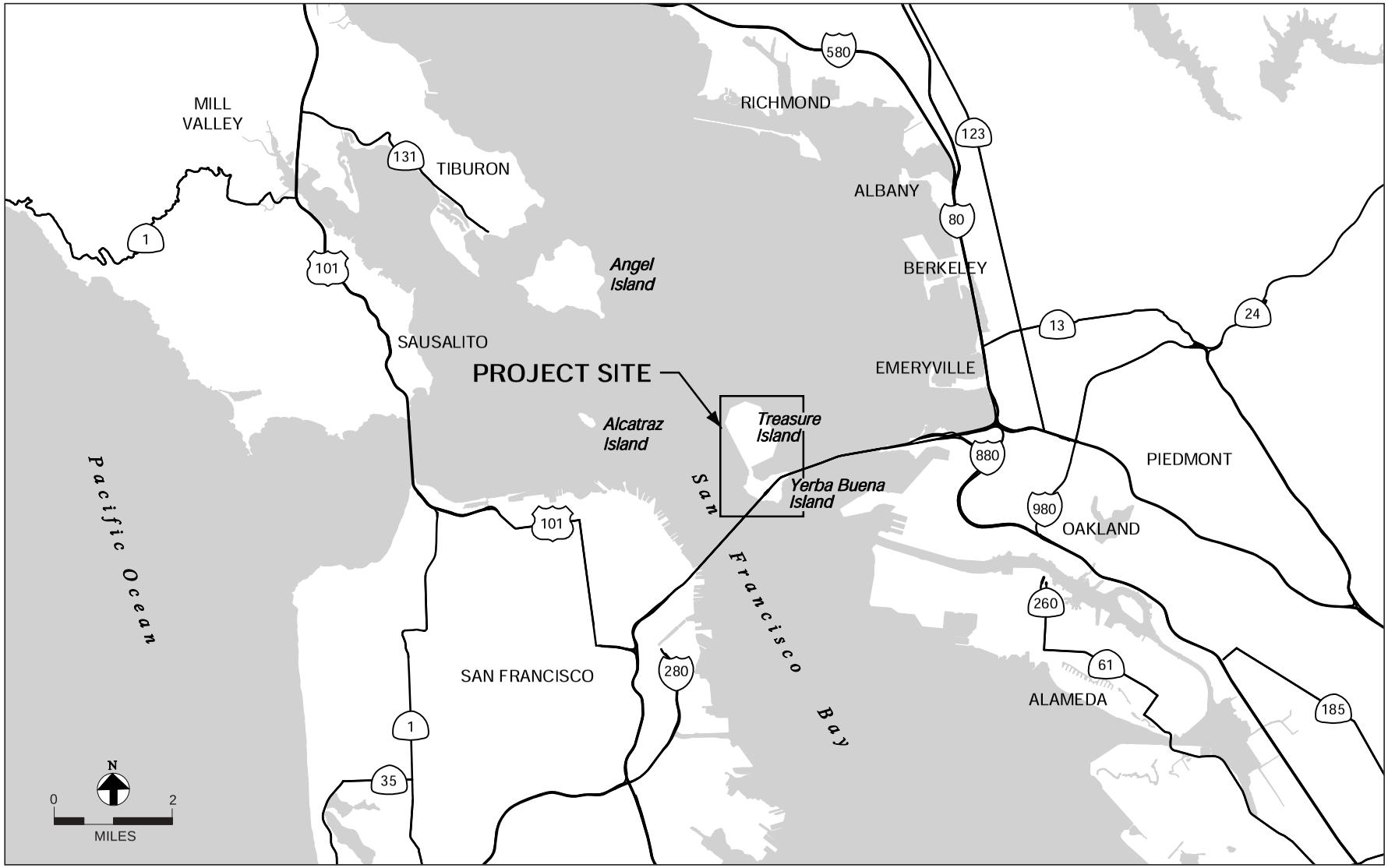
A. OVERVIEW

Treasure Island and Yerba Buena Island (collectively, "the Islands") are in San Francisco Bay, about halfway between the San Francisco mainland and Oakland. (See Figure II.1: Regional Location.) The Islands are the site of the former Naval Station Treasure Island ("NSTI"), which is owned by the U.S. Navy. NSTI was closed on September 30, 1997, as part of the Base Realignment and Closure Program. The Islands also include a U.S. Coast Guard Station and Sector Facility, a U.S. Department of Labor Job Corps campus, and Federal Highway Administration ("FHWA") land occupied by the San Francisco-Oakland Bay Bridge ("Bay Bridge") and tunnel structures.

The Treasure Island Development Authority ("TIDA") is proposing to redevelop the portions of NSTI still owned by the Navy, once they are transferred to TIDA. The Development Plan would be carried out by Treasure Island Community Development, LLC ("TICD"), a private entity competitively selected as the prospective master developer, subject to approval of a Disposition and Development Agreement and related conveyance agreements governing redevelopment of NSTI. One or more Infrastructure Financing districts ("IFDs") would be used to help finance public facilities and infrastructure improvements.

Currently, the former military base consists primarily of low-density residential uses, along with vacant and underutilized non-residential structures. There are about 1,005 total dwelling units[1] on Treasure Island and Yerba Buena Island (of which about 805 are available for occupancy[2]), about 100 buildings with existing and former non-residential uses, parking and roadways, open space, a wastewater treatment facility, and other infrastructure. The Development Plan Area would be redeveloped with a new, high-density, mixed-use community with a variety of housing types, a retail core, open space and recreation opportunities, on-site infrastructure, and public and community facilities and services. In all, there would be up to approximately 8,000 residential units; up to approximately 140,000 square feet (sq. ft.) of new commercial and retail space; approximately 100,000 sq. ft. of new office space; up to 500 hotel rooms; approximately 300 acres of parks and open space with possible cultural uses such as a museum; bicycle, transit, and pedestrian facilities; a Ferry Terminal and intermodal Transit Hub; and new and/or upgraded public services and utilities, including a new or upgraded wastewater treatment plant and a new recycled water plant. Three historic buildings on Treasure Island would be adapted to house

[1] Of the 1,005 total units, 908 are located on Treasure Island and 97 are on Yerba Buena Island.
[2] About 200 units are not occupiable for a variety of reasons, including ongoing remediation of hazardous materials in buildings or hazardous materials in the soil.



SOURCE: Turnstone Consulting

TREASURE ISLAND AND YERBA BUENA ISLAND REDEVELOPMENT PROJECT EIR

FIGURE II.1: REGIONAL LOCATION

up to 311,000 sq. ft. of commercial space.[3] Nine historic buildings and four garages on Yerba Buena Island would be adaptively reused for various commercial activities such as a hotel/wellness center and possibly a restaurant. The Navy would remediate sites containing hazardous materials to standards consistent with applicable Federal laws governing base closure prior to transfer.[4] Any remaining site remediation, to the extent that such remediation was not required of, or performed by the Navy, but is necessary to meet the requirements of applicable regulatory agencies for the proposed uses of the Treasure Island / Yerba Buena Island Area Plan ("Area Plan") and Treasure Island / Yerba Buena Island Special Use District ("SUD"), would be carried out by TIDA as part of the implementation of the Area Plan/SUD. Finally, geotechnical improvements would be made to stabilize Treasure Island and the causeway that connects it to Yerba Buena Island. Buildout would be implemented in four phases, anticipated to occur from approximately 2011 through 2031, depending on market conditions.

Another document, the *Design for Development for Treasure and Yerba Buena Islands* ("*Design for Development*"), would be adopted in connection with the SUD. The draft *Redevelopment Plan* and an accompanying required report called the Preliminary Report are expected to be available in July 2010.[5] Together, these documents would establish the land use controls and design standards and guidelines for the project site. The Area Plan/SUD would be implemented through a Disposition and Development Agreement ("DDA") between TIDA and TICD, and related transactional documents. The Area Plan/SUD, the *Design for Development*, the DDA, and related transactional documents and policies that would be adopted to implement the Area Plan/SUD, and the development program described in the Area Plan/SUD and *Design for Development* collectively form the "Proposed Project"

[3] The commercial adaptive reuse includes approximately 67,000 sq. ft. of additional retail use, which, when combined with the 140,000 sq. ft. of new retail, yields a total of approximately 207,000 sq. ft. of retail use proposed on the Islands.

[4] Remediation activities on the Islands are currently underway and are being carried out by the Navy, which has conducted separate environmental review of the remedial activities pursuant to the National Environmental Policy Act. In limited circumstances, some portions of Treasure Island may be conveyed to TIDA pursuant to a Finding of Suitability for Early Transfer ("FOSET"), and remediation activities under the FOSET would be implemented by TIDA in accordance with the provisions of the FOSET, as further discussed in Section IV.P, Hazards and Hazardous Materials, in this EIR.

[5] All of these documents are available for review in the Mayor's Office of Economic and Workforce Development, Room 448, City Hall, San Francisco.

analyzed in this Environmental Impact Report ("EIR").[6] The anticipated program of development is also referred to in this EIR as the "Development Plan."

CHAPTER ORGANIZATION

This chapter begins with a discussion of the project sponsors' objectives and the location of the Islands. It then describes existing land uses. Next, it addresses Development Plan characteristics, the proposed *Transportation Plan*, the proposed utilities, the proposed geotechnical stabilization, proposed grading, and the proposed *Sustainability Plan*. The chapter concludes with a discussion of project phasing and construction, and of the intended uses of the EIR.

B. PROJECT SPONSORS' OBJECTIVES

TIDA, a single-purpose public agency responsible for the Project Area, and TICD, a private entity competitively selected as the prospective master developer, are joint sponsors of the Proposed Project. The Proposed Project's overall purpose is to convert approximately 367 acres on Treasure Island and approximately 94 acres on Yerba Buena Island from a former military base to a dense, mixed-use development with residential, commercial, cultural, hotel, recreational, and retail uses centered around an intermodal Transit Hub. Supporting infrastructure, public services and utilities, and a substantial amount of open space would also be provided, consistent with the following list of objectives.

Project Objectives Shared by TIDA and TICD

Land Use

- Create a unique San Francisco neighborhood that includes facilities and amenities necessary to support a diverse, thriving community, with a special emphasis on providing amenities for families and tools and services to ensure that the neighborhood has a cohesive feel and meets the needs of its residents.
- Provide a model of 21st century sustainable urban development that displays architectural and landscape design excellence befitting the Islands' history, location, and prominence and capitalizes on the spectacular views of San Francisco.
- Implement a land use program with high-density, compact residential and commercial development located within walking distance of an intermodal Transit Hub to maximize

[6] The basis for the proposed Area Plan/SUD is the *Development Plan and Term Sheet for the Redevelopment of Naval Station Treasure Island* (the "*Development Plan*"), which was endorsed by TIDA in October 2006 and by the Board of Supervisors in December 2006, and updated by the *Development Plan Update* endorsed by the TIDA Board in March 2010 and by the Board of Supervisors in June 2010. The *Development Plan* was prepared along with supporting studies that address project design concepts, transportation, infrastructure, sustainability, community services, affordable housing, jobs, and other aspects of the development. Copies of these documents are available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E, and available online at http://www.sftreasureisland.org/index.aspx?page=26.

walking, bicycling, and use of public transportation and to minimize the use and impacts of private automobiles.

- Provide a comprehensive new regional waterfront system of parks and public open spaces that is programmed with a variety of uses, including recreational, passive open space, arts, cultural, and educational uses, and that establishes the Development Plan Area as a regional destination.
- Provide a high-quality public realm, including a pedestrian and bicycle-friendly environment with high design standards for public open spaces, parks, and streetscape elements.
- Activate and link the area surrounding the historic structures by providing a dense, urban retail/mixed-use environment that attracts residents and visitors to the area.

Housing

- Provide high-density, mixed-income housing with a variety of housing types, consistent with transit-oriented development, that include both ownership and rental opportunities, to attract a diversity of household types, especially families.
- Include enough residential density to create a sustainable community that supports neighborhood-serving retail, community facilities, and transit infrastructure and service.

Sustainability

- Demonstrate leadership in sustainable design and provide new benchmarks for sustainable development practices in accordance with the *Treasure Island Sustainability Plan*.
- Organize streets and open spaces to respond to Treasure Island's microclimate of wind, sun, and fog and optimize solar exposure, in part by shifting the conventional street grid.

Transportation

- Create a circulation and transportation system that emphasizes transit-oriented development, discourages automobile use, and supports and promotes the use of public transportation and car-sharing, through a comprehensive transportation demand management program.
- Provide a range of public transit choices as part of the transportation system.

Infrastructure

- Provide geotechnical and infrastructure improvements and perform environmental remediation to standards necessary to achieve the land use objectives and all applicable building, regulatory, and seismic safety standards.

Additional TIDA Objectives

In addition to the shared objectives, TIDA has the following project objectives:

- Provide an affordable housing program that delivers 25 percent of all residential units at below market rates across a wide range of income levels, including units for formerly

homeless persons, as provided in the City's agreement with Treasure Island Homeless Development Initiative ("TIHDI").

- Adaptively reuse historic buildings listed on the National Register either individually or as contributors to a National Register District in compliance with the Secretary of Interior Standards for Historic Rehabilitation.
- Create an organizational structure that provides for high-quality development, operations and maintenance of parks and open space.
- Maximize opportunities for on-site renewable energy production.
- Create a development that is financially feasible; that allows for the delivery of infrastructure, public benefits, and affordable housing subsidies; and that is able to fund the Proposed Project's capital costs and ongoing operation and maintenance costs relating to the redevelopment and long-term operation of the project site.
- Provide a comprehensive jobs and community development program that includes the creation of significant numbers of construction and permanent jobs.
- Implement jobs programs that target employment opportunities to economically disadvantaged San Franciscans.
- Support TIHDI jobs and economic development programs.

Additional TICD Objective

In addition to the shared objectives, TICD has the following project objective:

- Construct a high-quality development project that is able to attract investment capital and construction financing and produces a reasonable return on investment.

C. LOCATION

Treasure Island and Yerba Buena Island are in San Francisco Bay, about halfway between the San Francisco mainland and Oakland, on Assessor's Block 1939, Lots 001 and 002. Treasure Island contains approximately 404 acres of land, and Yerba Buena Island, approximately 160 acres. The Islands are within the City and County of San Francisco, near the boundary with Alameda County. The Bay Bridge provides direct access to Yerba Buena Island, which is linked to Treasure Island by a causeway.

As described on p. II.1, the Islands are the site of the former NSTI, which is owned by the Navy and was operated as a functioning military base until it was closed on September 30, 1997, as part of the Base Realignment and Closure Program. NSTI included all of the land on Treasure Island and about 94 acres of the land on Yerba Buena Island, plus approximately 540 acres of unfilled tidal and submerged lands adjacent to the Islands in San Francisco Bay. The Navy has transferred approximately 37 acres in the center of Treasure Island to the U.S. Department of Labor for the Job Corps facility, approximately 48 acres of land on Yerba Buena Island to the U.S. Coast Guard, and approximately 18 acres of land on Yerba Buena Island to the Federal Highway Administration. The remaining NSTI areas would be transferred as part of the

Proposed Project to TIDA subject to environmental review and approval of an Economic Development Conveyance Memorandum of Agreement between TIDA and the Navy. TIDA currently serves as caretaker of the Islands, via a Cooperative Agreement with the Navy, and is responsible for overseeing the operations and maintenance of the base, and managing a variety of interim land uses through a Master Lease with the Navy.

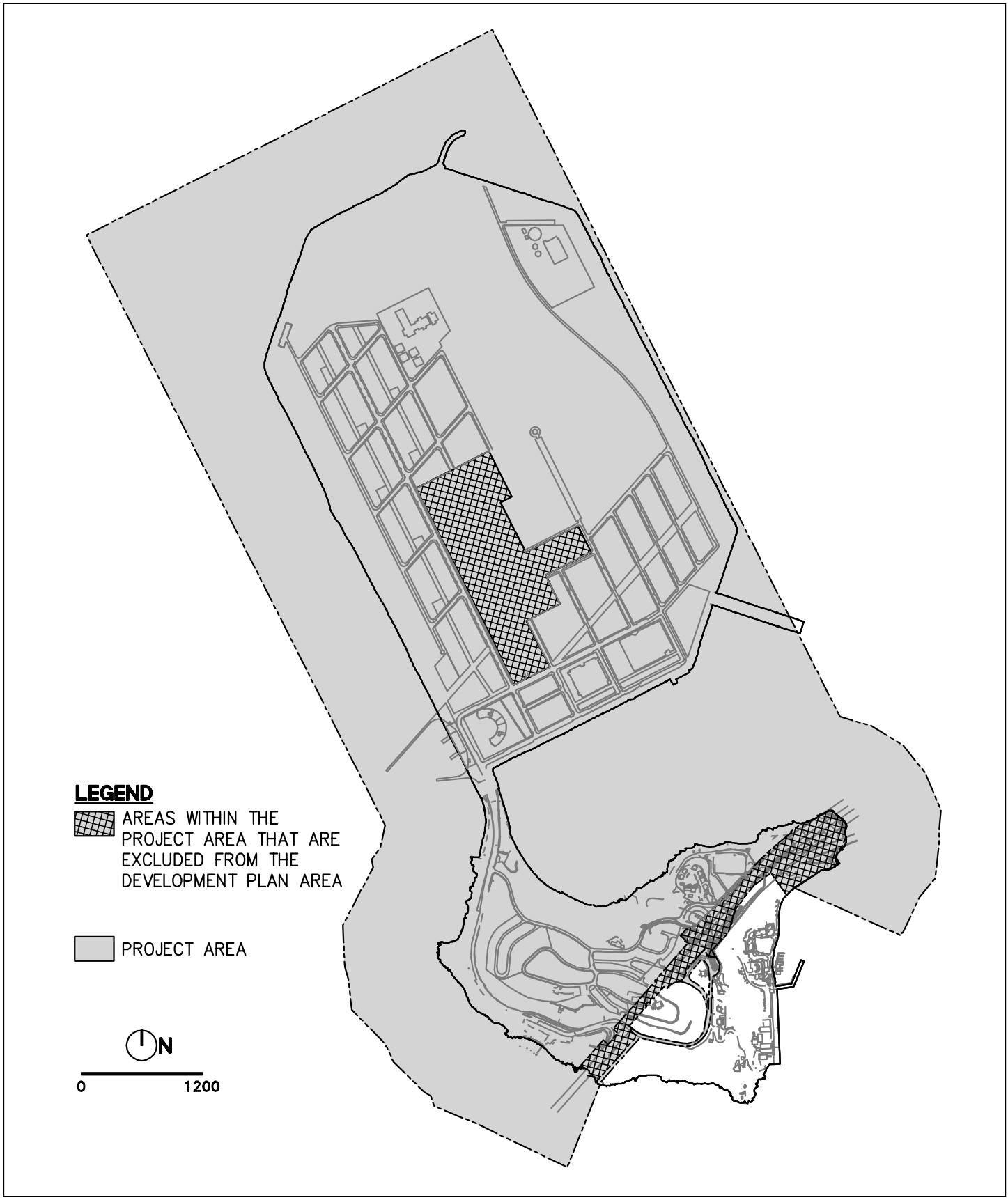
The proposed Project Area includes all of Treasure Island and the portions of Yerba Buena Island not owned by the U.S. Coast Guard, plus the adjacent unfilled tidal and submerged lands mentioned above. (See Figure II.2: Proposed Project Area.) Although the Project Area includes the U.S. Department of Labor Jobs Corps campus and the approximately 18 acres under FHWA and the California Department of Transportation ("Caltrans") jurisdiction, the Area Plan/SUD itself would not apply to, and TIDA would not have any jurisdiction over, any of those areas unless and until they leave State or Federal ownership. The *Development Plan* focuses only on the property that will be received by TIDA from the Navy that is not part of the Job Corps campus or subject to Caltrans' exclusive control; that property is referred to as the "Development Plan Area." The Development Plan Area includes portions of Lots 001 and 002 within Assessor's Block 1939.

D. EXISTING LAND USES

TREASURE ISLAND

Treasure Island, which consists entirely of level, filled land, was constructed by the U.S. Army Corps of Engineers from 1936 to 1939 as the long-term site for the future San Francisco Airport and the short-term site for the 1939-1940 Golden Gate International Exposition. However, the land and buildings never served as an airport because the Navy took possession of Treasure Island from the City of San Francisco in 1941. Buildings remaining from the Exposition include Buildings 1, 2, and 3 (along with Building 111, an addition to Building 3), which are located along the south side of the island. Buildings 1, 2, and 3 are listed as individual resources on the National Register of Historic Places. Approximately 92 post-World War II-era buildings remain on the island, which appear to date primarily from the 1960s through the early 1990s.

Existing land uses at Treasure Island include approximately 110 acres of residential uses, 90 acres of open space, 95 acres of parking and roads, and 70 acres dedicated to former institutional, retail, office, and industrial uses. In addition, the U.S. Department of Labor owns an approximately



SOURCE: BKF

FIGURE II.2: PROPOSED PROJECT AREA

37-acre parcel on Treasure Island that is occupied by the Job Corps educational and training program. The Jobs Corps campus includes dormitories, classrooms, and indoor and outdoor recreational facilities.[7]

Outside of the Job Corps campus, Treasure Island alone currently has approximately 725 occupiable housing units out of 908 units total,[8] and approximately 91 buildings with approximately 2.3 million sq. ft. of present and former non-residential uses. The housing units are mostly in two-, four-, and eight-unit two-story buildings; there are also barracks once used by military personnel (now unusable). Current non-residential uses include offices, a small restaurant, a convenience store, several event venues, a guard shack, warehouse/storage/ manufacturing facilities, a childcare center, a fire station and fire training academy, a wastewater treatment plant, a gymnasium, film production facilities, a chapel, and a yacht club. Other buildings on the island are unoccupied but available for lease or are unoccupied because they are in hazardous condition or are within a site undergoing hazardous waste remediation. Treasure Island also includes outdoor recreation facilities and open space areas. Although the Navy has temporarily restricted access to portions of the northern shoreline for remediation activities, interim access to the perimeter pedestrian path and the boat launch is allowed for launching recreational watercraft, e.g. boardsailing and kayaks. Marine-related facilities include an approximately 100-slip marina in Clipper Cove, which is between Treasure Island and Yerba Buena Island. Pier 1, a long finger pier located on the southeast corner of Treasure Island, is occasionally used for berthing larger vessels that cannot use the marina or for loading and unloading barges.

The existing ground elevations on Treasure Island range from approximately 6 feet (above NAVD88[9]) in the northwestern edge of the island to approximately 14 feet NAVD88 near the southern edge. The perimeter berm around Treasure Island generally ranges from 10 to 14 feet NAVD88. Landscaped areas on Treasure Island include mature ornamental trees, shrubs, and grasses.

Clipper Cove Marina Project

TIDA has entered into an Exclusive Negotiating Agreement and endorsed a Development Plan with Treasure Island Enterprises, LLC, for redevelopment and expansion of the Clipper Cove Marina (the "Marina Project"). The Marina Project was analyzed in the *Transfer and Reuse of*

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[7] Treasure Island Job Corps Center website, http://treasureisland.jobcorps.gov/about.aspx, accessed June 20, 2010. Job Corps is a no-cost education and technical career training program administered by the U.S. Department of Labor for young people ages 16 through 24.

[8] The remaining 97 units are located on Yerba Buena Island, for a total of 1,005 housing units on both Islands.

[9] North American Vertical Datum of 1988.

Naval Station Treasure Island Final Environmental Impact Report, which was certified in 2005,[10] but to date has not been approved by TIDA.

The Marina Project, as described in the 2005 EIR, included both landside and waterside improvements. The landside improvements are no longer being pursued as part of that project, and thus are no longer pending. The waterside improvements, approval of which is still pending, consist of phased demolition of the existing 100 boat berths, new construction of 400 boat berths, and a floating breakwater/public pier, and dredging.

The Proposed Project's landside improvements along Clipper Cove would serve either the existing marina or the Marina Project's waterside improvements in the event that the expansion from 100 slips to 400 slips is approved. These landside improvements include restrooms, laundry facilities, and other improvements that are designed to serve marina tenants as well as the existing Treasure Island Sailing Center, a separate facility that also uses Clipper Cove. All of these proposed landside improvements are part of the proposed Development Program and are therefore analyzed in this EIR. If the Proposed Project is approved, these landside improvements would be constructed regardless of whether the marina is expanded. The Marina Project waterside improvements are not part of the Proposed Project and are therefore analyzed only as part of the cumulative scenario in this EIR.

YERBA BUENA ISLAND

Yerba Buena Island is a natural island that has been used by private parties and by the U.S. Army, Navy and Coast Guard since the 1840s. It is steeply sloped and highly vegetated. In 1867, the U.S. Army established a post on the northeastern side of the island adjacent to present-day Clipper Cove, and it maintained a small base on the island until 1960. In 1898, the Navy established a training station there and, after 1923, operated the facility as a receiving station for servicemen returning from overseas. The Torpedo Assembly Building, built in 1891, and the Senior Officers' Quarters District, constructed in the early 1900s as part of the Navy training station, both remain, along with houses constructed during the same period. Other buildings on the island date from various periods during World War I (1914-1919), World War II in the 1940s, and periods in between. Some residential buildings were constructed in the 1960s. In the areas outside of the Coast Guard and Caltrans facilities discussed below, Yerba Buena Island includes a total of 97 housing units (of which about 80 are occupiable), and 10 non-residential buildings. Quarters 1 (also known as the Nimitz House), the Torpedo Assembly Building, and Quarters 10 and its garage (Building 267) are listed as individual resources on the National Register of Historic Places. Yerba Buena Island also contains the National Register-listed Senior Officers' Quarters Historic District,

[10] *Transfer and Reuse of Naval Station Treasure Island Final Environmental Impact Report*, Planning Department Case No. 94.448, State Clearinghouse No. 1996092073, May 5, 2005. A copy of this report is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

comprised of Quarters 1 through 7, their garages (Building 83, Building 205, Building 230), and certain formal landscaping elements adjacent to the houses.

Caltrans occupies about 18 acres of land on Yerba Buena Island (land owned by the FHWA) with portions of the Bay Bridge and tunnel. Caltrans is now building a new east span of the Bay Bridge and demolishing the old one as part of the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project (hereinafter "Bay Bridge East Span project"). Several structures on the south side of the Bay Bridge in this area were removed to allow construction of a temporary bridge structure in 2009. The new east span of the Bay Bridge is expected to be completed by 2013.[11]

The existing ground elevations on Yerba Buena Island range from 0 feet NAVD88 near the water's edge to 340 feet NAVD88 near the middle of the island. Yerba Buena Island contains landscaped areas, non-native eucalyptus stands, and several types of native habitat. The native vegetation communities are mainly on the western and northern edges of the island and include populations of dune gilia along the western shoreline, although there are special status species present throughout the island.

- U.S. Coast Guard facilities occupy approximately 48 acres of land on Yerba Buena Island adjacent to the Project Area. The U.S. Coast Guard Station and Sector Facility, on the southeast side of Yerba Buena Island, includes housing, administrative facilities, open storage and docks, buoy maintenance facilities, and a lighthouse built in 1872. Coast Guard facilities also include a vehicle tracking system facility on the northwestern part of Yerba Buena Island and Navigation Light No. 6 on the northern end of Treasure Island. The Coast Guard facilities are expected to remain in use in their present location for the foreseeable future.

EXISTING INFRASTRUCTURE

Water, wastewater, stormwater, and power services exist on the Islands. Water service is provided by the San Francisco Public Utilities Commission ("SFPUC") through a 10-inch water line on the Bay Bridge from a pump station on Spear Street on the San Francisco mainland. The four existing water storage tanks on Yerba Buena Island are filled to substantially less-than-full capacity due to their age and poor condition. A water supply pipeline (used only in emergencies) extends under the east span of the Bay Bridge and is supplied by the East Bay Municipal Utility District ("EBMUD"). The service connection is on Beach Street in Oakland, with a pump station located in a column at the eastern end of the Bay Bridge. The Bay Bridge East Span project includes a replacement water supply pipeline that will be connected to the existing back-up water

[11] The San Francisco-Oakland Bay Bridge Seismic Safety Project website, http://baybridgeinfo.org/faqs, accessed June 3, 2010.

service pipelines at each end once the new span is completed. The SFPUC is responsible for maintaining the line from the Beach Street meter to Treasure Island.

A wastewater treatment plant is located in the northeast quadrant of Treasure Island; the treatment plant provides secondary treatment prior to discharge. The Navy holds a National Pollution Discharge Elimination System ("NPDES") permit for discharge to the Bay of an average of 2 million gallons per day (mgd) of treated effluent during dry weather. Stormwater runoff from streets and paved areas is collected in a separate storm drain system and is discharged untreated directly to the Bay through 31 outfalls around the perimeter of Treasure Island and 32 outfalls from Yerba Buena Island.

The distribution/collection pipeline systems for water, stormwater, and wastewater were installed by the Navy as they were needed; therefore, they are somewhat haphazard. They are generally in poor condition, and may not comply with current SFPUC standards. Some of the water distribution pipelines were replaced with new PVC pipe in 1990. The SFPUC maintains and operates all of the existing distribution and collection systems.

- Electric service to the Islands is provided by the SFPUC. Electrical service for the Islands comes from a PG&E substation in Oakland and is routed through a substation located at Seventh Street and Maritime Street on Port of Oakland property operated by the Port and leased to the Navy. From the substation, a Navy-owned 12-kV overhead line conveys power to a location near the Bay Bridge, where two recently installed submarine transmission cables on the Bay bottom connect to Treasure Island. Currently, one of the two submarine cables is capped at both ends and needs underground switches at both ends to be operational.[12] A submarine cable from Treasure Island under Clipper Cove provides electricity to Yerba Buena Island. Natural gas is provided by the SFPUC through a contract with the State of California Department of General Services ("DGS"). The contract with DGS provides for the transmission of natural gas through PG&E transmission lines in the East Bay to a submarine pipeline from Oakland. Portions of this gas pipeline have been replaced as part of the new Bay Bridge East Span project now underway.

Roadways, Access, and Transit

Treasure Island is served by a basic grid of collector roads and local roads; Avenue of the Palms, along the western edge of the island, provides access to Yerba Buena Island via a causeway, and access to the Bay Bridge on a series of viaducts. Parking is provided on Treasure Island on some of the roadways, in parking lots, and in off-street spaces within the residential areas. The road network on Yerba Buena Island consists primarily of Treasure Island Road (the primary access road to the Bay Bridge ramps) and Macalla Road. Yerba Buena Island provides off-street parking only.

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[12] *Treasure Island Infrastructure Update*, December 2008 (hereinafter cited as "*Treasure Island Infrastructure Update*") Section 11, Dry Utilities, Subsection 11.1.4, Submarine Cables, dated August 18, 2009. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

Access to the Project Area is provided via the Bay Bridge ramps at Yerba Buena Island. There is one off-ramp and two on-ramps in the westbound direction, and two off-ramps and one on-ramp in the eastbound direction. The ramps are accessed from a series of short bridges, or viaducts, on the west side of Yerba Buena Island that are an integral part of the interchange, and from Hillcrest Road and South Gate Road on the east side of the island. The following series of interchange improvements are currently under construction or being studied:

- The existing eastbound on-ramp is being rebuilt as part of the Bay Bridge East Span project.
- Improvement and/or replacement of the other ramps on the east side of the Yerba Buena Island tunnel is under study by the San Francisco County Transportation Authority and Caltrans. Those agencies and FHWA are conducting environmental review to satisfy NEPA and the California Environmental Quality Act ("CEQA") requirements for that project. Improvement or replacement of these ramps, if undertaken, would be a separate project from both the Bay Bridge East Span project currently under construction and the Proposed Project.
- Retrofit of the viaduct structures on the west side of the Yerba Buena Island tunnel is also under study by the San Francisco County Transportation Authority and Caltrans. Those agencies and FHWA will conduct environmental review to satisfy NEPA and CEQA requirements for that project.

The Islands are served directly by San Francisco Municipal Railway ("Muni") bus line 108 Treasure Island, which runs between the Islands and the Transbay Terminal in San Francisco. There is no direct transit service between the Islands and the East Bay, and no public ferry serving the Islands.

ADJACENT AND NEARBY USES

The Islands are surrounded by San Francisco Bay waters. The San Francisco mainland is about 1.6 miles to the west and Oakland and Emeryville are about 3.5 miles to the east. Uses to the west along and adjacent to the San Francisco waterfront include the Ferry Building, The Embarcadero Promenade, pier bulkhead buildings and sheds, and the San Francisco downtown financial district. Nearby uses to the east include Port of Oakland container terminal shipping facilities; the former Oakland Army Base; the MacArthur Maze junction of I-80, I-580, and I-880; the joint Union Pacific Intermodal Terminal Oakland Naval Supply Center; and downtown high-rise office buildings in Oakland. Also to the east of the Project Area are high-rise office and residential buildings, a marina, and regional shopping centers in Emeryville. The former Alameda Naval Air Station on the north end of Alameda Island is southeast of Yerba Buena Island.

EXISTING ZONING AND THE TIDELANDS TRUST EXCHANGE

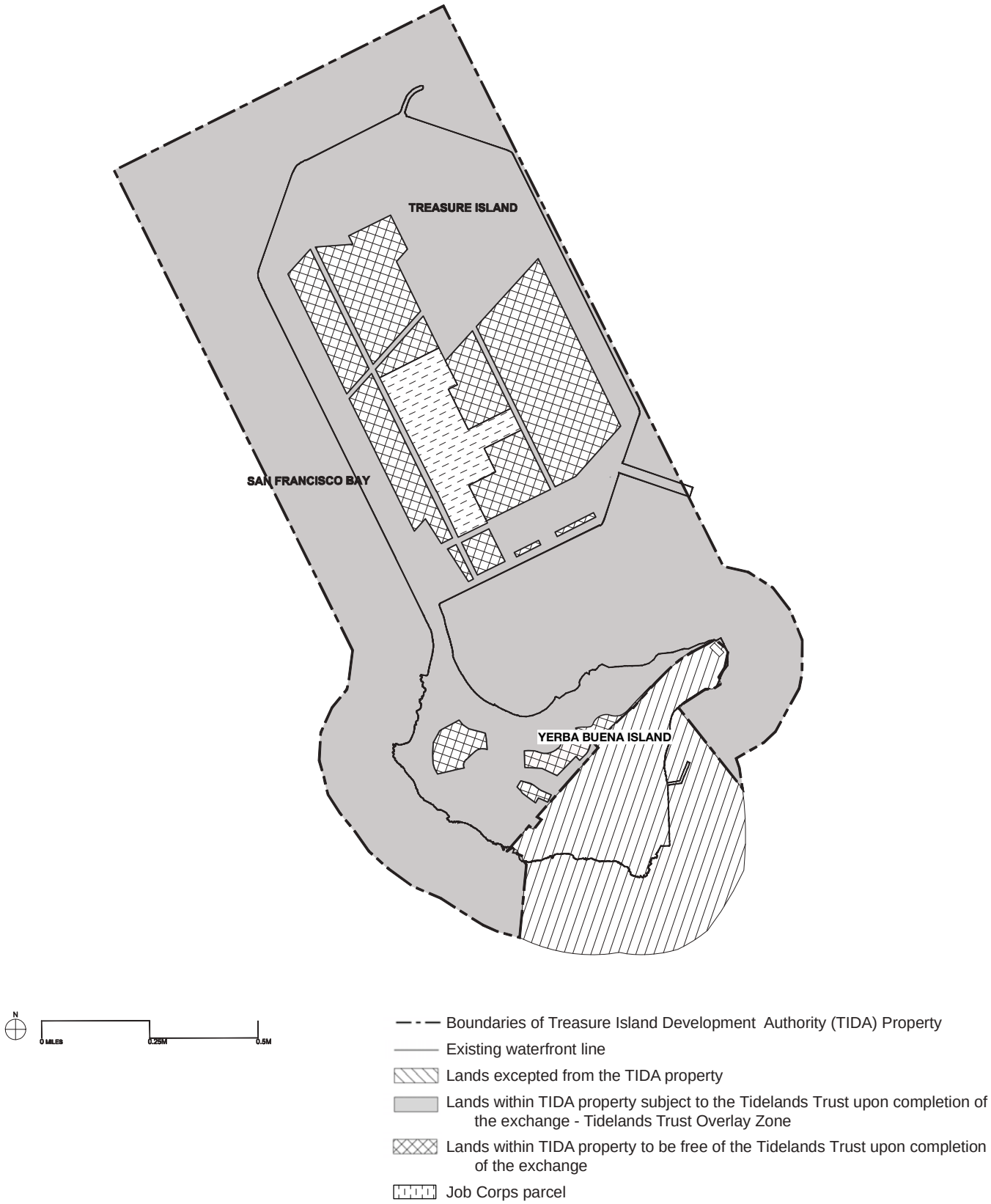
The entire Project Area is within the P (Public) Use District on the San Francisco Planning Code Zoning Map. According to the San Francisco Zoning Map and Section 105(f) of the San Francisco Planning Code, the Project Area is within a 40-X height and bulk district.

In addition, any portion of the Development Plan Area that consists of tidelands and submerged lands, or former tidelands and submerged lands that have been filled, will become subject to the use restrictions imposed under the California Tidelands Trust Doctrine and the statutory trust imposed by the 1997 Treasure Island Conversion Act[13] (collectively, the "Tidelands Trust") upon their conveyance from the Navy to TIDA.[14] These areas include all of Treasure Island and all of the tidal and submerged lands within the Project Area. The approximately 37-acre Job Corps campus would not be subject to the Tidelands Trust as long as it remains in Federal ownership.

The Tidelands Trust generally prohibits residential, general office, non-maritime industrial, and certain recreational uses on lands that are subject to the Trust. Under the 1997 Treasure Island Conversion Act,[15] existing uses on Treasure Island that are inconsistent with the Tidelands Trust, such as the existing residential buildings, are permitted to continue for their remaining useful life, defined as no less than 25 years or no more than 40 years from the date of the Act.

To facilitate proposed residential and other non-trust uses on the areas of Treasure Island that would be subject to the Tidelands Trust upon conveyance to TIDA, the State legislature authorized a Tidelands Trust exchange.[16] Under the authorized exchange, the Tidelands Trust restrictions would be removed from the portions of Treasure Island that are planned for residential and other non-Trust uses and transferred to portions of Yerba Buena Island that would be used for Trust purposes (see Figure II.3: Tidelands Trust Land Exchange). The proposed Tidelands Trust exchange authorized by Senate Bill 1873 would be implemented through an Exchange Agreement entered into between the State Lands Commission and TIDA.

[13] California Health & Safety Code Section 33492.5.
[14] The 1943 legislation that authorized the State to convey the property to the Federal Government removed the Tidelands Trust use restrictions from the property. However, the California Attorney General has opined that the Tidelands Trust will apply to the property once conveyed out of Federal ownership.
[15] California Health & Safety Code Section 33492.5.
[16] Chapter 543, Statutes of 2004, as amended in 2007 and 2009 (SB 1873).



SOURCE: Perkins + Will

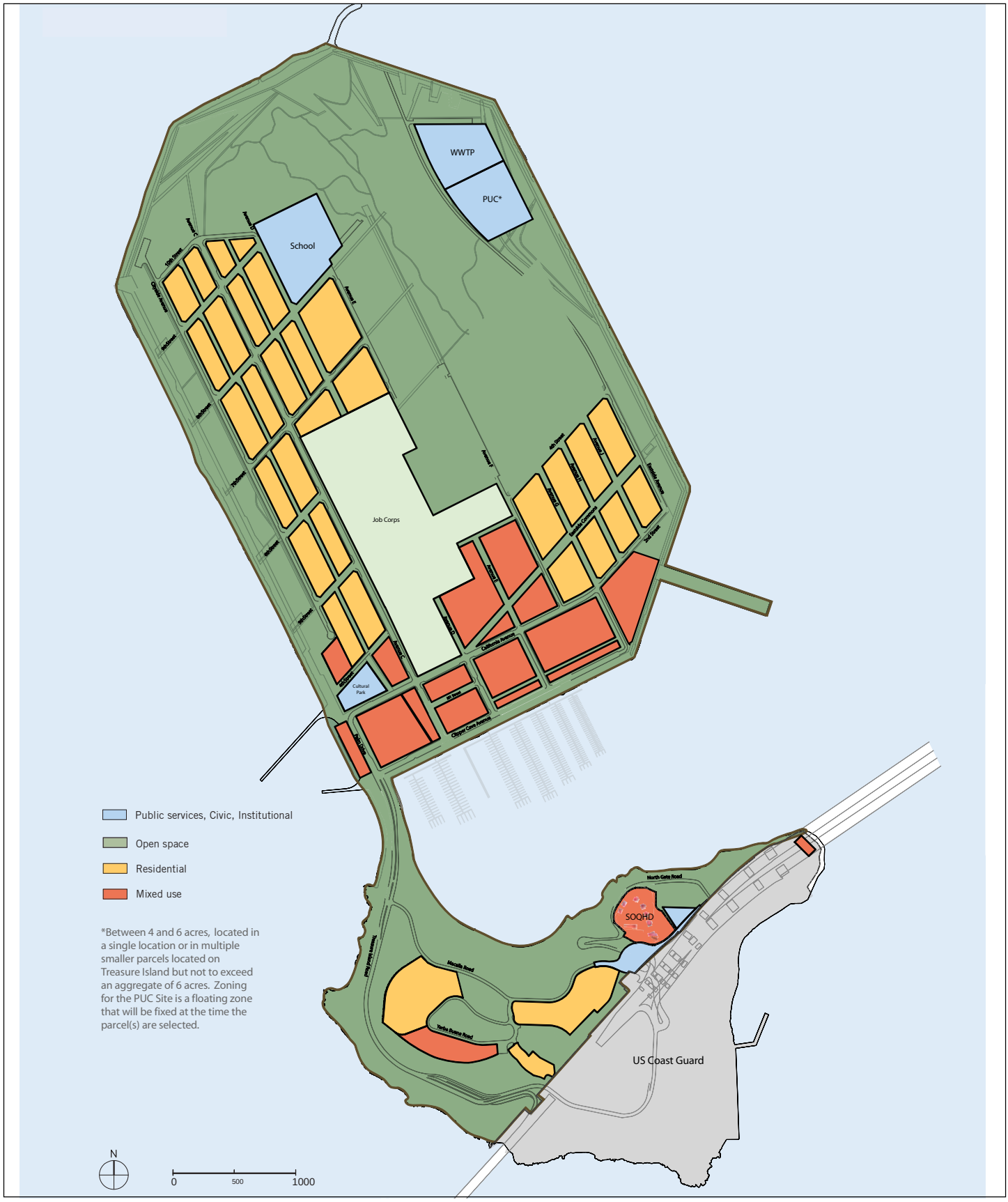
FIGURE II.3: TIDELANDS TRUST LAND EXCHANGE

E. DEVELOPMENT PLAN CHARACTERISTICS

The Development Plan includes:

- Geotechnical stabilization of Treasure Island and the causeway connecting it to Yerba Buena Island, and addition of fill to raise the surface elevation on Treasure Island to address flood protection and potential future sea level rise;
- Up to approximately 8,000 residential units;
- Up to approximately 140,000 sq. ft. of new commercial and retail space;
- Up to approximately 100,000 sq. ft. of new office space;
- Adaptive reuse of Buildings 1, 2, and 3 with up to 311,000 sq. ft. of commercial/flex space (the adaptive reuse would include approximately 67,000 square feet of additional retail, which, when combined with the 140,000 square feet of new retail, yields a total of 207,000 square feet of retail space proposed on the Islands);
- Rehabilitation of the historic buildings on Yerba Buena Island;
- Retention and continued use of the existing chapel in its existing location for general assembly and non-denominational religious activities;
- Up to approximately 500 hotel rooms;
- New and/or upgraded public facilities, including a joint police/fire station, a school, and other community facilities;
- New and/or upgraded public utilities, including the water distribution system, wastewater collection and treatment, recycled water system, and stormwater collection and treatment;
- Approximately 300 acres of parks and public open space, including cultural uses such as a museum;
- New and/or upgraded streets and public ways;
- Bicycle, transit, and pedestrian facilities;
- Landside and waterside facilities for the Treasure Island Sailing Center;
- Landside services for the marina; and
- A Ferry Terminal and intermodal Transit Hub.

The proposed land uses are shown in Figure II.4: Conceptual Land Use Plan, and listed in Table II.1.



SOURCE: Perkins+Will

FIGURE II.4: CONCEPTUAL LAND USE PLAN

Table II.1: Proposed Development Plan

Land Use	Total Amount Proposed
Residential	8,000 units
Retail (new)	140,000 sq. ft.
Office (new)	100,000 sq. ft.
Adaptive Reuse (Buildings 1, 2, 3)	
Entertainment	150,000 sq. ft.
Food Production	22,000 sq. ft.
Retail	67,000 sq. ft.
Community uses	30,000 sq. ft.
Circulation	42,000 sq. ft.
Hotel	500 rooms
Police/Fire Station	30,000 sq. ft.
Cultural/Museum	75,000 sq. ft.
Community Facilities[1]	48,500 sq. ft.
School	105,000 sq. ft.
Sailing Center[2]	15,000 sq. ft.
Open Space	300 acres

Notes:

[1] Several small community spaces in neighborhoods, such as a senior center, childcare facility, library, or similar uses, as well as an interpretive center or other open space facility.

[2] Landside facilities such as classrooms, restrooms, and other facilities to support the Sailing Center's programming; the Sailing Center also has proposed waterside improvements that are part of the Proposed Project.

PROJECT VARIANTS

The Proposed Project includes several variants to transportation and infrastructure features, which are briefly described in this chapter and fully described in Chapter VI, Project Variants. These variants are also listed in Table II.2. These variants are not part of the Proposed Project. They are being identified and analyzed, however, to provide the flexibility to allow the City to approve them. The variants are therefore analyzed at project level.

OVERALL DESIGN CONCEPT

The Area Plan/SUD would define the boundaries of the Project Area, set out allowable land uses and land use guidelines, establish maximum development and height limits within the Project Area, and authorize TIDA to adopt a *Design for Development* document for the Development Plan Area. The draft *Design for Development* sets forth the underlying vision and principles for redevelopment of the Islands and establishes land use and development standards and design guidelines to implement the vision and principles. It describes the character of the Islands' districts, parks and open spaces, and the network of streets,

Table II.2: Project Variants Overview

Variant Category/Name	Description
Energy Variants	Variants for renewable energy sources.
Variant A1 Renewable Electricity Generation – Increased Solar Photovoltaic	Increase in number of acres with ground or roof-mounted photovoltaic panels from 1.4-3 acres to up to 20 acres in open space areas on eastern and northern shorelines of Treasure Island and/or in center of island near the proposed Urban Agricultural Park.
Variant A2 District Heating and Cooling	Centralized District Energy[1] plant to provide heating and cooling only.
Variant A3 District Energy Heating, Cooling, and Power	Centralized District Energy plant to provide heating, cooling, and electricity.
Subvariants to Variants A2 and A3	Subvariants could be applied to either Energy Variant A2 or A3 and are not mutually exclusive; they could be implemented separately or together. All the Subvariants assume that low-rise residential buildings on Treasure Island would not have cooling systems and would not be served by a district heating/cooling facility.
Energy Subvariant A	Use of alternative heat rejection (i.e., getting rid of waste heat) involving either dry cooling towers or combination wet-dry cooling towers.
Energy Subvariant B	Use of satellite District Energy plants in proposed Cityside and Eastside residential districts to provide redundancy and/or distribution efficiency.
Energy Subvariant C	Use of solar thermal energy to collect heat for district heating and to heat water that could provide heat and also drive chillers for district cooling.
Ferry Terminal Breakwater Variants	Variants on the breakwater configurations.
Breakwater Variant B1	Symmetrical breakwater design, with two angled breakwaters, each extending the same distance (about 600 feet) from the land connection. The 200-foot-wide harbor opening would be directly west of the shoreline and the ferry berths.
Breakwater Variant B2	Two symmetrical angled breakwaters extending about 500 feet from the land connection, with a south-facing harbor opening of about 300 feet, plus a third, detached breakwater on the north side of the Ferry Terminal extending further into the Bay at an oblique angle. The 300-foot harbor opening would face south.
Breakwater Variant B3	Same configuration as in the Proposed Project, but the northern breakwater would be constructed first as part of building the Ferry Terminal, and the southern breakwater would be constructed in a later phase.

(continued)

Table II.2 (continued)

Variant Category/Name	Description
Supplemental Firefighting Water Supply Variants	Variants to use of recycled water as a supplemental water supply for firefighting.
Supplemental Firefighting Water Supply Variant C1	Use of potable water instead of recycled water for the supplemental water supply. It would add a 1.84-million-gallon storage tank with appropriate pumps and emergency generator on Treasure Island in the vicinity of the wastewater treatment plant to store potable water. Would result in an overall increase in storage on the Islands of about 840,000 gallons. The recycled water tank on Treasure Island would be reduced from 1.26 million gallons to 0.42 million gallons. The proposed suction hydrants and fire boat manifolds would be retained under this variant.
Supplemental Firefighting Water Variant C2	Use of Bay water instead of recycled water for the supplemental water supply. It would add a pump station and emergency generator with a saltwater intake pipe; a main trunkline distribution piping system to connect to the pump station; up to 29 fire hydrants connected to this separate firefighting water supply; fireboat manifolds and other facilities for connection to the trunkline distribution system and the hydrants; and up to 3 suction hydrants located around the perimeter of Treasure Island.
Wastewater Wetlands Variants	Variants for the wastewater treatment facility, each involving the use of wetlands in the wastewater treatment process.
Wastewater Wetlands Variant D1	About 5 acres of constructed wetlands to provide tertiary treatment of the portion of the secondary-treated effluent from the treatment plant to be recycled; this would occur prior to the microfiltration step, reducing the need for reverse osmosis for the recycled water. Public access would be restricted.
Wastewater Wetlands Variant D2	About 2 to 4 acres of wetlands to polish the majority of the treated wastewater effluent to be discharged through the outfall, after microfiltration and UV disinfection. Wetlands would provide wildlife habitat, and public access would not be restricted.
Automated Waste Collection System Variant	Implementation of an automated, mechanical system to collect solid waste from new buildings on Treasure Island.
Off-Site Electrical Transmission Facility Improvements Variant	Upgrades to the off-site electrical system to improve capacity and reliability.

Note:

[1] District Energy means using a centralized location to provide heating and cooling for a group of residential and commercial buildings. Hot water may be used for space heating and water heating. Chilled water may be used for space cooling. District Energy plants may provide higher efficiencies and better pollution control than boilers and chillers located in each building.

including pedestrian and bicycle routes. It also establishes specific land use controls, defines view corridors, establishes bulk limits and tower separation, as well as building design controls and guidance, and establishes parking and loading regulations that would be applicable to the Development Plan Area.

The draft *Design for Development* sets forth parameters for design. Under these guidelines, individual buildings would be designed and approved at a later date. For this reason, the analysis

in this EIR assumes maximum development within a given district; actual development may be less. The entitlement would provide flexibility to design buildings within a given district.

An overview of the Development Plan for the Treasure Island districts, the Yerba Buena Island District, and open space on both islands is shown in Figure IV.A.3: Proposed Districts, in Section IV.A, Land Use and Land Use Planning, p. IV.A.18, and is described below.

Island Center District

The Island Center District would occupy the southern portion of Treasure Island and would abut the southern/southeastern boundary of the Jobs Corps campus. This new neighborhood would include a dense mix of retail, restaurant, office, hotel, residential, transit, and community services uses. The Ferry Terminal and intermodal Transit Hub would be located in the Island Center at the southwestern shore of Treasure Island. A pedestrian link is planned between the Ferry Terminal and Clipper Cove, with pedestrian paths around and connecting to corridors through Buildings 1, 2 and 3, the historic structures (see Figure II.10: Proposed Street System, p. II.41). Buildings 1, 2, and 3 would be adaptively reused for commercial and recreation/entertainment uses. As part of the adaptive reuse, Building 111, which is an addition to Building 3, would be demolished. The existing chapel would be retained in its current location and used for general assembly and non-denominational religious activities.

The highest residential densities and tallest buildings are proposed in this district. A residential tower up to 650 feet tall is proposed adjacent to and north of Building 1. The Island Center could also include several additional high-rise towers up to 450 feet tall. (See Figure IV.B.10: Proposed Representative Massing Diagram, in Section IV.B, Aesthetics, p. IV.B.20, for an example of where towers could be located.)

Cityside and Eastside Residential Districts

The Cityside and Eastside Districts would provide high-density residential land uses adjacent to the retail and transit services in the Island Center. The Cityside District would occupy the western portion of Treasure Island and would abut the western and northern boundaries of the Job Corps campus. The Eastside District would be adjacent to and northeast of the Island Center. Individual neighborhood blocks would consist primarily of dense, low-rise structures of up to 70 feet and mid-rise buildings of between 70 and 130 feet, with neighborhood high-rise towers (up to 240 feet) serving as neighborhood markers (see Figure IV.B.10). Housing in the Cityside District would be east of the Waterfront Park along the shoreline and sited around neighborhood parks of approximately 0.1 to 0.3 acres. The Eastside District housing would form the border of a six-block-long linear park. The buildings would be spaced to enhance views and preserve view corridors intended to contribute to a varied skyline when seen from San Francisco and the East Bay. Most residential parking would be in subsurface garages in residential buildings. Up to approximately 20 percent of residential parking is anticipated to be in centralized parking

garages; neighborhood parking structures would be surrounded by residential or other active uses and screened to reduce visual impacts. Community and commercial spaces would be included at the ground-floor level of some of the buildings.

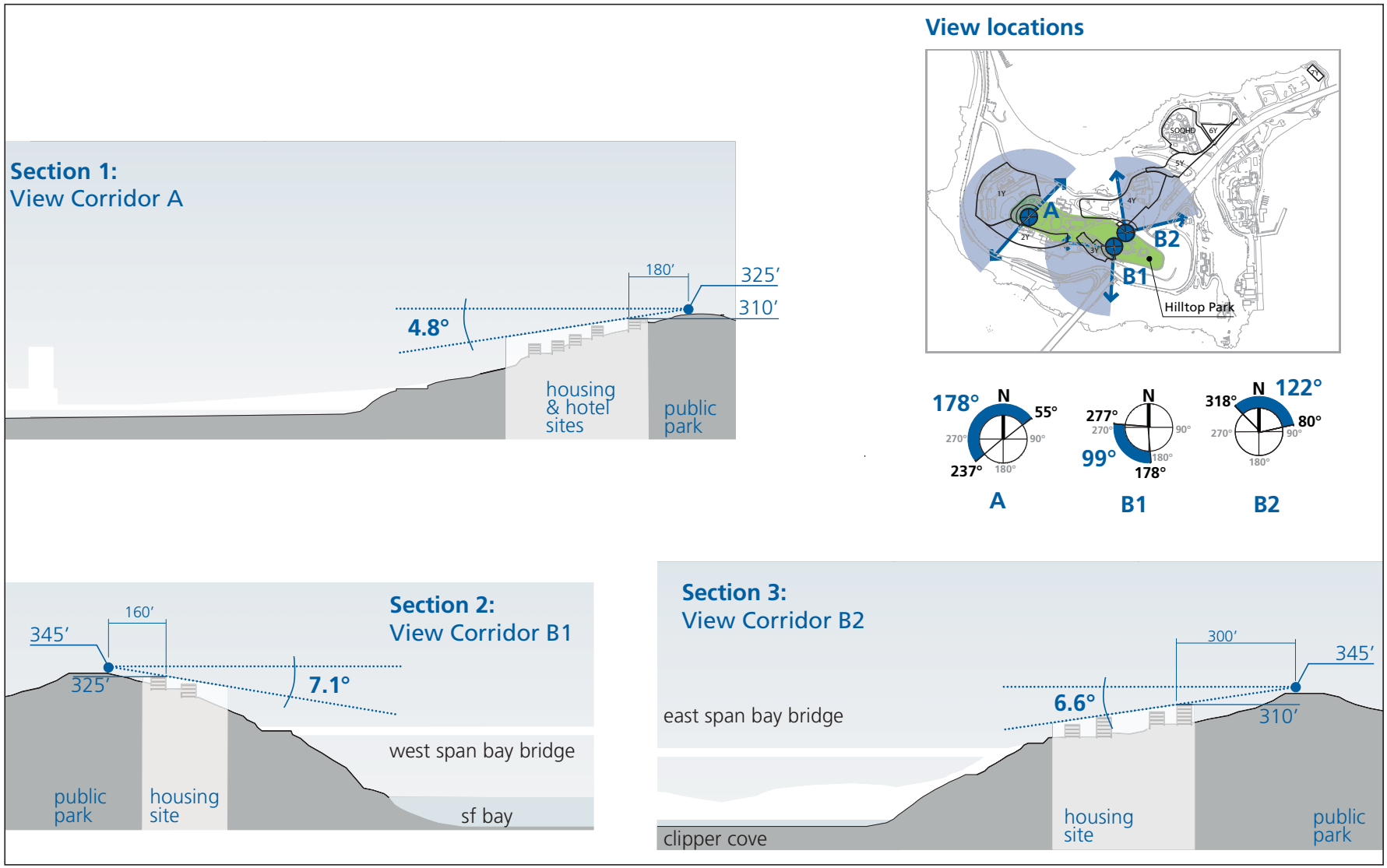
Yerba Buena Island District

Development on Yerba Buena Island would include limited uses and much lower densities than those planned for Treasure Island. A lodging facility/hotel is planned, and the historic Nimitz House and eight other Senior Officers' Quarters (collectively, the "Great Whites"), and the Torpedo Assembly Building would be rehabilitated and programmed for public uses. New residential development (approximately 150 to 300 units) would be clustered and placed primarily on the sites of existing buildings, replacing the 97 existing housing units. A small amount of retail space is proposed for the Yerba Buena Island District. Development would be predominantly low-rise, stepping down hillsides, and would be designed to preserve and enhance views from and of the new hilltop park. Building height limitations would ensure that development would not substantially interfere with views as they existed on January 1, 2010, from the proposed new Trust Lands on the eastern and western hilltop public park areas (see Figure II.5: Yerba Buena View Corridors).[17] New structures would be designed to complement Yerba Buena Island's natural conditions and would not restrict access to the hillside open spaces and trail network.

Open Space

The system of open space on the Islands would include neighborhood- and visitor-serving parkland, ecological, recreational, neighborhood, and cultural areas (see Figure II.7, Proposed Open Space, on p. II.30). The approximately 300 acres of open space would include a wide variety of programmed and natural habitat elements, including public spaces and recreation areas; shoreline trails and access improvements, including the proposed extension of the San Francisco Bay Trail from the Bay Bridge bicycle and pedestrian path on the new east span, down Yerba Buena Island, and around the entire perimeter of Treasure Island; a stormwater wetland of about 10 to 15 acres to provide water quality treatment and natural habitat; an urban farm of approximately 20 acres (the "Urban Agricultural Park"); a cultural park adjacent to Building 1; the Building 1 Plaza adjacent to the Ferry Terminal and Transit Hub; a pedestrian promenade along Clipper Cove on the south shoreline of Treasure Island (the "Clipper Cove Promenade"); preserved, restored, and enhanced habitat areas on Yerba Buena Island; and a new hilltop park with vista points, overlooks, and trails on Yerba Buena Island. Also included in the 300 acres of open space are approximately 25-40 acres proposed on the east side of Treasure Island for a regional sports complex with baseball diamonds, soccer fields, and other sports facilities (the Sports Park). The Waterfront Plaza, Cityside Waterfront Park, Northern Shoreline Park, Eastern

[17] Senate Bill 833, Section 8 in Chapter 208 Statutes of 2009, establishes this height limit and the date of existing views to be preserved.



SOURCE: Perkins+Will

● FIGURE II.5: YERBA BUENA VIEW CORRIDORS

Shoreline Park, and Clipper Cove Promenade would provide public access to the shoreline on all sides of Treasure Island. A Habitat Management Plan ("HMP") is proposed to manage and improve plant and wildlife habitat in the undeveloped areas on Yerba Buena Island. The gardens adjacent to the historic Nimitz House on Yerba Buena Island would be improved as part of the open space program.

LAND USES

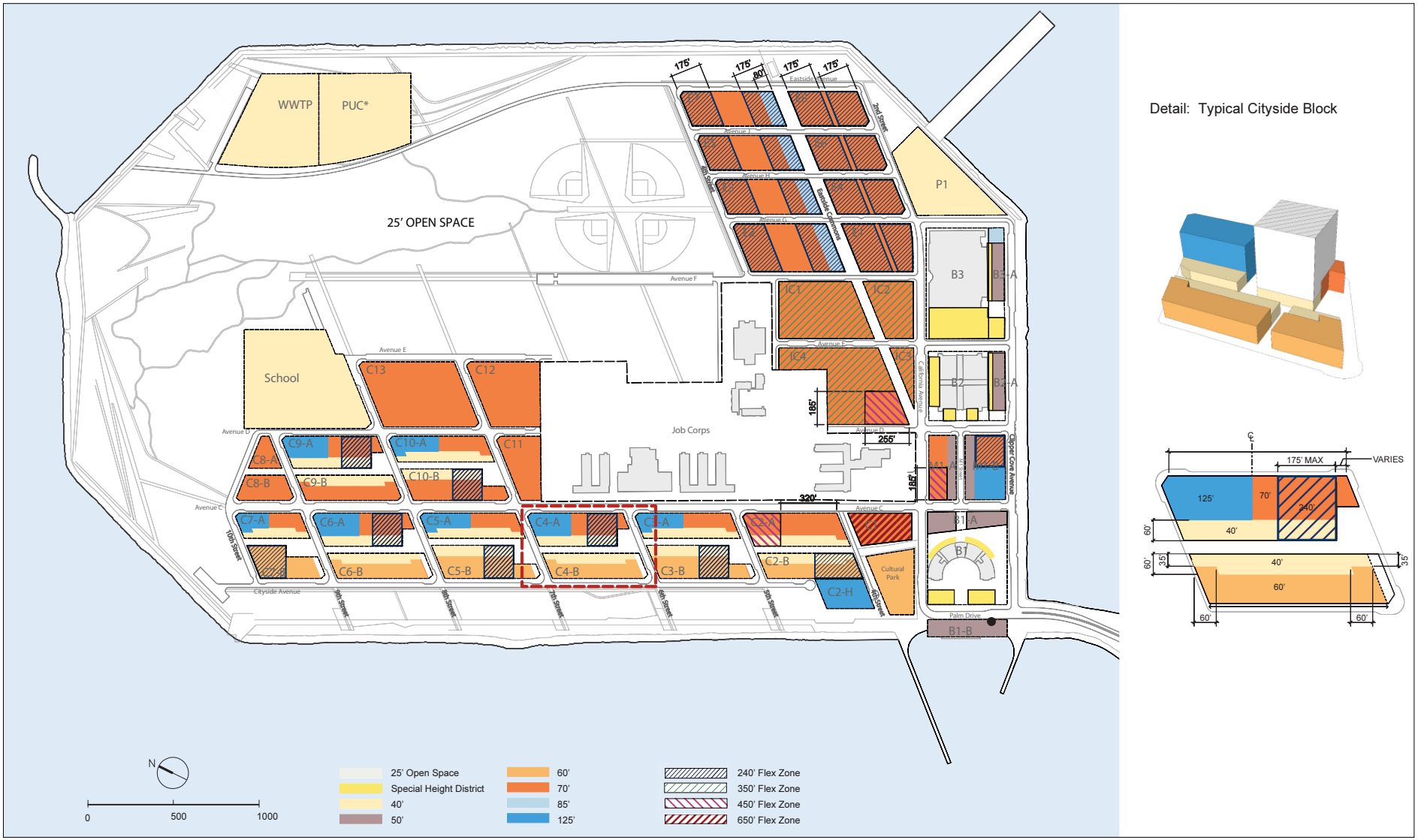
Residential

The proposed Development Program would include up to approximately 8,000 residential units, including approximately 7,700 to 7,850 units on Treasure Island and approximately 150 to 300 units on Yerba Buena Island. The residential units would be in approximately 100-125 buildings with a total of approximately 9.6 million net sq. ft. The proposed residences would include both market-rate and affordable rental and for-sale units in townhomes and low-, mid-, and high-rise buildings, including a 650-foot-tall tower in the Island Center District. A minimum of 20 percent of the proposed residences would be sized for families.[18]

Building Heights

A range of building heights is proposed for Treasure Island. Approximately 51 percent of all housing units are anticipated to be in low-rise buildings (building height 70 feet and lower), 34 percent would be in mid-rise buildings (generally buildings 85 to 125 feet in height) or neighborhood towers (building height between 125 and 240 feet), and 15 percent would be in high-rise buildings (building height greater than 240 feet). As noted above, the tallest buildings would be located in and adjacent to the Island Center District, near the proposed Ferry Terminal and Transit Hub, with one 650-foot-tall building in the "Main Tower" height zone across California Avenue from Building 1 (see Figure II.6a: Treasure Island Maximum Height Limit Plan). The Eastside and Island Center Districts would each have base height limits, ranging from 40 to 85 feet in the Eastside District and from 30 to 125 feet in the Island Center District. In addition, the Eastside and Island Center Districts would each have a "Tower Flex Zone" on either side of the linear park. These flex zones would allow about 11 to 13 towers that would be taller than what would be allowed under the base height limits; tower heights would be limited to 240 feet in the Eastside Tower Flex Zone and 450 feet in the Island Center Tower Flex Zone.

[18] Family-sized units are those with two or more bedrooms.



Detail: Typical Cityside Block

SOURCE: Perkins+Will

● FIGURE II.6a: TREASURE ISLAND MAXIMUM HEIGHT LIMIT PLAN

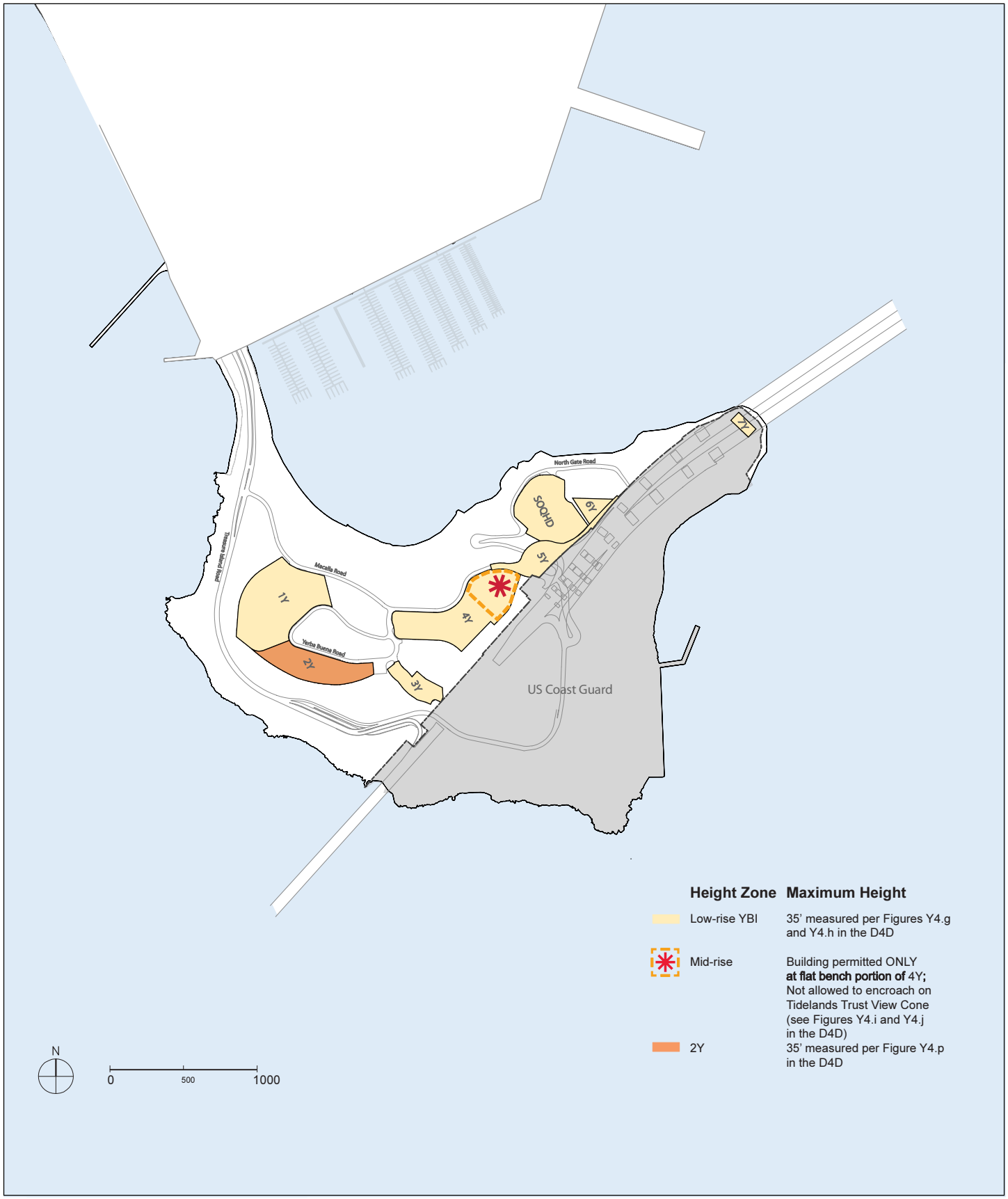
The remaining buildings in these Districts would be limited generally to 50, 70, 85, and 125 feet in height. The locations of tall towers would be limited (and, as a result, the number of towers would be limited) by the following rules in the draft *Design for Development*: (1) towers would be located on the corner lot of the block adjacent to the linear park or adjacent open space, with active ground floor uses oriented to the open space; (2) a minimum distance of 115 feet would be required between adjacent towers; and (3) a clear view corridor of at least 500 feet from building faces would be required above 85 feet, to be aligned to north-south avenues and extend in all four compass directions from the tower faces. The Eastside District would be filled in with low-rise buildings that are generally 5 stories and up to 70 feet tall. A Special Height District would surround most of Buildings 1, 2, and 3, limiting heights of new buildings adjacent to these historic structures.

The Cityside District would include a 240-foot height zone in seven of the eight blocks north of Fifth Street, a 450-foot height zone in the block north of the Main Tower, and multiple mid-rise height zones of up to 125 feet. If a tower is not built in one of the 240-foot Neighborhood Tower Zones, buildings in those zones located on the east side of a block would be limited to mid-rise heights (125 feet) and those on the west side of a block would be limited to low-rise heights (60 feet). A Shared Public Way ("Mews") is proposed to bisect most Cityside District blocks in a north-south direction. Mews are proposed to have no on-street parking, with design features that are intended to create unified, single-surface (no vertical separations) public rights-of-way to encourage walking and bicycle use and discourage automobile use while providing visual and tactile cues to provide safe and accessible routes of travel. Buildings directly adjacent to the mews streets would be required to step back at a ratio of 1:1.2 above a height of 40 feet.

At full buildout there would be about 75 to 80 residential buildings of 2 to 5 stories, about 25-35 residential buildings of 6 to 22 stories, and about 5-7 residential buildings taller than 23 stories. All residential buildings on Yerba Buena Island would be 4 stories tall or lower, as measured from the adjacent grade, with the exception of one building on the east side of the island that could be up to 8 stories tall (see Figure II.6b: Yerba Buena Island Maximum Height Limit Plan).

<u>Affordable Housing Program</u>

- The Proposed Project includes several affordable housing initiatives that would allow up to approximately 25 percent (approximately 2,000) of the new housing units to be priced at a range of below-market rates. Specifically:
    - Inclusionary Housing. The Proposed Project would require a portion of the units in market-rate buildings be set aside as affordable. It is expected that approximately 5 percent of the units in market rate buildings, or up to 316 units, would be sold or leased



SOURCE: Perkins+Will

● FIGURE II.6b: YERBA BUENA ISLAND MAXIMUM HEIGHT LIMIT PLAN

as inclusionary. The inclusionary housing units would generally serve moderate-income households (in the for-sale units) and low-income households (in the rental units).[19]

- Treasure Island Homeless Development Initiative ("TIHDI"). The Proposed Project includes land and funding to replace the 250 units of housing in the existing TIHDI program, as well as land for an additional 185 residential units, expanding the program to a total of 435 units. The TIHDI units would generally be for formerly homeless (extremely low-income) families.
- Stand-alone Affordable Housing. Up to 1,684 units (which could be a mix of rental and for-sale units) would be in stand-alone, affordable buildings, of which up to around 1,249 units would be developed by developers selected by TIDA or its designee. The TIDA units would likely include a mix of rental and for-sale units and would target very-low-, low-, and moderate-income households.

At least 20 percent of the affordable units would be affordable to very-low-income residents. To meet the State law requirement for replacement of affordable housing removed within an Infrastructure Financing District, the Proposed Project includes a replacement housing plan that would be adopted as part of the Infrastructure Financing planning process. Pursuant to State law, whenever residential units housing low- or moderate-income persons are destroyed or taken out of the low- and moderate-income market as part of the activities of an Infrastructure Financing District, the district must cause replacement of those units with new or rehabilitated low- and moderate-income units. In addition, the district must replace 20 percent of the units that are destroyed or removed that are occupied by persons above moderate income. The units must be replaced within 4 years after they are destroyed or removed from the housing market. Replacement units may be located anywhere within the district. All of the replacement units must be affordable to low- or moderate-income households.

Transition Housing Program

As noted above, there are approximately 805 households currently residing on the Islands. A transition housing program would be established before existing residential units are

[19] Moderate-income households are defined as earning no more than 120 percent of the area median income levels for San Francisco, as published by the California Department of Housing and Community Development (California Health & Safety Code Section 50093). Low-income households are those earning no more than 80 percent of area median income.

deconstructed, to ensure that existing qualifying households have the opportunity to continue living on the Islands if they choose. The program would be open to all existing qualifying households in good standing at the time the DDA is executed who continuously remain residents of the Islands in good standing during implementation of the Proposed Project.

Open Space and Recreation

The Development Program would include approximately 300 acres of publicly accessible pathways, parks, open space, and shoreline improvements, comprising more than one-half of Treasure Island and approximately three-quarters of the Development Plan Area of Yerba Buena Island (see Figure II.7: Proposed Open Space). The recreational and open space uses would include the following:

- A shoreline path for pedestrians and bicycles around the entire perimeter of Treasure Island; pedestrian and bicycle paths would continue on Yerba Buena Island to connect to the new pedestrian and bicycle path on the east span of the Bay Bridge and from there to the Bay Trail in the East Bay. The proposed alignment would also allow the Yerba Buena Island pedestrian and bicycle facilities to connect to any future pedestrian and/or bicycle path added to the west span of the Bay Bridge. The shoreline path and regional Yerba Buena Island facilities would be part of a network of bicycle and pedestrian trails connecting the various land uses that would serve as a recreational exercise system.
- The Great Park, an approximately 100-acre park with stormwater wetlands, passive open space, the existing sailboarding launch area, and space for an environmental education center that could include a gift shop, small café, interpretive center, and classrooms.[20]
- About seven neighborhood parks and playgrounds of about 7,500 to 30,000 sq. ft. each in the Cityside District, some with community gardens, and connecting linkages between parks.
- A linear park, called the Eastside Commons, connecting the Island Center and Eastside District to the Eastern Shoreline Park.
- Off-leash dog areas in various open space areas and parks located on both islands.
- Spaces for public and private permanent and temporary art installations, including space in the Cityside Waterfront Park on the western shoreline and the Cultural Park across from Building 1 (see below), and spaces for festivals and other special events.
- The Urban Agricultural Park, an approximately 20-acre demonstration organic urban farm in the center of Treasure Island, with composting facilities to compost the portion of the green waste projected to be generated by households on the Islands, a plant nursery, and possibly some greenhouses. The compost would be used in the park and in other open spaces.

[20] The Great Park consists of the Northern Shoreline Park, the Wilds, and the Wetlands, as identified in Figure II.7 on p. II.30.

SOURCE: CMG, TICD

● **FIGURE II.7: PROPOSED OPEN SPACE**

- The Sports Park, a regional recreational park of up to 40 acres with a variety of athletic fields and associated facilities. The facilities may include courts and fields for baseball (including batting cages), softball, soccer, rugby, lacrosse, and volleyball, as well as associated services such as a concessionaire, parking, and restroom facilities.
- The existing Sailing Center near Pier 1 would be improved with new vessel launch and retrieval facilities. The improvements would include a new pier on pilings to accommodate two vessel launch and retrieval cranes, entry landings and gangways, and floating docks. The waterside facilities would require dredging about 1,500 to 3,700 cubic yards, and would result in about 0.25 to 0.4 acre of pile-supported fill and 0.4 to 0.45 acre of floating fill in the Bay. Landside facilities would include restrooms, laundry facilities, and other improvements to serve the tenants of the Sailing Center (as well as future tenants of the separate Marina Project, if approved).
- Yerba Buena Island parks and open space (about 84 acres), including the 5- to 6-acre Hilltop Park, trails connecting the Hilltop Park to the shore and Treasure Island, improved and managed natural habitat areas, a beach, and the Nimitz Gardens and historic structures associated with the Senior Officers' Quarters.
- A series of plazas for outdoor activities around Building 1 and Clipper Cove Promenade, a pedestrian promenade adjacent to the Clipper Cove Marina.
- Multi-use active public spaces linked to Pier 1, including landscaped areas linked to other nearby parks, and an approximately 35,000-sq.-ft. community building that could accommodate recreational activities and/or an interpretive center and other visitor-serving facilities.
- A 3-acre Cultural Park adjacent to Building 1. The park would include a future building site for a cultural institution, such as a museum, of up to 75,000 sq. ft. The existing chapel would be retained in its current location.

A range of possible additional open space and recreation improvements could be constructed within the proposed 300 acres as part of the Development Program. TICD would provide developable pads that could be used for the Treasure Island Sailing Center, an Environmental Education Center, and community gardens within the park system.

Yerba Buena Island Habitat Management Plan

The Development Program includes a proposed Habitat Management Plan ("HMP") for Yerba Buena Island.[21] The proposed HMP focuses on the island's approximately 74 acres of natural open space areas, and the parks and gardens in the Development Plan Area covering all of the island except the portions owned and occupied by FHWA/Caltrans for the Bay Bridge and by the

[21] Draft *Yerba Buena Island Habitat Management Plan*, prepared for Treasure Island Community Development by ESA, Wood Biological Consulting, and CMG, December 2009 (hereinafter "HMP"). A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

U.S. Coast Guard. The areas proposed for development in the Proposed Project are addressed in the HMP in a more limited way than the open space areas. The HMP would be implemented and overseen by TIDA as the long-term owner of the habitat management areas. (The existing biological habitats and special status species are described in this EIR in Section IV.M, Biological Resources. That section is based in part on the information in the HMP.)

The HMP describes existing topography, geology, climate, and vegetation communities on Yerba Buena Island; establishes habitat management strategies and best management practices ("BMPs"); establishes habitat management zones; and presents detailed management recommendations for each of the zones. The HMP identifies two habitat management approaches that could be selected, managing for special-status species and managing for biodiversity, and recommends managing for biodiversity as the preferred approach. The basic management strategies described in the HMP are preservation, restoration, and enhancement. Preservation would involve further mapping of existing resources, establishing access restrictions where appropriate, and establishing educational programs and stewardship programs. Restoration could involve revegetating areas with native and ecologically appropriate plant species to re-create appropriate habitat, and removing invasive species.

The HMP identifies the following 11 BMPs: (1) revegetate with native species; (2) protect sensitive resource areas; (3) protect nesting birds and roosting bats; (4) remove invasive plants; (5) prevent spread of invasive plants; (6) survey for hazardous trees (trees that could fall) to determine if they need to be removed; (7) remove non-native trees, including eucalyptus, Monterey pine, and Monterey cypress; (8) prevent the occurrence of sudden oak death (not currently present on the island); (9) apply herbicides to non-native plants if necessary as part of habitat restoration or enhancement; (10) control erosion; and (11) minimize recreational impacts on natural areas. These BMPs provide guidance for protecting existing resources and for limiting disturbance during implementation of the habitat management actions.

Eight overall habitat management zones are identified in the HMP. One zone is made up of the areas to be redeveloped as part of the Development Plan; no HMP actions are proposed for these areas but management actions are recommended. In this zone, efforts would be made, to the extent feasible, to preserve important natural features, including specimen trees, that would contribute to the overall health and biodiversity of the habitats on Yerba Buena Island. The other seven management zones each have a group of attributes and threats that generate the overall management "prescription" or recommended approach for that zone. The recommended approaches emphasize preservation and restoration or enhancement, and suggest restrictions on public access where appropriate; however, site-specific plans would need to be developed in the future prior to carrying out some of the recommended actions that are analyzed in this EIR.

The HMP outlines an approach for implementation of the HMP, including direction for implementing the prescriptions; establishes ecological priorities in coordination with the Development Program; and provides a timeline for implementation. The HMP outlines a process for monitoring and maintaining the habitat management zones over the long term to assess the success of management actions, as well as steps for refining and adjusting the program based on future experience.

Commercial

The Development Plan's commercial component would include the following: (1) up to 311,000 sq. ft. of commercial and entertainment uses in the renovated historic Buildings 1, 2, and 3; (2) retail uses along a new main street between historic Buildings 1 and 2 on Block M1 (see Figure II.4 on p. II.17); (3) ancillary retail uses along the Clipper Cove Marina and in the residential neighborhoods, including about 5,000 sq. ft. of neighborhood-serving retail in the residential neighborhoods on Yerba Buena Island; (4) up to 100,000 sq. ft. of office space; and (5) up to 500 hotel rooms, which may include one or more full-service hotels near the Transit Hub, one or more boutique time-share hotels at Clipper Cove on Treasure Island, and a hotel on Yerba Buena Island. A variety of retail uses are anticipated, including neighborhood-serving uses such as personal services, restaurants and cafés, housewares and apparel shops, and health and fitness clubs. The Proposed Project would also include a grocery store or market to serve local residents on the Islands (about 30,000 sq. ft.), most likely in Building 2, along with approximately 22,000 sq. ft. of food production uses. Regional-serving retail uses could include specialty foods, specialty gift or crafts, and entertainment uses. As currently envisioned, Building 3 would be used for approximately 150,000 sq. ft. of entertainment/recreation uses, such as a movie theatre and/or indoor sports/recreational facilities that would also be regional-serving retail uses. Building 1 would have approximately 25,000 sq. ft. of retail/restaurant uses; the balance of the space in Building 1 would be used for civic/institutional purposes. The total amount of retail space provided in the Development Program would not exceed 210,000 sq. ft.

Institutional and Public Services

The Development Program would provide space for a variety of community programs in the historic former Administration Building (Building 1), in some of the proposed residential buildings, and in a new 35,000-sq.-ft. building near Pier 1 expected to provide space for recreational or interpretive center activities. Space for public offices, such as TIDA, and childcare also would be provided. Space for an up to 75,000-sq.-ft. museum or other cultural institution is planned in the Cultural Park north of Building 1. The existing chapel, on the site of the proposed Cultural Park, would be retained in its current location and used for general assembly and non-denominational religious activities. The existing public grammar school on Treasure Island, now closed, would be improved or rebuilt as a K-8 public school in coordination with the San Francisco Unified School District. The existing wastewater treatment plant would be replaced by the SFPUC (as discussed below in "Proposed Utilities"). A recycling program would be established, and a recycling center/corporation yard would be provided. A joint police/fire station would be provided on Treasure Island. The existing Job Corps facility would remain in use in its current location on Treasure Island, under the jurisdiction of the U.S. Department of Labor.

PROPOSED GENERAL PLAN AND PLANNING CODE AMENDMENTS

Although Treasure Island and Yerba Buena Island are located within the jurisdictional boundaries of the City and County of San Francisco, the *San Francisco General Plan* ("*General Plan"*) and its related planning and policy documents do not specifically address development on the Islands because the Islands have been under Federal ownership and jurisdiction. Consequently, land use planning within the Project Area has not been directly controlled by the City and was not considered in the *General Plan*, although many objectives and policies would be applicable. The Planning Code does, however, apply zoning and height and bulk classifications for both Treasure Island and Yerba Buena Island, although the Islands are not included on the Planning Code Zoning Map.

- The Proposed Project includes amendments to the *General Plan* and Planning Code that would identify the geographic and physical boundaries of Treasure Island and Yerba Buena Island. The Planning Code amendments would add a new Treasure Island / Yerba Buena Island Special Use District ("SUD") that establishes the land use controls for Treasure Island and Yerba Buena Island and incorporates by reference the land use controls and design standards and guidelines in the *Design for Development*. The *General Plan* would be amended by adding a new Treasure Island / Yerba Buena Island Area Plan that would reference the new neighborhoods on Treasure Island and Yerba Buena Island and define City objectives and policies related to redevelopment of the Islands.

- The City would consider adopting amendments to the Planning Code that would establish the SUD, incorporating by reference the *Design for Development*. The Planning Code text amendments would also modify the provisions of Section 105(f) by removing the portion that currently imposes a height limit of 40 feet on all of Treasure Island and Yerba Buena Island pursuant to the Planning Code amendment process provided in Section 302; and would amend Section 201 to reference the new classes of land use districts on Treasure Island and Yerba Buena Island created by the SUD. The Planning Code would also be amended to establish a Treasure Island/Yerba Buena Island "TI Height and Bulk District" that would reference the permitted height and bulk standards from the SUD and *Design for Development*. Zoning Map amendments would add new Sheet ZN14 to change the zoning designation within the Development Plan Area from "Public" to the Treasure Island/Yerba Buena Island SUD. Areas remaining under the jurisdiction of the Job Corps, FHWA and Caltrans would remain as "P" districts within a 40-X height and bulk district. Zoning map amendments would also add new Sheet HT14 to change the height and bulk district within the Development Plan Area from 40-X to the TI Height and Bulk District, which would include the designations contained in the SUD. Zoning Map amendments would also add a new Sectional Map Sheet SU14 to establish the Treasure Island/Yerba Buena Island SUD.

Overall, average residential densities are proposed at approximately 100 to 110 units per acre, or approximately 1 unit for each 400 to 430 sq. ft. of developed residential land area. (Note that the proposed Area Plan/SUD does not include density limits similar to those in the existing Planning Code; these approximate densities are provided for comparison purposes. The Area Plan/SUD instead establishes a total maximum number of residential units allowed in the Development Plan Area.) Maximum height limits would be 40 feet for areas designated for open space uses, and would range from 30 to 650 feet in areas designated for residential, retail, and commercial uses, as shown on Figure II.6a, on p. II.25.

F. PROPOSED TRANSPORTATION PLAN

TRANSIT HUB

The proposed *Transportation Plan*[22] relies on the use of alternative transit modes (buses and ferries) for off-island trips and shuttle/pedestrian/bike facilities for on-island travel. The Development Program would include the construction of a Transit Hub in the Island Center. The Transit Hub would have a new Ferry Terminal (described below), shelters for bus and shuttle transfers, and an area for ticket sales and travel and tourist information.

Bus stops and facilities for East Bay and San Francisco bus service providers, shuttle service stops, bicycle parking, a pool of shared bicycles ("Bicycle Library"), a car share pod, and administration/office space for the new Treasure Island Transportation Management Agency ("TITMA") would be located at or near the Transit Hub. (See "Encouraging Use of Transit and Discouraging Automobile Use," p. II.51, for a discussion of TITMA's responsibilities.) TIDA and TICD would prepare the designs for transit facilities in consultation with SFMTA, AC Transit, and WETA.

Ferry Service

Ferry service between the west side of Treasure Island and the San Francisco Ferry Building is proposed as part of the project. The Proposed Project includes construction and operation of a new Ferry Terminal. The proposed Ferry Terminal is composed of a Ferry Terminal building housing ticket facilities and janitorial supplies, a ferry quay and docks, breakwaters, and the ferry basin enclosed by the breakwaters.

The Ferry Terminal, which would be located just north of the causeway, opposite Building 1, would have two ferry slips for bow-loading ferries. One slip would have a boarding float and gangway for side-loading ferries. Each ferry slip would have two wingwalls to secure the bow of the ferry vessel. Mooring dolphins and/or fender walls would be installed to protect the ferry from bumping against the slips and other structures. Riders would reach the bow-loading ferries by walking over covered transfer span ramps (similar to hinged gangways) that end in an apron between the transfer span and the ferry. The transfer spans would be approximately 110 feet long and 25 to 30 feet wide, supported on piles at the shore end and hinged at that end. They would adjust to the tides with hydraulic support towers located near the ferry ends. Each transfer span would also have handrails and lighting, and each slip would have navigation lights. The boarding float attached to one of the bow-loading slips would be held in place by six to eight guide piles, and would have a fixed platform and a gangway. The float would be about 30 feet wide and 70 feet long. A passenger waiting area on the shore would have railings, weather screens, a canopy or roof structure, an information kiosk, ticket vending machines, a ticket collection area, and

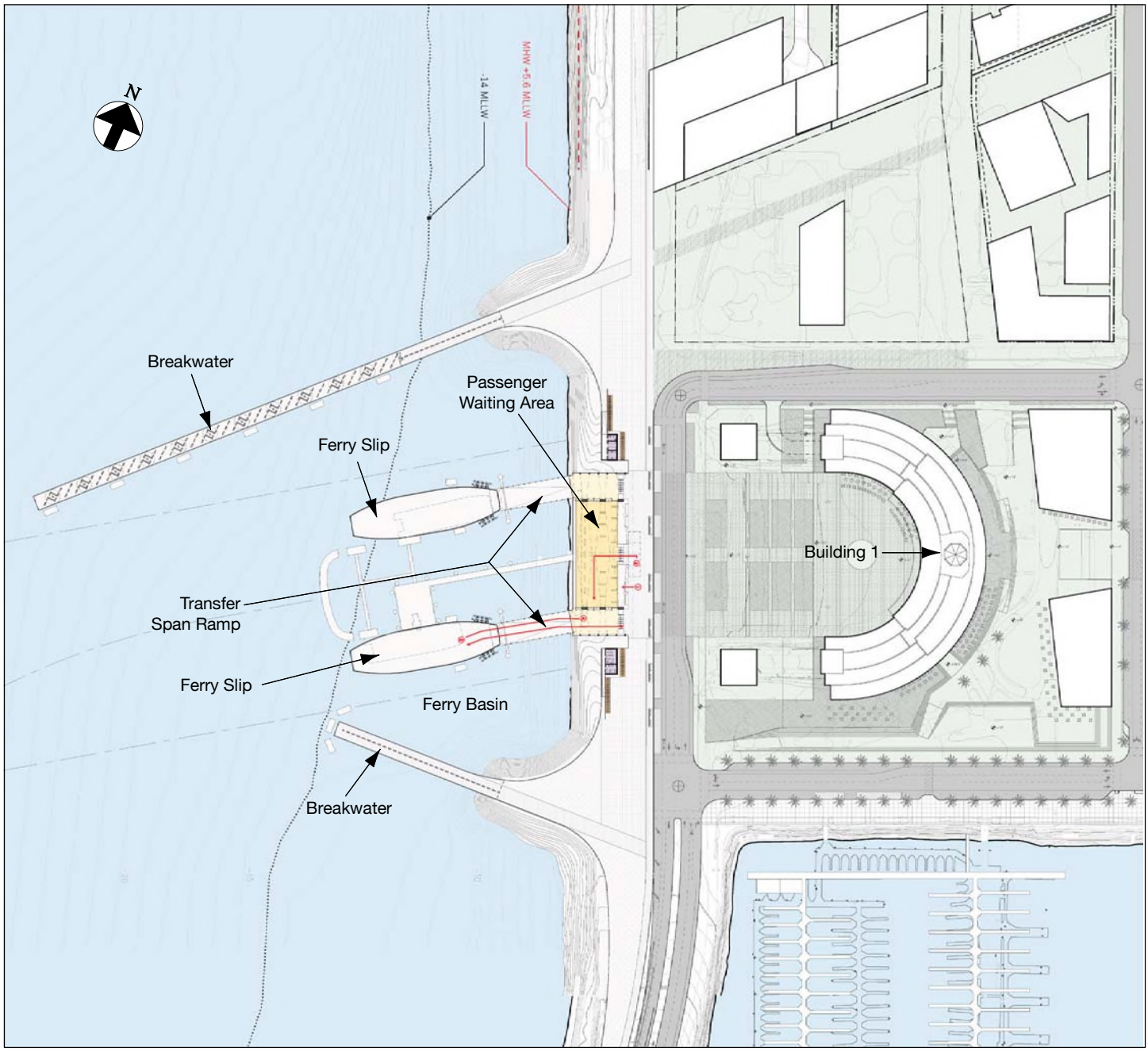
[22] Treasure Island Community Development, *Treasure Island Transportation Plan*, September 2006. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File 2007.0903E.

seating. The Ferry Terminal would also have staff facilities, a storage room, and maintenance facilities such as a trash/recycling room and a janitor's closet.

The ferry slips would be in a basin protected by angled breakwaters made of precast concrete sheet piles. The basin would have a generally trapezoidal shape created by the angled breakwaters, with a waterside entry about 200 to 300 feet wide. Various configurations for the breakwater are being considered. The preferred configuration has asymmetrical breakwaters, with the longer one on the north side of the basin and the opening directed slightly southward (see Figure II.8: Proposed Ferry Terminal Site Plan). Three Breakwater Variants are under consideration: 1) symmetrical breakwaters with a 200-foot west-facing opening (Breakwater Variant B1); 2) two symmetrical breakwaters plus a third, separate, detached breakwater, and a 300-foot opening facing southwest (Breakwater Variant B2); and 3) phased construction of the breakwaters, configured as for the Proposed Project with the northern, longer breakwater constructed first, along with the ferry slips and passenger facilities. The southern breakwater could be constructed several years later depending on a range of factors including desired frequency of service and routine maintenance dredging requirements (Breakwater Variant B3). (These variants are discussed in Chapter VI, Project Variants, "B, Ferry Terminal Breakwater Variants," p. VI.20.) Navigation lights would be provided on the breakwaters to mark the harbor entrance. The southern breakwater would have additional lighting for safety and accessibility if it is open to public access. Public access on the northern breakwater is not proposed, as it could occasionally be overtopped by high waves.

To construct the basin, about 4.9 acres (about 227,000 sq. ft.) would have to be dredged to a depth of about -16 feet at the basin shoreline. This depth includes approximately 2 feet of overdepth dredging to provide adequate depth for the ferry vessels and a boarding float. The two angled concrete sheetpile breakwaters, about 350 and 800 feet long, would be constructed, and riprap would be installed along the shore of the basin and the shore ends of the breakwaters for wave suppression. Piles for hydraulic supports for the two transfer spans and aprons leading to each ferry would be installed, as would guide piles to support the boarding float. Additional piles for wingwalls and guide piles, with mooring dolphins or fender walls, would also be installed. The transfer spans would be constructed and installed.

Approximately 32,000 cubic yards of dredge material would be removed from the ferry basin. Dredge material would be reused on-site if they are determined to be suitable after testing. The boarding float and gangway, transfer spans, and breakwaters would add a total of about 0.94 acre of new Bay fill: up to 0.73 acre of solid fill, about 0.01 acre of pile-supported fill, and about



SOURCE: Moffatt & Nichol

FIGURE II.8: PROPOSED FERRY TERMINAL SITE PLAN

0.2 acre of floating fill.[23] In addition, the shoreline would be improved and some existing riprap would be replaced. The total area of embankment affected by this shoreline treatment (from the Bay floor to the mean high water level) would be about 1.12 acres.

The project sponsors would fund construction of the Ferry Terminal and Transit Hub improvements, and provide funds for lease of one ferry vessel; the project sponsors would also seek funding to lease additional vessels. Service would be implemented by the Water Emergency Transportation Authority ("WETA"). The *Transportation Plan* anticipates that ferry service would ultimately be provided to and from San Francisco at 15-minute intervals at peak periods, with the ferry operating between 5 AM and 9 PM. In the early phases of development, one ferry would provide service at approximately 50-minute intervals. The Proposed Project analyzed in this EIR assumes that one ferry is available and that it operates at 50-minute headways; additional ferries and shorter headways are included in the Expanded Transit Service Mitigation Measure analyzed in Section IV.E, Transportation, as Mitigation Measure M-TR-2, p. IV.E.74.

Ferry vessels could hold from 299 up to 699 passengers, and would be up to approximately 200 feet long and 55 feet wide, with a draft of about 8 feet.[24] Two ferry vessels could overnight at the Ferry Terminal, although they might overnight at other locations away from Treasure Island. Routine operations, such as sewage pump-out, filling potable water storage containers, and light maintenance, would be carried out at the Ferry Terminal.

Bus Service

Buses from San Francisco and the East Bay would arrive and depart from the Transit Hub. They would stop at three locations within the Island Center area, but would not circulate around the Islands.[25] The pick-up area for service from the Islands would be opposite the Ferry Terminal in front of Building 1 at the Transit Hub. Drop-off for service from San Francisco and the East Bay would occur in two locations: on First Street south of Building 1, and on Avenue D in front of historic Building 2. The Proposed Project includes maintaining the bus service to and from the Transbay Terminal via existing Muni route 108 Treasure Island; ultimately, it is planned that the service to the Transbay Terminal would be expanded and a second destination, such as the Civic Center or the Caltrain depot at 4th and King Streets, would be added. The project sponsors would fund 20 percent of the cost of the new Muni buses estimated for service on these two routes.

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[23] Skidmore. Owings & Merrill, LLP, and Moffatt & Nichol, *Treasure Island Ferry Terminal Project Coastal Engineering Assessment*. September 2009, pp. 4 and 6-8. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

[24] The Proposed Project includes a variant that would utilize two 899-passenger vessels rather than three 699-passenger vessels at full buildout with Expanded Transit Service mitigation. Under this variant, the 699-passenger vessels would be reconfigured to accommodate up to 899 passengers, with additional crew required.

[25] See Section IV.E, Transportation, "Transit Improvements," beginning on p. IV.E.33, for more detail about proposed bus service.

Muni would establish the new route in coordination with TIDA and TITMA based on future demand. Operation of the Transbay Terminal route at existing service levels is assumed as part of the Proposed Project; expansion of that service and addition of a second line are not.

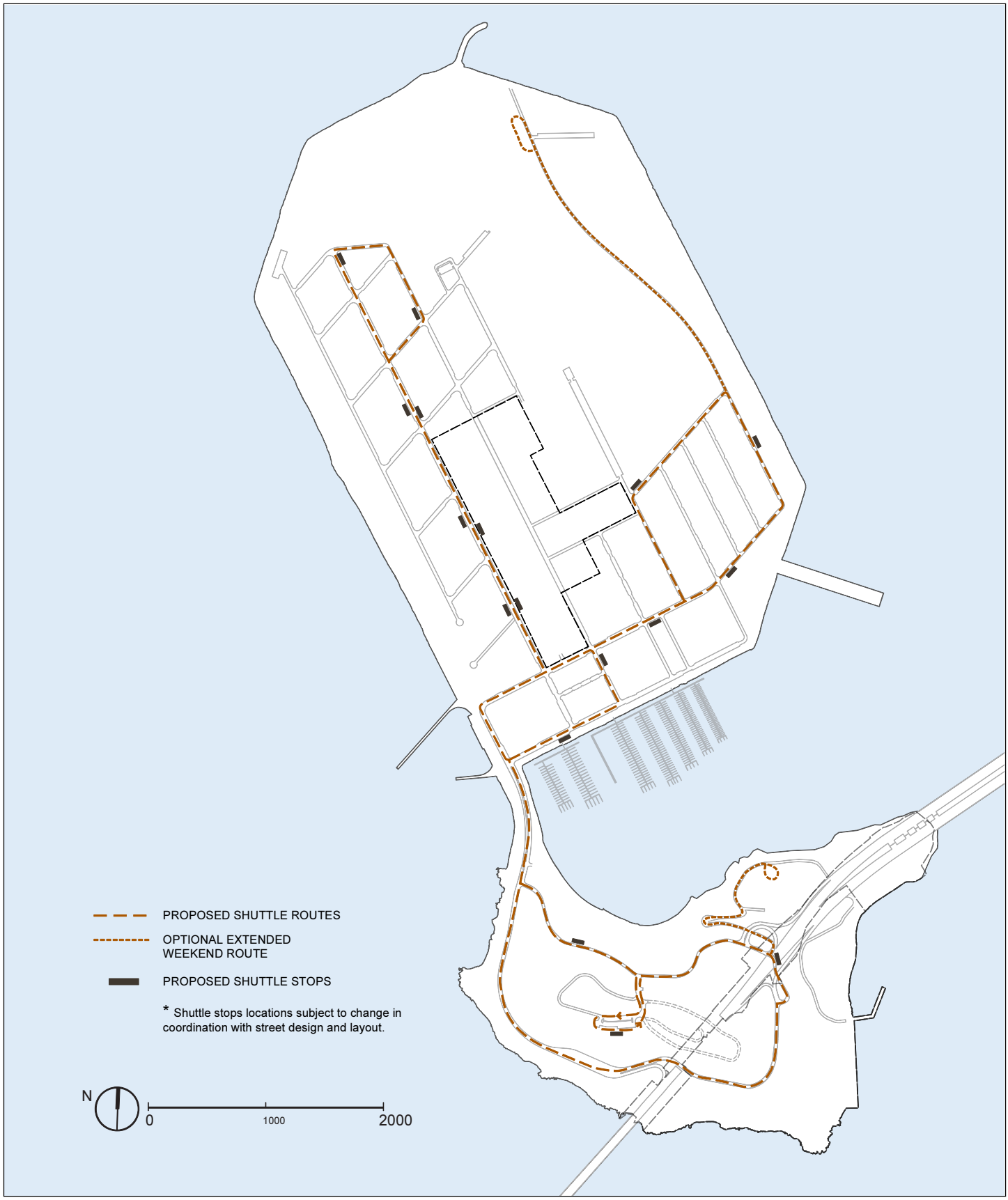
To initiate bus service to the East Bay, the project sponsors would fund the purchase of about 8 to 10 buses as necessary for service to the Islands. Service would be provided by AC Transit or another operator. The initial East Bay route would end on Broadway in downtown Oakland; additional service to the East Bay could be provided to the MacArthur BART Station or a similar location. The downtown Oakland service is assumed as part of the Proposed Project; additional service is not. Additional Muni service is included in the Expanded Transit Service Mitigation Measure analyzed in Section IV.E, Transportation, in Mitigation Measure M-TR-2, p. IV.E.74.

ON-ISLAND SHUTTLE SERVICE

The Development Program would include a fleet of up to four electric or alternative fuel shuttles for circulation around the Islands. The shuttles would be free to all users and would serve residential, commercial, and open space areas on Treasure Island and Yerba Buena Island. The shuttles would operate primarily on three routes: one would serve the west side of Treasure Island, another would serve the east side of Treasure Island, and the third would serve Yerba Buena Island. (The proposed routes are shown on Figure II.9: Proposed Shuttle Routes; however, the routes are intended to be flexible and can be modified to meet demand.) The two routes on Treasure Island could be extended to serve the open spaces and school during peak use periods. The shuttles would provide continuous service on each route from early morning to late evening. The free shuttles would be expected to operate on a "pulse" schedule, with departures and arrivals coordinated with the ferry and bus service at the Transit Hub. The shuttles would circulate around their respective neighborhoods and provide timed transfer connections for ferry and bus service. All three shuttle routes would provide stops at the Ferry Terminal/out-bound off-island bus stop in front of Building 1, and at the retail area near Building 2. Shuttle routes would be coordinated with the bicycle parking and route network and the proposed amounts and locations of parking (discussed in "Walking and Biking," and "Parking," on pp. II.45 and II.50).

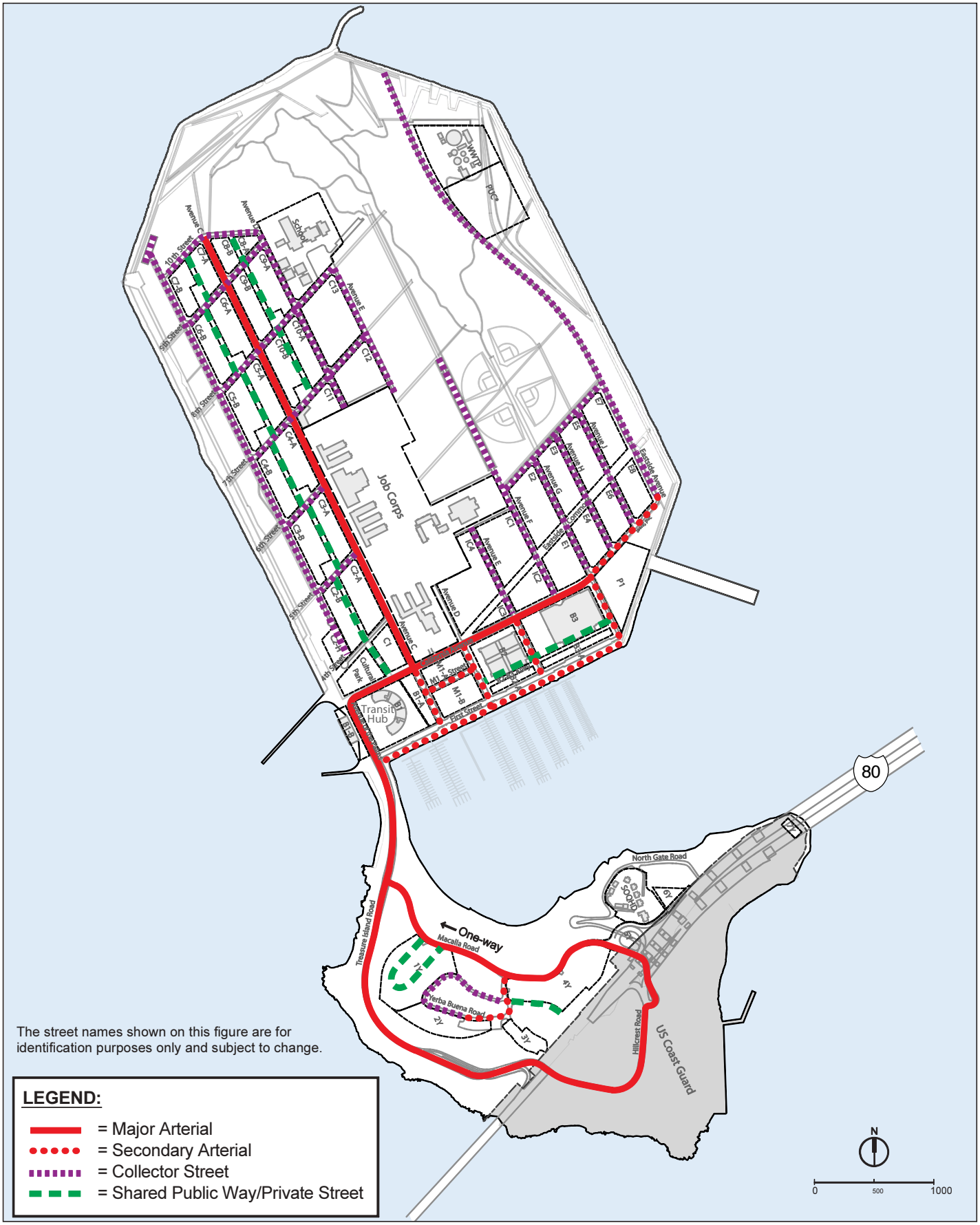
PROPOSED STREET SYSTEM

The proposed street network is shown in Figure II.10: Proposed Street System. The roadway system would consist of three levels of public roadways: major and secondary arterial streets, collector streets, and Shared Public Ways. Yerba Buena Island would also have privately owned streets that provide access to the main residential districts. Standard typical cross sections for these streets are included in Figure II.11: Representative Street Cross Sections, and the sections are described below. All of the streets on Treasure Island would be new construction, and would meet the requirements of the San Francisco Fire Department ("SFFD"), SFPUC, San Francisco Department of Public Works ("SFDPW"), San Francisco Mayor's Office of Disability, and the



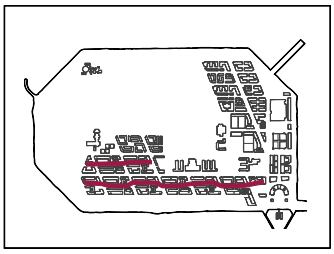
SOURCE: Perkins+Will

● FIGURE II.9: PROPOSED SHUTTLE ROUTES

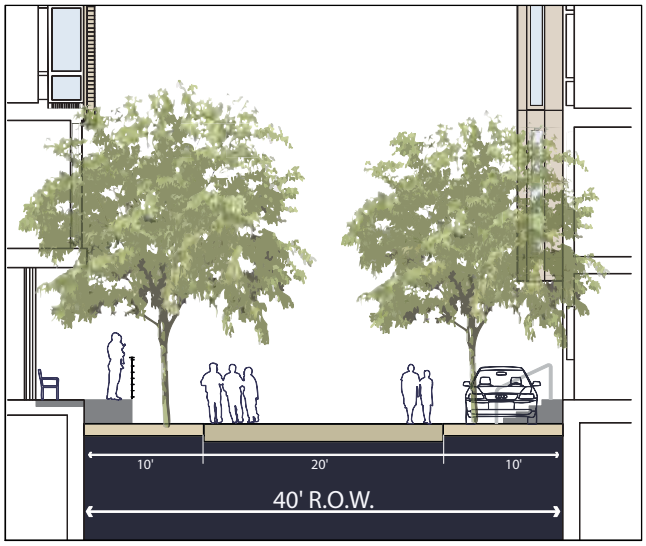


SOURCE: Fehr & Peers, 2009

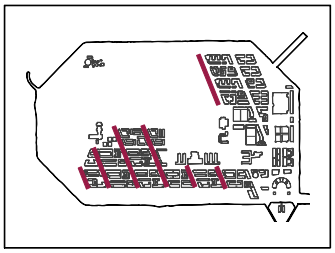
● FIGURE II.10: PROPOSED STREET SYSTEM



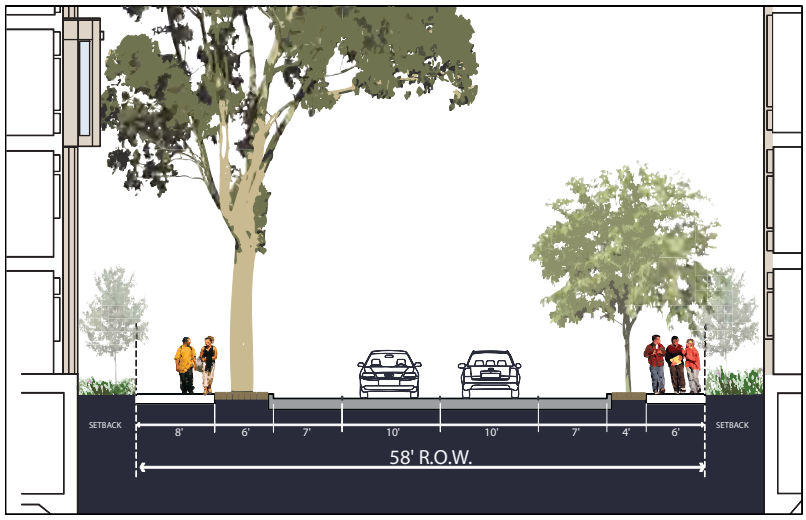
The Shared Public Way is located in the Cityside Neighborhood.



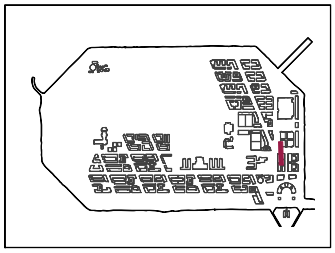
Shared Public Way Street Section

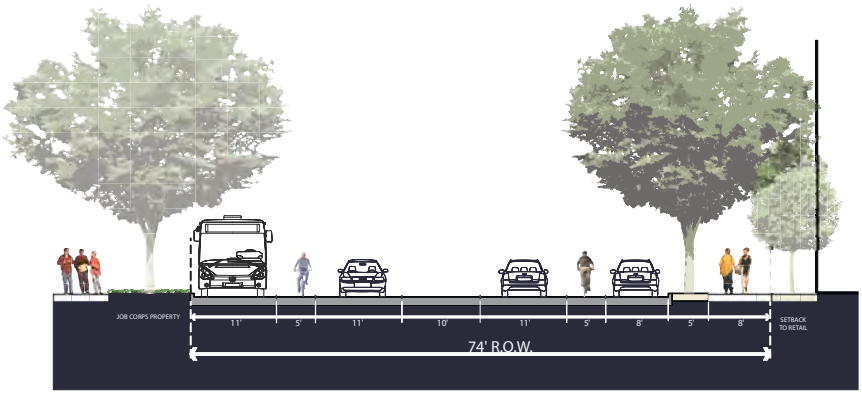


Windrows Streets are orientated at 68 degrees to the streets that north south on Treasure Island



Typical Windrow Streetscape





Typical California Avenue-M1 Block Street Section

SOURCE: Perkins+Will

FIGURE II.11: REPRESENTATIVE STREET CROSS SECTIONS

San Francisco Municipal Transportation Agency ("SFMTA"). Each type of street is briefly described below.

Arterial Streets

Major arterial streets would make up the main east/west and north/south streets on Treasure Island, including the access to the causeway in the Transit Hub area. The typical sections for these streets would include, in each direction, an 11- to 12-foot-wide traffic lane, an 8-foot-wide parking bay, and a 5-foot-wide Class II striped bike lane. Additional 10-foot-wide lanes may be added for exclusive turn lanes in high traffic areas. Landscaping and a 6- to 8-foot-wide sidewalk would be provided on each side of the road.

Two secondary arterial streets on Treasure Island – First Street (called Clipper Cove Avenue in the draft *Design for Development*) and the portion of Avenue D between First Street and California Avenue – would serve the retail area along the south edge of the island beside Buildings 1 and 2 and in front of Building 2. These streets would not provide direct access to the causeway and the Bay Bridge; therefore, they are not classified as a major arterial. Typical cross sections of secondary arterials would include 11-foot-wide traffic lanes and a 7-foot-wide parking bay in the eastbound direction and a 5-foot-wide Class II bicycle lane and an 8-foot-wide parking bay in the westbound direction. Where parking is adjacent to the bus route, there would be a 6-foot flex lane between the parking bay and the travel lane. As with major arterials, there would be landscaping and sidewalks on both sides of the street. Building setbacks would typically be about 6 feet from the right-of-way.[26] This space could be used for stoops, porches, or gardens for residential building entries.

Collector Streets

Collector streets would provide circulation loops for movement through and around the Island Center and residential neighborhoods, and for the historic hangars and Sailing Center along the southern edge of Treasure Island. Collector streets would also connect to the Job Corps campus and the Urban Agricultural Park and Sports Park. The typical section for these streets would include, in each direction, a 10-foot-wide traffic lane and a 7-foot-wide parking bay. Where a 5-foot-wide Class II bike lane is provided, parking bays would be 8 feet wide. Both sides of the street would have landscaping and sidewalks. Building setbacks would be similar to those for arterial streets.

Shared Public Ways

Shared Public Ways, sometimes called "Mews," are proposed on Treasure Island in the Cityside District to provide access within large blocks, bisecting them in a north-south direction, and on

[26] Treasure Island Development Authority, *Design for Development for Treasure and Yerba Buena Islands,* Public Review Draft, March 5, 2010, Section T4.2, p. 160 and Figure T4.d, p. 161.

the south sides of the historic hangars (Buildings 2 and 3) adjacent to proposed new low-rise buildings. These Mews streets would have a single surface with no vertical separations, unlike typical traditional curb-and-gutter street design, with narrower rights-of-way than other streets at about 40 feet wide, and would be designed to emphasize pedestrian and bicycle travel, with slow-moving vehicles allowed.[27] The travel lanes would be a total of 20 feet wide, and surface or architectural treatments would be used to provide delineation between pedestrian-only and shared pedestrian-vehicular areas. Building setbacks from the right-of-way along the Mews would vary from 0 to 6 feet.

The cross sections for these streets have been developed in collaboration with various City departments. In November 2008, TIDA and TICD initiated an interagency planning process to define design criteria and establish policy guidance to create a new street typology called Shared Public Ways, the formal designation for the Mews streets. This new street typology is intended to serve as a pedestrian-priority space, allowing occasional, low-speed vehicles to access local residential development. This collaborative effort culminated in the signing of a Letter of Agreement between senior staff at TIDA, TICD, SFMTA, SFDPW, and the Mayor's Office of Economic and Workforce Development.[28] The Letter of Agreement expresses the intent of its signatories to work together to complete the design, public outreach, approvals, construction, and acceptance by the City of the Shared Public Ways for the Proposed Project as public rights-of-way, assuming that issues of public safety, accessibility, liability, and maintenance can be adequately addressed during the final design and approvals process. Any approvals necessary to select the design and implement the Shared Public Ways would not occur until after certification of this EIR.

Streets on Yerba Buena Island

The street improvements on Yerba Buena Island would generally follow the locations and layout of the existing streets, with improvements for fire access and connections for pedestrian and bicycle paths to the new east span of the Bay Bridge. Due to the topography, new streets would be constructed by cutting into hillsides or filling on downslopes, and adding retaining walls.

The major arterial streets would provide access to Treasure Island and to/from the Bay Bridge, including the causeway, Treasure Island Road, Macalla Road, and Hillcrest Road. The primary road on the west side of Yerba Buena Island (Treasure Island Road, converting to Hillcrest Road past the westbound Bay Bridge entrance) would include 12-foot-wide traffic lanes and a 5-foot-

[27] *Design for Development,* Section T2.22, pp. 138-141.

[28] Jack Sylvan, Treasure Island Redevelopment Project Director, Letter to Nathanial P. Ford, Sr., Susan Mizner, Ed Reiskin, and Kheay Loke, June 9, 2009. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, San Francisco, in Case File No. 2007.0903E.

wide Class II bicycle lane.[29] Sidewalks are planned on the causeway portion of Treasure Island Road linking to Macalla Road at that intersection; no sidewalks are proposed on Treasure Island Road or Hillcrest Road for the remaining link to the Bay Bridge ramps. Macalla Road is proposed to become a one-way road from the Bay Bridge westbound on/off ramps down to the Treasure Island Causeway, with an 11-foot-wide traffic lane and a 5-foot-wide Class II bicycle lane on the right side of the road, and a 6-foot-wide contraflow bicycle lane and a 5-foot-wide sidewalk on the left side.

One secondary arterial would lead from Macalla Road into the residential neighborhood and the Hilltop open space, with 15-foot-wide travel lanes and a 5-foot sidewalk on only the north side of the street.

A one-way collector street would form a loop connecting to the middle and the hilltop end of the secondary arterial. This collector street would have one 20-foot-wide travel lane and 5-foot sidewalks on both sides of the street.

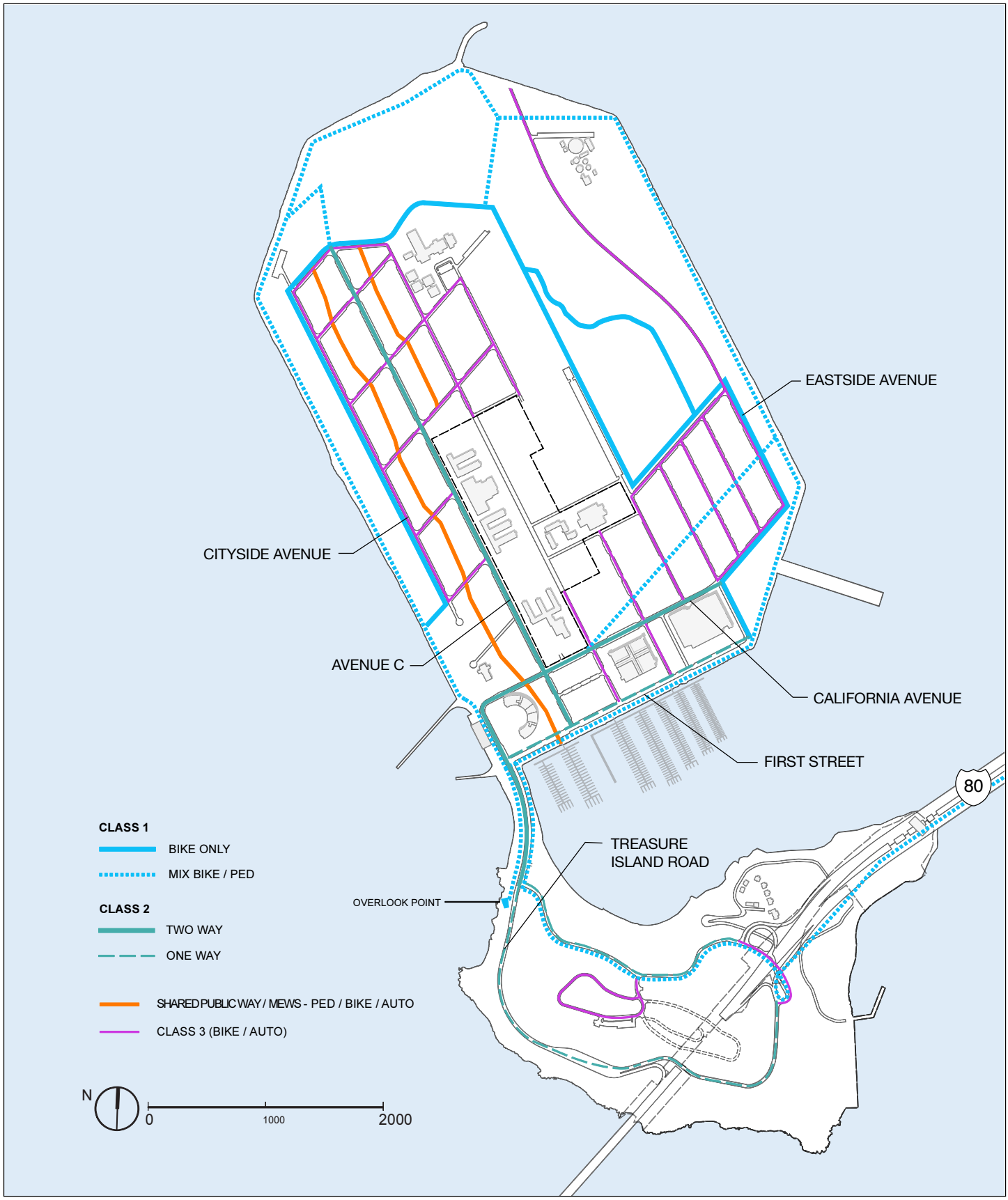
Access to homes on Yerba Buena Island would be from private streets with 11-foot travel lanes in each direction. The private streets would accommodate emergency vehicles and would have wider curb return radii at intersections.

WALKING AND BIKING

The proposed *Land Use Plan* and *Transportation Plan* are intended to encourage the use of walking and bicycling as primary on-Island travel modes. The proposed pedestrian and bicycle facilities are illustrated in Figure II.12: Proposed Bicycle Routes. The following aspects of the Proposed Project are aimed at enhancing walking and biking (see Figure II.13: Walking Times to Transit Hub):

- Approximately 50 percent of the residential units would be within an approximately 10-minute walk or less of the Transit Hub.
- All residential units on Treasure Island would be within an approximately 15-minute walk of the Transit Hub. In addition, all residents of both islands would be within an approximately 5-minute walk of a shuttle stop.
- Markets, the school, and other public/community facilities would be within short walk/bike distances from the majority of the Islands' residential units.

[29] Mitigation Measure M-TR-24, identified in Section IV.E, Transportation, p. IV.E.100, could create a transit-only lane and remove the bicycle lane on Treasure Island Road if congestion on Treasure Island Road adversely affects transit operations. If the bicycle lane were removed, cyclists would continue to have access to the Bay Bridge and Yerba Buena Island. The bicycle lanes on Macalla Road would provide bicycle access on Yerba Buena Island to the east span of the Bay Bridge via Macalla Road, which would also provide access to the west span if a bicycle lane were to be constructed there in the future.



SOURCE: Perkins+Will

● FIGURE II.12: PROPOSED BICYCLE ROUTES

SOURCE: Perkins + Will

● FIGURE II.13: WALKING TIMES TO TRANSIT HUB

- A network of bicycle, pedestrian, and shared-use paths would connect all of the Islands' major destinations.
- A comprehensive way-finding signage program would support the network of proposed walkways and shared-use paths.
- Streets would be low speed, with the intent of creating an environment that is compatible with walking and bicycling and that emphasizes attractiveness and safety.
- Safe bike parking (e.g., bike lockers) would be provided at all major destinations, and a bicycle library program would make bikes available for all Island residents and visitors.
- Shareable-width outside lanes or bicycle lanes would be provided on the Islands' busiest roadways, as appropriate for the traffic volumes and street function.
- The Islands' walkways and bicycle route network would be connected as an extension of the San Francisco Bay Trail and the shared-use path on the Bay Bridge east span currently under construction, and to the recreational paths around the Islands. The walkways and bicycle routes would be designed to allow for possible future connections to other pedestrian and bicycle routes.
- Provisions of the Americans with Disabilities Act ("ADA") and U.S. Access Board's Revised Draft Guidelines for Accessible Public Rights-of-Way would be met, as applicable.

Class I mixed bicycle and pedestrian paths are proposed around the perimeter of Treasure Island, connecting to Class I bicycle-only bicycle paths in the open space areas. A Class I mixed-use, two-way bicycle/pedestrian path along the south side of Macalla Road would connect to the east span of the Bay Bridge on Yerba Buena Island. A Class II bicycle lane also would be provided on the north side of Macalla Road for cyclists heading downhill (with traffic) from the Bay Bridge. Class II bicycle lanes in streets are proposed for the two major arterials on Treasure Island – California Avenue and Avenue C – and on Yerba Buena Island, the causeway, Treasure Island Road, and Macalla Road. No designated Class III bike routes are proposed on Treasure Island, although all other streets are proposed to be designed to encourage shared use by bicycles and autos. A stretch of Treasure Island Road on Yerba Buena Island, east of the entrance to the west span of the Bay Bridge, that is not wide enough for a striped Class II bike lane is proposed to be signed as a Class III bike route. A Class I mixed-use, two-way bicycle pedestrian path would be provided west of and parallel to Treasure Island Road south of the causeway, leading to a scenic overlook to be provided about 500 feet south of the intersection with Macalla Road.

Minimum bicycle parking standards would be required for residential and commercial uses. Bicycle parking would be required in all residential buildings with four or more residential units. In buildings with up to 50 residential units, 1 bicycle parking space would be provided for each 2 residential units. In buildings with more than 50 units, 25 bicycle parking spaces would be required for the first 50 units and 1 space for every 4 units above 50 units. Office buildings

would be required to provide bicycle parking at a rate of 3 spaces for buildings between 10,001 and 20,000 gross square feet (gsf), 6 bicycle spaces for buildings between 20,001 and 50,000 gsf, and 12 bicycle spaces for larger buildings. Retail buildings between 25,000 and 50,000 gsf would be required to have 3 bicycle parking spaces; those between 50,001 and 100,000 gsf would be required to have 6 bicycle parking spaces; and those over 100,000 gsf would be required to have 12 bicycle parking spaces.

All streets on Treasure Island, except the Mews, would have sidewalks. The Mews would be a curbless pedestrian-priority street with a shared path of travel. The shared pedestrian/bicycle path around the perimeter of Treasure Island would provide pedestrian access to the shoreline. Pedestrian access would be particularly encouraged along the Shared Public Ways – the Mews – in the Cityside residential neighborhood. The linear park along the Third Street right-of-way in the Island Center and Eastside Districts would contain a pedestrian-only pathway along its entire length between California Avenue and Eastside Avenue. Sidewalks on Yerba Buena Island would be limited due to steep grades. Pedestrian paths would lead from Yerba Buena Road and Macalla Road into the adjacent residential neighborhoods, and pedestrian trails would be provided in the Hilltop Park and from the park to the residential neighborhoods.

BAY BRIDGE ACCESS

As a separate project, the San Francisco County Transportation Authority and Caltrans are studying the replacement or improvement of the westbound on- and off-ramps on the east side of Yerba Buena Island that connect the Islands to the Bay Bridge, to improve seismic conditions and traffic safety. Senate Bill 163 (Migden), chaptered October 13, 2007, requires Caltrans to work with TIDA on the design and engineering of replacement ramps connecting Yerba Buena Island to the Bay Bridge. A Project Study Report was executed by Caltrans on December 19, 2007, and designated the San Francisco County Transportation Authority as the Lead Agency for this project. Caltrans and the San Francisco County Transportation Authority are preparing a joint Environmental Impact Report/Environmental Impact Statement on the Ramps Project.[30]

Improvements to Bay Bridge ramps are not part of the Proposed Project. These improvements are being pursued by Caltrans and the San Francisco County Transportation Authority to address existing safety conditions. These improvements are not proposed in order to facilitate the Proposed Project and are proposed to be implemented whether the Proposed Project is implemented or not. For these reasons, the ramps are undergoing separate environmental review under the auspices of Caltrans and the San Francisco County Transportation Authority.

These ramp improvements have not yet been approved and funded; thus it is not known whether the ramp improvements will be constructed. For these reasons, this EIR analyzes the impacts of the Proposed Project with both the existing ramps and with the proposed new ramps.

Replacement of the only eastbound on-ramp (located on the east site of Yerba Buena Island) is part of Caltrans' Bay Bridge East Span project, which is approved and currently under construction. Therefore, replacement of the eastbound on-ramp is assumed to be in place in the EIR's analysis.

[30] San Francisco County Transportation Authority, *Notice of Preparation*, *Yerba Buena Island Ramps Improvement Project*, September 5, 2008. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

PARKING

- The Development Program includes approximately 10,675 parking spaces to be provided on the Islands. All of these spaces would incur a charge for use. A breakdown of the proposed parking spaces by type of space is shown below:

Type of Space	No. of Spaces*
Off-Street Spaces	
Residential	8,000
Hotel	220
Retail	415
Office	100
Open Space	465
Marina	235
Flex	205
Subtotal	9,640
On-Street Spaces	
Subtotal	1,035
Total Parking Supply	**10,675**

* Numbers have been rounded

Off-street parking would not be required for any use. For residential uses, the draft *Design for Development* provides for an island-wide maximum ratio of one parking space per dwelling unit. The sale or rental of these spaces would not be bundled with the sale or rental of dwelling units, so that residents would have the option of purchasing or renting a parking space. In addition, up to approximately 30 percent of the spaces may not be located in the residential buildings, but rather in centralized garages in the residential neighborhoods and/or in the Island Center within walking distance of the residential neighborhoods. Car-share parking spaces would be required at a rate of 1 car share space for residential buildings with 50 to 200 units, and 2 car-share spaces plus 1 more space for every 200 additional units in buildings with 201 or more units.[31] Car-share parking spaces would not count against the maximum parking allowed.

- Off-street parking standards for commercial uses on Treasure Island would be reduced from those in the San Francisco Planning Code: 1 parking space for each 1,000 sq. ft. of gross floor area for office uses, 1 parking space for each 1,000 sq. ft. for retail uses, and 0.4 space for each hotel room. Car-share spaces would be required in commercial buildings at a rate of 1 space for each 50 parking spaces for all buildings with more than 25 parking spaces. Approximately 1,640 off-street and 1,035 on-street parking spaces are planned to serve the proposed commercial, retail, and hotel uses; the visitor-serving recreational uses; the uses in Buildings 1, 2, and 3; and the

[31] Thus, a 610-unit building would have 4 car-share parking spaces: 2 + 1 + 1.

Clipper Cove Marina. Retail and hotel parking spaces would be generally located in off-street parking garages. Both on- and off-street parking spaces would be provided for the other proposed uses. Visitors to these uses would pay for off-street or on-street parking, and the revenues would be combined

with those from transit passes and a congestion pricing program to offset the transportation program's operating costs for services, such as the off-island transit service, the on-island shuttle service, and the bicycle library.

ENCOURAGING USE OF TRANSIT AND OTHER MODES, AND DISCOURAGING AUTOMOBILE USE

The Proposed Project would include formation of the Treasure Island Transportation Management Agency ("TITMA"), a transportation management agency to be created by the Board of Supervisors after recommendation by TIDA to serve residents and visitors to the Islands. TITMA would be responsible for implementing a comprehensive transportation management program designed to discourage driving and promote use of alternative travel modes. TITMA would also oversee transit services and would implement a series of transportation demand management ("TDM") measures included in the Proposed Project. These measures are described in more detail in Section IV.E, Transportation, beginning on p. IV.E.45. Some TDM measures would encourage the use of transit, carpooling, walking, and bicycling. These measures include free on-island shuttle service for both islands; a car-share program; a bicycle rental system; mandatory purchase of a pre-paid transit voucher by households and hotel visitors; and support for vanpool and carpool matching services. Other TDM measures are designed to discourage automobile use. These measures include parking pricing policies requiring that visitors to the Islands pay for parking and that residential parking be leased or purchased separately from the residential unit; a congestion pricing program; and ramp metering on the access ramps to the Bay Bridge. The congestion pricing program would allow for imposition of fees applicable to residents who drive on and/or off the Islands during peak travel periods. The congestion pricing fees could be adjusted to reflect traffic patterns, congestion levels, time of day, and other conditions that affect the roadway system. TITMA would have the authority to impose the congestion pricing fees on other uses of the Islands should it be deemed necessary. TITMA would also have the flexibility to adjust the TDM measures and transit services as needed to affect travel behavior and encourage the use of alternative travel modes.

LOADING

Residential buildings, office buildings, and hotels of over 100,000 sq. ft. would have one required loading space, and those over 200,000 sq. ft. would have two required loading spaces. Retail buildings of 10,000 sq. ft. or less would not require a loading space; buildings of 10,001 to 60,000 sq. ft. would provide one loading space; retail buildings of 60,001 to 100,000 sq. ft. would provide two loading spaces; and retail buildings over 100,000 sq. ft. would provide three loading spaces plus one for each additional 80,000 sq. ft. Required loading spaces may be provided in on-street or off-street locations. Where on-street loading is provided, the draft *Design for Development* standards require review of each proposed loading zone to ensure that on-street loading spaces would not obstruct vehicular, transit, bicycle, or pedestrian circulation, either by

location outside of the path of travel or by limiting the hours of operation of loading zones to times that would not result in conflicts. On-street loading would be prohibited in the Treasure Island transit loop adjacent to the Ferry Terminal and Buildings 1 and 2, unless the loading space(s) can be located outside of the travel path of buses and shuttles or loading hours are restricted to times that would not interfere with transit operations. Where off-street loading is provided, standards in the draft *Design for Development* establish minimum sizes for the first and additional loading spaces, similar to those in Planning Code Section 154(b), and require that access be designed to minimize conflicts with transit, bicycles, and pedestrians. Guidelines in the draft *Design for Development* call for locating off-street loading spaces away from intersections and major pedestrian and bicycle routes, and shared with parking entrances where possible.

G. PROPOSED UTILITIES

WATER

The following discussion summarizes the preliminary design for proposed water supply, storage, and distribution. The preliminary design is based on an estimated average daily demand for potable water of 1.21 million gallons per day ("mgd") if recycled water is able to be used for toilet flushing in residential units, or 1.32 mgd if recycled water cannot be used in residential units.[32] These estimates are for full project buildout, and include demand from the Coast Guard and Job Corps facilities that will remain. (The Proposed Project would also include the use of recycled water, described in "Recycled Water," p. II.60.)

A Water System Master Plan is proposed to be prepared in coordination with the City as part of the design and permitting process. The plan will be consistent with the supply, storage, and distribution information described below.

Proposed Water Supply

The Proposed Project would continue to use the existing primary water supply. Water is provided by the SFPUC through a 10-inch-diameter steel pipe attached to the west span of the Bay Bridge. Water is pumped across the bridge by a pumping station located on Spear Street in San Francisco. The maximum output of the pumping station is 1,500 gpm. The SFPUC chloraminates the water prior to transmission, and the water does not require additional treatment on Treasure Island. A booster chlorine station is available at the water line entry point to Treasure Island for emergencies.

The emergency water supply would continue to be provided by EBMUD, through a new 12-inch water main that is being constructed by Caltrans as part of the new east span of the Bay Bridge. Capacity of the new service will be equivalent to the in-place 12-inch main on the existing

[32] This potable water demand estimate is less than total water demand because of the production and use of recycled water. See Section IV.K, Utilities and Service Systems, pp. IV.K.17, IV.K.18, IV.K.55, and IV.K.60, for further explanation.

east span of the Bay Bridge. A new 12-inch pipe would be constructed along North Gate Drive on Yerba Buena Island to connect the replacement emergency water supply line to the proposed new storage tanks (described below). The system has been designed to deliver approximately 1,500 gpm during emergency situations, with a typical average annual flow of 35 gpm, in keeping with current operations. The water would continue to be chloraminated by EBMUD prior to delivery. The system would only be used in emergencies when the water supply from San Francisco to the Islands is disrupted and for operational flows to maintain water quality.

Proposed Water Storage

The four existing water storage tanks on Yerba Buena Island are in poor condition and would be replaced with two new tanks. Proposed water storage is based on an estimated need for 4.0 million gallons of operational[33] storage.[34] The proposed locations for the new tanks are based on a detailed study that evaluated ten sites. The existing 1-million-gallon tank south of (uphill from) Macalla Road, located above an elevation of 230 feet, would be replaced with a new circular steel tank of approximately the same size. This tank would serve the lower elevations of Yerba Buena Island and all of Treasure Island. A second 3-million-gallon tank, divided into two 1.5-million-gallon cells, would be located either above the south (upper) portion of Yerba Buena Road at elevation 275 feet, or below the lower portion of Yerba Buena Road above Macalla Road at elevation 250 feet, adjacent to the 1-million-gallon tank. The second tank would be constructed of either concrete or steel. Both tanks would be approximately 35 feet tall. The upper 3-million-gallon storage tank would be supplied by water pumped directly from the 10-inch supply line from San Francisco and the supplemental supply from EBMUD during emergencies. Supply to the lower 1-million-gallon tank would flow by gravity from the larger tank. Water service to the upper elevations on Yerba Buena Island would require a booster pump system to meet operating pressure and flow requirements. The new pump station is proposed to be adjacent to the upper 3-million-gallon storage tank.

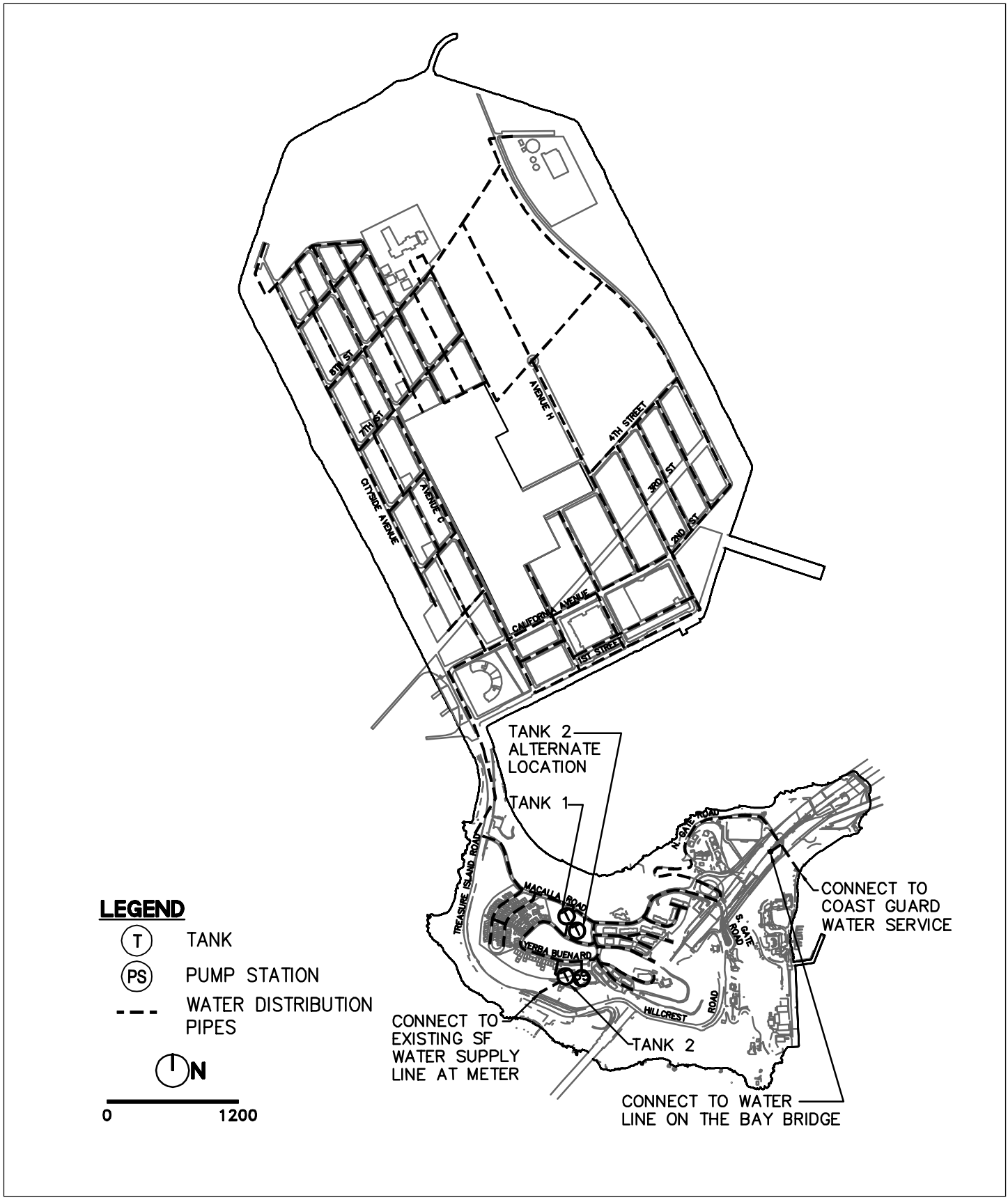
Proposed Water Distribution System

The existing water distribution piping on the Islands would be replaced completely, in phases. A preliminary water system model was developed to determine the required water line sizes, based

[33] "Operational storage" refers to the amount of recycled water that could be drawn from the storage tank at any one time. In addition to this operational storage, in any water storage tank there is a small amount of "dead storage," which is water that cannot be accessed. The dead storage volume is typically small in relation to the overall tank volume.

[34] This estimate is based on two days of peak maximum daily-water demand plus four hours of fire flow.

on State requirements for firefighting water flows, the conceptual plans for water tank elevations, and the proposed site plan layout. The conceptual system is shown in Figure II.14: Proposed Water Distribution System. The proposed distribution system includes a series of 8-inch, 12-inch, and 18-inch lines of ductile iron pipe. During construction, continued, uninterrupted service would be provided to existing residents and commercial tenants.



SOURCE: BKF

FIGURE II.14: PROPOSED WATER DISTRIBUTION SYSTEM

Firefighting Water Supply System

The Proposed Project would provide stored potable water on Yerba Buena Island as the primary firefighting water supply for both islands. About 840,000 gallons of potable water in the storage tanks would be dedicated to providing firefighting water supply for 4 hours at 3,400 gpm.

The Proposed Project would include use of recycled water as a supplemental water supply system for firefighting on Treasure Island (see the discussion of recycled water provided below on p. II.60). This system would enable the SFFD to use recycled water to fight large fires on Treasure Island or to fight fires in the event of a total disruption to both sources of water supply to the Islands. An additional 840,000 gallons of recycled water storage would be constructed, which, with the proposed 420,000 gallons of operational storage for landscaping irrigation and other uses, results in a total of 1.26 million gallons of stored recycled water on Treasure Island. The recycled water storage tank would be either steel or concrete and would be about 80 feet in diameter and 30 feet tall. Pumping facilities with the supplemental firefighting water supply would be larger than those proposed for the recycled water system alone, and the recycled water distribution mains would be larger and would include hydrants connected to this separate water supply. The supplemental firefighting water supply system would also include facilities to connect to fireboats, located on either side of Treasure Island, near the Ferry Terminal and near Pier 1.

The firefighting water supply on Yerba Buena Island would be drawn from the 3 million gallons of stored potable water. A supplemental supply would not be needed.

Two variants to the Supplemental Firefighting Water System are under consideration by the project sponsors: Supplemental Water Variant C1 would use potable water by installing additional storage and pumping facilities on Treasure Island; and Supplemental Water Variant C2 would use Bay water for the supplemental supply. The larger recycled water storage system, larger recycled water pipes, and recycled water hydrants would not be constructed with either variant.

Supplemental Water Variant C1 would include a 1.84-million-gallon circular steel or concrete storage tank on Treasure Island in the vicinity of the wastewater treatment plant (described in "Proposed Wastewater Treatment," p. II.58). It would be approximately 105 feet in diameter and 30 feet tall and would store potable water. With this volume of storage on Treasure Island, the potable water storage tanks on Yerba Buena Island would be reduced by 1 million gallons to a total of 3.0 million gallons, resulting in an overall increase in storage on the Islands of about 840,000 gallons.

As part of Supplemental Water Variant C1, a pump station and back-up diesel generator would also be constructed on Treasure Island near the water storage tank. Some 8-inch water mains would need to be increased to 12-inch mains for fire flow and domestic water pressure. Several pressure-sustaining and/or pressure-reducing valves also would be installed.

In addition to the potable water storage on Treasure Island, as part of Variant C1, two fireboat manifolds and two suction hydrants could be installed along the southern shore of Treasure Island and near Pier 1 and the Ferry Terminal, if required by the Fire Department.

Supplemental Water Variant C2 would use Bay water as the exclusive source for the supplemental firefighting water supply. This variant would consist of a pump station with a saltwater intake pipe; facilities to connect to fireboats; up to 3 suction hydrants located around the perimeter of Treasure Island; up to 29 fire hydrants connected to this separate firefighting water supply; and a main trunk line distribution piping system to connect the pump station, the same fireboat connections as with the proposed supplemental system, and the fire hydrants.

WASTEWATER

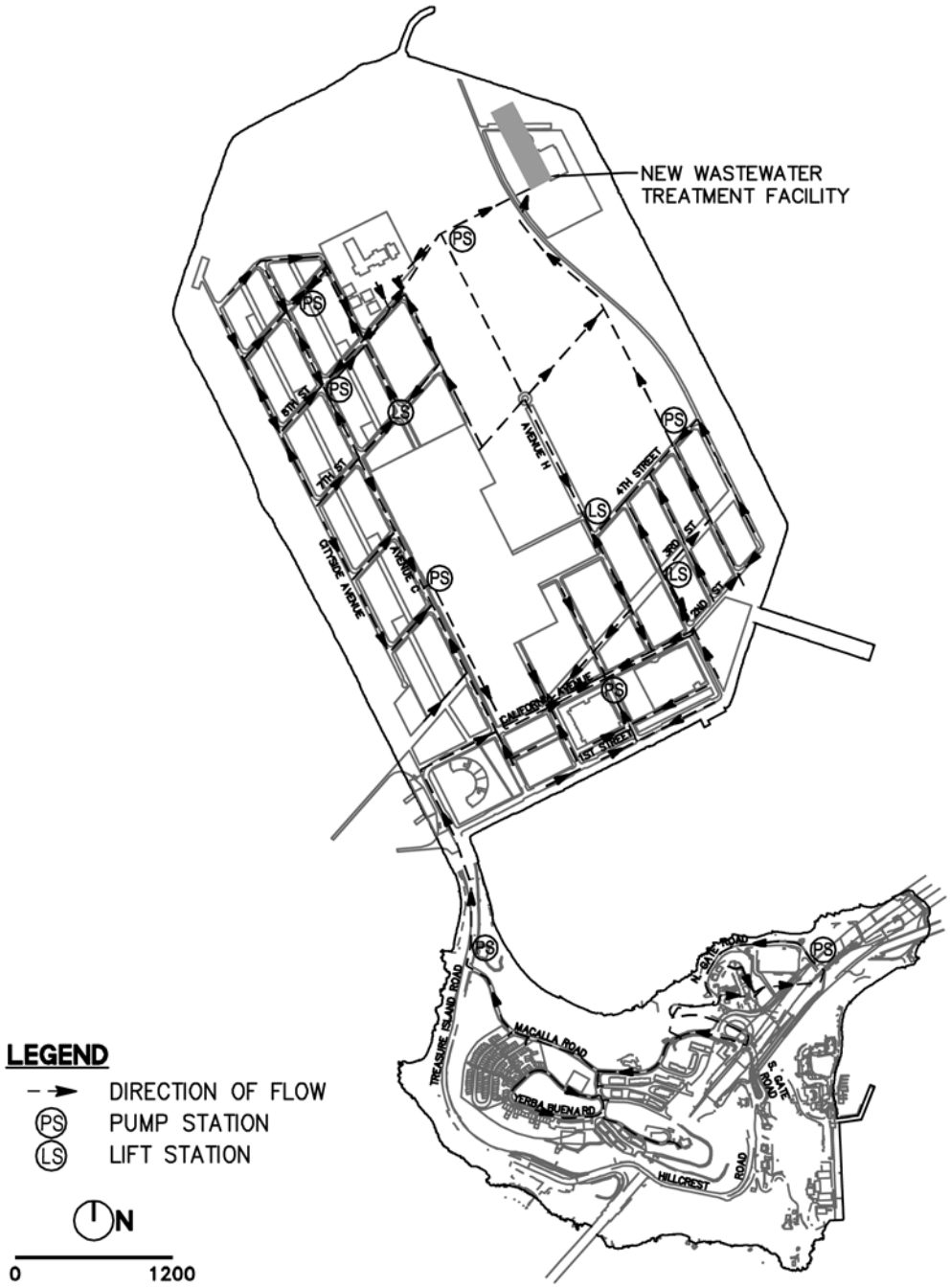
Under the Proposed Project, the existing wastewater collection system would be completely replaced, and the existing wastewater treatment facility would be rebuilt in essentially its current location in the northeastern corner of Treasure Island. (Stormwater flows would continue to be collected in a separate system, discussed in "Stormwater," p. II.61.)

A Master Wastewater System Plan is proposed to be prepared in coordination with the SFPUC. Design criteria for the new treatment facility will also be coordinated with the SFPUC to determine the design requirements. The plan will be consistent with the components of the wastewater system described below.

Proposed Wastewater Collection

The existing wastewater collection gravity lines, pump stations, and force mains would be completely replaced over time with a new collection system. The conceptual system is shown in Figure II.15: Proposed Wastewater Collection System. As shown in the figure, the proposed collection system would include a series of gravity sewer pipelines and force mains[35] located under the new or (in the case of Yerba Buena Island) rebuilt streets. The pipe materials would be mainly vitrified clay for the gravity pipelines and ductile iron for the force mains, or an alternative material such as high-density polyethylene ("HDPE") if approved by reviewing City agencies. The existing 27 pump stations and lift stations would also be replaced with 10 to 12 pump or lift stations. The western side of Yerba Buena Island would be served by gravity pipelines flowing down to a pump station at the south end of the causeway.

[35] A force main is a pipe through which liquid is pumped (forced) rather than conducted by gravity flow.



SOURCE: BKF

FIGURE II.15: PROPOSED WASTEWATER COLLECTION SYSTEM

The eastern side of Yerba Buena Island would be served by gravity-flow to the east, to a new pump station under the east span of the Bay Bridge, replacing an existing pump station. This pump station would pump wastewater to the top of the island, where it would flow by gravity to the causeway pump station, and then be pumped along with wastewater from the west side of Yerba Buena Island into the Treasure Island wastewater collection system. The proposed system would be connected to the existing U.S. Coast Guard and Job Corps systems at their respective property lines.

The existing wastewater system would be retained to the extent feasible while the new system is under construction. The system would be repaired and upgraded as necessary by the SFPUC to keep it operational until it is replaced.

Proposed Wastewater Treatment

The SFPUC operates the existing wastewater treatment plant, located at the northeastern corner of Treasure Island, under a Cooperative Agreement between TIDA and the Navy.[36] The plant treats wastewater from existing development on the Islands. The treatment plant provides secondary treatment and has a peak treatment capacity of 2.0 mgd. As part of the Proposed Project, a new or upgraded wastewater treatment plant would be constructed at or near the existing plant site. The new or upgraded treatment plant would be financed, built, owned, and operated by the SFPUC. The new or upgraded treatment plant would have the capacity to treat the estimated average dry-weather buildout flow of 1.3 mgd (based on 95 percent of domestic water demand and all of the recycled water demand except that used for irrigation) and the estimated peak wet-weather flow of 2.9 mgd (based on SFPUC standard peaking factors and inflow and infiltration allowance).

The treatment process would start with primary and secondary treatment. The primary treatment process would remove settleable solids in a primary sedimentation tank. Solids would be dewatered and processed in a digester. The secondary treatment process would use trickling filters and solids contact tanks to remove suspended solids. Up to 0.42 mgd of the effluent would undergo further treatment by microfiltration and, to the extent required, reverse osmosis for use as recycled water in appropriate plumbing fixtures in commercial buildings and residential buildings to the extent permitted by regulations in effect at the time each building is constructed, and for irrigation (see “Recycled Water” on p. II.60). These additional processes remove solids and salts. Either ultraviolet light or chlorination would be used to disinfect both the treated water to be

[36] Regional Water Quality Control Board San Francisco Bay Region, NPDES Permit No. CA0110116, August 1, 2004, p. 5.

recycled and the remaining secondary-treated effluent prior to discharge through the existing outfall from the existing treatment plant to the Bay. If chlorination were selected, the treatment plant would use sodium hypochlorite to disinfect, and then sodium bisulfite to dechlorinate the effluent. Solids generated in the primary and secondary treatment processes would be digested and dewatered, and the resulting biosolids would be trucked to an off-island landfill for disposal, as with the existing treatment system.

Two variants in the wastewater treatment process, each involving wetlands, are under consideration. These wetlands, if constructed, would be separate from the 10-15 acre wetland proposed to treat stormwater before discharge to the Bay, discussed in "Proposed Stormwater Treatment," p. II.64. Under Wastewater Wetland Variant D1, treated effluent to be recycled would be discharged to constructed (man-made) wetlands for tertiary treatment before microfiltration. This would improve the quality of the water prior to microfiltration; microfiltration would be accomplished at a higher rate than in the system included in the Proposed Project. Reverse osmosis would be used when necessary to remove salts before the recycled water was used for irrigation. The wetlands would occupy about 5 acres and would include both open water areas and planted areas, with the water depth varying from 1.5 to 4 feet. Public access to the constructed wetlands would be restricted. Bulrushes and native wetland plant species would be used in the shallower wetlands areas. Mosquitofish would be added to the wetlands to minimize the number of mosquitoes. Effluent that is not recycled would be disinfected after tertiary treatment in the wetland, and then discharged through the existing outfall.

Under Wastewater Wetland Variant D2, effluent would undergo microfiltration and disinfection, and then the wetlands would further reduce pollutants such as nitrogen, phosphorus, and trace metals for most of the treated effluent, which would be discharged through the outfall. Recycled water, however, would not pass through the wetlands. About 0.27 mgd would be diverted from the treatment plant and treated with reverse osmosis; this water would be used for landscape irrigation. An additional approximately 0.15 mgd would be diverted from the treatment plant and used for commercial and residential toilet flushing. The remainder of the disinfected effluent from the treatment plant (about 0.9 mgd) would be directed to the wetlands. The wetlands would be smaller than the Variant D1 wetlands, occupying about 2 to 4 acres of land. These wetlands would be suitable to serve as wildlife habitat. Public access to the constructed wetlands in Wastewater Wetlands Variant D2 would not be restricted because the wetlands water would be disinfected. The impacts of these variants are discussed briefly in Chapter VI, Project Variants, "D, Wastewater Wetlands Variants."

The treated effluent would be routed to the existing outfall. The existing NPDES permit discharge limit of 2.0 mgd average dry weather flow would continue to cover the expected dry weather discharge of about 1.3 mgd if none of the treated effluent were recycled. The existing treatment plant would remain in operation as long as feasible during the first phases of new construction. Portions of the new treatment plant would be constructed as needed and as feasible during each phase to meet the flow requirements of the project.

New technologies for processing effluent or biosolids could be tested and possibly used at the new or upgraded wastewater treatment plant. For example, a small-scale co-generation facility could possibly be installed. This facility would use digester gas to generate electricity for

a portion of the wastewater treatment plant's needs. The SFPUC plans on retaining the flexibility to add different equipment or processes and would then assess the effectiveness of these additions at a demonstration level. No specific processes or equipment have been identified for addition to the new treatment plant. If any are identified, they would be subject to separate review and approval, including CEQA review, as applicable.

In addition to constructing and operating the new or upgraded wastewater treatment plant, the SFPUC would have the use of an additional 4 to 6 acres near the treatment plant on Treasure Island. The SFPUC would use this property for a range of uses that may include infrastructure improvements furthering the objectives in the *Sustainability Plan* (see Section J, Proposed Sustainability Plan, p. II.77, for additional discussion of the objectives in this *Plan*). No detailed plans have been prepared for any of these potential uses. After feasibility studies, concepts that are selected for construction or installation would be subject to further review and approval, including CEQA review, as applicable. For this reason, impacts associated with the use of this 4- to 6-acre area have not been analyzed.

As noted elsewhere, the Proposed Project includes supplying 5 percent of the project's peak electrical demand from on-site renewable sources. This can be met by means of rooftop solar photovoltaic facilities; thus, the Proposed Project would not depend on development of the 4- to 6-acre site to meet the 5 percent objective.

RECYCLED WATER

The following discussion summarizes the preliminary design for the proposed recycled water system. A detailed Master Recycled Water Plan will be prepared in coordination with the SFPUC. The plan will be consistent with the overall recycled water program described below.

The Proposed Project includes a program to use recycled water on Treasure Island that would be treated to tertiary levels. The recycled water would be used for irrigation of open space areas, the Urban Agricultural Park, roadside plantings, and landscape water features, and in appropriate plumbing fixtures in commercial and residential buildings to the extent permitted at the time of construction. Recycled water would also be used to maintain water levels in the stormwater treatment wetlands during the dry season (see the discussion under "Stormwater," p. II.61).

The recycled water would be provided by an on-island recycled water plant, sized to meet the average long-term demand (estimated to be approximately 0.42 mgd). A storage tank with 0.42 million gallons of operational storage would be constructed adjacent to the recycled water plant to meet peak demand of about 0.5 mgd.[37] Treatment of secondary wastewater effluent by microfiltration and reverse osmosis to meet California standards for recycled water is described

[37] This tank may be reduced in size if either of the Supplemental Firefighting Water System Variants is implemented, as described on pp. II.55-II.56, and in Chapter VI, Project Variants.

above in "Wastewater" on pp. II.58 and II.59. The Development Program would provide a developable pad for the plant, which would be constructed as a part of the wastewater treatment plant. The facility would be constructed and operated by the SFPUC.

Distribution piping for recycled water would be provided throughout Treasure Island (see Figure II.16: Proposed Recycled Water Distribution System). The pipe material would be selected to meet SFPUC requirements. The recycled water would be distributed using a pumping system constructed near the storage tank at the recycled water plant. Recycled water is not proposed to be supplied to Yerba Buena Island due to the island's distance from the recycled water treatment plant and the pumping that would be required to reach its high elevations.

- The California Department of Housing and Community Development allows the use of gray water (water from sinks, showers, and similar sources, captured for local reuse) under certain circumstances.[38] Use of gray water is not part of the Proposed Project at this time; any future proposed use of gray water would conform to all applicable State and local requirements. Because it is not known where or whether these gray water sources would be used, they are not evaluated further in this EIR.

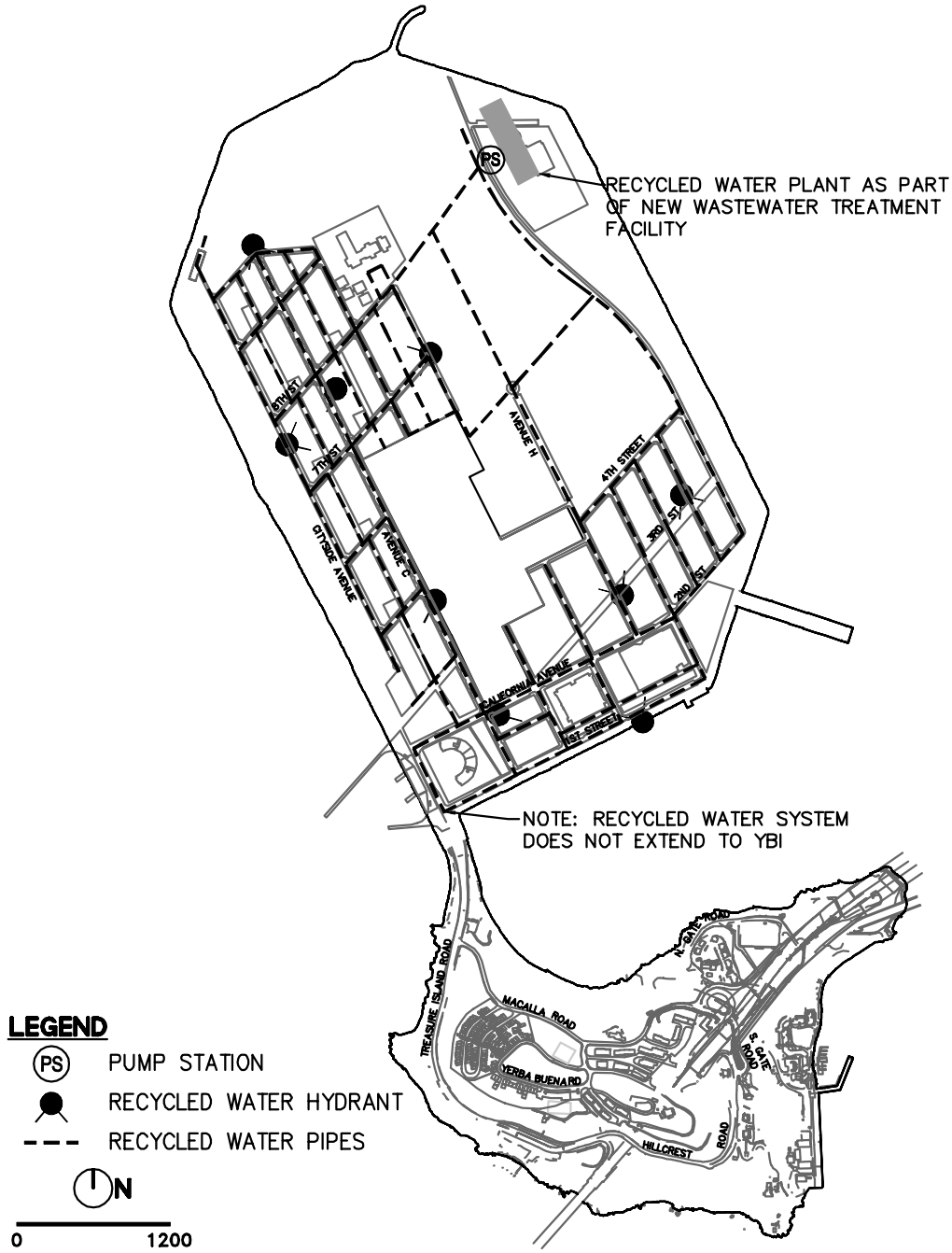
STORMWATER

The following discussion summarizes the preliminary design for the proposed stormwater collection and treatment system. A Master Storm Drainage Plan and Stormwater Control Plan will be developed in coordination with the SFPUC. The plan would be consistent with stormwater collection and treatment systems described below.

Proposed Stormwater Collection

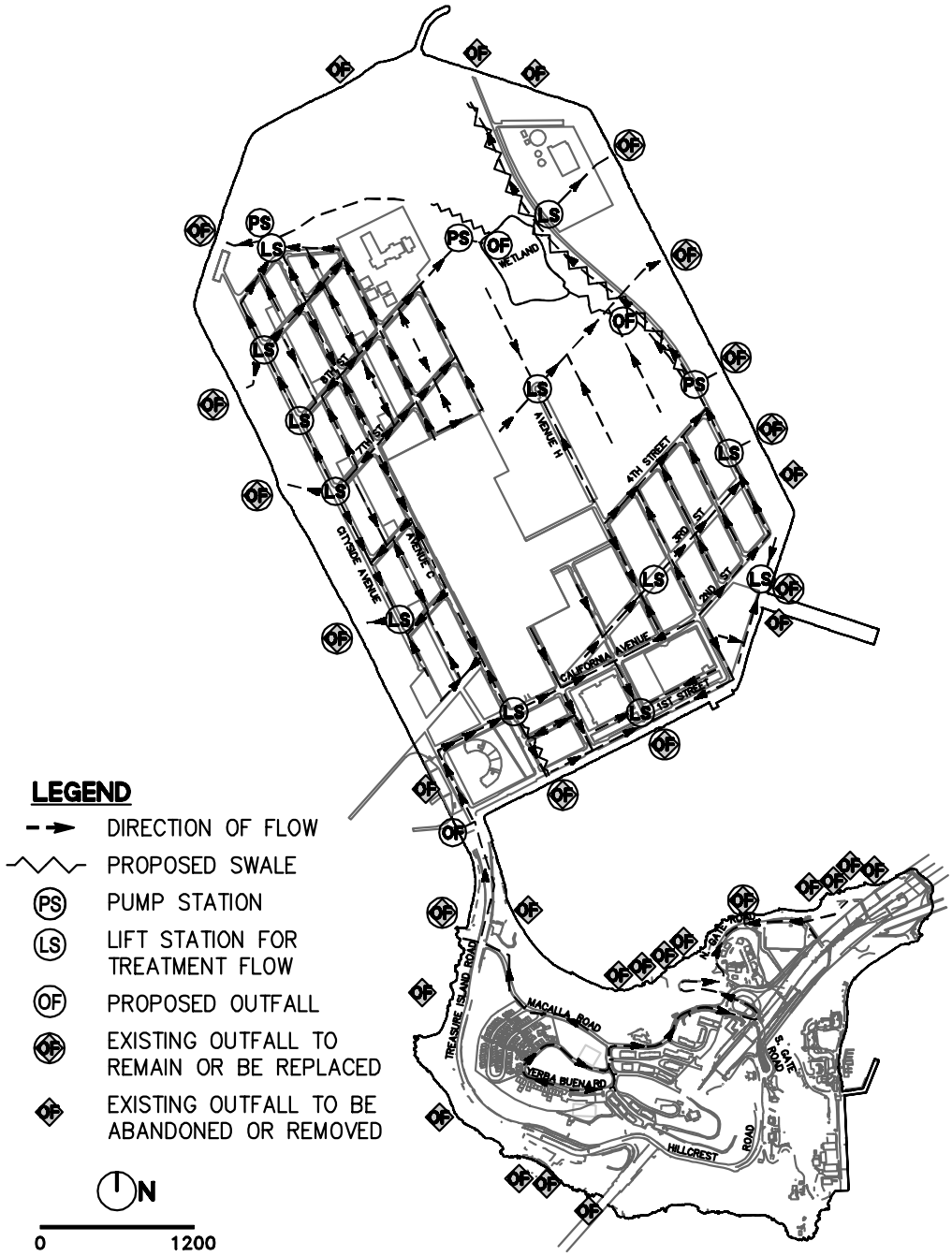
The existing stormwater collection system would be replaced with a new collection system, which would include gravity pipelines, force mains, lift stations, pump stations, and new outfalls to the Bay. Figure II.17: Proposed Stormwater Collection System, shows the preliminary pipeline locations, pump stations, and outfall locations. As currently envisioned, the gravity pipelines would range from 12 inches to 60 inches and would generally follow the proposed road layout. Force mains and pump stations would be used to direct a portion of the stormwater to the treatment wetlands in the northeast quadrant of Treasure Island. The pipe materials would be a combination of reinforced concrete for gravity pipelines and ductile iron for the two proposed forcemains. HDPE pipes could be used if approved by the SFPUC. The system would comply

- [38] California Code of Regulations, Title 24, Part 5, Chapter 16A. See footnote regarding gray water on p. IV.K.19 in Section IV.K, Utilities and Service Systems.



SOURCE: BKF

FIGURE II.16: PROPOSED RECYCLED WATER DISTRIBUTION SYSTEM



SOURCE: BKF

FIGURE II.17: PROPOSED STORMWATER COLLECTION SYSTEM

with SFPUC storm drainage requirements and California Regional Water Quality Control Board, San Francisco Bay Region ("RWQCB") requirements for treatment of stormwater flows.[39]

Based on SFPUC requirements, the storm drain pipes would be sized to accommodate rainwater flows from a 5-year storm. Stormwater flows resulting from a storm of 0.2 inch per hour ("treatment flows") would be directed to treatment areas. Flows larger than the treatment flows, up to the 5-year storm event plus the 100-year high tide, would flow in the pipes, bypassing the treatment devices, and flow directly to the Bay. Flows larger than 5-year storm events would flow overland through the streets of the Development Plan Area toward the open spaces around the perimeter of Treasure Island and Yerba Buena Island. The flows would collect in these areas and drain out to the Bay through inlets attached to the 12 proposed new consolidated outfall structures serving Treasure Island and 2 serving Yerba Buena Island. The inlets and outfalls would be sized to accommodate the 100-year storm event, and to account for higher tide elevations resulting from estimated potential future sea level rise. The outfall locations would be designed to accommodate future pump stations to account for estimated potential future sea level rise.[40]

Proposed Stormwater Treatment

The proposed stormwater treatment system includes a range of best management practices ("BMPs") distributed throughout the Development Plan Area. One of the main elements of the proposed stormwater treatment system is the creation of a 10- to 15-acre wetland area in the northeast area of Treasure Island. This wetland would be separate from the wastewater wetland that may be constructed as part of Wastewater Variants D1 or D2. In addition to the stormwater treatment wetland, "localized" stormwater BMPs would be included to provide treatment of all runoff in stormwater treatment areas on Treasure Island and Yerba Buena Island. BMPs are measures and procedures used to reduce pollution in stormwater; facilities included as BMP measures would be sized and designed in relation to localized building sites and land spaces in each of several stormwater watersheds for Treasure Island and Yerba Buena Island. Stormwater controls on Yerba Buena Island would include provisions for erosion control, given the steep topography of much of that island. The BMPs would be based on SFPUC *Stormwater Design*

[39] The *Treasure Island Infrastructure Update* assumes that SFPUC *Stormwater Design Guidelines* will require treatment of 90 percent of the average yearly flow, using volume-based BMPs. For design of flow-based BMPs, the SFPUC would require treatment of flows from a storm of greater intensity than 0.2 inch per hour (see *Treasure Island Infrastructure Update*, Section 10, and Memorandum from PWA to Treasure Island EIR Team dated December 1, 2009). The Memorandum from PWA is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

[40] See Section IV.O, Hydrology and Water Quality, for a discussion of sea level rise, where it is expected that the amount of sea level rise predictions range from 12 inches to 55 inches or higher by the year 2100. The Proposed Project designs account for a rise of 36 inches with an adaptive management plan to accommodate greater increases if they occur in the future.

Guidelines,[41] and could include features such as bioretention/infiltration planters and swales, rain gardens, and permeable paving.

The stormwater wetland area is proposed to provide both stormwater treatment during the winter months and a wildlife habitat area on Treasure Island. The wetland would be sized based on the water treatment requirements for discharge of stormwater set by the RWQCB in compliance with the City's NPDES discharge permit and the SFPUC *Stormwater Design Guidelines*. A sediment and trash collection area, or forebay, would be provided at the entrance to the stormwater wetlands in advance of the main perennial wetland area. Flows to the perennial wetland areas from the forebay would be controlled by a weir structure. Perennial wetlands remain moist or wet throughout the year. Seasonal wetland areas—meadow-like areas that flood only during the rainy season—would be adjacent to the main, permanent wetland pool to provide additional treatment and habitat area. Water from the main perennial pool would expand into the seasonal areas during and after storm events. Pollutants would be removed through settling, adsorption, filtering, and nutrient uptake by wetland vegetation. The stormwater wetland would discharge to the Bay. Any desired permanent water level during the dry months would be maintained with water from the recycled water system.

Public access would be provided to the stormwater wetland area. In some parts of the wetlands, low fences may be needed to separate people and dogs from the habitat areas and to ensure public safety. Signs would be posted to advise visitors that the water is non-potable. Access to the habitat areas in the wetlands would also be controlled with pathways and planting. An Integrated Pest Management program for Treasure Island would include vector control for the wetland area. Mosquitofish would be used, and plants that attract mosquitoes would be avoided. The edges of permanent pool areas of the wetlands would be designed to allow access to mosquito predators. In addition, water levels in the wetland would be varied to discourage mosquito development by occasional drawdown at some times and augmentation with recycled water at other times. Vegetation maintenance would reduce breeding habitat.

In addition to the stormwater treatment wetland, localized stormwater runoff BMPs would be included to provide required levels of treatment for stormwater on Treasure Island and Yerba Buena Island. These treatment techniques could include, but are not limited to:

- Bioretention. Bioretention areas are vegetated systems that rely on solid infiltration and biogeochemical processes to slow, store, and remove pollutants from stormwater. Examples are soil- and plant-based filtration devices, including a planted buffer strip, a sand bed, a ponding area, and a planted area with an organic (or mulch) layer and planting soil.

[41] San Francisco Public Utilities Commission and Port of San Francisco, *Stormwater Design Guidelines*, released November 2009. SFPUC Stormwater Design Guidelines web page: http://www.sfwater.org/mto_main.cfm/mc_id/14/msc_id/361/mto_id/543, accessed June 16, 2010.

- Vegetated swale. A vegetated swale is a broad, shallow channel with plants on the sides and bottom to collect and slowly convey rainwater runoff, with treatment provided through filtering by the vegetation and soil or infiltration into the underlying soils.

- Vegetated buffer strip. Vegetated buffer strips are sloping planted areas designed to treat and infiltrate sheet flow from adjacent impervious areas.

- Infiltration basin. An infiltration basin is a shallow impoundment over permeable soil that captures stormwater, stores it, and allows it to infiltrate. These function like bioretention areas, but are usually larger.

- Infiltration trench. An infiltration trench is a long, narrow, rock-filled trench that allows stormwater to infiltrate.

- Permeable pavement. Permeable pavement is a paving system that includes an underlying layered structure to temporarily store rainwater prior to infiltration or drainage to a collection facility. Examples are porous asphalt, porous concrete, interlocking concrete blocks, or grass pavers.

- Vegetated roofs. Vegetated roofs are covered partially or entirely with vegetation and soils. These filter contaminants. They also absorb stormwater, thereby reducing runoff, and slow stormwater, thereby delaying the peak flow.

- Rainwater harvesting. Rainwater harvesting is the practice of collecting rainwater from impervious surfaces, such as roofs or patios, and using it for irrigation.

Combinations of these features and similar BMPs are expected to be used in each stormwater treatment area. The options for localized stormwater treatment, along with the stormwater treatment wetland, will be reviewed in detail with SFPUC and the RWQCB, and will be subject to a final Stormwater Control Plan.

ELECTRICITY, NATURAL GAS, AND TELECOMMUNICATIONS

The following discussion summarizes the preliminary design for the proposed dry utility systems (electricity, natural gas, and telecommunications). Master utility plans for the electrical and gas system service will be prepared in coordination with the City and utility providers, as appropriate.

Electricity

The existing electrical power supply for Treasure Island and Yerba Buena Island is from the Davis Substation located at 7th Street and Maritime Street on Port of Oakland property, where power is stepped down to 12 kilovolts ("kV"). The supply uses a 12-kV overhead line to connect to two submarine cables at the Port of Oakland shoreline near the end of the Bay Bridge. The old submarine cable that previously served the Islands has been replaced with two cables, each with adequate capacity to serve the proposed development. No changes are anticipated to be needed in this part of the supply system to adequately serve the Proposed Project and the needs of the U.S.

Coast Guard and Department of Labor Job Corps, although improvements or upgrades to this off-site electrical distribution system could occur in the future and are described below. The existing submarine cable connecting Yerba Buena Island to the Treasure Island power supply is also proposed to remain.

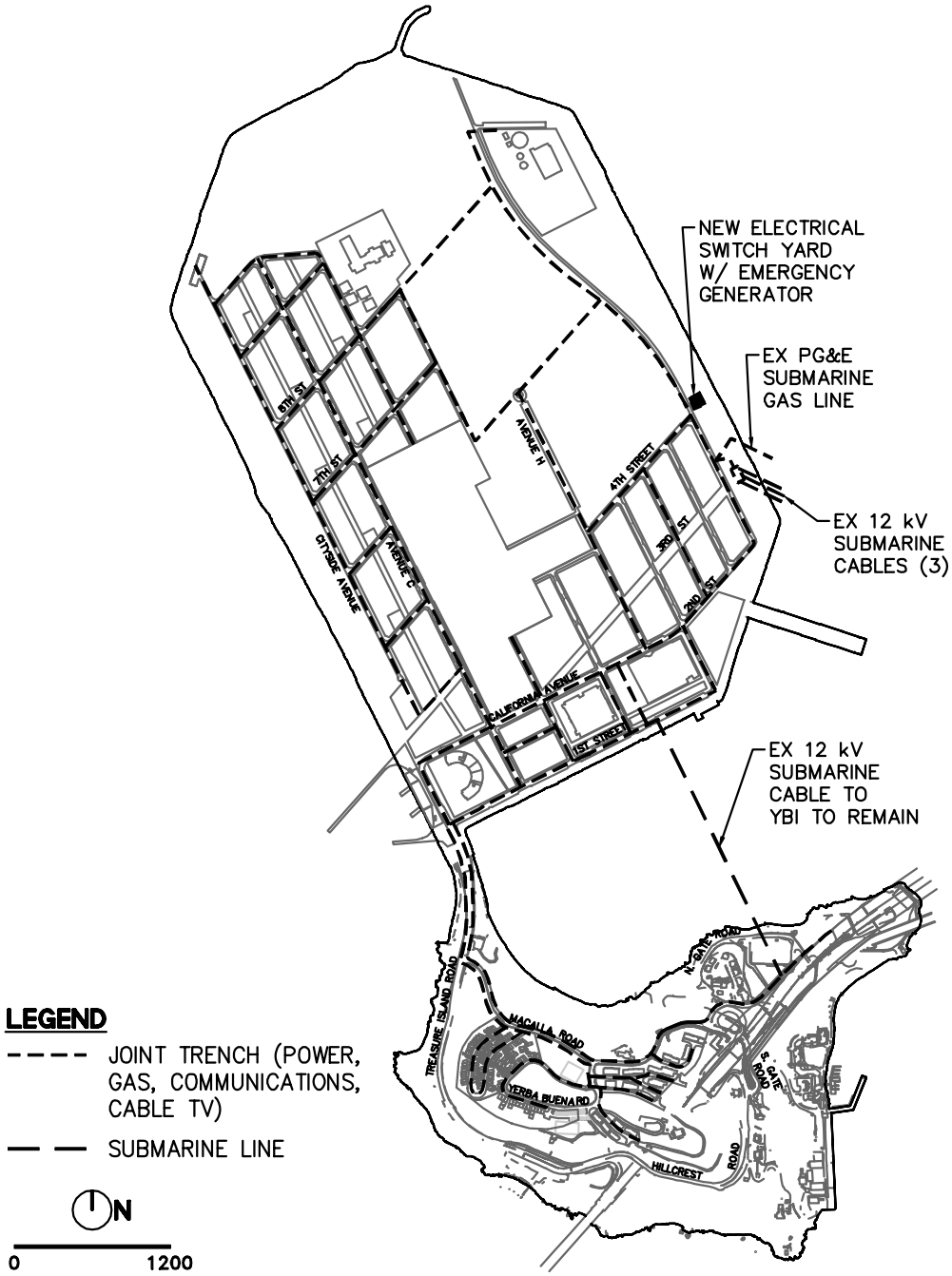
The existing electrical distribution system on Treasure Island and Yerba Buena Island would be replaced in phases during project buildout. The new on-island distribution system would include new switchgear in an outdoor fenced enclosure, connecting to both existing submarine cables, and an underground distribution system in a proposed joint trench layout (see Figure II.18: Proposed Dry Utilities System). The joint trench would follow the proposed roadway layout, and would accommodate electric, natural gas, and telecommunications lines. In order to avoid interruptions, existing service would remain in place until new service is established. The new switchgear would also be connected to two trailer-mounted diesel-powered generators (2 megawatt ["MW"] each) that currently serve as the Islands' source of emergency back-up power. The generators would be relocated near the new switchgear from their existing location near Building 3.

On-Site Generation

The proposed Treasure Island Infrastructure Update includes a renewable energy component, involving solar power and possibly small vertical-axis wind turbines. A minimum of 5 percent of peak power demand would be created through on-site renewable resources. This target would be achieved by designing building rooftops to accommodate photovoltaic systems, potentially using solar water heating, and potentially providing demonstration-level wind energy production.

The Proposed Project also includes strategies that could enable more than 5 percent of estimated peak demand to be generated on site. These could include:

- Involving third-party investors and power providers, through power purchase agreements, or other delivery/business models, in the implementation of renewable energy systems that would produce substantially more than 5 percent of estimated peak demand.
- Encouraging future development of wind power. Wind energy production facilities and locations are expected to be selected at some time in the future and would undergo appropriate environmental review at that time; wind power is not evaluated in this EIR.
- Allowing for solar photovoltaic systems. The draft *Design for Development* would permit development of either ground-mounted or roof-mounted photovoltaic systems. With current technology, about 1.4 to 3 acres of photovoltaic panels would be required to meet the goal of 5 percent of the peak power demand. Roof-mounted panels could also satisfy this goal. The Proposed Project includes Variant A1, which would provide up to 20 acres of ground-mounted photovoltaic panels in open space areas on the eastern or northern shorelines of Treasure Island and/or in the center of the island near the Urban Agricultural Park. A total of 28 acres has been tentatively identified as potentially



SOURCE: BKF

FIGURE II.18: PROPOSED DRY UTILITIES SYSTEM

available for this use. Photovoltaic panels would be oriented to the south and tilted at approximately 20 degrees (from parallel to the ground or a flat roof) to maximize energy generation. If panels were installed on the roofs of historic Buildings 1, 2, or 3, they would be required to meet the *Secretary of the Interior's Standards for Rehabilitation*.

Off-Site Distribution

The electrical service to Treasure Island from Oakland is considered a "radial service;" that is, it has one point of connection to the grid. For demand less than 20 MW, utility best practices do not typically require a redundant service point for reliability.[42] Although the existing capacity is sufficient, a number of upgrades to the existing off-site electrical distribution system could be made to improve capacity, reliability, or redundancy of service. These upgrades could be a combination of several of the following:

- Add fans at the Davis Street Substation to cool equipment, improving capacity and reliability.
- Add switchgear tying the Davis Street Substation to the adjacent Cuthbertson Substation to provide reliability and redundancy.
- Re-conductor the existing overhead distribution line between the Davis Street Substation and the submarine cable, using the existing poles and pole framing, to provide increased capacity.
- Rebuild the existing overhead distribution line at the same or greater capacity, with new poles, between the Davis Street Substation and the submarine cable, to provide additional capacity and reliability.
- Add one or two new underground lines between the Davis Street Substation and the submarine cable, to either expand (one underground line plus existing overhead line) or replace and expand (two underground lines with no overhead line) capacity, reliability, and redundancy.
- Connect the existing submarine cable to the existing PG&E distribution system via a short overhead wire, to provide reliability and redundancy if capacity is available in that part of the distribution system.

The Proposed Project does not include any of the above upgrades. Variants to the Proposed Project that are studied in this EIR include three possible combinations of upgrade: combining both improvements at the Davis Street Substation, to add fans and tie the substation to the adjacent Cuthbertson Substation; adding fans at the Davis Street Substation and undergrounding existing overhead lines; or tying the Davis and Cuthbertson Substations, re-conductoring the existing overhead lines, and connecting the submarine cable to the existing PG&E distribution system. It is less likely that undergrounding the overhead lines would be combined with retaining or improving the overhead lines.

[42] *Treasure Island Infrastructure Update*, Chapter 11, Section 11.2.2.

As noted above, these upgrades may be carried out and are analyzed in this EIR, but none are necessary to serve the proposed development on Treasure Island and Yerba Buena Island.

Natural Gas

It is expected that PG&E would continue to be the natural gas provider. Natural gas would be supplied to the Islands through an existing PG&E submarine pipeline, portions of which have been upgraded as part of the construction of the east span of the Bay Bridge. Proposed natural gas distribution lines would be installed in the joint trench described above. As with electrical service, existing gas lines would be left in place until new infrastructure has been completed to avoid interruptions in service.

Telecommunications

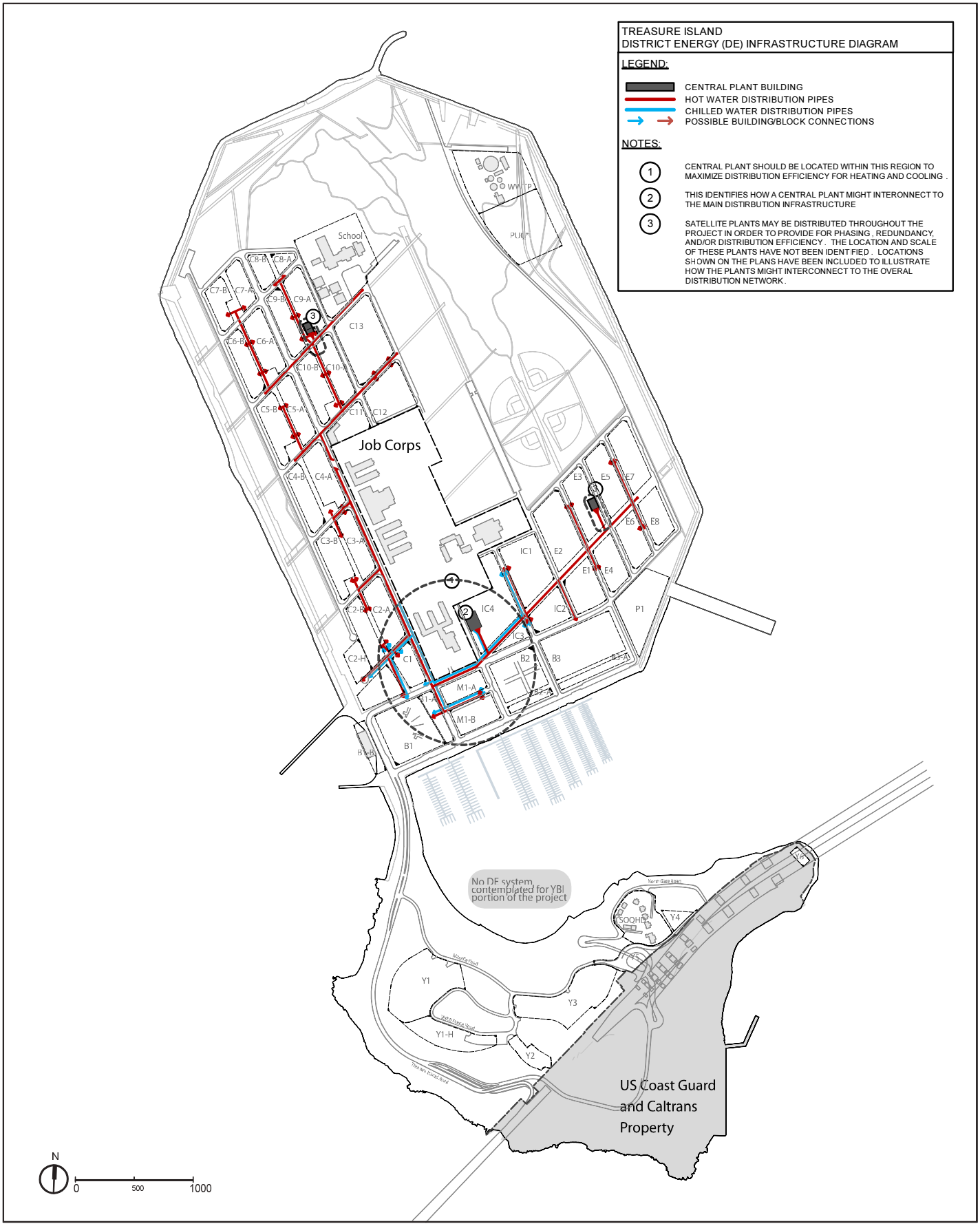
The entire telecommunication system would be replaced as part of the Development Program. Project sponsors will identify, and negotiate with, telecommunication service providers to design and construct a system to serve the Islands. It is anticipated that the telecommunication distribution network would be included in the joint trench described above.

DISTRICT HEATING AND COOLING OPTIONS

Heating and cooling is proposed to be generated in each building, as is typical of residential and commercial buildings throughout San Francisco and the region. However, the project sponsors are considering several central heating and cooling plant variants for Treasure Island. The two main variants under consideration are a district heating and cooling plant with a distribution system for heated and chilled water (Energy Variant A2, discussed in Chapter VI, Project Variants, p. VI.12), or a district plant that would generate power and use the resulting waste heat for heating purposes and/or to chill water for cooling (Energy Variant A3). Subvariants applicable to either option include (A) use of alternative ways to address cooling (heat rejection) with either wet or dry cooling towers or a combination of both; (B) use of satellite plants in the Cityside and Eastside Districts to provide redundancy and/or distribution efficiency; and (C) use of solar thermal collectors to heat water that could provide heat and also drive chillers. All of these variants assume that low-rise residential buildings would not have cooling systems.

The central plant facility would most likely be located in the Island Center area (see Figure II.19: Proposed Representative District Heating and Cooling System), either as a separate structure or integrated into a parking garage. It could vary in size from about 12,000 to 18,000 sq. ft. and from 30 to 40 feet tall, assuming that cooling towers were on the roof.

A central heating and cooling plant (Energy Variant A2) would have natural gas boilers providing "low temperature" hot water (less than 250 degrees), and electrically driven chillers with water-cooled chilling towers. The plant structures would include acoustical insulation to meet the



SOURCE: Arup, TICD

FIGURE II.19: PROPOSED REPRESENTATIVE DISTRICT HEATING AND COOLING SYSTEM

requirements of the San Francisco Noise Ordinance. The plant would also have water treatment equipment for both the heating and chilling processes, pumps, and other similar equipment. Cooling towers require high volumes of air to reject the heat from the chilling process; therefore, it is assumed that they would be on the roof of the plant. Architectural and acoustical screening would be used around the cooling towers, with sufficient clearances to allow for necessary air circulation. Baffles would be installed with the cooling towers to limit "drift"—droplets of water that are carried out of the cooling tower with tower exhaust air. (These baffles are called drift eliminators.) Water treatment chemicals would be used to remove scale and avoid corrosion of pipes and equipment, address hard or soft water conditions, and otherwise maintain equipment efficiency. Back-up generators may be provided, along with fuel storage for the generators.

Heated and chilled water for heating and cooling buildings would be distributed through hydronic piping networks using 12-inch pipes and pumps providing flows of about 2,800 gallons per minute for hot water and 2,200 gallons per minute for chilled water. The pipe systems would be sufficiently separated to avoid transfer of heat between the two systems. Buildings that use this heated and chilled water would not be required to construct individual building-level heating and cooling plans.

A subvariant to use dry cooling towers or a combination of dry and wet cooling towers could be selected (Energy Subvariant A). Dry cooling towers would be about 30 to 50 percent larger and taller than wet cooling towers.

If satellite district plants were included as in Energy Subvariant B, they would be located in the residential neighborhoods on Treasure Island and would be built in phases as development occurs to serve nearby buildings. Satellite facilities would have smaller footprints than the central plant, would be a similar height, with acoustical and architectural screening, and could either be separate structures or be integrated into one or more buildings in their neighborhood. Inclusion of satellite district plants would allow the central plant to be smaller, but the overall footprint of all facilities in this subvariant would be larger than with the use of one central plant.

A subvariant to integrate solar thermal panels with the central plant is also under consideration (Energy Subvariant C). The collectors would be on building roofs or the upper level of a parking structure, adjacent to the central heating and cooling plant. Other equipment to operate the solar collectors would include pumps, heat exchangers, storage tanks, and control systems in an approximately 800-square-foot structure for about 10,000 sq. ft. of solar collectors. The hot water generated would be used either in the heating system or to drive an absorption chiller to produce chilled water.

Energy Variant A3 would provide heating and cooling, as with the Central Plant in Energy Variant A2, and would also generate about 1 to 3 MW of electricity. This variant would likely use natural gas-fired steam boilers for heating and making steam, and steam turbines or natural

gas-fired combustion turbines to produce electricity. Waste heat from the turbines would be captured and converted to heat water via a heat exchanger or used in absorption chillers to make chilled water. Cooling towers would still be needed, as for the central heating and cooling plant. Back-up generators may be provided, along with fuel storage for the generators. Other features and the size of this central plant would be similar to those described for the central plant without power generation.

H. GEOTECHNICAL STABILIZATION

The proposed geotechnical stabilization is intended to improve seismic safety on the Islands and to meet all applicable building and seismic safety standards. As outlined in the *Treasure Island Infrastructure Update*, the proposed geotechnical stabilization would address the following major components:

- Stabilization of the causeway connecting Treasure Island and Yerba Buena Island;
- Densification of existing fill throughout the portions of the development area on Treasure Island where buildings and roads are proposed to be built;
- Elevation of the ground surface in areas proposed for development on Treasure Island with fill to compensate for lowering caused by densification and to provide long-term protection against flooding and drainage, including an allowance for estimated potential future sea level rise;
- Strengthening and raising the perimeter berm around Treasure Island;
- Surcharging to reduce or avoid effects of future settlement of Young Bay Mud beneath the existing fill in the development area of Treasure Island;
- Construction of appropriate building foundations on Treasure Island, to include one or two basement levels for most buildings except townhomes and, in general, pile foundations for buildings over ten stories; and
- Repair and rebuilding of concrete retaining walls on Yerba Buena Island as necessary.

CAUSEWAY IMPROVEMENTS

The causeway is an on-grade roadway constructed on fill connecting Yerba Buena Island to Treasure Island. In addition to being the only vehicular access route to Treasure Island, the causeway also contains water supply mains and telecommunications lines serving Treasure Island. The causeway connecting Treasure Island and Yerba Buena Island would be stabilized through densification. The likely geotechnical techniques to strengthen the embankment of the causeway include deep dynamic compaction, vibro-compaction, and vibro-replacement, all described below under "Densification of Areas to Be Developed."

DENSIFICATION OF AREAS TO BE DEVELOPED

Treasure Island is made up of sandy shoal areas and dredged sand fill to depths up to 50 feet below the ground surface. These sands are subject to liquefaction and settlement during

earthquakes. Settlement could also occur due to continued consolidation of the Young Bay Mud under the sand fill. Densification of these sandy soils is proposed to create a stable "platform" in the approximately 100-acre area proposed to be developed with new buildings and roads (see Figure IV.N.2: Areas of Proposed Geotechnical Improvements, in Section IV.N, Geology and Soils, on p. IV.N.26). The techniques likely to be used on Treasure Island are deep dynamic compaction (repeatedly dropping a large weight onto the soil), and vibro-compaction (using a vibrating probe). Vibro-replacement may also be used in areas near existing buildings (including the Job Corps buildings) or along the perimeter; this method is initiated with vibro-compaction and the hole left by the vibration probe is filled with gravel to create a stone "column."

In addition to densification, development areas would generally be surcharged. Whereas densification improves the strength of the sand layer, surcharging preloads the layer of Young Bay Mud that lies beneath the 50 feet of sand, minimizing the impact of gradual settlement from the placement of new fill or building weight on the densified sand layer. Surcharging is anticipated to involve temporarily placing approximately 15 to 30 feet of soil on the area to be surcharged. The material, acting as a static weight on the underlying compressible soils, is then left in place for a period of time; the surcharge height and exact length of time would be determined during a design-level geotechnical study. Prefabricated vertical (wick) drains may be placed during the surcharge to accelerate the process. Following completion of the surcharge program, the surcharge soil is removed to the depth of proposed finished grades.

The large open space areas in the northeast corner of Treasure Island would not be densified or surcharged. Geotechnical improvements would not be made on the Job Corps site.

ELEVATION OF TREASURE ISLAND GROUND SURFACE

Densification would result in lowering the existing ground surface. Fill is proposed to be used to raise the surface, to compensate for the change due to densification, and also to raise the surface of the entire development area to a level that would provide long-term protection from flooding during storm surges and/or from estimated potential future sea-level rise. Fill material would be obtained from excavation of building basements, grading in undeveloped areas, and from off-site sources, where possible. The thickness of the fill would vary from approximately 2 to 7 feet, with the minimum finished floor elevations in new buildings proposed to be approximately 12.6 feet NAVD88. The proposed elevation of the new ground surface in the developed area takes into account current storm drainage and freeboard requirements, as well as an allowance for potential sea level rise of up to 3 feet. Overall amounts of fill materials are provided below in Section I, Proposed Grading, p. II.76.

Minor amounts of cut and fill are proposed in the large open space area in the northeast corner of Treasure Island; grading of the open spaces is planned to create varied terrain in The Wilds area

of the Great Park. Similarly, minor cut and fill is proposed in the sports complex area northeast of the Eastside District.

No grade changes are proposed where existing buildings would remain: on the Job Corps campus, the existing school, and Buildings 1, 2, and 3. The difference in grade between raised developed areas and adjacent existing areas to remain would vary, but would generally be less than 2 feet. These differences would be accounted for on the land that is being raised by gradually grading out the elevation difference or treating it architecturally through low-seat walls or planters.

STRENGTHENING OF TREASURE ISLAND PERIMETER BERM

Portions of the perimeter of Treasure Island would need to be strengthened. Detailed study and laboratory analyses of the perimeter would be conducted prior to construction. If these studies indicate that all or portions of the perimeter need strengthening, the proposed approach would include densification of the fills via impact or vibratory methods, temporary surcharging, or using deep soil mixing or jet grout techniques to create vertical soil-cement columns. The work would be done in a 50-foot-wide area inside the existing shoreline riprap and dike, with no construction activities proposed on the waterside of the berm.

It is likely that, following any strengthening work, portions of the perimeter berm would need to be raised. The finished height for the berm would vary around the perimeter in response to the differing wind and wave conditions that exist in different locations. It is estimated that on the north and west sides of Treasure Island, the perimeter berm would be raised to heights of about 14 to 16 feet. The perimeter berm could be raised further in the future, in response to more frequent wave overtopping resulting from rise in sea level coupled with increased wave action.

BUILDING FOUNDATIONS

The type of foundation used for each building within the Development Plan Area would be based on a detailed geotechnical exploration for the building site. Foundation systems on Treasure Island would range from mat foundations for low-rise buildings and one-level basements, and mat foundations for most mid-rise buildings up to ten stories, to pile foundations and one- or two-level basements for high-rise buildings, depending on site-specific subsurface conditions.

As discussed above, surcharging is likely to be necessary before individual building foundations are constructed for most buildings on Treasure Island, to limit settlement. Flexible utility connections and transition slabs around the buildings would be used to accommodate additional settlement.

The majority of the proposed buildings on Yerba Buena Island would be two to four stories tall, and would likely use shallow mat, spread footings with slab-on-grade or drilled pier foundations.

The mid-rise buildings that could be constructed on Yerba Buena Island would likely have drilled pier, slab-on-grade, or thickened mat foundations.

I. PROPOSED GRADING

A Master Grading and Drainage Plan will be prepared for the Proposed Project. The Master Grading Plan would be developed in consultation with the City.

On Treasure Island, the proposed grading for the development would be dictated in part by a combination of the 1 percent chance of flooding due to a 100-year high tide under existing circumstances, allowances for estimated potential future sea level rise of up to 36 inches in development parcel areas (including streets and utilities), and anticipated settlement of the Bay Mud beneath the island. Accounting for these factors, the minimum finished floor elevations on the development sites would need to be at least 12.6 feet NAVD88. Existing ground elevations range from about 6 feet to 14 feet NAVD88.

As noted in the discussion of geotechnical stabilization, elevation of the ground surface for the developed areas of Treasure Island would ensure that these areas are outside the Federal Emergency Management Agency floodplain zones. Perimeter improvements would raise the ground level in these areas, providing protection from wave run-up during unusual storm surges or tsunami. The perimeter berm could be raised in the future adjacent to the open space areas if necessary to avoid frequent overtopping as a result of estimated potential sea level rise. Similarly, a short wall (approximately 2 feet) could be constructed along the southern perimeter within the proposed pedestrian promenade area to protect this portion of the island in the event of sea level rise; such a wall could be treated as a seating area. A range of features to address potential sea level rise could be made, as needed, depending on edge conditions and wave run-up characteristics.

Grading on Yerba Buena Island would be mainly for improving roads for access, preparing development pads, and erosion control. The existing topography would be retained wherever possible.

The combination of geotechnical stabilization and increased ground elevations for Treasure Island would require approximately 2 million cubic yards of soil fill. Excavation for building basements would generate approximately 0.5 million cubic yards of fill material, and grading in the open space areas would generate approximately 0.4 million cubic yards. Up to 100,000 cubic yards of fill material could be generated from grading on Yerba Buena Island. The remaining approximately 1.1 million cubic yards of fill material would need to be imported to the project site. Grading would be completed in phases over approximately 10 to 15 years, coinciding with geotechnical stabilization and phased building construction. Imported soil would be barged and/or trucked to the site. If only barges were used, approximately 1,000 barge round trips would

be required; if trucks were used, approximately 110,000 round trips would be required.[43] It is likely that a combination of barges and trucks would be used.

J. PROPOSED SUSTAINABILITY PLAN

A major component of the Proposed Project is the *Sustainability Plan*. The *Sustainability Plan* documents the guiding principles for the Development Program and identifies implementation measures to be undertaken by TICD and other stakeholders. The *Sustainability Plan* includes a framework that encompasses ten key focus areas:

- Site design and land use;
- Landscape and biodiversity;
- Transportation;
- Energy;
- Water and wastewater;
- Solid waste;
- Materials;
- Health, safety, and security;
- Community and society; and
- Economic development and viability.

A series of specific goals and obligations has been established for each of the focus areas; the plan includes strategies and targets to support each goal.

Many of these measures are integral to the Proposed Project, and are intended to facilitate progressively higher levels of sustainability over time. These include the proposed residential densities, proximity to transit facilities, orientation of streets and buildings, and green building specifications, which would be incorporated into the Proposed Project's *Design for Development* guidelines and conditions of approval. In addition, the Proposed Project would include strategies intended to achieve Gold certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design-2009 for Neighborhood Development ("LEED-ND") rating system, and good-faith efforts to achieve Platinum certification.

Because new technologies and higher performance standards would likely emerge during the phased buildout of the Proposed Project and beyond, the *Sustainability Plan* also describes goals, strategies, and targets that could be achieved through collaboration between TIDA, TICD, other government agencies, utility providers, and various organizations. These include a number of proposed transportation strategies, including transit-oriented development, parking capacity

[43] *Treasure Island Infrastructure Plan*, Section 5.6.

controls, congestion pricing, ramp metering, and a comprehensive TDM program, including the establishment of an on-island transportation coordination office intended to achieve greater sustainability through reduced automobile use. Other strategies include provision of infrastructure to maximize the on-site production of renewable energy as technologies and delivery mechanisms become available; a parks and open space program to create, restore, and maintain habitat and landscape areas; and other features that would reduce potable water usage. A number of the variants studied in this EIR are intended to implement these sustainability goals, in the event the variants become feasible projects over time.

TICD has committed to include the following sustainability components in the Proposed Project:

- Green building specifications for all new buildings in the Development Plan Area, which would be incorporated into the project design guidelines and conditions of approval;
- Strategies intended to achieve Gold certification under the LEED-ND rating system (TICD would use good faith efforts to achieve Platinum certification, the highest level);
- The proposed *Land Use Plan*, which includes a dense, compact, walkable design around an intermodal Transit Hub; orientation of streets and buildings to maximize the effects of sun and minimize the effects of wind; and the establishment of neighborhood-serving retail and services;
- The *Land Use Plan*'s proposed open space elements, which include (among other components) the use of native or regionally appropriate species for landscaping, protection of sensitive species in accordance with applicable laws, and establishment of a temporary plant nursery for the propagation of native species;
- Those elements of the transportation programs included in the proposed *Transportation Plan* and corresponding funding for capital improvements and operating subsidies that are identified in the *Sustainability Plan* and DDA as being funded by TICD;
- Design standards that require most building roofs to enable the installation of photovoltaic panels;
- Infrastructure system components including stormwater treatment wetlands, water storage, and a recycling and composting center;
- Measures to protect public health and safety including supplemental environmental remediation, geotechnical stabilization, and emergency support services;
- Deconstruction and re-use of existing buildings and materials;
- Adaptive re-use of existing historic structures;
- Provision of public and community facilities;
- Affordable housing, including a transition housing component; and
- A Jobs and Equal Opportunity Program.

In addition, TICD would commit to good faith efforts to work toward implementing other stated goals and objectives of the *Sustainability Plan*.

- In May 2009, the Proposed Project was selected as one of a total of 17 projects worldwide to join the Climate Positive Development Program, a joint initiative of the Clinton Climate Initiative, a project of the William J. Clinton Foundation, and the U.S. Green Building Council. The Climate Positive Development Program supports the development of large-scale urban projects that are striving to reduce the amount of on-site greenhouse gas emissions to below zero. The Climate Positive Development Program was created to meet the dual challenge of rapid urban growth and climate change by setting a new global benchmark for leadership in large-scale urban development. The Proposed Project is participating in the program's efforts to develop a "Climate+" greenhouse gas metric and measurement standard. The Proposed Project is also leveraging the program's technical support, business and financial analysis, and partnership facilitation to advance the sustainability and renewable energy objectives of the Proposed Project.

K. PROJECT PHASING AND CONSTRUCTION

Construction and buildout of the proposed Development Program would be phased and would be anticipated to occur over an approximate 15- to 20-year period. Assuming that construction would begin in approximately 2011, the last building constructed would be ready for occupancy in about 2030. However, the actual timing of construction would depend on market conditions and other factors.

The Development Program is expected to involve four major phases. The first phase would include the installation of the infrastructure backbone and portions of the geotechnical stabilization; the subsequent phases would include the extension of infrastructure and ground improvements and the development of the residential, commercial, open space/recreational, cultural, and institutional and public uses. The second phase is expected to overlap with the first phase; phases three and four may also overlap with other phases.

To ensure that existing households are accommodated in the proposed redevelopment, the Proposed Project would include a transition housing program for all eligible residents of the Islands at the time of the execution of the DDA who continuously remain Island residents in good standing during project development.

Affordable housing would be constructed in phases such that approximately 30 percent of the residential units in each phase would be affordable housing. Infrastructure and public facilities would be phased with the intent of providing continuous service to existing residents and businesses. Open space and recreational uses would be developed proportionally with the proposed housing and commercial uses; the proposed Great Park would be developed in the final phase to allow retention of the existing housing in that location until that time.

To the extent practical, existing structures would be "deconstructed," allowing for reuse or recycling of wood, concrete, metals, and other materials. Demolition/deconstruction would begin

with removal and abatement of any hazardous materials such as lead paint and asbestos. Where possible, concrete and asphalt pavements would be recycled or used on site or made available for use elsewhere; a concrete/asphalt crushing plant would be operated on Treasure Island to assist in recycling/reuse of these materials. The crushing plant would be a temporary facility in use for up to 15 years. It would be placed on different sites, located for efficiency during the various demolition and construction phases, taking into consideration the need to limit impacts on existing and future businesses and residents. It would occupy approximately 3 to 5 acres and would operate on weekdays during typical construction hours of about 7:00 a.m. to about 3:00 or 4:00 p.m. Mounds of materials could be 10 to 30 feet high. Metals in utilities would be recycled as feasible. Significant trees and other major plantings would be retained or relocated whenever feasible based on an arborist's report, or recycled by composting for on-site uses. Plants to be retained would be relocated to a temporary nursery until they could be permanently installed in new locations. A Master Deconstruction and Demolition Plan would be prepared according to the City's requirements, and would likely identify hazardous materials on a building-by-building basis, list recyclable materials, and recommend demolition or deconstruction as the preferred approach for each building.

The proposed demolition and deconstruction would likely occur in three main phases in conjunction with building construction. Each phase of demolition would include work in several smaller areas to tailor the demolition/deconstruction process to the area required for individual building sites in each phase, allowing existing utilities and streets serving active uses to remain in place as long as possible.

As the Development Program is implemented, the phasing could be adjusted for economic or constructability reasons, to the extent permitted by the DDA. It is anticipated that the DDA will provide flexibility in implementing the Proposed Project and permit modifications to the phasing. Such adjustments to the phasing could affect the number, order, and timing of phases. This flexibility is necessary for a project of this length and complexity in order to respond to availability of contractors and materials in the marketplace as well as possible changes in market conditions, including both the capital and housing markets. For purposes of this analysis, a representative phasing plan was analyzed. The major components of the representative phasing that are assumed in this analysis include the following:

Phase 1 (Infrastructure Only)

- Stabilization of causeway;
- Establishment of construction staging area around Pier 1 on Treasure Island;
- In areas adjacent to Phase 1 and Phase 2 development sites, stabilization of perimeter and regrading;

- Remediation of sites within Phase 1 to standards required by applicable regulatory agencies (to the extent that such remediation is not required to be performed by the Navy under applicable Federal Base Closure law prior to transfer);
- Construction of Ferry Terminal;
- Start of construction of bike and pedestrian paths;
- Establishment of on-site plant nursery;
- Ground improvement, including compaction, surcharge, and placement of fill to raise some ground surfaces in initial development areas on Treasure Island;
- Construction of initial backbone infrastructure; and
- Start of deconstruction activities, including deconstruction of the existing residential units on Yerba Buena Island.

Phase 2 (Building Construction and Associated Infrastructure; would occur with Phase 1)

- Remediation of sites within Phase 2 to standards required by applicable regulatory agencies (to the extent that such remediation is not required to be performed by the Navy under applicable Federal Base Closure law prior to transfer);
- Development of residential units in a portion of the Cityside District on Treasure Island and residential units on Yerba Buena Island;
- Construction and installation of new water storage tanks and infrastructure improvements on Yerba Buena Island;
- Development of neighborhood-serving retail uses, Transit Hub, and maritime support uses in the Island Center District on Treasure Island;
- Development of southern portion of Cityside Waterfront Park;
- Implementation of bus and ferry service and TDM measures by TITMA;
- Renovation of Building 2 on Treasure Island;
- Construction of Clipper Cove Marina edge and Sailing Center improvements;
- Construction of police/fire facility;
- Renovation or reconstruction and reopening of Treasure Island school;
- Establishment of localized stormwater measures (BMPs); and
- Phased construction of wastewater treatment and recycled water facilities (by SFPUC).

Phase 3 (Building Construction and Associated Infrastructure)

- Remediation of sites within Phase 3 to standards required by applicable regulatory agencies (to the extent that such remediation is not required to be performed by the Navy under applicable Federal Base Closure law prior to transfer);
- Development of residential units, linear park, and portions of Eastern Shoreline Park in the Eastside District on Treasure Island and new residential units in Yerba Buena Island East area;

- Establishment of localized stormwater measures (BMPs) and stormwater wetlands, continued from Phase 2;
- Phased construction of wastewater treatment and recycled water facilities (by SFPUC) continued from Phase 2;
- Additional development of retail district in the Island Center District behind Building 1;
- Renovation of Building 1 on Treasure Island;
- Development of the regional sports complex on Treasure Island; and
- Development of hotel on Yerba Buena Island.

Phase 4 (Building Construction and Associated Infrastructure)

- Remediation of sites within Phase 4 to standards required by applicable regulatory agencies (to the extent that such remediation is not required to be performed by the Navy under applicable Federal Base Closure law prior to transfer);
- Development of remaining residential units in Cityside and Island Center Districts, Main Tower in Island Center District, and hotel uses on Treasure Island;
- Development of remaining portion of Cityside Waterfront Park;
- Development of the Great Park on Treasure Island;
- Development of the Cultural Park around the existing Navy chapel, which would be retained;
- Renovation of Building 3 on Treasure Island;
- Development of the Senior Officers' Quarters Historic District and landscaping improvements on Yerba Buena Island;
- Development of Urban Agricultural Park;
- Development of Pier 1 facilities; and
- Demolition of temporary utilities and other temporary facilities.

Construction materials would be transported to Treasure Island by a combination of trucks and/or barges, which would be off-loaded at Pier 1 on the east side of the island and then trucked to each construction site. Construction equipment would generally be trucked to Treasure Island.

L. INTENDED USES OF THE EIR

The Planning Department will distribute the Draft EIR to State agencies through the State Clearinghouse, to local agencies, and to interested members of the public. Following publication of the Draft EIR there will be a 45-day written comment period and a joint public hearing before the San Francisco Planning Commission and TIDA to solicit public comment on the adequacy and accuracy of the Draft EIR. At the close of the comment period, the Planning Department will prepare responses to written and oral comments, including revisions to the Draft EIR text where appropriate, and will publish these in a Comments and Responses document. The Planning Department will present the Draft EIR and Comments & Responses to the Planning Commission

and TIDA for certification as to their accuracy, objectivity, and completeness. Certification of the Final EIR (Planning Commission and TIDA as joint lead agencies, appealable to Board of Supervisors) is required before any discretionary approvals or permits can be issued.

Ultimately, TIDA and the San Francisco Planning Commission would consider an action recommending that the Board of Supervisors approve the Area Plan/SUD, and the San Francisco Board of Supervisors would consider approval of the plan. The Area Plan/SUD would define the boundaries of the Project Area and set forth land use guidelines such as the basic land use designations and allowable land uses, and maximum development and heights. In addition, the SUD would incorporate by reference a *Design for Development*, which would establish specific land use controls, development standards, and design guidelines. TIDA would also adopt a *Design Review and Document Approval Procedure*, which would set forth the approval processes and standards for development. The *Design Review and Document Approval Procedure* would be an attachment to the DDA. All City departments having jurisdiction over part or all of the project site would also approve and enter into an Interagency Cooperation Agreement that would set forth the procedures and standards for permit review. Additionally, all City agencies providing services to the Islands would approve and enter into a Sustainability Memorandum of Agreement to use best faith efforts to deliver services in a manner that is consistent with the sustainability goals of the Proposed Project.

As described in "Existing Zoning and the Tidelands Trust Exchange," on p. II.14, the Islands include areas that would be subject to the Tidelands Trust upon transfer from the Navy. The Tidelands Trust generally prohibits residential, general office, non-maritime industrial, and certain recreational uses. Under an Exchange Agreement authorized by the California State Legislature, the Trust would be lifted from the portions of Treasure Island that are planned for residential and other non-Trust uses and transferred to portions of Yerba Buena Island that currently are not subject to the Trust.

The EIR is intended to be a project-level EIR on the Area Plan/SUD and the Development Program. The required approvals for the Proposed Project include (but are not limited to) the following:

- Adoption of CEQA findings and mitigation monitoring program (TIDA, Planning Commission, Board of Supervisors, SFMTA, SFPUC, SFDPW);
- Actions on Planning Code, Zoning Map, and *General Plan* amendments (Planning Commission, Board of Supervisors), including adoption of Area Plan and SUD;
- Planning Code Section 101.1 (Priority Policies) and *General Plan* findings for the Area Plan/SUD (Planning Commission, Board of Supervisors);
- Approval of DDA and related transactional documents (TIDA, Board of Supervisors);

- Recommendation by TIDA to adopt Area Plan/SUD (TIDA);
- Filing report and recommendation for approval of Area Plan with the Board of Supervisors by the Planning Commission (waived if no action within 30 days after receipt of Area Plan);
- Adoption of *Design for Development* (TIDA and Planning Commission, subject to final approval of DDA by Board of Supervisors);
- Adoption of a Treasure Island/Yerba Buena Island Subdivision Code (Board of Supervisors);
- Adoption of Owner Participation Rules (TIDA);
- Approval of an Interagency Cooperation Agreement (TIDA, San Francisco Board of Supervisors, SFMTA, SFPUC, San Francisco Port Commission, SFFD, SFDPW);
- Approval of subdivision maps (SFDPW, Board of Supervisors);
- Approval of Tidelands Trust Exchange Agreement (TIDA, Board of Supervisors, State Lands Commission);
- Permits for fill and dredging in San Francisco Bay and improvements within the 100-foot shoreline band (San Francisco Bay Conservation and Development Commission), which may include consultation with the California Department of Fish and Game or other agencies as directed by BCDC;
- Section 10 and/or 404 permit(s) (U.S. Army Corps of Engineers, after agency consultation), including, if and as required, consultation with the U.S. Fish and Wildlife Service, NOAA, and other agencies as directed the Corps of Engineers;
- Encroachment permit if construction occurs in right-of-way owned by the California Department of Transportation (Caltrans District 4);
- Water quality certification, NPDES permit, and waste discharge requirements (Regional Water Quality Control Board);
- Approval of agreement between TIDA and SFPUC for the financing, construction, operations, and maintenance of the proposed wastewater treatment plant and recycled water plant and transfer of the 4- to 6-acre parcel from TIDA to the SFPUC;
- Approval of permits (such as Authority to Construct and Permit to Operate) if a new wastewater treatment plant is constructed (Bay Area Air Quality Management District);
- Approval of operating agreement for supplemental (emergency) water supply line from Oakland (EBMUD);
- Creation or designation of a Treasure Island Transportation Management Agency (Board of Supervisors);
- Approval of metering system for Bay Bridge ramps (Caltrans) if located on Caltrans property; and
- Demolition and building permits for individual projects within the Development Plan Area (DBI).

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
9	2002 CAP	Section 2.5	Final Corrective Action Plan for Sites 06, 14/22, 15, and 25, Naval Station Treasure Island, San Francisco, California. Tetra Tech EM Inc. June 28, 2002. Section 4.2 and Tables 4-4, 4-5, and 4-6.

4.2 RISK BASED SCREENING EVALUATION

The following subsections present the steps involved in the screening evaluations for shallow soil and groundwater at Site 06.

4.2.1 Site 06 – Shallow Soil Risk Evaluation

The screening evaluation at Site 06 was conducted using industrial screening criteria, as the Navy has determined that industrial reuse is appropriate for this site. The 0- to 5.5-foot-bgs depth interval represented the vadose zone for shallow soil at Site 06.

Step 1 – The constituents detected in shallow soil at Site 06 are identified in Table 4-4.

Step 2 – Table 4-4 summarizes the results of the comparison of constituent concentrations detected in samples of shallow soil at Site 06 with the corresponding human health screening criteria. The summary includes the number of detections that exceeded the selected industrial soil screening criteria and the specific criteria used. The constituents that exceeded the selected screening criteria, their sampling locations, their detected concentrations, and the specific criteria used at Site 06 are presented below.

Analyte	Sampling Location	Detected Concentration (mg/kg)	Soil Screening Criteria (mg/kg)
Xylene	06-SB01	1.7	1
	06-HP023	1.2	
Arsenic	SS-4-04	15.8	10
	06-HP057	13.1	
	06-HP008	10.4	
OCDD	06-HP023	0.0041	0.0039

Notes:

mg/kg Milligram per kilogram
OCDD Octachlorodibenzo-p-dioxin

Step 3 – Spatial analysis combined with information on chemical composition and ambient level was used to further evaluate xylene, arsenic, and OCDD in Step 3.

The concentrations of the two detections of xylene above the screening criterion (1.7 and 1.2 mg/kg) are only slighted elevated over the RBSL screening criterion of 1.0 mg/kg. This RBSL value is based on a target HI of 0.2 to accommodate the potential for additive effects of multiple chemicals. An RBSL based on a target HI of 1 is appropriate in cases such as this, with only one chemical detected at concentrations near the RBSL. Neither of the two concentrations of xylene exceeds the screening criterion based on a target HI of 1 (5 mg/kg).

Concentrations of arsenic in three soil samples exceeded the 95th percentile concentration in the ambient data set, and two of those concentrations were within the range of the ambient data set. A statistical comparison of the concentrations of arsenic at Site 06 and the ambient arsenic data set using the Wilcoxon rank sum (WRS) test indicated that the concentrations at Site 06 were not significantly different from the ambient data set. The results are summarized below:

Wilcoxon Rank Sum Test Results – Arsenic in Soil at Site 06		
	Ambient Data Set	**Site 06 Data Set**
Sample Size	231	46
WRS Test Statistic	6,749.5	
Standardized Score (Z)	0.7156	
Probability (p–value)	0.23	

The null hypothesis (H_o) in the WRS test is that the median concentration of arsenic at the site is less than or equal to the median concentration in the ambient population. If the probability (p-value) for the WRS test is less than 0.05, H_o is rejected and it is concluded that the median site concentration exceeds the median ambient concentration. The test p-value of 0.23 indicates that the median concentration of arsenic at Site 06 is not significantly greater than the median ambient concentration. Additionally, the locations of the highest concentrations of arsenic at Site 06 and the overall spatial distribution of the arsenic concentrations at Site 06 do not indicate that a source of arsenic was present or that a release of arsenic had occurred at the site. Based on these considerations, the concentrations of arsenic detected in soil at Site 06 were considered to represent ambient concentrations, and no remedy is recommended for arsenic.

Although the concentration of OCDD at sampling location 06-HP023 (0.004 mg/kg) nominally exceeds the screening criterion (0.0039 mg/kg), it was not evaluated further because the two values are not meaningfully different. The precision in estimates of cancer risk precludes use of more than one significant figure in the values compared. That is, a more appropriate expression of the screening criterion is 0.004 mg/kg, which is not exceeded by the measured concentration.

Step 4 – No detected constituents need be remediated in shallow soil at Site 06.

4.2.2 Site 06 – Groundwater Risk Evaluation

Groundwater at Site 06 was encountered at depths between 3.0 and 7.9 feet bgs. Groundwater flows toward the shoreline (north) at an average gradient of 0.0023 foot per foot.

Step 1 – The constituents detected in groundwater at Site 06 are identified in Table 4-6.

Step 2 – Table 4-6 summarizes the results of the comparison of constituent concentrations detected in groundwater at Site 06 with the corresponding human health and ecological screening criteria. The summary includes the number of detections that exceeded the selected human health and ecological screening criteria, as well as the specific criteria used. The constituents that exceeded the selected screening criteria, their sampling locations, their detected concentrations, and the specific criteria used at Site 06 are presented below.

Analyte	Sampling Location	Detected Concentration (µg/L)[a]	Human Health Groundwater Screening Criteria (µg/L)[a]	Ecological Groundwater Screening Criteria (µg/L)[a]
TPH as diesel (mg/L)[a]	06-MW01	10; 4; 3.5	NC	**1.4**
	06-MW21	3.4		
	06-MW22	7.7; 1.5		
TPH as motor oil (mg/L)[a]	06-MW01	2	NC	**1.4**
TPH as gasoline (mg/L)[a]	06-MW01	57.5; 48.5; 34; 16.7	NC	**1.4**
Benzene	06-MW01	5,600; 5,350; 4,900; 2,175	**46**	**71**
	06-MW23	100; 85.5; 81		
Ethylbenzene	06-MW01	1,800; 1,750; 1,600; 758.5	**290**	29,000
Toluene	06-MW01	11,000; 9,550; 6,100; 3,145	**130**	**5,000**
Xylene (Total)	06-MW01	10,500; 9,450; 9,200; 6,100; 2,800	**13**	NC
	06-MW02	50.5; 34		
Chloroform	06-MW16	39	**28**	470
Isopropylbenzene	06MW-01	85; 49.2	**46**	**71**
2-Methylnaphthalene	06-MW01	95.5; 62	NC	**60**
Naphthalene	06-MW01	310; 250; 270; 67.5	**24**	470
Bis(2-ethylhexyl)phthalate	06-MW23	180	**5.9**	**5.9**
Chrysene	06-MW03	0.06	**0.049**	**0.049**
Aluminum	06-MW21	68.5	**27**	**27**
	06-MW22	26,900		

Analyte	Sampling Location	Detected Concentration (µg/L)[a]	Human Health Groundwater Screening Criteria (µg/L)[a]	Ecological Groundwater Screening Criteria (µg/L)[a]
Arsenic	06-MW01	65.2; 56.95; 51.75; 50.9	**15**	**15**
	06-MW02	55.1; 50.6; 42.1; 32.45		
	06-MW07	24.6; 15.8		
	06-MW10	19.3		
	06-MW14	18.6		
	06-MW17	17.3; 16.1		
	06-MW18	21.9; 19.7; 18.9		
	06-MW21	65.3; 62.2; 55.2; 53.1; 32.2		
	06-MW22	175; 128; 122.5; 113; 107; 81.6		
	06-MW23	30.9; 28.2; 23.7; 22.6; 20.6		
	06-MW24	23.8; 19.8; 19.1; 18.1		

Analyte	Sampling Location	Detected Concentration (µg/L)[a]	Human Health Groundwater Screening Criteria (µg/L)[a]	Ecological Groundwater Screening Criteria (µg/L)[a]
Beryllium	06-MW01	0.65; 0.325	**0.04**	**0.04**
	06-MW03	0.11		
	06-MW07	0.16		
	06-MW10	0.13		
	06-MW18	0.15		
	06-MW21	0.53; 0.38; 0.17		
	06-MW22	0.84; 0.62; 0.42		
	06-MW24	0.21		
Cadmium	06-MW01	9.85	**0.27**	**9.3**
	06-MW02	11.7		
	06-MW03	10		
	06-MW07	6.8		
	06-MW10	8.5		
	06-MW14	7.6		
	06-MW15	0.6		
	06-MW16	0.61		
	06-MW18	0.48		
	06-MW19	0.65		
	06-MW22	0.4		
	06-MW23	10.7		
Chromium	06-MW17	1.4	**0.13**	**0.13**
	06-MW22	52.2; 0.53		
	06-MW23	4.95; 1.9		
	06-MW24	2.2; 1.5		
Copper	06-MW18	6.7	**6.6**	**6.6**
	06-MW22	19.8		
Lead	06-MW01	28.05	**2**	**5.6**
	06-MW02	34.9		
	06-MW03	30.4		
	06-MW07	21.8		
	06-MW10	29.3		
	06-MW14	24.5		
	06-MW23	31.6		
Manganese	06-MW01	2,060; 1,475; 1,455; 1,415;	**900**	**900**
	06-MW02	902		
	06-MW21	1,650; 1,580; 1,340; 983		
	06-MW22	3,135; 2,810; 2,640; 2,170; 1,960; 1,330		
Mercury	06-MW23	0.25	**0.1**	**0.1**
Molybdenum	06-MW22	28	**6.5**	**6.5**
	06-MW23	6.6		
Silver	06-MW18	2.4	**2.2**	**2.2**
	06-MW22	2.4		

Analyte	Sampling Location	Detected Concentration (µg/L)[a]	Human Health Groundwater Screening Criteria (µg/L)[a]	Ecological Groundwater Screening Criteria (µg/L)[a]
Thallium	06-MW01	7.7	**6.3**	**6.3**
	06-MW17	8.2		
	06-MW23	7.8		
Vanadium	06-MW17	4.4	**4.2**	**4.2**
	06-MW18	5		
	06-MW19	4.4		
	06-MW22	8.4		
	06-MW23	4.7; 4.6		
	06-MW24	5.8; 5.1; 4.6; 4.5		

Notes:

a The detected concentrations and criteria are presented in µg/L except for constituents of TPH, which are presented in mg/L.

µg/L Microgram per liter
mg/L Milligram per liter
NC No applicable toxicity screening criterion established
TPH Total petroleum hydrocarbons

Step 3 – Based on Step 2, concentrations of benzene, ethylbenzene, toluene, xylene, chloroform, isopropylbenzene, naphthalene, bis(2-ethylhexyl)phthalate, chrysene, aluminum, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, silver, thallium, and vanadium exceeded human health screening criteria. Concentrations of TPH as diesel, motor oil, and gasoline; benzene; toluene; isopropylbenzene; 2-methylnaphthalene; bis(2-ethylhexylphthalate); chrysene; aluminum; arsenic; beryllium; cadmium; chromium; copper; lead; manganese; mercury; molybdenum; silver; thallium; and vanadium exceeded ecological screening criteria. These constituents are evaluated further based on spatial analysis and information on chemical composition, maximum ambient concentration, mobility, and previous studies.

As part of the petroleum program, locations where concentrations of TPH exceeded screening criteria will be addressed in the proposed remedial action. The locations are spatially well delineated.

The locations where benzene, ethylbenzene, toluene, and xylene were detected at concentrations above screening criteria are consistent with the occurrence of TPH. Isopropylbenzene and naphthalene – which are other components of petroleum products at the site – were also detected at elevated concentrations at locations consistent with the occurrence of TPH. As part of a petroleum release, these contaminants will be addressed along with TPH remediation. Furthermore, BTEX, isopropylbenzene, and naphthalene – which were screened VOCs – are not generally considered constituents of concern in the offshore environment because they rapidly volatilize through mixing in the water column (PRC 1995b).

Chloroform was detected at a concentration of 39 µg/L; the RBSL screening criterion is 28 µg/L. The model used to develop RBSL values is conservative; therefore, a concentration of 39 µg/L is expected not to pose a significant risk to human health.

The highest concentration of 2-methylnaphthalene (95.5 µg/L) at Site 06 is less than two times higher than the screening criterion for 2-methylnaphthalene (60 µg/L, based on ecological effects) and corresponds to an HI of 1. This HI does not warrant additional evaluation of 2-methylnaphthalene in Section 4.3. Similarly, the highest concentration of chrysene (0.06 µg/L) is only slightly higher than the corresponding screening criterion (0.049 µg/L, based on cancer risk and ecological effects). Accordingly, the highest concentration of chrysene corresponds to an HI of 1 for potential ecological effects, and a cancer risk estimate of 1×10^{-6}, and neither warrants additional evaluation in Section 4.3. Furthermore, the locations where 2-methylnaphthalene and chrysene were detected above the screening criteria are consistent with the occurrence of TPH and will be addressed along with remediation of TPH.

The highest concentration of bis(2-ethylhexyl)phthalate (180 µg/L) is about 30 times higher than the screening criterion for this compound (5.9 µg/L, based on cancer risk and ecological effects). However, the location of this detection is consistent with the occurrence of TPH and will be addressed along with remediation of TPH.

Several samples that contained arsenic at concentrations above screening criteria and all the detections of manganese above the criterion are associated with TPH source areas. Based on the discussion in Section 3.2, these concentrations are associated with reducing conditions caused by TPH. Accordingly, elevated concentrations of these constituents will be addressed indirectly with TPH remediation, as the resultant change in geochemistry will create oxidizing conditions causing these metals to become less mobile. For the detections of arsenic that are not associated with TPH source areas, brackish water that mixes with groundwater before the groundwater reaches the bay is expected to provide an oxidizing environment that will precipitate arsenic from groundwater before the metals reach the shoreline.

The concentrations of several cadmium detections that were above the screening criterion were within the range of ambient concentrations at NAVSTA TI (1.4 µg/L). The locations of several other cadmium detections that were above the screening criterion were consistent with the occurrence of TPH. Lead was also detected at concentrations above screening criteria at several locations, most of which were consistent with the occurrence of TPH. Lead and cadmium are constituents of TPH and are likely attributed to the potential source. The results of total suspended solids and turbidity analyses indicate that the concentrations of these metals were exaggerated by sampling methodology. This conclusion is further

supported by analysis of temporal trends; the elevated concentrations were not observed at these sampling locations during previous sampling events. Lead and cadmium also have low mobility and are unlikely to migrate to the bay.

The concentration of one molybdenum detection above the screening criterion (6.6 µg/L) was within the range of ambient concentrations at NAVSTA TI (8.7 µg/L). The location of the other molybdenum detection that was above the screening criterion (28 µg/L) was consistent with the occurrence of TPH. Similar to arsenic and manganese, the removal of TPH at the location of the sample would eliminate reducing conditions in the groundwater and thereby decrease the potential for molybdenum to migrate to the bay.

Concentrations of aluminum, beryllium, chromium, copper, mercury, silver, thallium, and vanadium detected above the screening criteria would not pose a risk to human or ecological receptors because these constituents have low mobility and are unlikely to migrate to the bay.

Step 4 – TPH as diesel, motor oil, and gasoline, as well as BTEX, isopropylbenzene, and naphthalene are the only constituents to be directly remediated in groundwater at Site 06.

4.2.3 Site 06 – Air Risk Evaluation

To evaluate the potential human health risks associated with exposure to VOCs in air, the outdoor air concentration calculated for each VOC detected at Site 06 was compared to its corresponding ambient air PRG. Because an ambient air PRG concentration corresponds to a chemical-specific carcinogenic risk of 1×10^{-6} or a hazard index of 1.0, the air concentrations at Site 06, which are significantly below the PRG levels, would not be expected to pose an increased cancer risk or hazard to individuals in the vicinity of Site 06 (PRC 1997c).

4.2.4 Site 06 – Summary of Risk Evaluation Results

For shallow soil at Site 06, no detected constituents should be remediated. For groundwater at Site 06, the following detected constituents should be remediated:

Analyte	Sampling Location
TPH as diesel	06-MW01; 06-MW21; 06-MW22
TPH as motor oil	06-MW01
TPH as gasoline	06-MW01
Benzene	06-MW01; 06-MW23
Ethylbenzene	06-MW01
Toluene	06-MW01
Xylene (Total)	06-MW01; 06-MW02
Isopropylbenzene	06-MW01
Naphthalene	06-MW01

Note:

TPH Total petroleum hydrocarbons

4.3 CORRECTIVE ACTION AREAS

The following subsections present CAAs for shallow soil as well as deep soil and groundwater at Site 06.

4.3.1 Site 06 – Shallow Soil Corrective Action Areas

There are no CAAs in shallow soil at Site 06. No results for shallow soil samples exceeded the risk screening criteria.

4.3.2 Site 06 – Groundwater and Deep Soil Corrective Action Areas

The CAAs in groundwater and deep soil consist of two distinct plumes: the northern plume in groundwater, area 06-CAA-01, which contains mostly TPH as gasoline and a layer of free product, and the southern plume in groundwater, area 06-CAA-02, which contains primarily TPH as diesel. These two CAAs are shown on Figure 4-17.

Area 06-CAA-01 corresponds with two former underground fuel storage tanks. The 150-foot-wide groundwater plume extends 90 feet toward the shoreline. The estimated volume of contaminated groundwater is 48,000 gallons, which corresponds to 850 yd^3 of contaminated deep soil**.** In addition, floating product is known to exist in this area, as shown by the sampling locations and free product observations listed in Table 4-7.

Area 06-CAA-02 corresponds to the fire training operations area, two former underground fuel storage tanks, an oil tank, oil water separator, and a smother pit. The 160-foot-wide CAA originates from these sources, beginning under the concrete pad and extending downgradient 240 feet toward the shoreline.

TABLE 4-4
SHALLOW SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

Sample depth from 0.00 to 5.50 feet

Analyte	No. Detections/ No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)	No. Detections > Ambient Level	Ambient Level [A]	No. Detections > Industrial Criterion	Industrial Criterion	No. Detections > Ambient Level and Industrial Criterion
Petroleum Hydrocarbons (MG/KG)									
Diesel/Motor Oil Range (extractables)									
DIESEL RANGE ORGANICS	36/90	310	3 J	2,900 Y (06-HP023)	0	NC	0	6,700	0
MOTOR OIL RANGE ORGANICS	27/70	530	9 JY	6,300 M (06-BVW)	0	NC	0	9,400	0
Gasoline Range (purgeables)									
GASOLINE RANGE ORGANICS	6/56	520	1 Y	2,900 H (06-HP061)	0	NC	0	5,900	0
Total petroleum hydrocarbons [p]	40/90	720	3	6,300 (06-BVW)	0		0		0
Volatile Organic Compounds (MG/KG)									
BENZENE	1/55	0.001	0.001 J	0.001 J (06-HP019)	0	NC	0	0.4	0
ETHYLBENZENE	3/55	0.2	0.002 J	0.6 (06-SB01)	0	NC	0	24	0
METHYL-TERT-BUTYL ETHER	3/4	0.001	0.0006	0.002 (SS-4-05)	0	NC	0	1	0
TETRACHLOROETHENE	1/51	0.004	0.004 J	0.004 J (06-SB04)	0	NC	0	NC	0
TOLUENE	3/55	0.0009	0.0006 J	0.001 J (06-HP019)	0	NC	0	8	0
XYLENE (TOTAL)	8/55	0.4	0.0007 J	**2** (06-SB01)	0	NC	2	1	2
Semivolatile Organic Compounds (MG/KG)									
2-METHYLNAPHTHALENE	5/48	0.9	0.006	4 (06-SB01)	0	NC	0	500	0
ACENAPHTHENE *	1/50	0.003	0.003 J	0.003 J (06-HP095)	0	NC	0	38,000	0
ACENAPHTHYLENE *	1/50	0.003	0.003 J	0.003 J (06-HP095)	0	NC	0	NC	0
ANTHRACENE *	1/50	0.01	0.01	0.01 (06-HP095)	0	NC	0	100,000	0
BENZO(A)ANTHRACENE *	2/50	0.01	0.004 J	0.02 (06-HP095)	0	NC	0	NC	0
BENZO(A)PYRENE *	2/50	0.04	0.008	0.06 (06-HP095)	0	NC	0	NC	0
BENZO(B)FLUORANTHENE *	2/50	0.05	0.005	0.1 (06-HP095)	0	NC	0	NC	0
BENZO(G,H,I)PERYLENE *	2/50	0.04	0.008	0.08 (06-HP095)	0	NC	0	NC	0
BENZO(K)FLUORANTHENE *	2/50	0.03	0.007	0.05 (06-HP095)	0	NC	0	NC	0
CHRYSENE *	2/50	0.05	0.005	0.09 (06-HP095)	0	NC	0	290	0
DIBENZ(A,H)ANTHRACENE *	1/50	0.02	0.02	0.02 (06-HP095)	0	NC	0	NC	0
DIBENZOFURAN *	1/48	0.002	0.002 J	0.002 J (06-HP095)	0	NC	0	5,100	0
FLUORANTHENE *	2/50	0.02	0.008	0.03 (06-HP095)	0	NC	0	NC	0

TABLE 4-4
SHALLOW SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

Sample depth from 0.00 to 5.50 feet

Analyte	No. Detections/ No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)		No. Detections > Ambient Level	Ambient Level [A]	No. Detections > Industrial Criterion	Industrial Criterion	No. Detections > Ambient Level and Industrial Criterion
Semivolatile Organic Compounds (MG/KG)										
FLUORENE *	1/50	0.007	0.007	0.007	(06-HP095)	0	NC	0	NC	0
INDENO(1,2,3-CD)PYRENE *	3/50	0.02	0.0008 J	0.06	(06-HP095)	0	NC	0	NC	0
NAPHTHALENE *	3/50	0.9	0.003 J	3	(06-SB01)	0	NC	0	5	0
PHENANTHRENE *	5/50	0.2	0.006	0.7 J	(06-SB02)	0	NC	0	NC	0
PHENOL	14/45	0.5	0.2 J	2	(06-HP021)	0	NC	0	100,000	0
PYRENE *	4/50	0.1	0.01	0.2	(06-HP095)	0	NC	0	54,000	0
CARCINOGENIC PAH PEQ	3/50	0.04	0.003	0.1	(06-HP095)	0	NC	0	0.6	0
Metals (MG/KG)										
ALUMINUM	45/45	4,490	1,890	12,100 J	(06-HP006)	1	9,900	0	100,000	0
ANTIMONY	4/45	0.74	0.39 J	1.3 J	(SS-4-04)	0	2.9	0	818	0
ARSENIC	41/45	6.2	1.4 J	**15.8**	(SS-4-04)	3	10.0	3	10.0	3
BARIUM	44/45	25.5	6.3 J	124	(06-HP006)	0	260	0	100,000	0
BERYLLIUM	22/45	0.22	0.18	0.37	(SS-4-04)	22	0.12	0	2,240	0
CADMIUM	1/45	1.5	1.5	1.5	(06-SB06)	1	1.4	0	809	0
CALCIUM	44/45	11,400	689 J	25,500 J	(06-SB02)	0	NC	0	NC	0
CHROMIUM	45/45	37.9	10.7 J	141 J	(SS-4-04)	2	75.0	0	450	0
COBALT	45/45	7.7	4.1 J	13.0	(SS-4-04)	0	16.0	0	100,000	0
COPPER	37/45	12.3	3.1 J	51.2	(06-SB09)	0	85.0	0	76,000	0
IRON	45/45	13,800	8,470	18,400	(SS-4-04)	0	NC	0	NC	0
LEAD	45/45	10.8	1.8	230	(06-SB03)	3	21.0	0	750	0
MAGNESIUM	45/45	4,960	309 J	17,300	(SS-4-04)	0	NC	0	NC	0
MANGANESE	45/45	286	133 J	**637**	(SS-4-05)	1	550	0	NC	1
MERCURY	3/45	0.12	0.080 J	0.20	(06-SB01)	0	0.51	0	610	0
MOLYBDENUM	4/45	14.8	2.0	22.1	(SS-4-04)	3	2.0	0	10,000	0
NICKEL	45/45	38.8	5.0 J	89.9 J	(SS-4-04)	0	133	0	41,000	0
POTASSIUM	38/45	870	490 J	2,730 J	(06-HP006)	0	NC	0	NC	0

TABLE 4-4
SHALLOW SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

Sample depth from 0.00 to 5.50 feet

Analyte	No. Detections/ No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)	No. Detections > Ambient Level	Ambient Level [A]	No. Detections > Industrial Criterion	Industrial Criterion	No. Detections > Ambient Level and Industrial Criterion
Metals (MG/KG)									
SELENIUM	1/45	0.85	0.85 J	0.85 J (06-HP019)	1	0.50	0	10,000	0
SILVER	6/45	13.4	1.3 J	71.1 (SS-4-04)	6	0.45	0	10,000	0
SODIUM	15/45	220	85.7 J	297 J (06-HP023)	0	NC	0	NC	0
THALLIUM	5/45	0.87	0.66	1.4 (06-HP023)	3	0.71	0	130	0
VANADIUM	43/45	23.2	11.5	38.0 (06-HP006)	1	33.0	0	14,000	0
ZINC	42/45	36.4	15.5 J	247 (06-SB03)	1	94.0	0	100,000	0
Polychlorinated Dioxins and Furans (MG/KG)									
1,2,3,4,6,7,8-HPCDD	1/6	0.0003	0.0003 J	0.0003 J (06-HP023)	0	NC	0	0.003	0
HPCDDS (TOTAL)	1/6	0.0006	0.0006	0.0006 (06-HP023)	0	NC	0	NC	0
HPCDFS (TOTAL)	1/6	0.0001	0.0001 J	0.0001 J (06-HP023)	0	NC	0	NC	0
OCDD	1/6	0.004	0.004	0.004 (06-HP023)	0	NC	0	0.03	0
2,3,7,8-TCDD PEQ	1/6	0.000007	0.000007	0.000007 (06-HP023)	0	NC	0	NC	0

TABLE 4-4
SHALLOW SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

REMARKS AND NOTES

REMARKS:

1. Categories of analyses are shown, but only detected compounds are presented. A complete list of compounds analyzed by each method and the associated detection limits are presented in Appendix F.
2. When a set of duplicate samples was collected, the reported concentration is the average of the two detected results. If an analyte was detected in only one of the duplicate samples, the detected value is presented.
3. As noted below, only selected data qualifiers are presented in this data summary.
4. Based on analytical methods, naphthalene is considered an SVOC, however, for the purposes of risk screening, it is regarded as a VOC. This conservative risk screening approach addresses potential risk associated with inhalation.
5. There is no relevant screening criterion available for isopropyl benzene. As a result, the screening criteria for benzene were used as surrogates for this compound.

NOTES:

*	= PAH compound
A	= Detailed information on ambient metals concentrations is provided in "Final Technical Memorandum, Estimation of Ambient Concentrations of Metals in Groundwater", Tetra Tech EM Inc., March 30, 2001.
D	= Chromatographic pattern resembles diesel.
G	= Chromatographic pattern resembles gasoline.
H	= Chromatographic pattern is in the heavier hydrocarbon end of the analyte's range in the standard.
J	= Estimated value.
L	= Chromatographic pattern is in the lighter hydrocarbon end of the analyte's range in the standard.
M	= Chromatographic pattern resembles motor oil.
MG/KG	= Milligram per kilogram
NC	= No applicable toxicity screening criterion established.
ND	= None detected.
P	= For this evaluation of total petroleum hydrocarbons, extractable and purgeable detections were combined for each sample. Data qualifiers are not transferred to summed value. See note "T" below.
PAH	= Polynuclear aromatic hydrocarbon
PEQ	= Potency equivalent
T	= Petroleum screening criterion applies to the sum of purgeable and extractable detections. When available, extractable samples subjected to silica gel cleanup were used in this analysis.
UG/L	= Microgram per liter
Y	= Chromatographic pattern resembles hydrocarbon fuel pattern and was quantitated using the standard it resembled most.
Z	= Chromatographic pattern does not resemble TPH fuel pattern (individual peaks).

TABLE 4-5
DEEP SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

Sample depth from 5.50 to 100.00 feet

Analyte	No. Detections/ No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)	No. Detections > Ambient Level	Ambient Level [A]
Petroleum Hydrocarbons (MG/KG)						
Diesel/Motor Oil Range (extractables)						
DIESEL RANGE ORGANICS	50/138	4,200	4 J	21,000 D (06-HP056A)	0	NC
MOTOR OIL RANGE ORGANICS	41/132	260	6 J	1,200 L (06-HP087)	0	NC
Gasoline Range (purgeables)						
GASOLINE RANGE ORGANICS	29/123	1,400	0.3 JY	12,000 G (06-HP064)	0	NC
Total petroleum hydrocarbons [p]	61/141	4,200	4	23,000 (06-HP072)	0	
Volatile Organic Compounds (MG/KG)						
BENZENE	14/62	8	0.003 J	56 J (06-MP07)	0	NC
ETHYLBENZENE	12/62	46	0.003 J	250 J (06-HP071)	0	NC
METHYL-TERT-BUTYL ETHER	2/31	0.002	0.002 J	0.003 J (06-HP070)	0	NC
TOLUENE	12/62	80	0.001 J	440 J (06-HP071)	0	NC
XYLENE (TOTAL)	15/62	190	0.0006 J	1,300 J (06-HP071)	0	NC
Semivolatile Organic Compounds (MG/KG)						
2-METHYLNAPHTHALENE	7/27	18	0.02	72 (06-HP011)	0	NC
ACENAPHTHENE *	1/28	0.003	0.003 J	0.003 J (06-HP096)	0	NC
BENZO(G,H,I)PERYLENE *	1/28	0.02	0.02	0.02 (06-HP096)	0	NC
CHRYSENE *	2/28	0.08	0.002 J	0.2 J (06-SB08)	0	NC
DIBENZOFURAN *	1/27	0.003	0.003 J	0.003 J (06-HP096)	0	NC
FLUORANTHENE *	1/28	0.002	0.002 J	0.002 J (06-HP096)	0	NC
FLUORENE *	4/28	7	0.01	12 (06-HP011)	0	NC
INDENO(1,2,3-CD)PYRENE *	1/28	0.006	0.006	0.006 (06-HP096)	0	NC
NAPHTHALENE *	6/28	7	0.01	24 (06-HP011)	0	NC
PHENANTHRENE *	5/28	14	0.007	28 (06-HP011)	0	NC
PHENOL	12/26	0.8	0.4	2 (06-HP028)	0	NC
PYRENE *	4/28	0.2	0.005 J	0.5 (06-HP099)	0	NC
CARCINOGENIC PAH PEQ	2/28	0.4	0.003	0.9 (06-SB08)	0	NC

TABLE 4-5
DEEP SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

Sample depth from 5.50 to 100.00 feet

Analyte	No. Detections/ No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)		No. Detections > Ambient Level	Ambient Level [A]
Metals (MG/KG)							
ALUMINUM	26/26	4,620	2,570	16,200	(06-HP028)	1	9,900
ANTIMONY	4/26	5.2	0.61 J	18.7	(06-SB02)	1	2.9
ARSENIC	25/26	6.4	3.2	13.9	(06-HP008)	2	10.0
BARIUM	24/26	20.2	7.2 J	154	(06-HP004)	0	260
BERYLLIUM	5/26	0.21	0.21 J	0.22 J	(06-SB08)	5	0.12
CADMIUM	3/26	0.35	0.30	0.43	(SS-4-03)	0	1.4
CALCIUM	24/26	13,700	1,720	74,200	(SS-4-01)	0	NC
CHROMIUM	26/26	33.2	11.3	63.2	(06-SB08)	0	75.0
COBALT	24/26	8.3	5.1 J	15.7	(06-HP004)	0	16.0
COPPER	16/26	9.7	2.4 J	33.0	(06-HP028)	0	85.0
IRON	30/30	14,800	8,400	36,300	(06-BSW)	0	NC
LEAD	25/26	5.3	2.3	18.9	(06-HP058)	0	21.0
MAGNESIUM	26/26	4,880	829 J	11,100	(06-HP028)	0	NC
MANGANESE	26/26	308	163 J	1,070	(06-HP004)	1	550
MERCURY	2/26	0.070	0.050 J	0.090 J	(06-HP028)	0	0.51
MOLYBDENUM	4/26	9.3	3.8	13.2	(SS-4-03)	4	2.0
NICKEL	26/26	50.0	13.0	368 J	(06-HP033)	1	133
POTASSIUM	25/26	964	545 J	3,650 J	(06-HP028)	0	NC
SILVER	2/26	1.6	1.5	1.6	(SS-4-03)	2	0.45
SODIUM	9/26	314	124 J	812 J	(SS-4-01)	0	NC
THALLIUM	7/26	0.76	0.51 J	0.98	(SS-4-03)	4	0.71
VANADIUM	25/26	24.0	14.6	59.3	(06-HP028)	2	33.0
ZINC	22/26	28.4	16.5	74.0	(06-HP028)	0	94.0
Total Nitrogen (MG/KG)							
TOTAL NITROGEN	4/4	110	78	170	(06-BVW)	0	NC

TABLE 4-5
DEEP SOIL STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

REMARKS AND NOTES

REMARKS:

1. Categories of analyses are shown, but only detected compounds are presented. A complete list of compounds analyzed by each method and the associated detection limits are presented in Appendix F.
2. When a set of duplicate samples was collected, the reported concentration is the average of the two detected results. If an analyte was detected in only one of the duplicate samples, the detected value is presented.
3. As noted below, only selected data qualifiers are presented in this data summary.

NOTES:

*	= PAH compound
A	= Detailed information on ambient metals concentrations is provided in "Final Technical Memorandum, Estimation of Ambient Concentrations of Metals in Groundwater", Tetra Tech EM Inc., March 30, 2001.
D	= Chromatographic pattern resembles diesel.
G	= Chromatographic pattern resembles gasoline.
H	= Chromatographic pattern is in the heavier hydrocarbon end of the analyte's range in the standard.
J	= Estimated value.
L	= Chromatographic pattern is in the lighter hydrocarbon end of the analyte's range in the standard.
M	= Chromatographic pattern resembles motor oil.
MG/KG	= Milligram per kilogram
NC	= No applicable toxicity screening criterion established.
ND	= None detected.
P	= For this evaluation of total petroleum hydrocarbons, extractable and purgeable detections were combined for each sample. Data qualifiers are not transferred to summed value. See note "T" below.
PAH	= Polynuclear aromatic hydrocarbon
PEQ	= Potency equivalent
T	= Petroleum screening criterion applies to the sum of purgeable and extractable detections. When available, extractable samples subjected to silica gel cleanup were used in this analysis.
UG/L	= Microgram per liter
Y	= Chromatographic pattern resembles hydrocarbon fuel pattern and was quantitated using the standard it resembled most.
Z	= Chromatographic pattern does not resemble TPH fuel pattern (individual peaks).

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

	All Remedial Investigation Groundwater Data				2000 and 2001 Monitoring Well Groundwater Data						
Analyte	No. Det. / No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)	No. Det. / No. Analyzed	No. Det. > Ambient Level	Ambient Level [A]	No. Det. > Eco. Scrn. Criterion	Eco. Scrn. Criterion	No. Det. > HH Scrn. Criterion	HH Scrn. Criterion
Petroleum Hydrocarbons (MG/L)											
Diesel/Motor Oil Range (extractables) - Silica Gel											
DIESEL RANGE ORGANICS	22/72	2	0.1 D	**10** LJ (06-MW01)	20/54	0	NC	6	1[T]	0	NC
MOTOR OIL RANGE ORGANICS	2/72	1	0.4 LZ	**2** M (06-MW01)	2/54	0	NC	1	1[T]	0	NC
Diesel/Motor Oil Range (extractables)											
DIESEL RANGE ORGANICS	87/116	2	0.05 JZ	19 Y (06-MW06)	1/2	0	NC	0	1[T]	0	NC
MOTOR OIL RANGE ORGANICS	56/116	0.3	0.06 JY	2 Y (06-MW02)	0/2	0	NC	0	1[T]	0	NC
Gasoline Range (purgeables)											
GASOLINE RANGE ORGANICS	72/187	13	0.03 JY	270 Y (06-HP027)	15/56	0	NC	4	1[T]	0	NC
Total petroleum hydrocarbons [p]	137/201	8	0.03	270 (06-HP027)	25/56	0		7	1[T]	0	NC
Volatile Organic Compounds (UG/L)											
1,2-DICHLOROETHANE	3/178	17	2	46 (06-MW01)	3/56	0	NC	0	NC	0	NC
1,2-DICHLOROETHENE (TOTAL)	26/111	0.6	0.2 J	3 (06-MW19)	0/2	0	NC	0	NC	0	NC
BENZENE	77/236	2,900	0.2 J	39,000 (06-HP027)	17/56	0	NC	7	71	8	46
BROMODICHLOROMETHANE	1/178	0.1	0.1 J	0.1 J (06-MW16)	0/56	0	NC	0	NC	0	NC
CHLOROETHANE	3/178	0.8	0.5 J	1 J (06-MW02)	3/56	0	NC	0	NC	0	NC
CHLOROFORM	21/178	20	0.1 J	90 J (06-MW16)	11/56	0	NC	0	470	1	28
CHLOROMETHANE	4/178	0.7	0.4 J	0.8 J (06-MW22)	4/56	0	NC	0	6,400	0	6
CIS-1,2-DICHLOROETHENE	15/67	0.5	0.3 J	0.9 J (06-MW03)	14/54	0	NC	0	45,000	0	590
ETHYLBENZENE	53/236	570	0.4 J	4,200 (06-HP027)	8/56	0	NC	0	29,000	4	290
ISOPROPYLBENZENE	4/28	35	2	**85** J (06-MW01)	4/28	0	NC	1	71	2	46
METHYL-TERT-BUTYL ETHER	11/88	4	0.4 J	16 J (06-MW11)	9/56	0	NC	0	8,000	0	1,800
TETRACHLOROETHENE	6/178	5	0.08 J	27 (06-MW19)	1/56	0	NC	0	NC	0	NC
TOLUENE	64/236	3,500	0.2 J	46,000 (06-HP027)	19/56	0	NC	3	5,000	4	130
TRICHLOROETHENE	44/178	2	0.3 J	21 (06-MW19)	11/56	0	NC	0	81	0	81
VINYL ACETATE	1/61	7	7	7 (06-MW02)	0/28	0	NC	0	NC	0	NC
XYLENE (TOTAL)	57/244	2,800	0.6 J	22,000 (06-HP027)	11/64	0	NC	0	NC	7	13
Semivolatile Organic Compounds (UG/L)											
1,2-DICHLOROBENZENE	1/156	3	3 J	3 J (06-MW19)	0/56	0	NC	0	NC	0	NC

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

	All Remedial Investigation Groundwater Data					2000 and 2001 Monitoring Well Groundwater Data						
Analyte	No. Det. / No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)		No. Det. / No. Analyzed	No. Det. > Ambient Level	Ambient Level [A]	No. Det. > Eco. Scrn. Criterion	Eco. Scrn. Criterion	No. Det. > HH Scrn. Criterion	HH Scrn. Criterion
Semivolatile Organic Compounds (UG/L)												
1,3-DICHLOROBENZENE	2/156	3	1 J	4 J	(06-MW19)	0/56	0	NC	0	NC	0	NC
1,4-DICHLOROBENZENE	2/156	3	2 J	4 J	(06-MW19)	0/56	0	NC	0	NC	0	NC
2,4-DIMETHYLPHENOL	11/156	3	0.7 J	9 J	(06-HP027)	4/56	0	NC	0	2,300	0	2,300
2-METHYLNAPHTHALENE	29/156	32	0.05 J	120	(06-MW06)	5/56	0	NC	2	60	0	NC
2-METHYLPHENOL	13/156	13	0.8 J	75	(06-MW11)	4/56	0	NC	0	NC	0	NC
4-METHYLPHENOL	13/154	8	0.3 J	38	(06-HP027)	5/54	0	NC	0	NC	0	NC
ACENAPHTHENE *	11/156	1	0.06 J	3 J	(06-MW06)	6/56	0	NC	0	710	0	2,700
ACENAPHTHYLENE *	1/156	0.2	0.2 J	0.2 J	(06-MW22)	1/56	0	NC	0	60	0	NC
ANTHRACENE *	1/156	0.08	0.08 J	0.08 J	(06-MW02)	1/56	0	NC	0	110,000	0	110,000
BIS(2-ETHYLHEXYL)PHTHALATE	3/156	100	65	**180**	(06-MW23)	1/56	0	NC	1	6	1	6
BUTYLBENZYLPHTHALATE	1/156	0.3	0.3 J	0.3 J	(06-MW02)	1/56	0	NC	0	NC	0	NC
CHRYSENE *	1/156	0.06	0.06 J	**0.06** J	(06-MW03)	1/56	0	NC	1	0.05	1	0.05
DIBENZOFURAN *	5/156	1	0.2 J	4 J	(06-MW06)	2/56	0	NC	0	6,400	0	NC
FLUORANTHENE *	4/156	0.08	0.05 J	0.1 J	(06-MW24)	4/56	0	NC	0	16	0	370
FLUORENE *	13/156	4	0.1 J	18	(06-MW06)	6/56	0	NC	0	14,000	0	14,000
HEXACHLOROETHANE	1/156	48	48	48	(06-HP033)	0/56	0	NC	0	NC	0	NC
ISOPHORONE	1/156	2	2 J	2 J	(06-MW06)	0/56	0	NC	0	NC	0	NC
N-NITROSODIPHENYLAMINE (1)	2/156	3	2 J	3 J	(06-MW07)	0/56	0	NC	0	NC	0	NC
NAPHTHALENE *	29/156	110	0.05 J	330	(06-MW01)	7/56	0	NC	0	470	4	24
PHENANTHRENE *	7/156	8	1 J	27	(06-MW06)	0/56	0	NC	0	60	0	NC
PHENOL	18/156	34	0.5 J	200	(06-HP033)	6/56	0	NC	0	4,600,000	0	4,600,000
PYRENE *	7/156	0.2	0.06 J	0.8 J	(06-MW02)	5/56	0	NC	0	11,000	0	11,000
Metals (UG/L)												
Unfiltered												
ALUMINUM	88/162	4,570	18.0 J	51,600	(06-MW15)	5/64	2	27.0	2	27.0	2	27.0
ANTIMONY	10/162	3.2	1.6 J	9.3 J	(06-MW22)	4/64	4	1.7	0	4,300	0	4,300
ARSENIC	125/162	32.5	2.2 J	290	(06-HP008)	56/64	37	15.0	37	15.0	37	15.0

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

	All Remedial Investigation Groundwater Data					2000 and 2001 Monitoring Well Groundwater Data						
Analyte	No. Det. / No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)		No. Det. / No. Analyzed	No. Det. > Ambient Level	Ambient Level [A]	No. Det. > Eco. Scrn. Criterion	Eco. Scrn. Criterion	No. Det. > HH Scrn. Criterion	HH Scrn. Criterion
Metals (UG/L)												
Unfiltered												
BARIUM	126/162	18.2	3.2 J	212	(06-MW15)	43/64	0	120	0	120	0	120
BERYLLIUM	13/162	0.36	0.11 J	**0.84** J	(06-MW22)	13/64	13	0.040	13	0.040	13	0.040
CADMIUM	12/162	5.7	0.40 J	**11.7**	(06-MW02)	12/64	12	0.27	4	9.3	12	0.27
CALCIUM	160/162	68,000	13,700	311,000	(06-HP049)	64/64	0	NC	0	NC	0	NC
CHROMIUM	65/162	20.7	0.53 J	203	(06-MW15)	7/64	7	0.13	7	0.13	7	0.13
COBALT	60/162	8.7	0.50 J	102	(06-MW15)	3/64	0	1.4	0	1.4	0	1.4
COPPER	47/162	17.1	2.3 J	101	(06-MW13)	8/64	2	6.6	2	6.6	2	6.6
IRON	131/170	8,110	9.0	119,000	(06-MW15)	26/64	0	NC	0	NC	0	NC
LEAD	41/162	15.9	1.3 J	146	(06-MW15)	7/64	7	2.0	7	5.6	7	2.0
MAGNESIUM	160/162	41,100	2,130	257,000	(06-MW11)	64/64	0	NC	0	NC	0	NC
MANGANESE	154/162	843	3.3 J	6,390	(06-MW12)	57/64	15	900	15	900	15	900
MERCURY	9/162	0.36	0.10 J	1.5	(06-MW07)	1/64	1	0.10	1	0.10	1	0.10
MOLYBDENUM	43/129	4.3	1.2 J	**28.0**	(06-MW22)	24/64	2	6.5	2	6.5	2	6.5
NICKEL	79/162	25.5	1.5 J	302	(06-HP057)	4/64	0	5.8	0	8.2	0	4,600
POTASSIUM	162/162	39,800	2,200 J	170,000	(06-MW02)	64/64	0	NC	0	NC	0	NC
SELENIUM	7/162	3.5	1.9 J	4.5 J	(06-MW21)	7/64	7	1.8	0	71.0	0	1,100
SILVER	6/162	1.7	0.44 J	**2.4**	(06-MW22)	4/64	2	2.2	2	2.2	2	2.2
SODIUM	159/162	122,000	9,270 J	2,000,000	(06-MW22)	64/64	0	NC	0	NC	0	NC
THALLIUM	21/162	4.8	1.1 J	12.3	(06-MW15)	12/64	9	3.4	3	6.3	3	6.3
TIN	1/2	12.0	12.0 J	12.0 J	(06-MW21)	1/2	0	NC	0	NC	0	NC
VANADIUM	106/162	14.4	0.30 J	199	(06-MW15)	33/64	10	4.2	10	4.2	10	4.2
ZINC	58/162	51.7	1.8 J	414	(06-MW15)	16/64	14	4.4	0	81.0	0	69,000
Filtered												
ANTIMONY	2/18	1.7	1.7 J	1.7 J	(06-MW18)	0/0	0	1.7	0	4,300	0	4,300
ARSENIC	14/18	14.1	5.1 J	51.0	(06-MW01)	0/0	0	15.0	0	15.0	0	15.0
BARIUM	18/18	6.2	1.5 J	20.6 J	(06-MW01)	0/0	0	120	0	120	0	120
CADMIUM	1/18	0.83	0.83 J	0.83 J	(06-MW03)	0/0	0	0.27	0	9.3	0	0.27
CALCIUM	18/18	49,900	21,800	89,600	(06-MW17)	0/0	0	NC	0	NC	0	NC

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

	All Remedial Investigation Groundwater Data					2000 and 2001 Monitoring Well Groundwater Data						
Analyte	No. Det. / No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected (Point ID)		No. Det. / No. Analyzed	No. Det. > Ambient Level	Ambient Level [A]	No. Det. > Eco. Scrn. Criterion	Eco. Scrn. Criterion	No. Det. > HH Scrn. Criterion	HH Scrn. Criterion
Metals (UG/L)												
Filtered												
COBALT	5/18	1.1	1.0 J	1.4 J	(06-MW07)	0/0	0	1.4	0	1.4	0	1.4
COPPER	6/18	1.9	1.3 J	2.3 J	(06-MW20)	0/0	0	6.6	0	6.6	0	6.6
IRON	2/18	2,910	816	5,000	(06-MW01)	0/0	0	NC	0	NC	0	NC
LEAD	1/18	5.8	5.8	5.8	(06-MW15)	0/0	0	2.0	0	5.6	0	2.0
MAGNESIUM	18/18	34,300	4,240 J	158,000	(06-MW17)	0/0	0	NC	0	NC	0	NC
MANGANESE	13/18	283	0.80 J	1,790	(06-MW01)	0/0	0	900	0	900	0	900
MERCURY	1/18	0.13	0.13 J	0.13 J	(06-MW19)	0/0	0	0.10	0	0.10	0	0.10
MOLYBDENUM	13/18	2.9	1.3 J	6.4	(06-MW18)	0/0	0	6.5	0	6.5	0	6.5
NICKEL	9/18	12.2	1.1 J	96.6 J	(06-MW18)	0/0	0	5.8	0	8.2	0	4,600
POTASSIUM	18/18	36,700	2,570 J	122,000 J	(06-MW02)	0/0	0	NC	0	NC	0	NC
SODIUM	18/18	150,000	9,430	1,100,000	(06-MW17)	0/0	0	NC	0	NC	0	NC
VANADIUM	3/18	1.6	1.2 J	2.1 J	(06-MW20)	0/0	0	4.2	0	4.2	0	4.2
ZINC	2/18	13.6	3.0 J	24.2	(06-MW18)	0/0	0	4.4	0	81.0	0	69,000
Solids (UG/L)												
TOTAL DISSOLVED SOLIDS	93/93	690,000	59,000	7,680,000	(06-MW11)	41/41	0	NC	0	NC	0	NC
TOTAL SUSPENDED SOLIDS	16/24	10,600	600	39,000	(06-MW22)	16/24	0	NC	0	NC	0	NC
Major Anions (UG/L)												
CHLORIDE	46/46	170,000	480 J	2,300,000	(06-MW17)	20/20	0	NC	0	NC	0	NC
NITRATE	27/42	28,000	10	740,000	(06-MW14)	15/16	0	NC	0	NC	0	NC
SULFATE	46/46	56,000	5,100	350,000	(06-MW17)	20/20	0	NC	0	NC	0	NC
SULFIDE	1/3	110	110	110	(06-MW01)	1/3	0	NC	0	NC	0	NC
Methane, Ethane, and Ethene (UG/L)												
METHANE	26/46	480	2	3,400	(06-MW01)	17/20	0	NC	0	NC	0	NC

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

SITE 06

	All Remedial Investigation Groundwater Data					2000 and 2001 Monitoring Well Groundwater Data						
Analyte	No. Det. / No. Analyzed	Average Detected Value	Minimum Value Detected	Maximum Value Detected	(Point ID)	No. Det. / No. Analyzed	No. Det. > Ambient Level	Ambient Level [A]	No. Det. > Eco. Scrn. Criterion	Eco. Scrn. Criterion	No. Det. > HH Scrn. Criterion	HH Scrn. Criterion
Sulfide (UG/L)												
SULFIDE	5/43	710	38	3,100	(06-MW02)	4/17	0	NC	0	NC	0	NC
Field Test Kit Analyses (UG/L)												
ALKALINITY	46/46	360,000	140,000	750,000	(06-MW02)	20/20	0	NC	0	NC	0	NC
IRON (II)	19/46	1,900	10	4,800	(06-MW01)	13/20	0	NC	0	NC	0	NC
MANGANESE (II)	29/46	170	50	480	(06-MW01)	17/20	0	NC	0	NC	0	NC
Flowcell Field Measurement Data (UG/L)												
DISSOLVED OXYGEN	67/67	1,000	0.12	6,670	(06-MW23)	41/41	0	NC	0	NC	0	NC
OXIDATION-REDUCTION POTENTIAL	67/67	12.2	-191	343	(06-MW14)	41/41	0	NC	0	NC	0	NC
PH	67/67	7.4	5.3	8.0	(06-MW01)	41/41	0	NC	0	NC	0	NC
SPECIFIC CONDUCTIVITY	67/67	1.2	0.50	8.8	(06-MW17)	41/41	0	NC	0	NC	0	NC
TEMPERATURE	67/67	19.5	16.7	21.7	(06-MW09)	41/41	0	NC	0	NC	0	NC
TURBIDITY	28/28	4	0.1 J	53	(06-MW21)	28/28	0	NC	0	NC	0	NC

TABLE 4-6
REMEDIAL INVESTIGATION GROUNDWATER STATISTICAL SUMMARY
SITE 06 - FIRE TRAINING SCHOOL
NAVAL STATION TREASURE ISLAND

REMARKS AND NOTES

REMARKS:

1. Categories of analyses are shown, but only detected compounds are presented. A complete list of compounds analyzed by each method and the associated detection limits are presented in Appendix F.
2. When a set of duplicate samples was collected, the reported concentration is the average of the two detected results. If an analyte was detected in only one of the duplicate samples, the detected value is presented.
3. As noted below, only selected data qualifiers are presented in this data summary.
4. Based on analytical methods, naphthalene is considered an SVOC, however, for the purposes of risk screening, it is regarded as a VOC. This conservative risk screening approach addresses potential risk associated with inhalation.
5. There is no relevant screening criterion available for isopropyl benzene. As a result, the screening criteria for benzene were used as surrogates for this compound.

NOTES:

*	= PAH compound
A	= Detailed information on ambient metals concentrations is provided in "Final Technical Memorandum, Estimation of Ambient Concentrations of Metals in Groundwater", Tetra Tech EM Inc., March 30, 2001.
D	= Chromatographic pattern resembles diesel.
G	= Chromatographic pattern resembles gasoline.
H	= Chromatographic pattern is in the heavier hydrocarbon end of the analyte's range in the standard.
J	= Estimated value.
L	= Chromatographic pattern is in the lighter hydrocarbon end of the analyte's range in the standard.
M	= Chromatographic pattern resembles motor oil.
MG/KG	= Milligram per kilogram
NC	= No applicable toxicity screening criterion established.
ND	= None detected.
P	= For this evaluation of total petroleum hydrocarbons, extractable and purgeable detections were combined for each sample. Data qualifiers are not transferred to summed value. See note "T" below.
PAH	= Polynuclear aromatic hydrocarbon
PEQ	= Potency equivalent
T	= Petroleum screening criterion applies to the sum of purgeable and extractable detections. When available, extractable samples subjected to silica gel cleanup were used in this analysis.
UG/L	= Microgram per liter
Y	= Chromatographic pattern resembles hydrocarbon fuel pattern and was quantitated using the standard it resembled most.
Z	= Chromatographic pattern does not resemble TPH fuel pattern (individual peaks).

Det	= Detections
Eco	= Ecological
HH	= Human Health
Scrn	= Screening

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
10	2005 petroleum closure request	Section 2.5	Final Closure Report, Site 6, Request for No Further Action, Naval Station Treasure Island, San Francisco, California. Shaw Environmental, Inc. December 16, 2005. Section 4.0 and Tables 2 through 11.

4.0 Risk Evaluation

Potential risk from petroleum hydrocarbons remaining in soil and groundwater at Site 06 was evaluated using a risk-based screening method to determine if the site was suitable for NFA. This method is consistent with Water Board guidance documents for site risk screening (Water Board, 1996 and 2005). Concentrations of petroleum and petroleum constituents detected in representative soil and groundwater samples collected at the site were compared to risk-based screening criteria selected for the evaluation. The following sections identify the chemicals of potential concern (COPCs), define screening criteria, present the representative data selected, describe the evaluation methodology, and present the results of the screening evaluation for Site 06.

4.1 Chemicals of Potential Concern

Samples collected at Site 06 have been analyzed for TPH, VOCs, SVOCs, metals, pesticides, and polychlorinated biphenyls. All chemicals detected in soil and groundwater at Site 06 are listed in Tables A1 through A4. However, this risk evaluation only addresses petroleum and petroleum constituents in soil and groundwater at Site 06; other COPCs are addressed under the CERCLA program. Petroleum constituents and additives detected in soil include TPH-g, TPH-d, TPH as motor oil (TPH-mo), BTEX, cumene (isopropylbenzene), and naphthalene and those detected in groundwater include TPH-g, TPH-d, TPH-mo, BTEX, cumene, naphthalene, and MTBE.

PAHs as a COPC at Site 06 were addressed in the Final Technical Memorandum titled, "*Recommendations for Polycyclic Aromatic Hydrocarbons at Petroleum Program Sites, Naval Station Treasure Island, Treasure Island and Yerba Buena Island, San Francisco, California,*" (Shaw, 2004a) and the DTSC letter response to the Technical Memorandum dated February 25, 2004 (DTSC, 2004). The Technical Memorandum presented the Navy's position that PAHs do not pose a risk at Site 06 and that NFA for PAHs is required under the Petroleum Program. The DTSC letter to the Navy agreed that the sampling points presented within the Technical Memorandum for Site 06 were suitable for NFA. On March 4, 2004, the Water Board issued a letter to the Navy concurring with the Navy's recommendation that PAH concentrations remaining in soil at petroleum sites do not require further evaluation by the Petroleum Program and that any remaining issues should be addressed under the CERCLA program (Water Board, 2004). Thus, PAHs are not discussed or evaluated within this Closure Report.

4.2 Screening Criteria

Risk-based screening criteria for COPCs in soil and groundwater at Site 06 are selected based on site-specific potentially complete exposure pathways. Because the future land-use at Site 06 is uncertain, the screening criteria selected for the protection of human health are based on

unrestricted (residential) land use. The following subsections provide a brief description of risk factors and the criteria selected for evaluating soil and groundwater results.

4.2.1 Risk Factors

Risk factors form the basis for human health screening criteria. For carcinogens, screening levels for the protection of human receptors are associated with a target excess cancer risk factor. A cancer risk of 1×10^{-6} represents the most stringent of the potentially acceptable range of 10^{-6} to 10^{-4} recommended by the U.S. Environmental Protection Agency (EPA).

For non-carcinogens, each screening criterion is associated with a non-cancer hazard quotient (HQ). Screening criteria based on an HQ of 1 represent the high end bounding value for the maximum concentration of a COPC that will not adversely affect human or ecological receptors. In some cases, agencies also calculate lower screening criteria using a target HQ less than 1 (i.e., 0.1 and 0.2) to account for cumulative health risks resulting from more than one COPC. The HQs used to develop the soil and groundwater screening criteria for this risk assessment are noted in Sections 4.2.2 and 4.2.3, respectively.

To simplify evaluating potential hazards associated with remaining petroleum contamination, various screening criteria were modified by normalizing the target HQs to 1 and the potential cumulative hazard for multiple COPCs and multiple pathways is evaluated by calculating a hazard index (HI) for each potential receptor. The sum of the HQs for the COPCs and multiple pathways represents the cumulative HI. An HI is typically calculated to one significant figure (EPA, 1989). If an HQ or HI exceeds 1, it does not necessarily indicate that health effects would occur as a result of exposure. Rather, an HQ or HI that does not exceed 1 is an indication that further evaluation is unwarranted.

4.2.2 Soil Screening Criteria

Screening criteria for soil were selected to address each potentially complete soil exposure pathway identified at Site 06. The potentially complete exposure pathways and associated (unmodified) screening criteria are as follows:

Human receptors

Direct/indirect exposure of residents to shallow soil (including ingestion, dermal absorption, and inhalation of dust) (shallow soil is less than 5.5 feet bgs): For TPH, the action levels developed for the Presidio of San Francisco in the Fuel Product Action Level Development Report are applied (Montgomery Watson, 1995). The action levels are based on a cancer risk of 1×10^{-6} or a target HQ of 0.1. For the other COPCs, the residential EPA Region 9 Preliminary Remediation Goals (PRGs) are applied. The PRGs are based on a cancer risk of 1×10^{-6} or a target HQ of 1 (EPA, 2004).

Direct exposure of workers to deep soil (deep soil is 5.5 or more feet bgs): Future excavation or utility maintenance activities may potentially expose workers to petroleum contamination in deep soil. Due to the nature of these activities, the exposure would likely be short term or periodic (i.e., up to a total of 140 days of exposure over a seven year exposure period [Water Board, 2005]). The Navy will identify sites with petroleum-contaminated deep soil in the appropriate transfer documents so the future landowners will be aware of the potential for exposure.

Inhalation of indoor air: Chemicals may volatilize from unsaturated soil and migrate into indoor air, thereby posing a potential risk to human health. For the volatile COPCs, the Water Board screening levels for the evaluation of potential indoor air impacts are applied (Water Board, 2005). The criteria consider inhalation of chemicals volatilizing from highly permeable, vadose-zone soils directly beneath a building floor, and are based on a cancer risk of 1×10^{-6} or a target HQ of 0.2.

Ecological receptors

a) **Leaching of chemicals from soil to groundwater:** Chemicals adsorbed to shallow soil may leach to groundwater, thereby posing a potential risk to ecological receptors when the groundwater discharges to San Francisco Bay. For TPH, the site-specific levels developed for NAVSTA TI are applied (TtEMI, 2001c). For the volatile COPCs, the Water Board screening levels for the evaluation of soil leaching concerns are applied (Water Board, 2005). Leaching of chemicals from deep soil is not evaluated directly; rather, the risk is evaluated through the groundwater, since the deep soil coincides with the saturated zone.

Table 2, "Shallow Soil Screening Criteria (Unmodified), Site 06," provides a summary of the selected criteria for each potentially complete soil exposure pathway described above. Table 3, "Normalized Shallow Soil Screening Criteria, Site 06," provides a summary of the criteria (normalized to a target HQ of 1) used in the Tier 1 risk evaluation.

4.2.3 Groundwater Screening Criteria

Screening criteria for groundwater were selected to address each potentially complete exposure pathway from groundwater at Site 06. The potentially complete exposure pathways and associated screening criteria are as follows:

Human receptors

a) **Drinking water:** Because the groundwater at TI is not classifiable as a potential source of drinking water pursuant to State Water Resources Control Board Resolution 88-63 and Water Board Resolution No. 89-39 (Water Board, 2001), the drinking water exposure pathway is incomplete and is not evaluated in this risk evaluation.

Inhalation of indoor air: Chemicals may volatilize from groundwater and migrate into indoor air, thereby posing a potential risk to human health. For petroleum constituents, site specific screening levels for the evaluation of indoor air impacts are applied. As recommended in Section 2.8.2.2 of the environmental screening level (ESL) guidance document (Water Board, 2005), site-specific criteria for the Inhalation of Indoor Air Pathway were calculated using the Johnson and Ettinger Indoor Air Model for Subsurface Vapor Intrusion into Buildings (EPA, 2003). The input assumptions were the same as those used by the Water Board (in calculating the Tier 1 screening criteria for their ESL guidance document) except for the assumed depth to groundwater, which was adjusted to a (shallower) depth of 5 feet bgs. Additionally, to be more conservative, the resultant VOC criteria were not adjusted upwards by a factor of ten to account for assumed biodegradation in the vadose zone prior to emission at the surface (see the footnotes to Table E-1a [Water Board, 2005]). The resultant screening levels are based on a cancer risk of 1×10^{-6} or a target HQ of 0.2 or 1.

Consumption of aquatic organisms: Aquatic organisms may potentially be exposed to groundwater migrating from the site to the Bay. Human consumption of a contaminated organism may pose a potential risk to human health. The available EPA National Recommended Ambient Water Quality Criteria (AWQC) for Human Health Protection guidelines are applied (California Regional Water Quality Control Board, Central Valley Region, 2003). These criteria are based on a cancer risk of 1×10^{-6} or a target HQ of 1.

Ecological receptors

a) **Discharge to the Bay:** Aquatic organisms may potentially be exposed to groundwater migrating from the site to the San Francisco Bay. For TPH, the NAVSTA TI screening criterion is applied. This is a conservative screening criterion that is protective of ecological receptors at the shoreline as discussed in the *Final Preliminary Remediation Criteria for Petroleum and Petroleum Constituents Technical Memorandum, Naval Station Treasure Island, San Francisco, California* (TtEMI, 2001c). For other COPCs, the EPA AWQC for Saltwater Aquatic Life Protection are applied (California Regional Water Quality Control Board, Central Valley Region, 2003).

Table 4, "Groundwater Screening Criteria (Unmodified), Site 06," provides a summary of the criteria selected for each potentially complete groundwater exposure pathway. Table 5, "Normalized Groundwater Screening Criteria, Site 06," provides a summary of the criteria (normalized to a target HQ of 1) used in the Tier 1 risk evaluation.

4.3 Data Selection

The soil and groundwater data sets selected for the risk evaluation are defined in the following sections. The data sets were selected to be representative of current conditions at Site 06.

4.3.1 Soil Data

At NAVSTA TI, analytical results for soil are associated with shallow or deep soil: Shallow soil consists of the vadose zone above the smear zone, and deep soil consists of the smear zone and the saturated zone. The depth of division is based on water levels across the site. The depth to groundwater measured at the site has ranged between approximately 3 to 8 feet bgs. For the purpose of the risk screening evaluation in this Closure Report, soil samples collected from less than 5.5 feet bgs are defined as shallow soil samples, and soil samples collected from 5.5 feet or deeper are defined as deep soil samples. The Final CAP (TtEMI, 2002b) chose this depth to separate apparent surface-related chemical releases from groundwater mediated smearing of petroleum hydrocarbons at the site.

The soil data selected for the risk evaluation include all shallow soil samples left in-place. The locations where these samples were collected are shown on Figure 6, "Shallow Soil Left In-Place and Well Sample Location Map, Site 06." A list of the selected data is provided in Table 6, "Shallow Soil Left In-Place Screening Evaluation, Site 06." Deep soil data are not directly evaluated in this risk assessment. The potential risk to ecological receptors from leaching of chemicals in deep soil to groundwater is addressed in the groundwater screening evaluation. As discussed in Section 4.2.2, the Navy will identify sites with petroleum-contaminated deep soil in the appropriate transfer documents so the future landowners can manage the potential for exposure and the need for a soils management plan.

During the course of site investigation and remediation, several sample locations were overexcavated. Because the data from these samples are not representative of left in-place conditions (i.e., they have been removed by overexcavation), they are excluded from the risk evaluation. All soil samples collected within Site 06 have been designated as either "left in-place" or "removed" in the Appendix A data tables.

4.3.2 Groundwater Data

For groundwater, only data that are considered representative of current groundwater conditions are included in the risk evaluation. Due to soil and groundwater remedial actions and natural attenuation processes, historical sample results (prior to 2003) are not considered representative of current groundwater conditions and consequently are not included in the risk evaluation. At Site 06, the representative data set consists of samples collected during the last four sitewide groundwater monitoring events in June, August, and November 2003 and January 2004, and from well-specific monitoring events in March and May 2004. A complete list of the data selected for the risk evaluation is provided in Table 7, "Groundwater Screening Evaluation, Site 06."

4.4 Evaluation Methodology

The risk-based screening evaluation developed for NAVSTA TI includes four steps, all of which were performed in this risk evaluation of the Site 06 soil and groundwater data. The general methodology is as follows:

Step 1. Compile the Concentrations of all COPCs Detected in Soil and Groundwater: Soil and groundwater data representative of current, post-remediation conditions are selected and all petroleum hydrocarbons and related COPCs detected in the samples are identified. For this report, only petroleum and petroleum constituents in soil and groundwater are addressed as discussed in Section 4.1.

Step 2. Compare Concentrations to Chemical-Specific Screening Criteria: Detected concentrations of COPCs are compared to the normalized screening criteria provided in Tables 3 and 5. Total HIs and total cancer risk for each potential receptor are calculated using the maximum concentrations detected for each COPC. If the calculated total HI exceeds 1 or the total cancer risk exceeds $1x10^{-6}$, then further evaluation of specific samples is performed in Step 3.

Step 3. Additional Analyses to Support Risk Management: Receptors with a calculated total HI that exceeds 1 or a total cancer risk that exceeds 1×10^{-6}, using the maximum detected COPC concentrations, require further evaluation. This is necessary due to the uncertainty associated with the exposure assumptions used in Step 2: particularly, the assumption that a single individual is exposed to the maximum detected concentration of each COPC. The first additional analysis includes the evaluation of specific samples with maximum COPC concentrations. Specific total HIs and total cancer risks for each receptor are calculated for these samples. If a (sample specific) total HI exceeds 1 or the risk exceeds 1×10^{-6} then further analyses are performed. These analyses may include evaluation of the spatial distribution of COPCs, chemical composition, chemical properties and toxicity; site hydrogeologic and geologic characteristics; temporal changes in constituent concentrations; potentially complete exposure pathways; environmental fate and transport modeling; and relevant exposure scenarios.

Step 4. Summarize Results: If the results from Steps 2 and 3 indicate that the detected concentrations do not pose a potential hazard or risk to human or ecological receptors, then the site is recommended for closure. If the results indicate that impacts to human and ecological receptors are possible in the future, then institutional controls or corrective action is recommended.

4.5 Results of the Risk-Based Screening Evaluation for Soil

This section summarizes the results of the four-step risk-based screening evaluation performed for shallow soil at Site 06.

4.5.1 Step 1. Compile the Concentrations of all COPCs Detected in Soil

TPH-g, TPH-d, TPH-mo, BTEX, naphthalene, and cumene (isopropylbenzene) were detected in shallow soil left in-place at Site 06 (Table 6).

4.5.2 Step 2. Compare Concentrations to Chemical-Specific Screening Criteria

The results of the initial screening for shallow soil are shown on Figures 7 though 11. These figures compare left in-place shallow soil concentrations to unmodified residential screening criteria. The COPC concentrations were then compared to the normalized screening criteria presented in Tables 3 and 6 in order to simplify evaluating potential hazards from multiple COPCs over multiple exposure pathways.

The total HI and total cancer risk calculated using the maximum concentrations detected for each COPC exceed 1 and 1 x 10^{-6}, respectively, for the residential human receptor, the construction/trench worker, and ecological receptor as presented at the end of Table 6. These exceedances of total HI and total cancer risk indicate that further evaluation of specific samples is warranted as presented in Step 3.

4.5.3 Step 3. Additional Analyses to Support Risk Management

Based on the results of Step 2, the calculated total HI exceeds 1 and total cancer risk exceeds $1x10^{-6}$ (using normalized criteria) for the residential human receptor, the construction/trench worker, and ecological receptor and require further evaluation. This evaluation is necessary due to the uncertainty associated with the exposure assumptions used in Step 2: specifically, the assumption that a single individual is exposed to the maximum detected concentration of each COPC.

The first additional analysis is a quantitative evaluation of the samples with the maximum COPC concentrations. Specific total HIs and total cancer risks for each potential receptor are calculated for these samples as presented in Table 9, "Select Samples – Shallow Soil Left In-Place Total Hazard and Risk Analysis, Site 06." Results of this additional analysis are as follows:

- For the residential human receptor, one sample (06-HP015) exceeds a total cancer risk of 1 x 10^{-6} and another sample (06-077) exceeds a total HI of 1 and a total cancer risk of 1 x 10^{-6}
- For the construction/trench human receptor, one sample (06-077) exceeds a total HI of 1 and a total cancer risk of 1 x 10^{-6}
- For the ecological receptor, three samples exceed a total HI of 1 (06-BVW, 06-HP015, and 06-077)

Since some of the sample-specific total HIs exceed 1 and total cancer risks exceed 1 x 10^{-6}, further evaluation of the relevant exposure pathways is presented in the following text.

Further Evaluation of Shallow Soil Sample Location 06-HP015

For the residential human receptor and the construction/trench worker, sample 06-HP015 exceeds a total cancer risk of 1 x 10^{-6} (Tables 6 and 9). At the present time, much of Site 06 is paved, including the location of 06-HP015 which is beneath a concrete pad. Thus, the direct contact exposure pathway for human health is incomplete at this location and there is no current significant risk to human health. Soil to the east and south of 06-HP015 was previously excavated during 2002/2003 remedial excavation activities (Shaw, 2004b). Further excavation was not pursued at this location since the Navy has excavated the bulk of petroleum-impacted shallow soils to the extent economically practical at the site (excavation of the 06-HP015 location would require removing relatively large amounts of reinforced concrete from former building foundations). Results of two nearby sampling locations (to the northwest and southeast, shown on Figure 8) further confirm the limited extent of elevated TPH-d remaining in soil in this area. In addition, the exceedant TPH-d concentration was collected from a depth of 5.25- to 5.75-foot bgs and spans the shallow soil versus deep soil division. It is likely that the contamination observed in this sample coincides with the saturated zone (a sample collected from 5 to 9 feet bgs at this location also contained elevated TPH-d concentrations [see Table A2 in Appendix A]). Due to the affects of the remedial excavation and natural attenuation, sample 06-HP015 (collected in 1995) is no longer representative of current site conditions.

Chemicals adsorbed to shallow soil may also leach to groundwater and thereby pose a potential risk to ecological receptors when the groundwater discharges to the San Francisco Bay. The sample collected at 5.25 to 5.75 feet bgs from the 06-HP015 location exceeded a total HI of 1 for the ecological receptor as shown on Table 9. The exceedant sample at 06-HP015 was mainly comprised of diesel-range organics and is located over 300 feet from the shoreline. While the heavier-end petroleum compounds observed at this localized area may leach to the groundwater, it is unlikely that they will migrate the significant distance to the shoreline at concentrations that would pose a potential risk to ecological receptors due to natural attenuation processes. Further, natural attenuation data collected at Site 06 supports the assessment that biodegradation of petroleum hydrocarbons is occurring at the site and is contributing to the decrease in concentrations of petroleum hydrocarbons over time (TtEMI, 2002b).

Further Evaluation of Shallow Soil Sample Location 06-077

Sample 06-077 was collected in 2002 from the south sidewall of the former USTs 240A and 240B free product excavation. As noted in the Site 06 Remedial Excavation PCSR (Shaw, 2004b), analytical results observed for sample 06-S-077 were considered not representative of shallow soil conditions in the former UST 240A and 240B area. Because the excavation was performed to facilitate free product removal from the groundwater surface, which involved the excavation of highly contaminated smear zone soil at or slightly above the groundwater surface,

it is likely that cross contamination of the sidewall soil (represented by sample 06-077) occurred during excavation. Verification sampling (06-186 and -187) conducted in the vicinity of sample 06-077 confirmed that the results were anomalous (neither TPH-g or VOCs [with the exception of methylene chloride] were detected in the verification soil samples as shown on Table A1) (Shaw, 2004b). The excavation of this area was completed to an average depth of 6 feet bgs over an approximate 50-by-30-foot area and backfilled with clean fill material. No other shallow soil samples collected near former USTs 240A and 240B contained screening criteria exceedances as shown on Figures 7 through 11. For these reasons, this sample is excluded from further discussions of shallow soil left in-place.

For ecological receptors, exposures to COPCs in the deeper soil from the 06-077 sample location could occur via leaching into groundwater and subsequent discharge of the groundwater to surface water. The leaching of chemicals from deeper soil is not addressed directly; rather risk is evaluated through chemical concentrations measured in the groundwater (see Section 4.6, "Results of the Risk-Based Screening Evaluation for Groundwater") since the deeper soil coincides with the saturated zone (see Section 4.2.2). However, it should be noted that the localized area of impact at sample location 06-077 is located over 300 feet from the shoreline.

Further Evaluation of Shallow Soil Sample Location 06-BVW

Sample 06-BVW exceeded a normalized total HI of 1 for the ecological receptor as shown on Table 9. The exceedant sample at 06-BVW was mainly comprised of motor oil-range organics and the sample is located over 300 feet from the shoreline. While the heavier-end petroleum compounds observed at this localized area may leach to the groundwater, it is unlikely that they will migrate the significant distance to the shoreline at concentrations that would pose a potential risk to ecological receptors due to natural attenuation processes. Further, natural attenuation data collected at Site 06 supports the assessment that biodegradation of petroleum hydrocarbons is also occurring at the site and is contributing to the decrease in concentrations of petroleum hydrocarbons over `me (TtEMI, 2002b).

4.5.3.1 Additional Shallow Soil Sample Location Evaluations

Four additional shallow soil samples contained COPC concentrations that exceeded unmodified shallow soil screening criteria. These shallow soil samples, collected from locations 06-161, 06-170, 06-HP010, and 06-SB01, are evaluated further in the following text.

Further Evaluation of Shallow Soil Sample Location 06-161

As shown on Figure 8, TPH-d exceeded the unmodified screening criterion in the sample collected from 4.0 feet bgs from location 06-161. This sample was collected in 2002 from the east sidewall of the shallow soil overexcavation area in the vicinity of former UST 248B. As discussed in the Site 06 PCSR (Shaw, 2004b), additional excavation was not pursued at this location since the TPH-d concentration detected at this location

(1,500 milligrams(s) per kilogram [mg/kg]) only slightly exceeded the screening criteria. Further, soil to the north, east, and west of the sample location was previously excavated (Figure 8).

Further Evaluation of Shallow Soil Sample Location 06-170

As shown on Figure 8, TPH-d exceeded the unmodified screening criterion in the sample collected from 4.0 feet bgs from location 06-170. This sample was collected in 2002 from the west sidewall of the shallow soil overexcavation area in the vicinity of former UST 248B. As discussed in the Site 06 PCSR (Shaw, 2004b), additional excavation was not pursued at this location since additional excavation would require removing relatively large amounts of reinforced concrete (i.e., the foundations of former buildings; Figure 8) in order to remove limited TPH-impacted soils above groundwater. Soil to the north and east of the sample location was previously excavated.

Further Evaluation of Shallow Soil Sample Location 06-HP010

As shown on Figures 8 and 10, TPH-d and naphthalene exceeded the unmodified screening criteria in the sample collected from 3.0 to 7.0 feet bgs from location 06-HP010. This sample was collected in 1996 prior to remedial excavation activities performed at the site. Soil to the west of this sample location was excavated in 2002 (Figures 8 and 10 depict remedial excavation boundaries). The contamination observed in this sample may have been associated with the groundwater smear zone since the exceedant concentrations were collected from a depth that spans the shallow soil versus deep soil division. Due to the affects of the remedial excavation and natural attenuation, sample 06-HP010 is likely no longer representative of current site conditions.

Further Evaluation of Shallow Soil Sample Location 06-SB01

As shown on Figure 11, naphthalene exceeded the unmodified screening criteria in the sample collected from 2.5 to 3.0 feet bgs from location 06-SB01. This sample was collected in 1996 prior to remedial excavation activities performed at the site. Soil to the north, east, and shouth of this sample location was excavated in 2002 (Figure 11 depicts remedial excavation boundaries). At the present time, much of Site 06 is paved, including the location of 06-SB01 which is beneath a concrete pad. Thus, the direct contact exposure pathway for human health is incomplete at this location and there is no current significant risk to human health from this location.

4.5.4 Step 4. Soil Summary

The results of the initial screening for shallow soil at Site 06 indicate that concentrations of petroleum and associated chemicals in seven shallow soil samples exceed the selected unmodified screening criteria. As a result, further evaluation of the samples and relevant exposure pathways was completed. Of the three samples that contained maximum COPC

concentrations, one of the samples (06-077) represented anomalous analytical results and was eliminated from further evaluation as discussed above in Section 4.5.3. Another sample (06-HP015) that posed a potential risk to human receptors is currently located beneath concrete; therefore, no direct contact exposure pathway for human health currently exists. Soil to the east and south of this location has been excavated and results of two nearby sampling locations confirm the limited extent of elevated TPH-d remaining in soil in this area. For the ecological receptor, heavier-end petroleum compounds observed in samples 06-HP015 and 06-BVW may leach to the groundwater; however, it is unlikely that they will migrate the significant distance to the shoreline at concentrations that would pose a potential risk as a result of natural attenuation processes.

Proximity to remedial excavation areas, the timing of site remediation activities relative to sampling dates, sample depth, and practicality of removal were used to evaluate the remaining shallow soil samples with screening criteria exceedances. Based on these evaluations, no current health hazards were found associated with these locations (i.e., these samples exceedances are isolated occurrences and one location [06-HP010] may be representative of deep versus shallow soil conditions).

If Site 06 is developed in the future, impacted soil from 5.5 feet bgs or deeper could be excavated and left exposed at the surface during typical redevelopment activities, thereby completing the exposure pathway. To address this concern, the Navy will include notification of the residual TPH contamination in soil at 5.5 feet bgs or deeper in the appropriate transfer documents so that the soil can be managed properly.

For the ecological receptor, heavier-end petroleum compounds observed in samples 06-HP015 and 06-BVW may leach to the groundwater; however, it is unlikely that they will migrate the significant distance to the shoreline at concentrations that would pose a potential risk as a result of natural attenuation processes.

The results of the shallow soil screening at the Site 06 in Step 2 and Step 3 indicate that concentrations of petroleum and associated chemicals remaining in shallow soil (less than 5.5 feet bgs) do not pose a significant risk to human or ecological receptors; therefore, NFA for the remaining petroleum contamination in shallow soil is recommended for the site.

4.6 Results of the Risk-Based Screening Evaluation for Groundwater

This section summarizes the results of the four-step risk-based groundwater screening evaluation performed for Site 06.

4.6.1 Step 1. Compile the Concentrations of all COPCs Detected in Groundwater

TPH-g, TPH-d, TPH-mo, BTEX, MTBE, naphthalene, and cumene were detected in groundwater at Site 06 as shown in the risk-based screening evaluation provided in Table 7. A complete list of groundwater analytical results (both pre- and post-excavation) is provided in Table 10, "Summary of Analytical Results for Well Groundwater Samples, Site 06."

4.6.2 Step 2. Compare Concentrations to Chemical-Specific Screening Criteria

The results of the initial screening for groundwater indicate that total TPH, BTEX, and naphthalene exceeded the normalized screening criteria as shown on Table 7. The calculated total HI and total cancer risk (using the maximum concentrations detected for each COPC) exceeds 1 and $1x10^{-6}$, respectively, as presented at the end of Table 7. The total HI calculated using the maximum concentration detected for each COPC also exceeds 1 for the ecological receptor indicating that further evaluation is warranted as presented in Step 3.

4.6.3 Step 3. Additional Analyses to Support Risk Management

Based on the results of Step 2, the calculated total HI exceeds 1 for both the residential human receptor and the ecological receptor, and the total cancer risk (using the maximum concentrations detected for each COPC) also exceeded $1x10^{-6}$ for the human receptor (Table 7). The maximum COPC concentrations used to calculate the total HI and total cancer risk were detected in samples from only one monitoring well, 06-MW01 (in the former USTs 240A and 240B subarea). COPC concentrations in samples from wells 06-MW21 and 06-MW22 (associated with the former USTs 248A and 248B subarea) also contained elevated concentrations of TPH-d as shown in Table 7. To further evaluate the potential risk to human health (under a residential scenario) and ecological receptors from both subareas, four additional qualitative factors have been considered: 1) source removal, 2) the potential for groundwater to infiltrate into storm drain lines, 3) plume stability and the spatial distribution of contaminants, and 4) the likelihood of natural attenuation. Vapor intrusion concerns are separately evaluated in Section 4.6.3.5, "Vapor Intrusion Evaluation," below.

4.6.3.1 Source Removal

Remedial actions taken to remove the source of groundwater contamination associated with the former USTs 240A and 240B subarea began in 1992 with the removal of the USTs. Numerous holes were noted in the walls of both USTs at the time of removal. Between October 1995 and September 1996, the Navy used a passive skimmer (installed in well 06-RW3 [shown on Figure 1]) to skim free product from the groundwater surface. An excavation was subsequently performed in 2002 and 2003 to facilitate free product removal. Efforts to remove free product in the vicinity of former USTs 240A and 240B resulted in an open excavation that extended to groundwater over an area of approximately 50 feet by 30 feet. Free product that accumulated on the groundwater pool was then removed with oil absorbent pads (Shaw, 2004b). A measurable

thickness of free product has not been observed in any of the site monitoring wells since completion of the remedial excavation in 2003 (Shaw, 2004c).

Remedial actions taken in the former USTs 248A and 248B subarea began with removal of the USTs in 1995. Subsequent remedial excavation activities in 2002 through 2003 removed TPH-impacted soil, waste fuel USTs 248C and 248D, and OWS components and associated piping (Shaw, 2004b).

4.6.3.2 Groundwater Infiltration into Storm Drain Lines

An evaluation of the potential for groundwater infiltration into storm drain lines is necessary to address risks to the ecological receptor. As described in the Final CAP (TtEMI, 2002b), three separate storm drainage areas are present within Site 06. One storm drain passes south (upgradient) of the site and includes several catch basins and laterals that drain the area of former buildings that were located along the southern boundary of the site. As shown on Figure 1, a second storm drain line along the eastern and northern portion of the site receives runoff from the former training area and from paved areas northeast of the site. This drain is plugged with concrete at the manhole at the northeast corner of Site 06. Lastly, a third storm drain flows north from the parking area at the northernmost portion of the site and drains the immediate vicinity. A survey conducted in 2001 concluded that the storm drain system both within and immediately surrounding Site 06 is unlikely to be a significant conduit for contaminant migration since the storm drain system is mostly above groundwater (TtEMI, 2002b).

4.6.3.3 Spatial Distribution of Contaminants and Plume Stability

To assess the potential migration of contaminated groundwater from the former USTs 240A and 240B and former USTs 248A and 248B subareas to the Bay, both the spatial distribution of contaminants and plume stability were evaluated. The screening criterion for total TPH in groundwater (1,400 microgram(s) per Liter[μg/L]) is for the protection of ecological receptors at the shoreline (TtEMI, 2001b). The screening criterion for benzene is 51 μg/L in groundwater for the protection of human receptors at the shoreline (for consumption of aquatic organisms). Therefore, if concentrations of total TPH or benzene in groundwater will not exceed 1,400 μg/L or 51 μg/L, respectively, at the shoreline, then the groundwater does not pose a significant risk to ecological receptors or human receptors via discharge to the Bay.

Former USTs 240A and 240B Subarea

At the former USTs 240A and 240B subarea, TPH exceedances in groundwater are limited to areas within the site boundary (Figure 12). TPH was either not-detected or was detected at low concentrations (below the screening criteria) in groundwater samples collected along the shoreline during the last four site-wide groundwater monitoring events. Similarly, Figure 13 illustrates that the distribution of benzene, the primary volatile COPC, is also only elevated in the

former source area (i.e., near wells 06-MW01 and 06-MW02) and is below screening criteria downgradient of the former source area. Although concentrations of benzene reported in samples collected from 06-MW01 continue to exceed the screening criteria for the infiltration of subsurface vapors from groundwater to indoor air (Table 7), soil gas sampling performed in 2004 in the vicinity of this well confirmed a localized, versus widespread, area of concern as shown on Figures 16, 17, and 18 (see also Section 3.5). Section 4.6.3.5, "Vapor Intrusion Evaluation," presents the risk-based screening evaluation for soil gas samples collected at Site 06.

To evaluate dissolved hydrocarbon trends in groundwater in this subarea, the natural log of total TPH and benzene concentrations (post-remediation) were plotted versus time (*i.e.,* days since source area excavation activities were completed) as shown on Figure 20, "Total TPH Concentration vs. Time, Well Trend Analysis, Former USTs 240A and 240B Subarea – Site 06," and Figure 21, "Benzene Concentration vs. Time, Well Trend Analysis, Former USTs 240A and 240B Subarea – Site 06." As shown on Figure 20, although the trendline for total TPH concentrations in the downgradient wells (06-MW23, 06-MW16, and 06-MW17) show an upward trend (or rebound) relative to the first event around day 50, total TPH concentrations in the source area well, 06-MW01, as well as the dissolved benzene concentrations in both the source area and downgradient wells appear to remain stable with time (following the first post remediation monitoring event in October 2002). As noted in the Water Board Memorandum entitled *"Regional Board Supplemental Instructions to State Water Board December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Sites"* (Water Board, 1996), groundwater plumes often display short term variability in groundwater concentrations due to changes in groundwater flow, degradation rates, and sampling procedures; this behavior should not be construed as evidence of an unstable plume but may be the natural variations of a stable plume in the environment.

To further assess plume stability and the potential migration of contaminated groundwater from the former USTs 240A and 240B subarea, fate and transport modeling was performed using the BIOSCREEN model (EPA, 1996). The dissolved TPH as gasoline and benzene concentrations along the plume centerline were modeled using a 100-year simulation time for both no degradation and first order decay scenarios. Both scenarios assumed that the source was infinite and that the groundwater flow direction was directly towards the shoreline. The input parameters and results of the model simulations are presented in Figure 22, "BIOSCREEN Model Results for TPH as Gasoline – 100 yr. Simulation with An Infinite Source, Former USTs 240A and 240B Subarea," and Figure 23, "BIOSCREEN Model Results for Benzene – 100 yr. Simulation with An Infinite Source, Former USTs 240A and 240B Subarea." The results presented in Figure 22 indicate that dissolved TPH as gasoline concentrations will likely not exceed the ecological screening criterion (1,400 µg/L) beyond approximately 10 feet downgradient of the source (which is roughly 290 feet upgradient of the Bay) if first order decay

of an infinite source occurs. The results presented in Figure 23 indicate that dissolved benzene concentrations will likely not exceed the ecological screening criterion (51 µg/L) beyond approximately 180 feet downgradient of the source (which is roughly 120 feet upgradient of the Bay) if first order decay of an infinite source occurs.

Based on the evaluations of plume stability and spatial distribution of contaminants described above, the Navy believes that the remaining concentrations of petroleum and related constituents in groundwater at the former USTs 240A and 240B subarea are stable and will likely not exceed the screening criteria at the shoreline.

Former USTs 248A and 248B Subarea

TPH detected in samples from the former USTs 248A and 248B subarea were predominantly diesel-range organic hydrocarbons. Only non-detected to low concentrations of volatile COPCs were detected during the 2003/2004 groundwater monitoring events (Table 7) and previous monitoring events (Figure 15). As depicted on Figure 12, the distribution of total TPH in samples collected in well samples associated with the former USTs 248A and 248B subarea show that TPH remains elevated in and adjacent to the former source area (i.e., at wells 06-MW21 and 06-MW22); however, concentrations are below the screening criterion further downgradient of the source area (i.e., at wells 06-MW18, 06-MW19, and 06-MW24).

To evaluate dissolved hydrocarbon trends in groundwater in this subarea, the natural log (LN) of total TPH concentrations (post-remediation) were plotted versus time (*i.e.,* days since source area excavation activities were completed) as shown on Figure 24, "Total TPH Concentration vs. Time, Well Trend Analysis 1, Former USTs 248A and 248B Subarea – Site 06," and Figure 25, "Total TPH Concentration vs. Time, Well Trend Analysis 2, Former USTs 248A and 248B Subarea – Site 06." The data was split into two different groups and therefore two concentration versus time charts were produced due to the size of the source area and downgradient well layout. As shown on Figure 24, total TPH concentrations in wells near the former source area (06-MW21 and 06-MW22) show a notable downward (or declining) trend subsequent to the remedial excavation activities. Total TPH concentrations in downgradient well 06-MW18 appear to have a very slight upward trend while total TPH concentrations in downgradient well 06-MW19 illustrate a slightly declining trend. Total TPH concentrations in both downgradient wells are below the screening criterion and relatively stable. The second former USTs 248A and 248B subarea trend chart, Figure 25, also depicts a clear downward trend in total TPH concentrations observed in near source area wells 06-MW03 and 06-MW22. Total TPH concentrations in downgradient well 06-MW24 show a very slight upward trend but concentrations remain relatively stable below the screening criterion. As noted in the Water Board Memorandum entitled *"Regional Board Supplemental Instructions to State Water Board December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Sites"* (Water Board, 1996), groundwater plumes often display short term variability in groundwater

concentrations due to changes in groundwater flow, degradation rates, and sampling procedures; this behavior should not be construed as evidence of an unstable plume but may be the natural variations of a stable plume in the environment.

To further assess plume stability and the potential migration of contaminated groundwater from the former USTs 248A and 248B subarea, fate and transport modeling was performed using the BIOSCREEN model (EPA, 1996). The dissolved TPH as diesel concentrations along the plume centerline were modeled using a 100-year simulation time for both no degradation and first order decay scenarios. Both scenarios assumed that the source was infinite and that the groundwater flow direction was directly towards the shoreline. The input parameters and results of the model simulations are presented in Figure 26, "BIOSCREEN Model Results for TPH as Diesel – 100 yr. Simulation with An Infinite Source, Former USTs 248A and 248B Subarea." The results presented in Figure 26 indicate that dissolved TPH as diesel concentrations will likely not exceed the ecological screening criterion (1,400 µg/L) beyond approximately 5 feet downgradient of the source (which is roughly 265 feet upgradient of the Bay) if first order decay of an infinite source occurs.

Based on the evaluations of plume stability and spatial distribution of contaminants described above, the Navy believes that the remaining concentrations of petroleum and related constituents in groundwater at the former USTs 248A and 248B subarea are stable and will likely not exceed the screening criteria at the shoreline.

4.6.3.4 Natural Attenuation

Previous investigations of petroleum release sites at NAVSTA TI indicate that natural attenuation is occurring (TtEMI, 2003a, 2003b). Data on natural attenuation collected at Site 06 supports the assessment that biodegradation of petroleum hydrocarbons is also occurring at the site, most notably in the 06-MW01 source area, where biodegradation processes have been measured to the stage of methanogenesis via aerobic respiration, denitrification, and iron (III), manganese (IV), and sulfate reduction (TtEMI, 2002b). Thus, natural attenuation is contributing to the decrease in concentrations of petroleum hydrocarbons over time at the site.

4.6.3.5 Vapor Intrusion Evaluation

As recommended in Section 2.8.2.1 of the ESL guidance document (Water Board, 2005), soil gas samples were collected from an area within Site 06 where groundwater screening levels for vapor intrusion concerns were approached or exceeded for comparison to soil gas screening levels. The Water Board (2005) developed soil gas screening levels based on scientific models for vapor intrusion into buildings as well as data from actual field investigations. The resultant screening levels are based on a cancer risk of 1×10^{-6} or a target HQ of 0.2. Table 11, "Shallow Soil Gas Screening Criteria, Site 06," provides a summary of the selected shallow soil gas screening criteria for the inhalation of indoor air exposure pathway. To simplify evaluating

potential hazards from multiple COPCs, the screening criteria were modified by normalizing the target HQs to 1, shown also on Table 11.

In areas where buildings may be constructed in the future, the Water Board recommends collecting samples from a depth of 5 feet bgs (soil gas samples collected from depths less than 5 feet bgs may be unreliable due to the increased potential to draw in ambient, surface air). At Site 06, however, the water table is at 5 feet bgs; therefore, the soil gas samples were collected from depths between 3 to 4 feet bgs, just above the shallow water table.

As previously discussed in Section 3.5, soil gas samples collected from Site 06 were analyzed for BTEX, MTBE, and isopropyl alcohol (a leak detection compound) in accordance with the Final Project Plan Addendum for Soil Gas Sampling at Site 06 (Shaw, 2004d). BTEX constituents and isopropyl alcohol were detected in some of the soil gas samples; MTBE was not detected in any of the samples as listed in Table 8. Figures 16, 17, and 18 depict the analytical results for the three soil gas sampling events performed (in July, August, and October 2004, respectively) and compare these results to unmodified screening criteria. An analytical results summary for all three soil sampling events is provided in Figure 19. Table 8 compares analytical results to screening criteria normalized to a target HQ of 1 for residential exposure. Concentrations of benzene and toluene detected in sample SV-04B exceed the normalized screening criteria, resulting in the calculated total HI and total cancer risk to exceed 1 and 1×10^{-6}, respectively, as presented at the end of Table 8. Because the concentrations observed in this sample location exceed the soil gas ESLs by more than one order of magnitude, engineering controls (for future building designs) may be necessary to mitigate vapor intrusion concerns if the property is developed in the future. As discussed in the Water Board ESL guidance document (2005), the scope and oversight of these controls will be determined on a site-specific basis by the property owner in coordination with overseeing regulatory agencies.

4.6.4 Step 4. Groundwater Summary

Results for the quantitative screening of groundwater COPCs at Site 06 indicate that concentrations of remaining petroleum hydrocarbons and associated chemicals exceed the selected screening criteria indicating that further analysis was warranted to support risk management decisions. The criteria used for risk management were effectiveness of the historical remedial actions to remove free product, the potential for groundwater to infiltrate storm drain lines, plume stability and an evaluation of the spatial distribution of contaminants, and the likelihood of natural attenuation.

Free product removal was determined to be complete to the extent practical. Evaluation of the infiltration of groundwater into storm drains indicated that the storm drain system is mostly above groundwater at Site 06 and that the drainage system is unlikely to be a significant conduit for the impacted groundwater to reach ecological receptors. In addition, the concentrations of

total TPH and petroleum-related VOCs discharged to the Bay are not expected to exceed the ecological screening criterion based on groundwater monitoring results of downgradient wells which indicate that concentrations of COPCs in groundwater do not exceed the screening criterion at the shoreline and fate and transport modeling that indicates remaining concentrations of petroleum and related constituents at Site 06 will likely not exceed the relevant screening criterion at the shoreline. In addition, natural attenuation processes are expected to continue to reduce concentrations of total TPH and petroleum-related VOCs in groundwater with time at the former USTs 240A and 240B subarea and total TPH concentrations in the former USTs 248A and 248B subarea.

The results of the evaluation indicate that residual levels of petroleum and petroleum-related VOCs at the site do not currently pose a significant risk to human or ecological receptors. Based on the results of Steps 2 and 3, remaining elevated concentrations of VOCs in groundwater in the immediate vicinity of former USTs 240A and 240B may pose a risk to human health if the site is developed in the future. The Navy will also disclose the potential for petroleum-related indoor air impacts in the immediate vicinity of former USTs 240A and 240B in the event that the property is developed. The potential risk to human health will be managed through the provisions of an agreed upon risk management plan that will be developed by the Navy or future property owners; thus, the Navy requests NFA with respect to petroleum hydrocarbons and petroleum constituents in groundwater for Site 06.

Table 2
Shallow Soil Screening Criteria (Unmodified), Site 06

Chemical of Potential Concern	Receptor	Human - Residential									Human - Construction/Trench Worker			Ecological	
	Exposure Pathway	Inhalation of Indoor Air			Direct / Indirect Contact						Direct / Indirect Contact			Leaching to Groundwater	
	Screening Criteria	Water Board Environmental Screening Levels [1] (mg/kg)	Target HQ or Risk	Basis	US EPA Preliminary Remediation Goals [2] (mg/kg)	Target HQ or Risk	Basis	Presidio Action Levels [3] (mg/kg)	Target HQ or Risk	Basis	Water Board Environmental Screening Levels [4] (mg/kg)	Target HQ or Risk	Basis	Naval Station Treasure Island Specific Levels [5] (mg/kg)	Water Board Environmental Screening Levels [6] (mg/kg)
Total Petroleum Hydrocarbons															
Gasoline-Range Organics		-	-	-	-	-	-	1,030	0.1	nc	6,000	0.5	nc	315	-
Diesel-Range Organics		-	-	-	-	-	-	1,380	0.1	nc	6,000	0.5	nc	1,500	-
Motor-Oil-Range Organics		-	-	-	-	-	-	1,900	0.1	nc	15,000	0.5	nc	1,850	-
Volatile Organic Compounds															
Benzene		0.18	1E-06	ca	0.64	1E-06	ca	-	-	-	16	1E-06	ca	-	2
Cumene (Isopropylbenzene)		390 [7]	0.2	nc	570	1	nc	-	-	-	400 [7]	1	nc	-	32 [7]
Ethylbenzene		390	0.2	nc	400	1	sat	-	-	-	400	1	sat	-	32
Naphthalene		0.46	1E-06	ca	1.7	1E-06	ca	-	-	-	97	1E-06	ca	-	4.8
Toluene		130	0.2	nc	520	1	sat	-	-	-	650	1	sat	-	9.3
Xylenes (total)		310	0.2	nc	270	1	nc	-	-	-	420	1	sat	-	11

Notes:

1. Soil screening levels were established by the Water Board for the protection of indoor air quality using the Johnson-Ettinger model assuming residential exposure to volatilization from highly permeable soil directly below a building floor, Table E-1b (Water Board, 2005).

2. Full documentation of the PRGs and their development is provided in (EPA, 2004). Cal-modified PRGs are used when available. The saturation limit ("sat") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

3. The screening criteria for TPH fractions for residential land-use are based on the soil action levels for the Presidio (Montgomery Watson, 1995).

4. Screening levels for the construction/utility worker exposure scenario are from Table K-3, "Direct-Exposure Screening Levels, Construction/Trench Worker Exposure Scenario" (Water Board, 2005). The saturation limit ("sat") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

5. The TPH screening criteria for leaching to groundwater are based on NAVSTA-TI specific levels presented in Table 2, "Soil Preliminary Remediation Criteria for TPH and TPH Constiutents for Protection of Marine Ecological Receptors" (TtEMI, 2001c). The target groundwater concentration is the NAVSTA TI screening criterion for the protection of ecological receptors, 1.4 mg/L (TtEMI, 2001c).

6. Screening levels for the leaching of volatile organic compounds to groundwater are from Table G, "Soil Screening Levels for Leaching Concerns" (Water Board, 2005). The target groundwater concentrations are the lowest Estuary Aquatic Habitat Goals presented in Table F-4a, "Summary of Selected Chronic Aquatic Habitat Goals" (Water Board, 2005).

7. There is no available screening criterion for this pathway or exposure scenario to evaluate potential impacts due to cumene. Based on similar chemical structure and reported adverse health effects, the criterion for ethylbenzene has been substituted.

General notes to tables follow Table 11.

References:

Montgomery Watson, 1995, Fuel Product Action Level Development Report, Presidio of San Francisco, California, October.

Regional Water Quality Control Board, San Francisco Bay Region (Water Board), 2005, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, February.

Tetra Tech EM, Inc. (TtEMI), 2001c, Final - Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Technical Memorandum , Naval Station Treasure Island, San Francisco, California, November 13.

U.S. Environmental Protection Agency (EPA), 2004, EPA Region 9 Preliminary Remediation Goals,October.

Table 3
Normalized Shallow Soil Screening Criteria, Site 06

Chemical of Potential Concern	Receptor	Human - Residential									Human - Construction/Trench Worker			Ecological	
	Exposure Pathway	Inhalation of Indoor Air			Direct / Indirect Contact						Direct / Indirect Contact			Leaching to Groundwater	
	Screening Criteria	Water Board Environmental Screening Levels [1] (mg/kg)	Target HQ or Risk	Basis	US EPA Preliminary Remediation Goals [2] (mg/kg)	Target HQ or Risk	Basis	Presidio Action Levels [3] (mg/kg)	Target HQ or Risk	Basis	Water Board Environmental Screening Levels [4] (mg/kg)	Target HQ or Risk	Basis	Naval Station Treasure Island Specific Levels [5] (mg/kg)	Water Board Environmental Screening Levels [6] (mg/kg)
Total Petroleum Hydrocarbons															
Gasoline-Range Organics		-	-	-	-	-	-	10,300	1	nc	12,000	1	nc	315	-
Diesel-Range Organics		-	-	-	-	-	-	13,800	1	nc	12,000	1	nc	1,500	-
Motor-Oil-Range Organics		-	-	-	-	-	-	19,000	1	nc	30,000	1	nc	1,850	-
Volatile Organic Compounds															
Benzene		0.18	1E-06	ca	0.64	1E-06	ca	-	-	-	16	1E-06	ca	-	2
Cumene (Isopropylbenzene)		400 [7]	1	sat	570	1	nc	-	-	-	400 [7]	1	sat	-	32 [7]
Ethylbenzene		400	1	sat	400	1	sat	-	-	-	400	1	sat	-	32
Naphthalene		0.46	1E-06	ca	1.7	1E-06	ca	-	-	-	97	1E-06	ca	-	4.8
Toluene		650	1	sat	520	1	sat	-	-	-	650	1	sat	-	9.3
Xylenes (total)		420	1	sat	270	1	nc	-	-	-	420	1	sat	-	11

Notes:

1. Soil screening levels were established by the Water Board for the protection of indoor air quality using the Johnson-Ettinger model assuming residential exposure to volatilization from highly permeable soil directly below a building floor, Table E-1b (Water Board, 2005).
The saturation limit ("sat") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

2. Full documentation of the PRGs and their development is provided in (EPA, 2004). Cal-modified PRGs are used when available.
The saturation limit ("sat") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

3. The screening criteria for TPH fractions for residential land-use are based on the soil action levels for the Presidio (Montgomery Watson, 1995).

4. Screening levels for the construction/utility worker exposure scenario are from Table K-3, "Direct-Exposure Screening Levels, Construction/Trench Worker Exposure Scenario" (Water Board, 2005).
The saturation limit ("sat") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

5. The TPH screening criteria for leaching to groundwater are based on NAVSTA-TI specific levels presented in Table 2, "Soil Preliminary Remediation Criteria for TPH and TPH Constiutents for Protection of Marine Ecological Receptors" (TtEMI, 2001c). The target groundwater concentration is the NAVSTA TI screening criterion for the protection of ecological receptors, 1.4 mg/L (TtEMI, 2001c).

6. Screening levels for the leaching of volatile organic compounds to groundwater are from Table G, "Soil Screening Levels for Leaching Concerns" (Water Board, 2005).
The target groundwater concentrations are the lowest Estuary Aquatic Habitat Goals presented in Table F-4a, "Summary of Selected Chronic Aquatic Habitat Goals" (Water Board, 2005).

7. There is no available screening criterion for this pathway or exposure scenario to evaluate potential impacts due to cumene. Based on similar chemical structure and reported adverse health effects, the criterion for ethylbenzene has been substituted.

General notes to tables follow Table 11.

References:

Montgomery Watson, 1995, Fuel Product Action Level Development Report, Presidio of San Francisco, California, October.

Regional Water Quality Control Board, San Francisco Bay Region (Water Board), 2005, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, February.

Tetra Tech EM, Inc. (TtEMI), 2001c, Final - Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Technical Memorandum , Naval Station Treasure Island, San Francisco, California, November 13.

U.S. Environmental Protection Agency (EPA), 2004, EPA Region 9 Preliminary Remediation Goals,October.

Table 4
Groundwater Screening Criteria (Unmodified), Site 06

Chemical of Potential Concern	Receptor	Human						Ecological
	Exposure Pathway	Inhalation of Indoor Air			Consumption of Aquatic Organisms			Discharge to San Francisco Bay
	Screening Criteria	Water Board Environmental Screening Levels Residential Land Use [1] (µg/L)	Target HQ or Risk	Basis	USEPA National Recommended Ambient Water Quality Criteria [2] (µg/L)	Target HQ or Risk	Basis	USEPA National Recommended Ambient Water Quality Criteria [3] (µg/L)
Total Petroleum Hydrocarbons								
Gasoline-Range Organics		-	-	-	-	-	-	1,400 [4]
Diesel-Range Organics		-	-	-	-	-	-	
Motor-Oil-Range Organics		-	-	-	-	-	-	
Total TPH		-	-	-	-	-	-	
Volatile Organic Compounds								
Benzene		43	1.E-06	ca	51	1.E-06	ca	700
Cumene (Isopropylbenzene)		170,000 [5]	1	sol	2,100 [5]	1	nc	680 [6]
Ethylbenzene		170,000	1	sol	2,100	1	nc	86
Methyl t-butyl ether		13,100	1.E-06	ca	-	-	-	8,000 [7]
Naphthalene		149	1.E-06	ca	-	-	-	470
Toluene		204,000	0.2	nc	15,000	1	nc	5,000
Xylenes (total)		160,000	1	sol	2,100 [5]	1	nc	86 [5]

Notes:

1. *Site specific screening levels were calculated using the Johnson Ettinger Indoor Air Model for Subsurface Vapor Intrusion Into Buildings (US EPA 2003), as recommended in Section 2.8.2.2 of the Water Board ESL guidance document (Water Board 2005). The input assumptions used were the same as those used by the Water Board except for the depth to groundwater, which was adjusted to a (shallower) depth of 5 feet bgs. Additionally, the VOCs were not adjusted upwards by a factor of ten to account for assumed biodegradation in the vadose-zone prior to emission at the surface (see the footnotes for Table E-1a [Water Board, 2005]).*
   The solubility limit ("sol") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).
2. *Screening criteria for human consumption of aquatic organisms are from the USEPA National Recommended Ambient Water Quality Criteria for Human Health (California Regional Water Quality Control Board, Central Valley Region, 2003).*
3. *Screening criteria for the protection of aquatic life are from the USEPA National Recommended Ambient Water Quality Criteria for Saltwater Aquatic Life Protection (California Regional Water Quality Control Board, Central Valley Region, 2003). Because recommended criteria were not available for these constituents, LOELs for chronic exposure were substituted. If a chronic exposure criterion was not available then 20% of the acute exposure criterion was substituted.*
4. *The total TPH screening criterion for the protection of ecological receptors was agreed upon by the Navy and the Water Board (TtEMI, 2001c).*
5. *Screening criteria for isopropylbenzene and xylenes were not available. Based on similar chemical structure and reported adverse health effects, the criteria for ethylbenzene have been substituted.*
6. *The screening criterion for cumene is based on an evaluation of available marine ecotoxicity data for ethylbenzene and isopropylbenzene (Shaw, 2005c).*
7. *The screening criterion for MtBE is based on the interim water quality objective from the Regional Water Quality Control Board, San Francisco Bay Region, 1998.*

Table 4
Groundwater Screening Criteria (Unmodified), Site 06

General notes to tables follow Table 11.

References:

California Regional Water Quality Control Board, Central Valley Region, 2003, A Compilation of Water Quality Goals, August.

California Regional Water Quality Control Board, San Francisco Bay Region, 1998, Recommended Interim Water Quality Objectives or Aquatic Life Criteria for Methyl Tertiary-Butyl Ether (MTBE), October 1.

California Regional Water Quality Control Board, San Francisco Bay Region (Water Board), 2005, Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, February.

Tetra Tech EM, Inc., 2001c, Final Technical Memorandum, Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Naval Station Treasure Island, San Francisco, California, November 13.

Table 5
Normalized Groundwater Screening Criteria, Site 06

Chemical of Potential Concern	Receptor	Human						Ecological
	Exposure Pathway	Inhalation of Indoor Air			Consumption of Aquatic Organisms			Discharge to San Francisco Bay
	Screening Criteria	Water Board Environmental Screening Levels Residential Land Use [1] (µg/L)	Target HQ or Risk	Basis	USEPA National Recommended Ambient Water Quality Criteria [2] (µg/L)	Target HQ or Risk	Basis	USEPA National Recommended Ambient Water Quality Criteria [3] (µg/L)
Total Petroleum Hydrocarbons								
Gasoline-Range Organics		-	-	-	-	-	-	1,400 [4]
Diesel-Range Organics		-	-	-	-	-	-	
Motor-Oil-Range Organics		-	-	-	-	-	-	
Total TPH		-	-	-	-	-	-	
Volatile Organic Compounds								
Benzene		43	1.E-06	ca	51	1.E-06	ca	700
Cumene (Isopropylbenzene)		170,000 [5]	1	sol	2,100 [5]	1	nc	680 [6]
Ethylbenzene		170,000	1	sol	2,100	1	nc	86
Methyl t-butyl ether		13,100	1.E-06	ca	-	-	-	8,000 [7]
Naphthalene		149	1.E-06	ca	-	-	-	470
Toluene		526,000	1	sol	15,000	1	nc	5,000
Xylenes (total)		160,000	1	sol	2,100 [5]	1	nc	86 [5]

Notes:

1. Groundwater screening levels for the protection of indoor air are from Table E-1a, "Groundwater Screening Levels for Evaluation of Potential Indoor Air Impacts" (Water Board, 2005). The solubility limit ("sol") was used as the upper limit for VOCs that are liquid at ambient conditions (EPA, 2004).

2. Screening criteria for human consumption of aquatic organisms are from the USEPA National Recommended Ambient Water Quality Criteria for Human Health (California Regional Water Quality Control Board, Central Valley Region, 2003).

3. Screening criteria for the protection of aquatic life are from the USEPA National Recommended Ambient Water Quality Criteria for Saltwater Aquatic Life Protection (California Regional Water Quality Control Board, Central Valley Region, 2003). Because recommended criteria were not available for these constituents, LOELs for chronic exposure were substituted. If a chronic exposure criterion was not available then 20% of the acute exposure criterion was substituted.

4. The total TPH screening criterion for the protection of ecological receptors was agreed upon by the Navy and the Water Board (TtEMI, 2001c).

5. Screening criteria for isopropylbenzene and xylenes were not available. Based on similar chemical structure and reported adverse health effects, the criteria for ethylbenzene have been substituted.

6. The screening criterion for cumene is based on an evaluation of available marine ecotoxicity data for ethylbenzene and isopropylbenzene (Shaw, 2005c).

7. The screening criterion for MtBE is based on the interim water quality objective from the Regional Water Quality Control Board, San Francisco Bay Region, 1998.

Table 5
Normalized Groundwater Screening Criteria, Site 06

General notes to tables follow Table 11.

References:

California Regional Water Quality Control Board, Central Valley Region, 2003, A Compilation of Water Quality Goals, August.

California Regional Water Quality Control Board, San Francisco Bay Region, 1998, Recommended Interim Water Quality Objectives or Aquatic Life Criteria for Methyl Tertiary-Butyl Ether (MTBE), October 1.

California Regional Water Quality Control Board, San Francisco Bay Region (Water Board), 2005, Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, February.

Tetra Tech EM, Inc., 2001, Final Technical Memorandum, Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Naval Station Treasure Island, San Francisco, California, November 13.

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
06-SB01	06SB01A	8/5/1992	1.5 - 2	NA	12.9 U	NA	0.01 U	0.01 U	NA	0.69 U	0.01 U	0.01 U
	06SB01B	8/5/1992	2.5 - 3	NA	150	NA	0.054 U	0.55	NA	2.7	0.054 U	1.7
06-SB02	06SB02A	8/5/1992	1.5 - 2	NA	44.2	NA	0.01 U	0.01 U	NA	0.68 U	0.01 U	0.01 U
	06SB02B	8/5/1992	2.5 - 3	NA	895	NA	0.011 U	0.011 U	NA	0.71 U	0.011 U	0.011 U
06-SB07	06SB07A	8/27/1992	1.5 - 2	NA	12.9 U	NA	0.01 U	0.01 U	NA	0.69 U	0.01 U	0.01 U
	06SB07B	8/27/1992	2.5 - 3	NA	13.1 U	NA	0.011 U	0.011 U	NA	0.7 U	0.011 U	0.011 U
06-SB09	06SB09B	8/27/1992	2.5 - 3	NA	13 U	NA	0.01 U	0.01 U	NA	0.69 U	0.01 U	0.01 U
	06SB09C	8/27/1992	4.5 - 5	NA	13 U	NA	0.01 U	0.01 U	NA	0.69 U	0.01 U	0.01 U
06-HP006	199GG012	7/15/1995	0.25 - 0.75	0.54 U	11 U	55	0.011 U	0.011 U	NA	0.36 U	0.011 U	0.011 U
	199GG013	7/15/1995	3.3 - 4	0.52 U	5.7	34	0.01 U	0.01 U	NA	0.35 U	0.01 U	0.01 U
06-HP008	199GG015	7/17/1995	0.8 - 1.2	0.54 U	11 U	11 U	0.01 U	0.01 U	NA	0.36 U	0.01 U	0.01 U
	199GG016	7/17/1995	3.25 - 3.75	0.51 U	10 U	10 U	0.01 U	0.01 U	NA	0.34 U	0.01 U	0.01 U
06-HP010	199TT07	12/3/1996	3 - 7	94	4,300	530	0.053 U	0.053 U	NA	2.5	0.029 J	0.12
06-HP011	199GG028	7/17/1995	5.25 - 5.75	NA	NA	NA	0.011 U	0.011 U	NA	NA	0.011 U	0.011 U
06-HP012	199GG030	7/18/1995	0.75 - 1.25	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
06-HP013	199GG033	7/18/1995	1.25 - 1.75	0.51 U	10 U	10 U	0.01 U	0.01 U	NA	0.34 U	0.01 U	0.01 U
	199GG035	7/18/1995	5.25 - 5.75	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
06-HP014	199GG036	7/18/1995	1.5 - 2	0.51 U	25	43	0.01 U	0.01 U	NA	0.34 U	0.01 U	0.01 U
06-HP015	199GG042	7/18/1995	5.25 - 5.75	45	14,000	1,000	1.3 U	1.3 U	NA	11 U	1.3 U	1.3 U
06-HP017	199GG048	7/19/1995	1.5 - 2	0.53 U	11 U	11 U	0.011 U	0.011 U	NA	0.35 U	0.011 U	0.011 U
	199GG049	7/19/1995	3.25 - 3.75	NA	NA	NA	0.013 U	0.013 U	NA	NA	0.013 U	0.013 U
06-HP018	199GG051	7/19/1995	1.5 - 2	3.5	79	150	0.01 U	0.005 J	NA	0.35 U	0.01 U	0.043
	199GG053	7/19/1995	5.25 - 5.75	0.55 U	11 U	11 U	0.011 U	0.011 U	NA	0.37 U	0.011 U	0.002 J
06-HP019	199GG057	7/19/1995	4.5 - 5	NA	NA	NA	0.001 J	0.002 J	NA	NA	0.001 J	0.022
06-HP020	199GG059	7/19/1995	0.75 - 1.25	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.001 J
	199GG060	7/19/1995	2.75 - 3.25	0.51 U	10 U	10 U	0.01 U	0.01 U	NA	0.34 U	0.01 U	0.01 U
06-HP021	199GG062	7/19/1995	1 - 2.25	0.56 U	11 U	11 U	0.011 U	0.011 U	NA	0.37 U	0.011 U	0.011 U
	199GG064	7/19/1995	5 - 5.5	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
06-HP023	199TT06	12/3/1996	1 - 5	16	450	170	0.027 U	0.027 U	NA	0.11	0.027 U	0.038
	199GG067	7/20/1995	3.25 - 3.75	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
	199GG068	7/20/1995	5 - 5.5	0.53 U	11 U	11 U	0.01 U	0.01 U	NA	0.35 U	0.01 U	0.01 U
06-HP025	199GG069	7/20/1995	1.5 - 2	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
06-HP026	199GG073	7/20/1995	2.75 - 3.25	0.53 U	11 U	11 U	0.011 U	0.011 U	NA	0.35 U	0.011 U	0.011 U
	199GG074	7/20/1995	4.5 - 5	NA	NA	NA	0.011 U	0.011 U	NA	NA	0.011 U	0.011 U
06-HP030	199GG082	7/21/1995	2.75 - 3.25	0.52 U	10 U	10 U	0.01 U	0.01 U	NA	0.34 U	0.01 U	0.01 U
	199GG083	7/21/1995	5 - 5.5	NA	NA	NA	0.011 UJ	0.011 UJ	NA	NA	0.011 UJ	0.011 UJ
06-HP033	199GG086	7/21/1995	2.75 - 3.25	NA	NA	NA	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
	199GG087	7/21/1995	5 - 5.5	0.53 U	11 U	38	0.011 U	0.011 U	NA	0.35 U	0.011 U	0.011 U
SD-4-02	041TC005	1/23/1997	0	0.13 U	38 J	180	0.0006 U	0.0006 U	NA	0.46 U	0.0006 U	0.001 U
12-HP158	150WW109	11/12/1997	0.5 - 1.5	0.051 U	4.1	150	0.01 UJ	0.01 UJ	NA	0.33 U	0.01 UJ	0.01 UJ
	150WW110	11/12/1997	4 - 5	0.027	6.3 U	20	0.01 UJ	0.01 UJ	NA	0.34 U	0.01 UJ	0.01 UJ

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
12-HP148	150WW084	11/13/1997	0.5 - 1.5	0.035	6.9 UJ	39	0.011 UJ	0.011 UJ	NA	0.38 UJ	0.011 UJ	0.011 UJ
	150WW085	11/13/1997	4 - 5	0.053 U	6	210	0.01 UJ	0.01 UJ	NA	0.34 UJ	0.01 UJ	0.01 UJ
06-MP04	25706SB025	1/5/2000	5 - 6	0.64 U	13 U	240	0.007 J	0.013 U	NA	NA	0.013 U	0.013 U
06-MP05	25706SB004	8/31/1999	5 - 5.5	0.61 U	12 U	12 U	0.012 U	0.012 U	NA	NA	0.012 U	0.012 U
	25706SB026	1/5/2000	5 - 5.5	0.59 U	12 U	25	0.012 U	0.012 U	NA	NA	0.012 U	0.012 U
06-BVW	25706SB006	9/1/1999	4.5 - 5.5	0.51 U	10 U	10 U	0.01 U	0.01 U	NA	NA	0.01 U	0.01 U
	25706SB029	1/5/2000	4.5 - 5	0.51 U	1,000 U	6,300	0.01 U	0.01 U	NA	NA	0.001 J	0.0008 J
06-HP040A	25706GS238	3/6/2000	3.5 - 4	NA	11 U	26 U	NA	NA	NA	NA	NA	NA
06-HP041A	25706GS240	3/6/2000	2.5 - 3	NA	220	640	NA	NA	NA	NA	NA	NA
	25706GS241	3/6/2000	3.5 - 4	NA	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP042A	25706GS244	3/6/2000	2.5 - 3	NA	14	60	NA	NA	NA	NA	NA	NA
	25706GS245	3/6/2000	3.5 - 4	NA	11 U	27 U	NA	NA	NA	NA	NA	NA
06-HP043A	25706GS249	3/6/2000	3.5 - 4	NA	7 J	75	NA	NA	NA	NA	NA	NA
06-HP044A	25706GS235	3/6/2000	2.5 - 3	NA	9 J	35	NA	NA	NA	NA	NA	NA
06-HP045A	25706GS356	3/9/2000	3 - 3.5	6 U	10 UJ	25 J	NA	NA	NA	NA	NA	NA
06-HP046A	25706GS253	3/6/2000	1.5 - 2	5 U	4 J	20 J	NA	NA	NA	NA	NA	NA
	25706GS254	3/6/2000	3.5 - 4	5 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP047A	25706GS255	3/6/2000	1.5 - 2	5 U	300	300	NA	NA	NA	NA	NA	NA
	25706GS256	3/6/2000	3.5 - 4	6 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP053A	25706GS357	3/9/2000	5 - 5.5	6 U	11 U	26 U	NA	NA	NA	NA	NA	NA
06-HP055A	25706GS285	3/7/2000	1.5 - 2	7 U	11 U	28 U	NA	NA	NA	NA	NA	NA
06-HP056A	25706GS345	3/9/2000	1.2 - 1.7	5 U	11 U	28 U	NA	NA	NA	NA	NA	NA
06-HP057A	25706GS353	3/9/2000	5 - 5.5	6 U	13 U	31 U	NA	NA	NA	NA	NA	NA
06-HP058A	25706GS350	3/9/2000	5 - 5.5	6 U	11 U	27 U	NA	NA	NA	NA	NA	NA
06-HP059	25706GS288	3/7/2000	5 - 5.5	6 U	11 U	27 U	NA	NA	NA	NA	NA	NA
06-HP061	25706GS269	3/7/2000	4 - 4.5	5 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP062	25706GS270	3/7/2000	1.5 - 2	5 U	11 U	28 U	NA	NA	NA	NA	NA	NA
	25706GS271	3/7/2000	4 - 4.5	5 U	11 U	28 U	NA	NA	NA	NA	NA	NA
06-HP063	25706GS272	3/7/2000	1.5 - 2	5 U	600	830	NA	NA	NA	NA	NA	NA
06-HP065	25706GS259	3/6/2000	3 - 3.5	6 U	21	27 U	NA	NA	NA	NA	NA	NA
	25706GS260	3/6/2000	4.5 - 5	5 U	5 J	29 U	NA	NA	NA	NA	NA	NA
06-HP066	25706GS257	3/6/2000	1 - 1.5	5 U	11 U	27 U	NA	NA	NA	NA	NA	NA
	25706GS258	3/6/2000	4 - 4.5	5 U	11 U	28 U	NA	NA	NA	NA	NA	NA
06-HP067	25706GS279	3/7/2000	1.5 - 2	5 U	3 J	27 U	NA	NA	NA	NA	NA	NA
	25706GS280	3/7/2000	2.5 - 3	6 U	3 J	26 U	NA	NA	NA	NA	NA	NA
06-HP068	25706GS220	3/3/2000	2.5 - 3	5 U	11 U	27 U	NA	NA	NA	NA	NA	NA
06-HP069	25706GS223	3/3/2000	2.5 - 3	6 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP070	25706GS232	3/6/2000	2.5 - 3	5 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP071	25706GS275	3/7/2000	2.5 - 3	6 U	10 U	26 U	NA	NA	NA	NA	NA	NA
06-HP083	25706GS475	5/31/2000	1.5 - 2	5 U	48	270	NA	NA	NA	NA	NA	NA
	25706GS476	5/31/2000	3.5 - 4	5.4 U	9 J	150	NA	NA	NA	NA	NA	NA

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
06-HP085	25706GS501	6/5/2000	2 - 2.5	5.2 U	10 U	26 U	NA	NA	NA	NA	NA	NA
	25706GS502	6/5/2000	4 - 4.5	5.1 U	10 U	25 U	NA	NA	NA	NA	NA	NA
06-HP091	25706GS545	8/15/2000	5 - 5.5	4 U	120	40	NA	NA	NA	NA	NA	NA
06-HP096	25706GS656	2/1/2001	5.25 - 5.75	NA	160	100 UJ	NA	NA	NA	0.011	NA	NA
06-HP097	25706GS661	2/1/2001	2 - 2.5	NA	5 UJ	36 UJ	NA	NA	NA	0.002 U	NA	NA
	25706GS660	2/1/2001	2.5 - 3	NA	13 UJ	79 UJ	NA	NA	NA	0.002 U	NA	NA
06-HP098	25706GS683	4/10/2001	1.5 - 2	NA	940	99	NA	NA	NA	0.11 U	NA	NA
06-HP100	25706GS682	4/10/2001	2.5 - 3	NA	1 U	5.2 U	NA	NA	NA	0.052 U	NA	NA
06-001	06-S-001	5/15/2002	2.3	NA	6 J	8 J	NA	NA	NA	NA	NA	NA
	06-S-001A	5/16/2002	2.3	0.7 J	NA	NA	NA	NA	NA	NA	NA	NA
06-002	06-S-002	5/15/2002	1.1	NA	34	120	NA	NA	NA	NA	NA	NA
	06-S-002A	5/16/2002	1.1	0.2 J	NA	NA	NA	NA	NA	NA	NA	NA
06-003	06-S-003	5/15/2002	1.5	0.5 J	1 J	11 U	NA	NA	NA	NA	NA	NA
06-007	06-S-007	5/21/2002	2	0.01 J	23	11 U	NA	NA	NA	NA	NA	NA
06-010	06-S-010	5/21/2002	4.6 - 5	0.3 J	12	11 U	NA	NA	NA	NA	NA	NA
06-011	06-S-011	5/21/2002	2	0.98 U	15	82	NA	NA	NA	NA	NA	NA
06-012	06-S-012	5/21/2002	2	1.1 U	11 U	11 U	NA	NA	NA	NA	NA	NA
06-013	06-S-013	5/21/2002	1.5	1 U	11 U	11 U	NA	NA	NA	NA	NA	NA
06-014	06-S-014	5/21/2002	1.5	1 U	6 J	11 U	NA	NA	NA	NA	NA	NA
06-015	06-S-015	5/21/2002	1.3	1.1 U	34	170	NA	NA	NA	NA	NA	NA
06-020	06-S-020	5/22/2002	3 - 3.7	1.2 U	40	4 J	NA	NA	NA	NA	NA	NA
	06-S-021	5/22/2002	3 - 3.7	0.99 U	14	11 U	NA	NA	NA	NA	NA	NA
06-022	06-S-022	5/22/2002	3	0.97 U	7 J	10 U	NA	NA	NA	NA	NA	NA
06-023	06-S-023	5/22/2002	3 - 3.8	1 U	22	11 J	NA	NA	NA	NA	NA	NA
06-026	06-S-026	5/30/2002	1.7	0.009 J	11 U	11 U	NA	NA	NA	NA	NA	NA
06-027	06-S-027	5/30/2002	1.2	80 J	200	120	NA	NA	NA	NA	NA	NA
06-028	06-S-028	5/30/2002	2	5 J	10 J	11 U	NA	NA	NA	NA	NA	NA
	06-S-029	5/30/2002	2	4 J	820	140	NA	NA	NA	NA	NA	NA
06-030	06-S-030	5/30/2002	1.3	0.6 J	2 J	9 J	NA	NA	NA	NA	NA	NA
06-031	06-S-031	5/30/2002	1.3	6 J	1 J	11 U	NA	NA	NA	NA	NA	NA
06-032	06-S-032	5/30/2002	2	0.04 J	12 U	12 U	NA	NA	NA	NA	NA	NA
06-033	06-S-033	5/30/2002	2.2	0.02 J	11 U	11 U	NA	NA	NA	NA	NA	NA
06-034	06-S-034	5/30/2002	2	1.1 U	11 U	11 U	NA	NA	NA	NA	NA	NA
06-035	06-S-035	6/4/2002	3.8 - 4.8	1.2 U	360	55 U	NA	NA	NA	NA	NA	NA
06-036	06-S-036	6/4/2002	3 - 4.3	1.1 U	37	11 U	NA	NA	NA	NA	NA	NA
06-037	06-S-037	6/4/2002	3 - 5	1 U	38	11 U	NA	NA	NA	NA	NA	NA
06-040	06-S-040	6/6/2002	4	0.02 J	1 J	11 U	0.0052 U	0.0052 U	0.0052 U	0.0052 U	0.0052 U	0.0052 U
06-041	06-S-041	6/6/2002	4	0.02 J	16	7 J	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U
	06-S-042	6/6/2002	4	0.03 J	29	9 J	0.0056 U	0.0056 U	0.0056 U	0.0056 U	0.0056 U	0.0056 U
06-043	06-S-043	6/6/2002	4	0.03 J	2 J	11 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U
06-044	06-S-044	6/6/2002	4	0.03 J	2 J	11 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
06-045	06-S-045	6/6/2002	4	0.03 J	3 J	10 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U
06-048	06-S-048	6/10/2002	4	0.05 J	8 J	4 J	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U
06-069	06-S-069	8/27/2002	3	0.04 J	6 J	10 U	0.0056 U	0.0056 U	0.0056 U	0.0056 U	0.0005 J	0.0056 U
06-070	06-S-070	8/27/2002	3	0.02 J	9 J	10 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.001 J	0.0006 J
06-072	06-S-072	8/29/2002	3	1.2 U	10 U	10 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
06-073	06-S-073	8/29/2002	3	1.1 U	10 U	3 J	0.0059 U	0.0059 U	0.0059 U	0.0059 U	0.0059 U	0.0059 U
	06-S-074	8/29/2002	3	1.1 U	10 U	10 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U
06-075	06-S-075	8/29/2002	3	1 U	10 U	10 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U	0.0054 U
06-076	06-S-076	8/29/2002	3	1.2 U	52	31	0.0059 U	0.0059 U	0.0059 U	0.0059 U	0.0059 U	0.0059 U
06-077	06-S-077	8/29/2002	3	4,000 J	490	260	36	368	46	120	40	722
06-086	06-S-086	10/22/2002	4	1.1 U	170	69	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U
	06-S-087	10/22/2002	4	0.01 J	140	55	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
06-088	06-S-088	10/22/2002	4	1.2 U	65	180	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
06-089	06-S-089	10/22/2002	4	1.1 U	12	5 J	0.0062 U	0.0062 U	0.0062 U	0.0062 U	0.0062 U	0.0062 U
06-090	06-S-090	10/22/2002	4	1 U	1 J	7 J	0.0057 U	0.0057 U	0.0057 U	0.0057 U	0.0057 U	0.0057 U
06-091	06-S-091	10/22/2002	4	0.008 J	11	11	0.0057 U	0.0057 U	0.0057 U	0.0057 U	0.0057 U	0.0057 U
06-092	06-S-092	10/22/2002	4	0.01 J	17	10	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
06-096	06-S-096	10/22/2002	4	1.1 U	3 J	11 U	0.0062 U	0.0062 U	0.0062 U	0.0062 U	0.0062 U	0.0062 U
06-107	06-S-107	11/13/2002	1.5	NA	100	220	NA	NA	NA	NA	NA	NA
06-108	06-S-108	11/13/2002	1.5	NA	140	300	NA	NA	NA	NA	NA	NA
06-109	06-S-109	11/13/2002	2	NA	190	120	NA	NA	NA	NA	NA	NA
06-110	06-S-110	11/13/2002	2.5	0.02 J	11 U	11 U	NA	NA	NA	NA	NA	NA
06-111	06-S-111	11/14/2002	4	NA	6 J	7 J	NA	NA	NA	NA	NA	NA
	06-S-112	11/14/2002	4	NA	24	6 J	NA	NA	NA	NA	NA	NA
06-113	06-S-113	11/14/2002	4	NA	275	150	NA	NA	NA	NA	NA	NA
06-114	06-S-114	11/14/2002	4	NA	10 U	10 U	NA	NA	NA	NA	NA	NA
06-115	06-S-115	11/14/2002	4	NA	1,110	61	NA	NA	NA	NA	NA	NA
06-116	06-S-116	11/14/2002	4	NA	18	14	NA	NA	NA	NA	NA	NA
06-125	06-S-125	11/18/2002	4.5	NA	980	210	NA	NA	NA	NA	NA	NA
06-126	06-S-126	11/18/2002	4	NA	92	95	NA	NA	NA	NA	NA	NA
06-128	06-S-128	11/18/2002	4	NA	630	350	NA	NA	NA	NA	NA	NA
06-131	06-S-131	11/18/2002	4	NA	11	52	NA	NA	NA	NA	NA	NA
06-132	06-S-132	11/18/2002	4	NA	2 J	27	NA	NA	NA	NA	NA	NA
06-133	06-S-133	11/18/2002	4	NA	2 J	14	NA	NA	NA	NA	NA	NA
	06-S-134	11/18/2002	4	NA	12	110	NA	NA	NA	NA	NA	NA
06-135	06-S-135	11/18/2002	4	NA	10 J	58	NA	NA	NA	NA	NA	NA
06-136	06-S-136	11/18/2002	4	NA	5 J	61	NA	NA	NA	NA	NA	NA
06-137	06-S-137	11/18/2002	4	NA	25	21	NA	NA	NA	NA	NA	NA
06-138	06-S-138	11/18/2002	4	NA	0.8 J	4 J	NA	NA	NA	NA	NA	NA
06-139	06-S-139	11/18/2002	4	NA	22	37	NA	NA	NA	NA	NA	NA
06-140	06-S-140	11/18/2002	4	NA	120	8 J	NA	NA	NA	NA	NA	NA

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
06-141	06-S-141	11/18/2002	3.5	NA	11 J	24	NA	NA	NA	NA	NA	NA
06-147	06-S-147	11/26/2002	4	NA	10 U	10 U	NA	NA	NA	NA	NA	NA
06-148	06-S-148	11/26/2002	4	NA	140	21	NA	NA	NA	NA	NA	NA
06-149	06-S-149	11/26/2002	4	NA	2 J	10 U	NA	NA	NA	NA	NA	NA
06-150	06-S-150	12/3/2002	4	NA	520	94 J	NA	NA	NA	NA	NA	NA
06-151	06-S-151	12/3/2002	4	NA	650	60 J	NA	NA	NA	NA	NA	NA
06-158	06-S-158	12/10/2002	4	NA	3 J	11 U	NA	NA	NA	NA	NA	NA
06-159	06-S-159	12/10/2002	4	NA	41 J	280	NA	NA	NA	NA	NA	NA
06-160	06-S-160	12/10/2002	4	NA	24	210	NA	NA	NA	NA	NA	NA
06-161	06-S-161	12/10/2002	4	NA	1,500	110	NA	NA	NA	NA	NA	NA
	06-S-162	12/10/2002	4	NA	95	19	NA	NA	NA	NA	NA	NA
06-163	06-S-163	12/30/2002	4	NA	12 U	12 U	NA	NA	NA	NA	NA	NA
	06-S-164	12/30/2002	4	NA	4 J	12 U	NA	NA	NA	NA	NA	NA
06-165	06-S-165	12/30/2002	4	NA	13	5 J	NA	NA	NA	NA	NA	NA
06-166	06-S-166	12/30/2002	4	NA	21	12 U	NA	NA	NA	NA	NA	NA
06-167	06-S-167	12/30/2002	4	NA	2 J	9 J	NA	NA	NA	NA	NA	NA
06-168	06-S-168	12/30/2002	4	NA	2 J	11 U	NA	NA	NA	NA	NA	NA
06-169	06-S-169	12/30/2002	4	NA	3 J	12 U	NA	NA	NA	NA	NA	NA
06-170	06-S-170	12/30/2002	4	NA	2,200	89 J	NA	NA	NA	NA	NA	NA
06-171	06-S-171	12/30/2002	4	NA	9 J	12 U	NA	NA	NA	NA	NA	NA
	06-S-172	12/30/2002	4	NA	6 J	12 U	NA	NA	NA	NA	NA	NA
06-173	06-S-173	12/30/2002	4	NA	12 U	12 U	NA	NA	NA	NA	NA	NA
06-174	06-S-174	12/30/2002	4	NA	3 J	11 J	NA	NA	NA	NA	NA	NA
06-175	06-S-175	12/30/2002	4	NA	13 U	13 U	NA	NA	NA	NA	NA	NA
06-176	06-S-176	12/30/2002	4	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
06-186	06-S-186	5/22/2003	3 - 3.5	1.1 U	10 U	10 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
06-187	06-S-187	5/22/2003	3 - 3.5	1.1 U	2 J	10 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U	0.0053 U
T107HP004	99T107HP016	4/15/2003	0 - 0.5	NA	160	820	NA	NA	NA	NA	NA	NA
	99T107HP017	4/15/2003	1 - 1.5	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
	99T107HP018	4/15/2003	4 - 4.5	NA	11 U	4 J	NA	NA	NA	NA	NA	NA
T107HP006	99T107HP024	4/15/2003	0 - 0.5	NA	22	140	NA	NA	NA	NA	NA	NA
	99T107HP025	4/15/2003	1 - 1.5	NA	13	92	NA	NA	NA	NA	NA	NA
	99T107HP026	4/15/2003	3 - 3.7	NA	45	140	NA	NA	NA	NA	NA	NA
T107HP008	99T107HP032	4/15/2003	0 - 0.7	NA	5 J	18 J	NA	NA	NA	NA	NA	NA
	99T107HP033	4/15/2003	1 - 1.7	NA	140	680	NA	NA	NA	NA	NA	NA
	99T107HP034	4/15/2003	3 - 3.7	NA	1 J	8 J	NA	NA	NA	NA	NA	NA
	99T107HP035	4/15/2003	4.7 - 5.4	NA	11 U	11 U	NA	NA	NA	NA	NA	NA

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
T107HP009	99T107HP036	4/15/2003	0 - 0.7	NA	550	2,100	NA	NA	NA	NA	NA	NA
	99T107HP037	4/15/2003	1 - 1.7	NA	3 J	32	NA	NA	NA	NA	NA	NA
	99T107HP038	4/15/2003	3 - 3.7	NA	11 U	5 J	NA	NA	NA	NA	NA	NA
	99T107HP039	4/15/2003	4 - 4.7	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
T107HP010	99T107HP040	4/15/2003	0 - 0.7	NA	15	41	NA	NA	NA	NA	NA	NA
	99T107HP041	4/15/2003	1 - 1.7	NA	4 J	28	NA	NA	NA	NA	NA	NA
	99T107HP042	4/15/2003	3 - 3.7	NA	11 U	7 J	NA	NA	NA	NA	NA	NA
	99T107HP043	4/15/2003	4 - 4.7	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
T107HP011	99T107HP044	4/15/2003	0 - 0.7	NA	11 U	11	NA	NA	NA	NA	NA	NA
	99T107HP045	4/15/2003	1 - 1.7	NA	410 J	2,200	NA	NA	NA	NA	NA	NA
	99T107HP046	4/15/2003	3 - 3.7	NA	50 J	630	NA	NA	NA	NA	NA	NA
	99T107HP047	4/15/2003	4.5 - 5.2	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
T107HP012	99T107HP048	4/15/2003	0 - 0.7	NA	11 U	7 J	NA	NA	NA	NA	NA	NA
	99T107HP049	4/15/2003	1 - 1.7	NA	11 U	11 U	NA	NA	NA	NA	NA	NA
	99T107HP050	4/15/2003	3 - 3.7	NA	10 U	10 U	NA	NA	NA	NA	NA	NA
T107HP020	99T107HP225	8/21/2003	0 - 0.7	NA	10 U	10 U	NA	NA	NA	0.025 U	NA	NA
	99T107HP226	8/21/2003	1 - 1.7	NA	10 U	10 U	NA	NA	NA	0.026 U	NA	NA
	99T107HP227	8/21/2003	2.3 - 3	NA	4 J	6 J	NA	NA	NA	0.027 U	NA	NA
T107HP021	99T107HP221	8/21/2003	0 - 0.7	NA	10 U	10 U	NA	NA	NA	0.025 U	NA	NA
	99T107HP222	8/21/2003	1 - 1.7	NA	10 U	10 U	NA	NA	NA	0.025 U	NA	NA
	99T107HP223	8/21/2003	2.5 - 3.2	NA	10 U	10 U	NA	NA	NA	0.026 U	NA	NA
	99T107HP224	8/21/2003	5.3 - 6	NA	11 U	11 U	NA	NA	NA	0.027 U	NA	NA

Table 6
Shallow Soil Left In-Place Screening Evaluation, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Potential Concern, mg/kg								
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	Naphthalene[3]	Toluene	Xylene (Total)
			No. detected/ No. Analyzed:	33 / 110	123 / 209	102 / 201	3 / 73	4 / 73	1 / 25	5 / 68	6 / 73	10 / 73
			Minimum Detection	0.008 J	0.8 J	3 J	0.001 J	0.002 J	46	0.011	0.0005 J	0.0006 J
			Maximum Detection (Point ID):	4,000 J (06-077)	14,000 (06-HP015)	6,300 (06-BVW)	36 (06-077)	368 (06-077)	46 (06-077)	120 (06-077)	40 (06-077)	722 (06-077)
Human Health - Residential			Inhalation of Indoor Air Pathway Screening Criteria[1]:	-	-	-	0.18 ca	400	400	0.46 ca	650	420
			No. of Exceedances:	-	-	-	1	0	0	3	0	1
			Direct/Indirect Contact Pathway Screening Criteria[1]:	10,300	13,800	19,000	0.64 ca	400	570	1.7 ca	520	270
			No. of Exceedances:	0	1	0	1	0	0	3	0	1
			Hazard Index (of maximum detection) for Both Exposure Pathways:	0.4	1	0.3	256	2	0.2	332	0.1	4
	Total Hazard Index (of maximum detection) for All COPCs and Both Exposure Pathways = 596											
	Total Cancer Risk (of maximum detection) for Carcinogenic COPCs and Both Exposure Pathways = 6×10^{-4}											
Human Health - Construction / Trench Worker			Direct/Indirect Contact Pathway Screening Criteria[1]:	12,000	12,000	30,000	16 ca	400	400	97 ca	650	420
			No. of Exceedances:	0	1	0	1	0	0	1	0	1
			Hazard Quotient (of maximum detection) :	0.3	1	0.2	2	1	0.1	1	0.1	2
	Total Hazard Index (of maximum detection) for All COPCs = 8											
	Total Cancer Risk (of maximum detection) for Carcinogenic COPCs = 3×10^{-6}											
Ecological			Leaching to Groundwater Screening Criteria[1]:	315	1,500	1,850	2	32	32	4.8	9.3	11
			No. of Exceedances:	1	4	3	1	1	1	1	1	1
			Hazard Quotient (of maximum detection) :	13	9	3	18	12	1	25	4	66
	Total Hazard Index (of maximum detection) for All COPCs = 151											

Notes:

1. *Screening criteria are presented in Table 3.*
2. ***Boldface** concentrations equal or exceed the corresponding screening criterion.*
3. *The values for naphthalene were entered from both VOC and SVOC lists. For not detected values, the lowest detection limit was chosen if both values were available.*

General notes to tables follow Table 11.

Table 7
Groundwater Screening Evaluation, Site 06

Well ID (Point ID)	Sample ID	Sample Collection Date	Sampling Event	Chemicals of Potential Concern, µg/L										
				Total TPH	Gasoline-Range Organics	Diesel-Range Organics	Motor-Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	MTBE	Naphthalene	Toluene	Xylene (Total)
06-MW01	06-W-301	6/5/2003	June 2003	80,000	59,000	21,000	280 U	3,800	2,200	86	1 U	530 J	8,000	8,900
06-MW02	06-W-302	6/5/2003		1,180	840	340	50 U	2.4	12	1.4	1 U	1 UJ	6.9	13
06-MW03	06-W-303	6/4/2003		2,400	100 U	2,400	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW18	06-W-304	6/9/2003		800	100 U	230	570	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW19	06-W-305	6/9/2003		410	100 U	90	320	1 U	1 U	1 U	1 U	0.99 J	1 U	1 U
06-MW21	06-W-306	6/9/2003		3,980	100 U	3,600	380	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW22	06-W-307	6/9/2003		8,590	100 U	7,800	790	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW23	06-W-308	6/5/2003		400	110	100	190	19	1 U	1 U	1.2	1 UJ	1 U	1 U
	06-W-311	6/5/2003		380	100	80	200	26	0.82 J	1 U	1.2	1 UJ	3.9	2.1
06-MW24	06-W-309	6/5/2003		480	100 U	90	390	1 U	1 U	1 U	1 U	0.6 J	1 U	1 U
06-MW01	06-W-313	8/20/2003	August 2003	34,900	28,000	6,900	100 U	3,300	1,800	75	25 U	400 J	3,400	4,300
06-MW02	06-W-314	8/20/2003		930	660	270	50 U	5.7	4.9	2.2	1 U	1 UJ	3.3	12
06-MW03	06-W-315	8/27/2003		270	100 U	270	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
	06-W-323	8/27/2003		260	100 U	260	60 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW18	06-W-316	8/25/2003		620	100 U	620	60 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW19	06-W-317	8/25/2003		430	100 U	50 U	430	1 U	1 U	1 U	1 U	0.57 J	1 U	1 U
06-MW21	06-W-318	8/20/2003		970 J	100 U	970 J	60 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW23	06-W-320	8/27/2003		150	100 U	150	50 U	0.94 J	1 U	1 U	0.98 J	1 UJ	1 U	1 U
06-MW24	06-W-321	8/27/2003		320	100 U	320	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW01	06-W-326	11/3/2003	November 2003	15,700	12,000	3,700	50 U	1,500	640	250 U	250 U	130 J	1,400	1,700
06-MW02	06-W-327	11/3/2003		900	590	310	50 U	3.7	1 U	0.78 J	1 U	1 U	1 U	1 U
06-MW03	06-W-330	11/3/2003		630	100 U	630	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW16	06-W-332	11/11/2003		140	100 U	140	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW17	06-W-333	11/11/2003		290	100 U	290	50 U	1 U	1 U	1 U	1 U	1.3 UJ	1 U	1 U
06-MW18	06-W-334	11/10/2003		740	100 U	740	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW19	06-W-335	11/11/2003		190	100 U	190	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	06-W-341	11/11/2003		220	100 U	220	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW21	06-W-328	11/3/2003		870	100 U	870	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW22	06-W-336	11/10/2003		5,300	100 U	5,300	100 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
06-MW23	06-W-331	11/3/2003		280	100 U	280	50 U	0.46 J	1 U	1 U	0.71 J	1 U	1 U	1 U
06-MW24	06-W-337	11/10/2003		480	100 U	480	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	06-W-339	11/10/2003		550	100 U	550	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table 7
Groundwater Screening Evaluation, Site 06

Well ID (Point ID)	Sample ID	Sample Collection Date	Sampling Event	Chemicals of Potential Concern, µg/L										
				Total TPH	Gasoline-Range Organics	Diesel-Range Organics	Motor-Oil-Range Organics	Benzene	Ethylbenzene	Cumene (Isopropyl benzene)	MTBE	Naphthalene	Toluene	Xylene (Total)
06-MW01	06-W-342	1/15/2004	January 2004	117,000	100,000	17,000	500 U	6,600	1,200	91	5 U	310 J	13,000	3,600
06-MW02	06-W-343	1/15/2004		1,240	820	420	50 U	1.8	1.7	4.6	1 U	1 UJ	1 U	1.8
06-MW03	06-W-344	1/7/2004		570 J	100 U	570 J	50 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW16	06-W-345	1/12/2004		220 J	100 U	220 J	50 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW17	06-W-346	1/8/2004		230	100 U	230	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW18	06-W-347	1/8/2004		920	100 U	920	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW19	06-W-348	1/8/2004		330	100 U	330	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
	06-W-353	1/8/2004		450	100 U	450	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW21	06-W-349	1/15/2004		1,600	100 U	1,600	50 U	1 U	1 U	1 U	1 U	0.42 J	1 U	1 U
06-MW22	06-W-350	1/15/2004		2,400	100 U	2,400	50 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW23	06-W-351	1/7/2004		180 J	100 U	180 J	50 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW24	06-W-352	1/7/2004		480 J	100 U	480 J	50 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
06-MW01	06-W-358	3/17/2004	March 2004	36,900	31,000	5,900	110 U	3,100 J	1,500 J	53 J	1 U	150 J	5,600 J	5,700 J
06-MW01	06-W-360	5/26/2004	May 2004	45,500 J	39,000 J	6,500	100 U	2,900	1,600	52 J	1 U	250 UJ	5,100	6,200
			No. Detected/ No. Analyzed:	46 / 46	12 / 46	45 / 46	8 / 46	14 / 46	10 / 46	9 / 46	4 / 46	9 / 46	9 / 46	10 / 46
			Minimum Detection:	140	100	80	190	0.46 J	0.82 J	0.78 J	0.71 J	0.42 J	3.3	1.8
			Maximum Detection: (Point ID):	117,000 (06-MW01)	100,000 (06-MW01)	21,000 (06-MW01)	790 (06-MW22)	6,600 (06-MW01)	2,200 (06-MW01)	91 (06-MW01)	1.2 (06-MW23)	530 J (06-MW01)	13,000 (06-MW01)	8,900 (06-MW01)
Human Health - Residential			Inhalation of Indoor Air Pathway Screening Criteria[1]:	-	-	-	-	43 ca	170,000	170,000	13,100 ca	149 ca	526,000	160,000
			No. of Exceedances:	-	-	-	-	6	0	0	0	5	0	0
			Consumption of Aquatic Organisms Pathway Screening Criteria[1]:	-	-	-	-	51 ca	2,100	2,100	-	-	15,000	2,100
			No. of Exceedances:	-	-	-	-	6	1	0	-	-	0	5
			Hazard Index (of maximum detection) for Both Exposure Pathways:	-	-	-	-	283	1	0.0	0.0	4	1	4
	Total Hazard Index (of maximum detection) for All COPCs and Both Exposure Pathways = 293													
	Total Cancer Risk (of maximum detection) for Carcinogenic COPCs and Both Exposure Pathways = 3×10^{-4}													
Ecological			Discharge to San Francisco Bay Pathway Screening Criteria[1]:	1,400	-	-	-	700	86	680	8,000	470	5,000	86
			No. of Exceedances:	12	-	-	-	6	6	0	0	1	4	6
			Hazard Quotient (of maximum detection):	84	-	-	-	9	26	0.1	0.0	1	3	104
	Total Hazard Index (of maximum detection) for All COPCs = 227													

Notes:

1. Screening criteria for groundwater are defined in Table 5.

*2. **Boldface** concentrations equal or exceed the corresponding screening criterion.*

General notes to tables follow Table 11.

Table 8
Soil Gas Sampling Results Summary and Screening Evaluation, Site 06

Point ID	Sample Date	Sample ID	Sample Depth (ft bgs)	Chemicals of Potential Concern (µg/m^3)					Leak Detection Compound
				Benzene	Ethylbenzene	Toluene	Total Xylenes	MTBE	Isopropyl Alcohol
SV-01	7/12/04	06-A-001	3.7-4.0	1,300 U	1,300 U	1,300 U	1,300 U	1,300 U	86,000
SV-02	7/12/04	06-A-002	3.7-4.0	2.0	1.5 U	5.6	9.1	1.5 U	300
SV-03	7/12/04	06-A-003	3.7-4.0	700 U	700 U	700 U	700 U	700 U	43,000
SV-04	7/12/04	06-A-004	3.7-4.0	9.2	2.1	5.0	36	1.5 U	74
	7/12/04	06-A-006	3.7-4.0	9.5	2.1	5.4	33	1.5 U	98
SV-05	7/12/04	06-A-005	3.7-4.0	16	13	24	77	1.4 U	160
SV-01B	8/9/04	06-A-009	3.7-4.0	5.9	1.5	7.3	10.4	1.4 U	2.5
SV-02B	8/9/04	06-A-010	3.7-4.0	8.5	1.4 U	8.2	6.7	1.4 U	3.3
	8/9/04	06-A-011	3.7-4.0	3.5	1.4 U	3.4	2.5	1.4 U	2.3
SV-03B	8/9/04	06-A-008	3.7-4.0	13 U	13 U	13 U	13 U	13 U	510
SV-04B	8/9/04	06-A-012	3.7-4.0	310,000	140,000	350,000	420,000	3,700 U	3,700 U
SV-05B	8/9/04	06-A-013	3.7-4.0	25	14	34	34	1.4 U	3.2
SV-06	10/26/04	06-A-016	3.7-4.0	140 U	140 U	140 U	140 U	140 U	56,000
SV-07	10/26/04	06-A-015	3.7-4.0	11	2.4	10	6.7	1.4 U	180
			No. Detected/No. Analyzed:	10 / 14	7 / 14	10 / 14	10 / 14	0 / 14	
			Minimum Detection:	2.0	1.5	3.4	2.5	-	
			Maximum Detection:	310,000	140,000	350,000	420,000	-	
			(Sample ID):	(SV-04B)	(SV-04B)	(SV-04B)	(SV-04B)	-	

Human Health Residential Shallow Soil Gas Screening Levels (µg/m^3)[1]	85 ca	2,100,000	315,000	750,000	9,400 ca
Number of Exceedances:	1	0	1	0	0
Hazard Quotient (of maximum detection):	3,647	0.1	1	0.6	-

Total Hazard Index (of maximum detection) for All COPCs = 3,649

Total Cancer Risk (of maximum detection) for Carcinogenic COPCs = 3.7×10^{-3}

Notes:

1. Shallow soil gas screening levels for vapor intrusion concerns are from Table E, "Environmental Screening Levels, Indoor Air and Soil Gas Vapor Intrusion Concerns" (Water Board, 2005) and have been normalized to a target HQ of 1 (see Table 11).
Boldface *concentrations equal or exceed the corresponding screening criterion.*

General notes to tables follow Table 11.

Table 9
Select Samples - Shallow Soil Left In-Place Total Hazard and Risk Analysis, Site 06

Point ID	Sample ID	Sample Collection Date	Sample Depth (feet bgs)	Chemicals of Concern, mg/kg									Human Health - Residential	Human Health - Construction/ Trench Worker	Ecological
				Total Petroleum Hydrocarbons			Benzene	Ethylbenzene	Cumene	Naphthalene [1]	Toluene	Xylenes (Total)	Total HI [2] / (Total Cancer Risk)	Total HI [2] / (Total Cancer Risk)	Total HI [3]
				Gasoline-Range Organics	Diesel-Range Organics	Motor Oil-Range Organics									
06-BVW	25706SB029	1/5/00	4.5 - 5	0.51 U	1,000 U	6,300	0.01 U	0.01 U	NA	NA	0.001 J	0.0008 J	0.3 / <1E-07	0.2 / <1E-07	3
06-HP015	199GG042	7/18/95	5.25 - 5.75	45	14,000	1,000	1.3 U	1.3 U	NA	11 U	1.3 U	1.3 U	1 / <1E-05	1 / 1E-07	10
06-077	06-S-077	8/29/02	3.0	4,000 J	490	260	36	368	46	120	40	722	595 / 6E-04	7 / 3E-06	140

		Screening Criteria (mg/kg) [4]								
Human Health - Residential	Inhalation of Indoor Air Pathway:	-	-	-	0.18 ca	400	400	0.46 ca	650	420
	Direct / Indirect Contact Pathway:	10,300	13,800	19,000	0.64 ca	400	570	1.7 ca	520	270
Human Health Construction/ Trench Worker	Direct / Indirect Contact Pathway:	12,000	12,000	30,000	16 ca	400	400	97 ca	650	420
Ecological	Leaching to Groundwater:	315	1,500	1,850	2	32	32	4.8	9.3	11

Notes:

1. Asterisk denotes that the values for naphthalene were entered from both VOC and SVOC lists. For not detected values the lowest detection limit was chosen if both values were available.
2. Total hazard index for all COPCs and both exposure pathways. Total cancer risk for carcinogenic COPCs and both exposure pathways.
3. Total hazard index for all COPCs. The subject sample locations are more than 300 feet from the San Francisco Bay.
4. Screening criteria are from Table 3.

Boldface *denotes a sample concentration that equals or exceeds one of the relevant screening criteria or a hazard index that exceeds 1.*
(1E-07) denotes a total cancer risk of 1 x 10^{-7}.
Note that non-detected compounds were not used in the total hazard index or total risk calculations.

General notes to tables follow Table 11.

Table 10
Summary of Analytical Results for Well Groundwater Samples, Site 06

Well ID	Well Type	Well Location [2]	Sample Date	Sample ID	Analytes of Concern[1] (µg/L)							
					Total TPH	TPH as gasoline	TPH as diesel	TPH as motor oil	Benzene	Ethylbenzene	Toluene	MtBE
USTs 240A & B Subarea												
06-MW01	M	S	7/9/87	06HLA1-1	97,000	97,000	5,000 U	na	7,400	250 U	12,700	na
			7/20/87	06HLA2-1	34,000	34,000	50 U	na	6,100	430	10,000	na
			11/7/94	199Q1005	73,000	60,000	13,000	520 U	8,900	1,900	19,000	na
			11/7/94	199Q1048	73,000	60,000	13,000	500 U	9,700	2,000	21,000	na
			2/6/95	199Q2005	71,500	66,000	5,500	500 U	12,000 J	1,800 J	19,000 J	na
			5/4/95	199Q3005	70,900	63,000	7,900	500 U	7,300	1,400	13,000	na
			11/27/95	199Q4005	68,740	67,000	1,500	240	3,600	990	7,400	na
			11/27/95	199Q4101	62,400	61,000	1,200	200	4,100	1,000	8,500	na
			5/20/98	196Q2048	na	na	na	na	4,300 J	2,000 J	11,000 J	12 U
			11/9/98	196Q4049	43,700	41,000	2,700	240 UJ	7,400	1,900 J	8,100	50 U
			5/22/00	284Q3054	57,000	47,000	10,000	1,000 UJ	5,700	1,800	9,800	50 U
			5/22/00	284Q3055	60,000	50,000	10,000	1,000 UJ	5,500	1,700	9,300	49 U
			10/3/00	284Q5004	40,000	34,000	4,000	2,000	4,900	1,600	6,100	37 U
			6/12/01	284Q6102	62,000	58,000	4,000	500 U	5,500	1,800	11,000	340 U
			6/12/01	284Q6103	60,000	57,000	3,000	500 U	5,200	1,800	11,000	340 U
			10/26/01	284Q8094	17,600	16,800	800	500 U	2,240	787	3,290	2 U
			10/26/01	284Q8095	17,300	16,600	700	500 U	2,110	730	3,000	2 U
			10/18/02	036Q2105	25,200	25,000	200	96 U	50 U	36 J	200 U	200 UJ
			10/18/02	036Q2106	24,400	24,200	200	96 U	50 U	33 J	200 U	200 UJ
			6/5/03	06-W-301	80,000	59,000	21,000	280 U	3,800	2,200	8,000	1.0 U
			8/20/03	06-W-313	34,900	28,000	6,900	100 U	3,300	1,800	3,400	2.5 U
			11/3/03	06-W-326	15,700	12,000	3,700	50 U	1,500	640	1,400	250 U
			1/15/04	06-W-342	117,000	100,000	17,000	500 U	6,600	1,200	13,000	5.0 U
			3/17/04	06-W-358	36,900	31,000	5,900	110 U	3,100	1,500	5,600	1.0 U
			5/26/04	06-W-360	45,500	39,000 J	6,500	100 U	2,900	1,600	5,100	1.0 U
06-MW02	M	S	7/9/87	06HLA1-2	14,000	14,000	5,000 U	na	250	50 U	50 U	na
			7/20/87	06HLA2-2	110,000	24,000	86,000	na	500 U	500 U	500 U	na
			11/7/94	199Q1006	7,900	1,700	4,300	1,900	17 J	8.0 J	24 J	na
			2/6/95	199Q2006	6,600	3,800	2,800	500 U	63	61	55	na
			5/4/95	199Q3006	6,000	3,600	2,400	500 U	30	46	39	na
			11/22/95	199Q4006	5,198	3,700	1,400	98	130	70	16	na
			5/20/98	196Q2047	na	na	na	na	16	26	28	0.5 U
			11/6/98	196Q4042	1,730	1,300	430	250 UJ	11	5.0	4.0	2.0 U
			5/22/00	284Q3057	1,200	1,000	200	100 U	15	32	45	1.0 U
			10/4/00	284Q5018	1,200	1,000	200	100 U	31	33	42	1.0 U
			10/4/00	284Q5019	1,200	1,000	200	100 U	32	36	47	1.0 U
			6/7/01	284Q6072	1,100	900	200	100 U	4.0	9.0	5.0 UJ	1.0 U
			10/26/01	284Q8096	1,230	930	300	500 U	10.8 J	5.5	6.1	2.0 U
			10/26/01	284Q8097	1,190	890	300	500 U	12.3	7.2	8.5	2.0 U
			10/18/02	036Q2111	1,140	1,000	140	96 U	2.3	0.9 J	0.8 J	2.0 UJ
			6/5/03	06-W-302	1,180	840	340	50 U	2.4	12	6.9	1.0 U
			8/20/03	06-W-314	930	660	270	50 U	5.7	4.9	3.3	1.0 U
			11/3/03	06-W-327	900	590	310	50 U	3.7	1.0 U	1.0 U	1.0 U

Table 10
Summary of Analytical Results for Well Groundwater Samples, Site 06

Well ID	Well Type	Well Location [2]	Sample Date	Sample ID	Analytes of Concern[1] (µg/L)							
					Total TPH	TPH as gasoline	TPH as diesel	TPH as motor oil	Benzene	Ethylbenzene	Toluene	MtBE
USTs 240A & B Subarea (continued)												
			1/15/04	06-W-343	1,240	820	420	50 U	1.8	1.7	1.0 U	1.0 U
06-MW16	M	D	11/27/95	199Q4018	27	27 J	100 U	100 U	0.5 U	0.5 U	0.5 U	na
			2/23/96	199Q5003	266	26 J	120	120	10.0 U	10.0 U	10.0 U	na
			6/7/96	199Q6003	53	50 U	53 J	100 U	0.5 U	0.5 U	0.5 U	na
			9/3/96	199Q7003	100	50 U	100 U	100	0.5 U	0.5 U	0.5 U	na
			5/20/98	196Q2046	ND	50 U	120 U	240 U	0.5 U	0.5 U	0.5 U	0.5 U
			11/9/98	196Q4047	ND	50 U	120 U	240 U	0.5 U	0.5 U	0.5 U	0.5 U
			5/22/00	284Q3053	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 UJ	1.0 U
			10/4/00	284Q5013	ND	50 U	100 U	100 U	0.5 U	1.0 U	5.0 UJ	1.0 U
			6/6/01	284Q6060	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 U	1.0 U
			10/29/01	284Q8103	ND	50 U	500 U	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			10/15/02	036Q2075	27	27 J	96 U	96 U	0.5 U	2.0 U	2.0 U	2.0 U
			11/11/03	06-W-332	140	100 U	140	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/12/04	06-W-345	220	100 U	220 J	50 UJ	1.0 U	1.0 U	1.0 U	1.0 U
06-MW17	M	D	11/27/95	199Q4019	258	28 J	110	120	0.5 U	0.5 U	0.5 U	na
			2/23/96	199Q5004	106	27 J	79 J	100 U	10.0 U	10.0 U	10.0 U	na
			6/7/96	199Q6004	354	30 J	240	84 J	0.5 U	0.5 U	0.5 U	na
			6/7/96	199Q6053	356	26 J	220	110	0.5 U	0.5 U	0.5 U	na
			9/3/96	199Q7004	310	35 J	95 J	180	0.3 J	0.5 U	0.5 U	na
			5/20/98	196Q2042	ND	50 U	120 U	250 U	0.5 UJ	0.5 UJ	0.5 UJ	5.0 J
			11/9/98	196Q4046	38	38 J	120 U	260 UJ	0.5 U	0.5 U	0.5 U	0.5 U
			5/25/00	284Q3109	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 U	2.0
			10/17/00	284Q5132	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 UJ	0.4 J
			6/8/01	284Q6077	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 U	0.8 J
			10/18/01	284Q8020	ND	50 U	500 U	500 U	0.5 U	2.0 U	2.0 U	1.0 UJ
			10/17/02	036Q2098	122	50 U	122	96 U	0.5 U	2.0 U	2.0 U	2.0 U
			11/11/03	06-W-333	290	100 U	290	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/8/04	06-W-346	230	100 U	230	50 U	1.0 U	1.0 U	1.0 U	1.0 U
06-MW23	M	D	8/28/00	284Q4038	60	60	100 U	100 U	100	1.0 U	1.0 UJ	5.0
			10/3/00	284Q5003	ND	50 U	100 UJ	100 U	4.0	1.0 U	0.6 J	2.0
			6/5/01	284Q6042	100	100	100 U	100 U	59	1.0 U	1.0 UJ	2.0
			8/22/01	284Q7025	ND	210 UJ	500 U	500 U	81	2.0 U	2.0 U	2.0
			10/26/01	284Q8093	70	70	500 U	500 U	4.2	2.0 U	0.3 J	4.0
			12/13/01	284Q9020	110	110	500 U	500 U	88	2.0 U	2.0 U	1.0 J
			12/13/01	284Q9021	ND	100 UJ	500 U	500 U	83	2.0 U	2.0 U	1.0 J
			10/16/02	036Q2086	46	46	96 U	96 U	0.4 J	2.0 U	2.0 U	1.0 J
			6/5/03	06-W-308	400	110	100	190	19	1.0 U	1.0 U	1.2
			6/5/03	06-W-311	380	100	80	200	26	0.8 J	3.9	1.2
			8/27/03	06-W-320	150	100 U	150	50 U	0.94 J	1.0 U	1.0 U	0.98 J
	M	D	11/3/03	06-W-331	280	100 U	280	50 U	0.46 J	1.0 U	1.0 U	0.71 J
			1/7/04	06-W-351	180	100 U	180 J	50 UJ	1.0 U	1.0 U	1.0 U	1.0 U

Table 10
Summary of Analytical Results for Well Groundwater Samples, Site 06

Well ID	Well Type	Well Location [2]	Sample Date	Sample ID	Analytes of Concern[1] (µg/L)							
					Total TPH	TPH as gasoline	TPH as diesel	TPH as motor oil	Benzene	Ethylbenzene	Toluene	MtBE
USTs 248A & B Subarea												
06-MW03	M	C	7/9/87	06HLA1-3	ND	5,000 U	5,000 U	na	5.0 U	5.0 U	5.0 U	na
			7/20/87	06HLA2-3	300	300	50 U	na	40	5.0 U	35	na
			11/7/94	199Q1049	1,100	50 U	1,100	500 U	2.0 UJ	1.0 J	2.0 UJ	na
			2/6/95	199Q2007	750	50 U	750	500 U	2.0 U	2.0 U	2.0 U	na
			5/5/95	199Q3012	570	50 U	570	500 U	0.5 UJ	2.0 U	2.0 U	na
			11/22/95	199Q4007	510	50 U	300	210	0.5 U	0.5 U	0.5 U	na
			5/20/98	196Q2039	ND	na	na	na	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
			11/9/98	196Q4050	ND	na	120 U	250 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
			10/4/00	284Q5017	ND	50 U	100 U	100 U	0.5 U	1.0 U	3.0 UJ	1.0 U
			10/26/01	284Q8098	ND	50 UJ	500 U	500 U	0.5 U	2.0 U	0.6 J	2.0 U
			10/18/02	036Q2112	129	50 UJ	129	96 U	na	na	na	na
			6/4/03	06-W-303	2,400	100 U	2,400	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			8/27/03	06-W-315	270	100 U	270	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			8/27/03	06-W-323	260	100 U	260	60 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/3/03	06-W-330	630	100 U	630	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/7/04	06-W-344	570	100 U	570 J	50 UJ	1.0 U	1.0 U	1.0 U	1.0 U
06-MW18	M	D	11/27/95	199Q4020	610	50 U	320	290	0.5 U	0.5 U	0.5 U	na
			2/23/96	199Q5005	360	50 U	240	120	10 U	10 U	10 U	na
			6/7/96	199Q6005	640	50 U	460	180	0.5 U	0.5 U	0.5 U	na
			9/3/96	199Q7005	690	50 U	340	350	0.5 U	0.5 U	0.5 U	na
			8/28/97	04106MW18	ND	50 U	na	na	1.0 U	1.0 U	1.0 U	1.0 U
			5/20/98	196Q2044	ND	na	130 U	260 U	0.5 U	0.5 U	0.5 U	0.5 U
			5/20/98	196Q2045	ND	na	120 U	240 U	0.5 U	0.5 U	0.5 U	0.5 U
			11/9/98	196Q4043	ND	na	120 U	240 U	0.5 U	0.5 U	0.5 U	0.5 U
			5/24/00	284Q3092	ND	50 U	100 UJ	100 U	0.5 U	1.0 U	1.0 U	1.0 U
			10/4/00	284Q5014	ND	50 U	100 U	100 U	0.5 U	1.0 U	5.0 UJ	1.0 U
			6/6/01	284Q6059	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 UJ	1.0 U
			10/29/01	284Q8104	ND	50 U	500 U	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			6/3/02	284QJ039	ND	50 U	490 U	490 U	na	na	na	na
			10/15/02	036Q2076	499	39	460	96 U	0.5 U	2.0 U	2.0 U	2.0 U
			6/9/03	06-W-304	800	100 U	230	570	1.0 U	1.0 U	1.0 U	1.0 U
			8/25/03	06-W-316	620	100 U	620	60 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/10/03	06-W-334	740	100 U	740	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/8/04	06-W-347	920	100 U	920	50 U	1.0 U	1.0 U	1.0 U	1.0 U
06-MW19	M	D	11/27/95	199Q4021	570	70	240	260	0.5 UJ	0.5 U	0.5 U	na
			2/23/96	199Q5006	242	50 U	150	92	10 U	10 U	10 U	na
			6/7/96	199Q6006	360	50 U	220	140	0.5 U	0.5 U	0.5 U	na
			9/4/96	199Q7006	500	50 U	200	300	0.5 U	0.5 U	0.5 U	na
			5/22/98	196Q2067	29	29	120 U	250 U	0.5 U	0.5 U	0.5 U	0.5 U

Table 10
Summary of Analytical Results for Well Groundwater Samples, Site 06

Well ID	Well Type	Well Location [2]	Sample Date	Sample ID	Analytes of Concern[1] (µg/L)							
					Total TPH	TPH as gasoline	TPH as diesel	TPH as motor oil	Benzene	Ethylbenzene	Toluene	MtBE
USTs 248A & B Subarea (continued)												
06-MW19 (continued)	M	D	5/22/98	196Q2068	39	39	120 U	250 U	0.5 U	0.5 U	0.5 U	0.5 U
			11/9/98	196Q4044	ND	50 U	120 U	330 UJ	0.5 U	0.5 U	0.5 U	0.5 U
			11/9/98	196Q4045	ND	50 U	120 U	240 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
			10/3/00	284Q5005	ND	50 U	100 UJ	100 U	0.5 U	1.0 U	0.8 J	1.0 U
			10/29/01	284Q8108	300	50 U	300	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			10/18/02	036Q2109	60	50 U	60	96 U	na	na	na	na
			6/9/03	06-W-305	410	100 U	90	320	1.0 U	1.0 U	1.0 U	1.0 U
			8/25/03	06-W-317	430	100 U	50 U	430	1.0 U	1.0 U	1.0 U	1.0 U
			11/11/03	06-W-335	190	100 U	190	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/11/03	06-W-341	220	100 U	220	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/8/04	06-W-348	330	100 U	330	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/8/04	06-W-353	450	100 U	450	50 U	1.0 U	1.0 U	1.0 U	1.0 U
06-MW21	M	D	4/3/00	284Q1003	3,490	80	3,410	100 U	15	2.0 U	2.0 U	5.0 U
			5/16/00	284Q3002	500	100	400	100 UJ	0.5 U	1.0 U	1.0 U	1.0 U
			8/25/00	284Q4022	200	50 U	200	100 U	0.5 U	1.0 U	0.2 J	1.0 U
			10/3/00	284Q5009	ND	50 U	100 UJ	100 U	0.5 U	1.0 U	2.0	1.0 U
			10/29/01	284Q8107	700	50 U	700	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			10/16/02	036Q2087	1,009	39 J	970	96 UJ	na	na	na	na
			6/9/03	06-W-306	3,980	100 U	3,600	380	1.0 U	1.0 U	1.0 U	1.0 U
			8/20/03	06-W-318	970	100 U	970 J	60 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/3/03	06-W-328	870	100 U	870	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/15/04	06-W-349	1,600	100 U	1,600	50 U	1.0 U	1.0 U	1.0 U	1.0 U
06-MW22	M	S	4/3/00	284Q1004	8,200	120	8,080	100 U	0.7	2.0 U	2.0 U	5.0 U
			4/3/00	284Q1005	7,450	110	7,340	100 U	0.5	2.0 U	2.0 U	5.0 U
			5/16/00	284Q3003	1,000	50 U	1,000	100 UJ	0.5	1.0 U	1.0 U	1.0 U
			8/25/00	284Q4023	400	50 U	400	100 U	0.5 U	1.0 U	1.0 U	1.0 U
			10/3/00	284Q5010	100	50 U	100	100 U	0.5 U	1.0 U	1.0	1.0 U
			6/8/01	284Q6075	1,400	50 U	1,000	400	0.5 U	1.0 U	2.0 UJ	1.0 U
			10/29/01	284Q8106	1,000	50 U	1,000	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			12/12/01	284Q9011	1,500	50 UJ	1,500	500 U	0.5 U	2.0 U	2.0 U	2.0 UJ
			6/3/02	284QJ041	2,430	30	2,400	490 U	na	na	na	na
			10/18/02	036Q2107	1,940	50 UJ	1,940	96 U	0.5 U	2.0 U	2.0 U	2.0 U
			10/18/02	036Q2108	2,410	50 UJ	2,410	96 U	0.5 U	2.0 U	2.0 U	2.0 UJ
			6/9/03	06-W-307	8,590	100 U	7,800	790	1.0 U	1.0 U	1.0 U	1.0 U
			11/10/03	06-W-336	5,300	100 U	5,300	100 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/15/04	06-W-350	2,400	100 U	2,400	50 U	1.0 U	1.0 U	1.0 U	1.0 U
06-MW24	M	D	8/28/00	284Q4039	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 UJ	1.0 U
			10/3/00	284Q5002	ND	50 U	100 UJ	100 U	0.5 U	1.0 U	1.0	1.0 U
			6/8/01	284Q6076	ND	50 U	100 U	100 U	0.5 U	1.0 U	1.0 U	1.0 U
			8/22/01	284Q7024	400	50 U	400 J	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			10/29/01	284Q8105	ND	50 U	500 U	500 U	0.5 U	2.0 U	2.0 U	2.0 U

Table 10
Summary of Analytical Results for Well Groundwater Samples, Site 06

Well ID	Well Type	Well Location [2]	Sample Date	Sample ID	Analytes of Concern[1] (µg/L)							
					Total TPH	TPH as gasoline	TPH as diesel	TPH as motor oil	Benzene	Ethylbenzene	Toluene	MtBE
USTs 248A & B Subarea (continued)												
06-MW24 (continued)	M	D	12/13/01	284Q9019	ND	50 U	500 U	500 U	0.5 U	2.0 U	2.0 U	2.0 U
			6/3/02	284QJ040	30	30	490 U	490 U	na	na	na	na
			10/15/02	036Q2077	504	34	470	96 U	0.5 U	2.0 U	2.0 U	2.0 U
			6/5/03	06-W-309	480	100 U	90	390	1.0 U	1.0 U	1.0 U	1.0 U
			8/27/03	06-W-321	320	100 U	320	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/10/03	06-W-337	480	100 U	480	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			11/10/03	06-W-339	550	100 U	550	50 U	1.0 U	1.0 U	1.0 U	1.0 U
			1/7/04	06-W-352	480	100 U	480 J	50 UJ	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

1. TPH as gasoline, diesel, and motor oil were analyzed by EPA Method 8015B and volatile organic compounds were analyzed by EPA Method 8260B.

2. Well location relative to the source area (i.e., S - source area, U - upgradient, C - crossgradient, or D - downgradient).

General notes to tables follow Table 11.

Table 11
Shallow Soil Gas Screening Criteria, Site 06

Chemical of Potential Concern	Receptor	Human					
	Exposure Pathway	Inhalation of Indoor Air					
		Unmodified			Normalized		
	Screening Criteria	Water Board Environmental Screening Levels Residential Land Use [1] ($\mu g/m^3$)	Target HQ or Risk	Basis	Water Board Environmental Screening Levels Residential Land Use [1] ($\mu g/m^3$)	Target HQ or Risk	Basis
Volatile Organic Compounds							
Benzene		85	1.E-06	ca	85	1.E-06	ca
Ethylbenzene		420,000	0.2	nc	2,100,000	1.0	nc
Methyl t-butyl ether		9,400	1.E-06	ca	9,400	1.E-06	ca
Toluene		63,000	0.2	nc	315,000	1.0	nc
Xylenes (total)		150,000	0.2	nc	750,000	1.0	nc

Notes:

1. Shallow soil gas screening levels for vapor intrusion concerns are from Volume 1, Table E, "Environmental Screening Levels, Indoor Air and Soil Gas Vapor Intrusion Concerns" (Water Board, 2005).

General notes to tables follow Table 11.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (Water Board), 2005, Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, February.

General Notes to Tables:

µg/L denotes microgram(s) per liter.
µg/m^3 denotes microgram(s) per liter.
bgs denotes below ground surface.
BTEX denotes benzene, toluene, ethylbenzene, and xylenes.
Ca denotes carcinogenic.
COPC denotes chemical of potential concern.
EPA denotes U.S. Environmental Protection Agency.
ERM denotes Environmental Resources Management-West.
HLA denotes Harding Lawson Associates.
ID denotes identification.
J qualifier indicates that the analyte was positively identified but the associated numerical value is estimated.
mg/kg denotes milligrams per kilogram.
M denotes monitoring well.
MNA denotes monitored natural attenuation.
MTBE denotes methyl tert-butyl ether.
NA denotes not analyzed.
na denotes not analyzed for this compound.
nc denotes non-carcinogenic.
NAVSTA TI denotes Naval Station Treasure Island.
PAH denotes polycyclic aromatic hydrocarbon.
PCB denotes polychlorinated biphenyl.
PRC denotes PRC Environmental Management, Inc.
PRG denotes preliminary remediation goal.
RI denotes Remedial Investigation.
sat denotes saturation level.
SVOC denotes semivolatile organic compound.
TPH denotes total petroleum hydrocarbon.
TtEMI denotes Tetra Tech EM, Inc.
U qualifier indicates that the analyte was not detected.
UJ qualifier indicates that the analyte was not detected. However, the reported quantitation limit is approximate.
UST denotes underground storage tank.
VOC denotes volatile organic compound.
Water Board denotes Regional Water Quality Control Board, San Francisco Bay Region.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
11	baseline HHRA	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Cover page through Section 3.3.1.

Appendix I. Baseline Human Health Risk Assessment

Human Health Risk Assessment for Installation Restoration Site 6 Former Fire Training School Naval Station Treasure Island San Francisco, California

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September 2012

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ACRONYMS AND ABBREVIATIONS

ADD	average daily dose
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
cm^2	square centimeter
cm^2/s	square centimeter per second
cm^3	cubic centimeter
COPCs	chemicals of potential concern
DTSC	Department of Toxic Substances Control
ECs	exposure concentrations
ED	exposure duration
EF	exposure frequency
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IR	Installation Restoration
IRIS	Integrated Risk Information System
J&E	Johnson & Ettinger
LADD	lifetime average daily dose
LLRW	low-level radiological waste
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mg/cm^2-event	milligrams per square centimeter per event
mg/kg	milligrams per kilogram
mg/kg-day	milligrams of chemical per kilograms of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
m^3/kg	cubic meter per kilogram
MCPP	methylchlorophenoxypropionic acid
MRL	minimum risk level
NAVSTA TI	Naval Station Treasure Island
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/kg	nanograms per kilogram

OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waster and Emergency Response
OWS	oil-water separator
PAHs	polycyclic aromatic hydrocarbons
PEF	particulate emission factor
RfCs	reference concentrations
RfDs	reference doses
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
RSL	regional screening level
SF	slope factor
SVOCs	semivolatile organic compounds
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran
TEF	toxic equivalent factor
TEQ	toxic equivalent
TIDA	Treasure Island Development Authority
UCL	upper confidence limit
URFs	unit risk factors
UST	Underground Storage Tank
VF	volatilization factor
VOCs	volatile organic compounds
Water Board	San Francisco Bay Regional Water Quality Control Board

Section 1.0: INTRODUCTION

This document presents the results of the human health risk assessment (HHRA) conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) at Installation Restoration (IR) Site 6, Former Fire Training School, at Naval Station Treasure Island (NAVSTA TI). The HHRA for IR Site 6 consists of three individual HHRAs for Subareas 1, 2, and 3. These HHRAs were conducted in accordance with guidelines published by the U.S. Environmental Protection Agency (EPA) in the "Risk Assessment Guidance for Superfund Part A" (EPA, 1989) and other appropriate EPA guidance, guidelines, and policies. In addition, guidance provided by California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) (available online at http://www.dtsc.ca.gov/AssessingRisk/index.cfm) has been incorporated where applicable.

The purpose of the HHRA is to assess and document the magnitude of potential risk to human receptors based on current and potential future exposures to chemicals of potential concern (COPCs) identified in soil, groundwater, and soil gas at IR Site 6. In addition, the risk assessment assesses the overall cancer risks and noncancer hazards to human health to address requirements in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Section 300.430(e)(9)(iii) of Title 40 Code of Federal Regulations (EPA, 1990). The results of the assessment will be used to make informed risk management decisions regarding the potential remedial action (EPA, 1991).

In addition to this brief introduction, this document is divided into the following sections:

- Section 2: **Site Description and Background.** This section briefly describes the history and operations, as well as the physical setting, at NAVSTA TI and IR Site 6.
- Section 3: **Risk Assessment Methodologies**. This section includes the data evaluation, exposure assessment, toxicity assessment, and risk characterization.
- Section 4: **Risk/Hazard Results for Subarea 1**. This section presents the HHRA results for Subarea 1.
- Section 5: **Risk/Hazard Results for Subarea 2**. This section presents the HHRA results for Subarea 2.
- Section 6: **Risk/Hazard Results for Subarea 3**. This section presents the HHRA results for Subarea 3.
- Section 7: **Uncertainties Associated with Risk Estimates**. This section provides the qualitative evaluation to address uncertainties associated with the estimates of risks and hazards presented in this report.
- Section 8: **Summary and Conclusions**. This section summarizes the results of the HHRAs for Subareas 1, 2, and 3 and provides conclusions based on the results.
- Section 9: **References**.

Section 2.0: SITE DESCRIPTION AND BACKGROUND

NAVSTA TI is located in the City and County of San Francisco, California, between San Francisco and Oakland in the San Francisco Bay. NAVSTA TI consists of two islands connected by a causeway. The northern island, Treasure Island, encompasses approximately 403 acres, and the southern island, Yerba Buena Island, encompasses approximately 147 acres (Figure 2-1). Treasure Island is a man-made island constructed of materials dredged from San Francisco Bay. At present, IR Site 6 covers approximately 4.54 acres of open space in the northeast portion of Treasure Island. IR Site 6 consists of the following two subareas: (1) the main rectangular subarea that was historically used as a former fire training school (hereinafter referred to as the "Former Fire Training School", and (2) an adjacent wedge-shaped subarea to the northeast that was used for parking and storage but was never associated with fire training activities (hereinafter referred to as the "Former Parking and Storage Area" (Figure 2-2).

For purposes of this HHRA, the site is subdivided into three subareas, which are referred to as Subareas 1, 2, and 3 (Figure 2-3). Subarea 1 consists of the western portion of the site, including Underground Storage Tank (UST) 240 Area. Subarea 2 consists of the eastern portion of the site, including the UST 248 Area, and Subarea 3 is the Former Parking and Storage Area. Each of the three subareas will be evaluated in the HHRA as separate exposure units.

The remainder of this section summarizes the history and operations and describes the physical setting of IR Site 6 as presented in the "Work Plan for Data Gaps Investigation" (SulTech, 2009).

2.1 Site History and Operations

IR Site 6 includes an area within the boundaries associated with the Former Fire Training School that was used for various firefighting training activities from 1944 to 1992. The current IR Site 6 boundary encompasses 4.54 acres of open space in the northeast portion of Treasure Island. Approximately 1.15 acres of IR Site 6 is covered with concrete, 1.34 acres is covered with asphalt, and 2.07 acres is currently unpaved. All buildings have been removed, and the site is currently closed to the public and secured with chain-link fencing.

Based on historic records, the Former Fire Training School at IR Site 6 once included six USTs, 10 buildings, and a central training yard (also known as the "central training area"), which consisted of an L-shaped concrete pad, concrete collector trench, and burn area lined with asphalt and concrete. Review of historic figures indicated that a helicopter training area and a portable aircraft area were located within the northern portion of the concrete central training area; training fires were ignited at these locations, as well as within the four buildings (240, 241, 242 and 243) in the central training area. Figure 2-2 shows the former site features.

During fire training exercises, diesel-, gasoline-, magnesium-, and wood-fueled fires were set in various mockups and then extinguished using a mixture of water and biodegradable emulsifiers. Diesel, or a mixture of gasoline and diesel, was supplied from four 1,500-gallon steel USTs (240A, 240B, 248A, and 248B) adjacent to the north and east sides of the concrete pad. The four USTs were removed between 1992 and 1995. Two additional steel 1,000-gallon USTs (248C and 248D), historically used to store waste fuel, were removed in 2002, as were the associated oil-water separator (OWS) systems. A 3,500-gallon steel aboveground storage tank (AST) (248), historically used to store waste fuel, was removed from IR Site 6 sometime prior to 1995. In addition, an AST (240) of unknown construction, capacity, and content may have been located near the northern boundary of IR Site 6; however, it is not clear from the historic records whether AST 240 was actually ever present or was constructed and subsequently removed.

Figure 2-1. Site Location Map

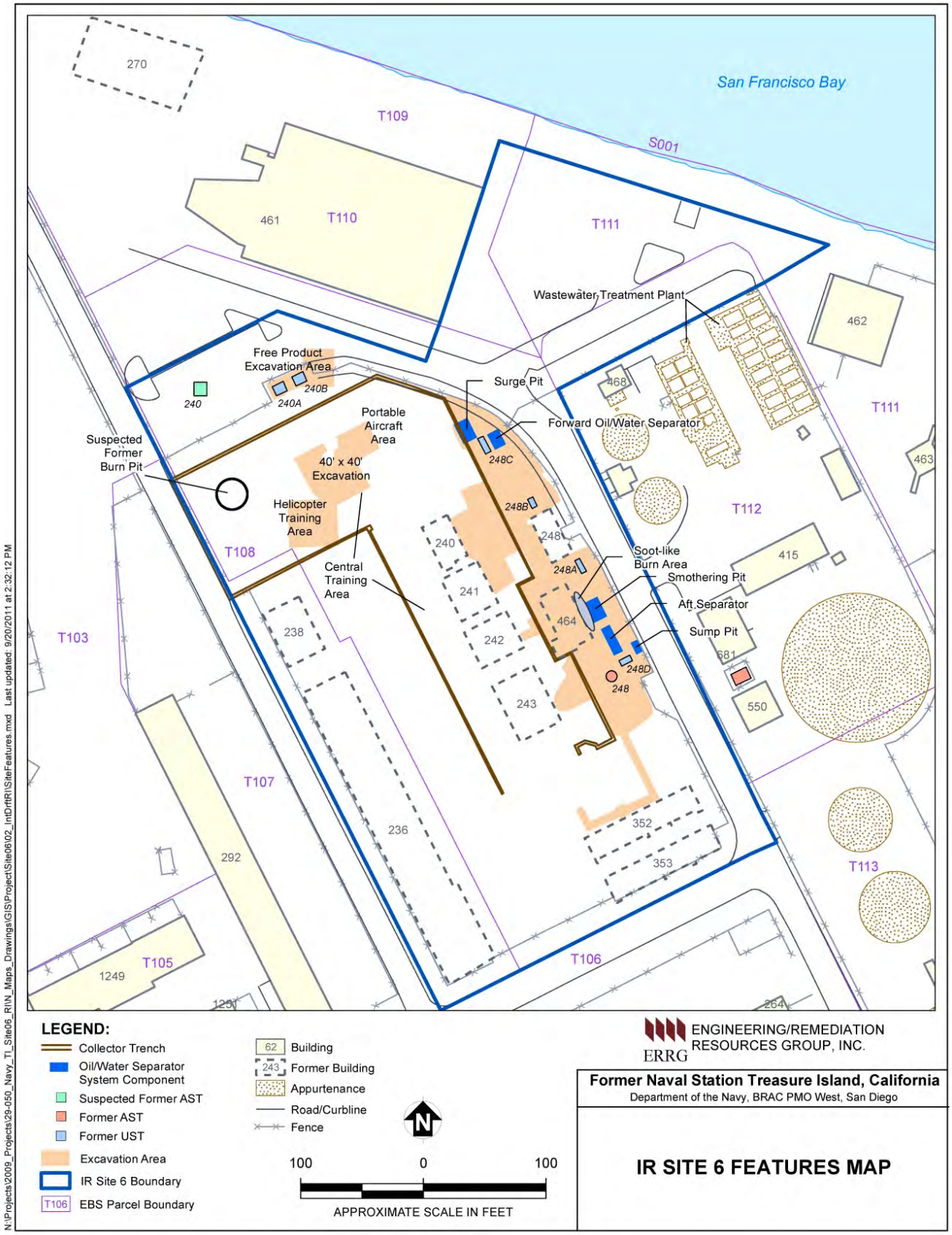

Figure 2-2. IR Site 6 Features Map

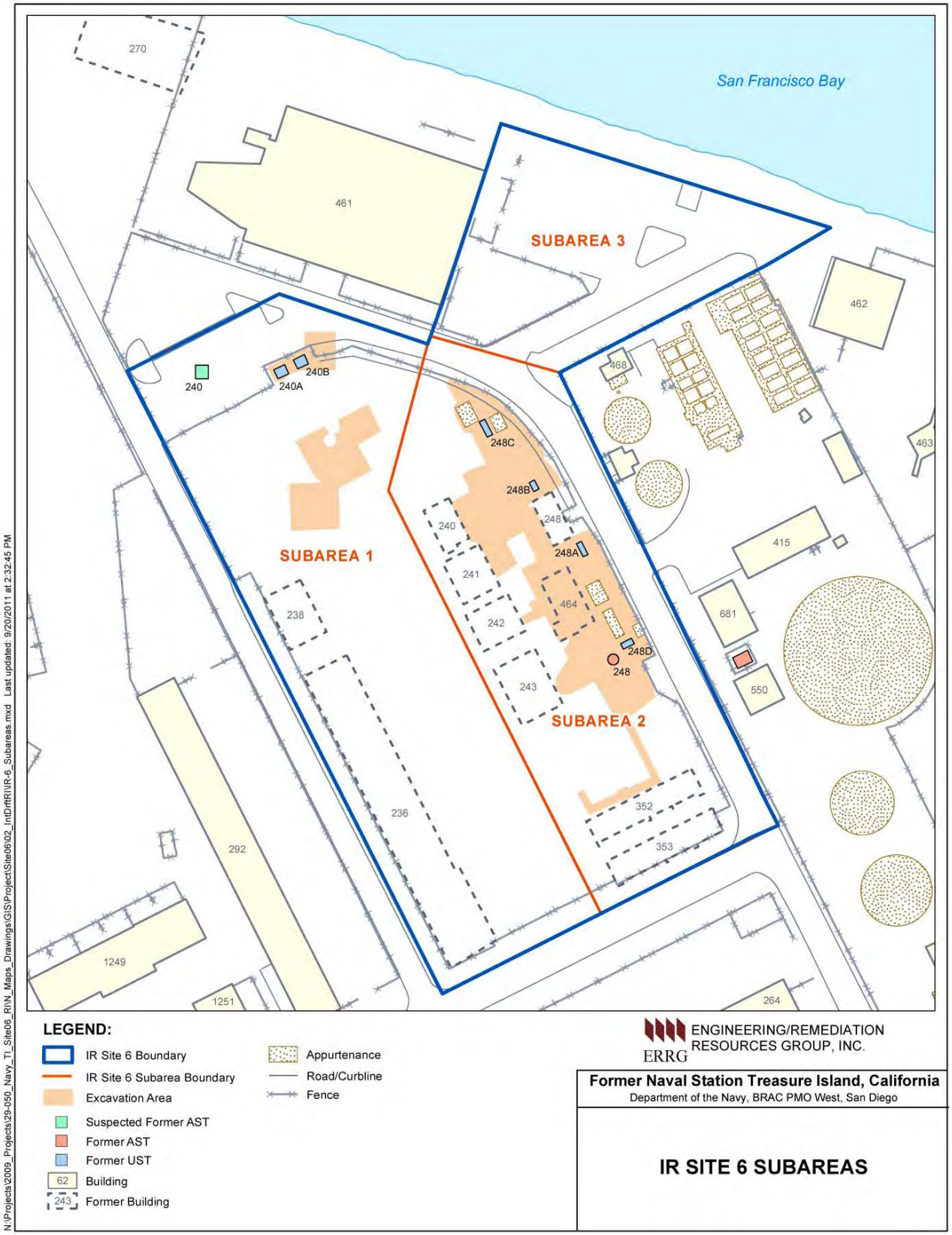

Figure 2-3. Installation Restoration Site 6 Subareas

Based on available information, it is estimated that approximately 18,700 gallons of gasoline and 31,500 gallons of diesel fuel were used at IR Site 6 each year and approximately 14,000 gallons of petroleum residue was generated on site. In addition, grease and paints stored in a portable locker may have been used in areas adjacent to the central training area on the L-shaped concrete pad. All 10 buildings at IR Site 6 were demolished and removed in 1993; however, many of the building foundations remain on site.

The central training area was surrounded by a concrete-lined collector trench or shallow surface drainage trench that historically conveyed wastewater runoff from the training area during training exercises. The wastewater and unburned fuels were conveyed to sumps and surge pits along the eastern side of the site. Wastewater from the sump pits passed through the OWSs associated with USTs 248C and 248D. The waste fuel was then pumped from these USTs through aboveground piping to 3,500-gallon AST 248, which was periodically emptied to a 5,000-gallon tank truck for off-island disposal. The separated wastewater was visually inspected and eventually discharged to the wastewater treatment plant. Before 1973, wastewater that flowed to the concrete trench was discharged to San Francisco Bay without treatment.

2.2 Physical Setting

The topography at Treasure Island is flat, consisting primarily of sand dredged from San Francisco Bay and the Sacramento-San Joaquin Delta and retained by a perimeter of rock and sand dikes. All land above sea level and extending to a depth of approximately 10 to 50 feet below sea level is composed of fill. Ground surface elevations at Treasure Island range from approximately 10 to 12 feet above mean sea level, based on the National Geodetic Vertical Datum of 1929. Surface runoff on paved areas flows into on-site storm catch basins and drains directly into San Francisco Bay.

Subsurface materials at Treasure Island can be categorized into the following five units, from youngest to oldest: (1) Fill (Dredged Sand Fill), (2) Shoal Sands (Yerba Buena Shoal Sands), (3) Younger Bay Mud, (4) Older Bay Mud, and (5) Franciscan Assemblage. IR Site 6 is underlain by dredged fill and shoal deposits predominantly consisting of fine- to medium-grained sands, with varying proportions of shell fragments, silt, and clay. The dredged fill was emplaced on top of the shoal sands during construction of Treasure Island. Younger Bay Mud, located about 40 to 50 feet below ground surface (bgs), consists of inter-bedded sand, silt, and clay, and underlies the shoal sands.

Groundwater conditions at Treasure Island are unconfined. In unpaved areas, recharge occurs primarily through infiltration of precipitation, augmented by recharge from landscape irrigation. Groundwater flow at Treasure Island is generally from the center of the island out toward San Francisco Bay. Groundwater levels at Treasure Island vary seasonally; water levels are highest from November to April and lowest from May to October. Groundwater at Treasure Island is not recognized as a potential source of drinking water (San Francisco Bay Regional Water Quality Control Board [Water Board], 2001).

Depth to groundwater at IR Site 6 has been measured from approximately 3 to 8 feet bgs since periodic groundwater monitoring began in 1994. The local groundwater flow direction at IR Site 6 is generally to the northeast toward the shoreline and San Francisco Bay. Hydraulic gradients measured at the site vary and depend on proximity to the shoreline and the extent of tidal influence; generally, steeper hydraulic gradients have been measured closer to the shoreline. Using gradients from quarterly groundwater monitoring events and porosity values based on site-specific geotechnical data, groundwater velocities at IR Site 6 ranged from 0.03 to 0.08 foot per day.

Section 3.0: RISK ASSESSMENT METHODOLOGIES

3.1 Identification of Chemicals of Potential Concern

Investigation activities at IR Site 6 have included investigations of soil, groundwater, and soil gas and removal of soil and free product. The identification of COPCs is based on a compilation of usable data for soil, soil gas, and groundwater for each of the three subareas. All data considered usable from previous investigations and the recent supplemental investigation were included (data qualified as rejected, "R", were not included in the HHRA). Data from samples collected at locations that have been the subject of a removal action are not included in the HHRA. Appendix A contains summary tables of all analytical data.

3.1.1 Soil

COPCs were identified for surface and subsurface soil from historic data collected between 1992 and 2010. Although EPA and Cal/EPA define surface soil as 0 to 6 inches bgs, most of the shallow soil samples were collected at IR Site 6 from between 0 and 2 feet bgs. Therefore, for the purposes of this HHRA, surface samples are represented by soil samples collected from 0 to 2 feet bgs, for all COPCs except dioxins and Aroclor-1260. Soil samples for dioxin analysis were collected within all three subareas from between 0 and 6 inches bgs and, in some cases, from varying depths down to 4 feet bgs. Therefore, surface samples for dioxins are represented by samples from 0 to 6 inches bgs. Soil samples for Aroclor-1260 analysis were collected within Subareas 2 and 3 from 0 and 1 foot bgs; Aroclor-1260 data are not available for Subarea 1. Subsurface soil is a combination of shallow and deep samples collected from 0 to 8 feet bgs because the maximum recorded depth to groundwater is approximately 8 feet bgs or shallower.

All organic chemicals reported in at least one soil sample were selected as COPCs. Metals were selected as COPCs based on the results of an ambient screening, except for calcium, magnesium, potassium, and sodium, which are known to be required human nutrients and therefore not selected as COPCs. Details of the ambient screening are provided in Section 8.1.1.1 of the RI/FS. Table 3-1 summarizes the COPCs for surface and subsurface soil for each of the subareas.

3.1.1.1 Dioxins

Some chemicals are members of the same family and exhibit similar toxicological properties; however, they differ in the degree of toxicity. Therefore, a toxic equivalency factor (TEF) is applied to adjust the measured concentrations to a toxic equivalent (TEQ) concentration. For dioxins, a TEF is a measure of the relative potency of a compound to cause a particular toxic or biological effect relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). By convention, TCDD is assigned a TEF of 1.0, and the TEFs for other compounds with dioxin-like effects range from 0 to 1. TEQ values for dioxin/furan congeners were calculated using congener-specific TEFs (see Table 3-2). The TEQs were calculated separately for each individual parameter and summed to derive the total TEQ value (denoted as "dioxin TEQ"). The TEFs used for these calculations were the World Health Organization values published in 2006 (Van den Berg et al., 2006; EPA, 2010a).

Table 3-1. Summary of COPCs in Soil

Subarea 1			Subarea 2			Subarea 3		
COPC	**Surface Soil**	**Subsurface Soil**	**COPC**	**Surface Soil**	**Subsurface Soil**	**COPC**	**Surface Soil**	**Subsurface Soil**
Dioxin TEQ (1)	X	X	Dioxin TEQ (1)	X	X	Dioxin TEQ (1)	X	X
Phenol	X	X	Phenol	X	X	Phenol		X
1,2,4-Trimethylbenzene		X	Ethylbenzene		X	Aroclor-1260	X	X
1,3,5-Trimethylbenzene		X	Isopropylbenzene			Cadmium		X
2-Chlorotoluene		X	n-Butylbenzene		X	Iron		X
4-Isopropyltoluene		X	Propylbenzene		X	Manganese		X
Acetone		X	sec-Butylbenzene		X	Molybdenum		X
Benzene		X	Toluene		X	Silver		X
Carbon Disulfide		X	Xylenes		X	Thallium		X
Chloroform		X	1,6,7-Trimethylnaphthalene		X			
Ethylbenzene	X	X	2,6-Dimethylnaphthalene		X			
Isopropylbenzene		X	Dibenzofuran		X			
Methyl Tert-Butyl Ether		X	Dibenzothiophene		X			
n-Butylbenzene		X	Perylene		X			
Propylbenzene		X	Acenaphthene		X			
sec-Butylbenzene		X	Acenaphthylene		X			
Styrene		X	Anthracene		X			
tert-Butylbenzene		X	Benzo[a]anthracene		X			
Toluene		X	Benzo[a]pyrene		X			
Xylenes		X	Benzo[b]fluoranthene		X			
1,1-Biphenyl		X	Benzo[e]pyrene		X			
1,6,7-Trimethylnaphthalene		X	Benzo[k]fluoranthene		X			
2,6-Dimethylnaphthalene		X	Benzo[g,h,i]perylene		X			
Dibenzothiophene		X	Chrysene		X			
Perylene		X	Fluoranthene		X			
Acenaphthene		X	Fluorene		X			
Acenaphthylene		X	Indeno[1,2,3-cd]pyrene		X			
Anthracene		X	1-Methylnaphthalene		X			
Benzo[a]anthracene		X	2-Methylnaphthalene		X			
Benzo[a]pyrene		X	Naphthalene		X			
Benzo[b]fluoranthene		X	Phenanthrene		X			
Benzo[e]pyrene		X	Pyrene		X			
Benzo[k]fluoranthene		X	Aroclor-1260	X	X			

Table 3-1. Summary of COPCs in Soil (Continued)

Subarea 1			Subarea 2			Subarea 3		
COPC	**Surface Soil**	**Subsurface Soil**	**COPC**	**Surface Soil**	**Subsurface Soil**	**COPC**	**Surface Soil**	**Subsurface Soil**
Benzo[g,h,i]perylene		X	Beryllium	X	X			
Chrysene		X	Iron	X	X			
Fluoranthene		X	Lead		X			
Fluorene		X	Thallium		X			
Indeno[1,2,3-cd]pyrene		X	MCPP		X			
1-Methylnaphthalene		X						
2-Methylnaphthalene	X	X						
Naphthalene		X						
Phenanthrene		X						
Pyrene		X						
Aluminum		X						
Antimony		X						
Beryllium	X	X						
Iron	X	X						
Molybdenum		X						
Nickel		X						
Silver	X	X						
Vanadium		X						
MCPP		X						

Notes:
X = denotes the chemical is a COPC.
(1) = Dioxin TEQ represents the sum of the dioxin/furan congeners based on a TEF approach (see Section 3.1.1.1).

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Table 3-2. TEQ Factors for Dioxin/Furans

Congener	TEF	Congener	TEF
2,3,7,8-TCDD	1	2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDD	1	1,2,3,7,8-PeCDF	0.03
1,2,3,4,7,8-HxCDD	0.1	2,3,4,7,8-PeCDF	0.3
1,2,3,6,7,8-HxCDD	0.1	1,2,3,4,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDD	0.1	1,2,3,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDD	0.01	1,2,3,7,8,9-HxCDF	0.1
OCDD	0.0003	2,3,4,6,7,8-HxCDF	0.1
		1,2,3,4,6,7,8-HpCDF	0.01
		1,2,3,4,7,8,9-HpCDF	0.01
		OCDF	0.0003

Dioxin data for Subarea 2 are from both discrete and composite soil samples (i.e., samples that combine soil samples across different locations). The composite samples were collected during excavation confirmation activities in 2003. Although in most instances composite samples are used to assess the presence or absence of contamination, they may be used in risk assessment to represent average concentrations (EPA, 1989). Because one-third of the total number of dioxin samples from Subarea 2 are composite samples, the decision was made to include them, rather than discard them, and to discuss any uncertainty with their use in the uncertainty analysis (Section 8).

3.1.2 Groundwater

For groundwater, the historic analytical data are from hydropunch samples, temporary well samples, and monitoring well samples collected between 1987 and 2010. The types of analyses (e.g., VOCs, SVOCs, metals) conducted on these groundwater samples have varied over the years and may have been a one-time event. In addition, bioventing and biosparging pilot tests were conducted between 1999 and 2001 in Subarea 1 near well 06-MW01, in which VOC concentrations have decreased significantly since that time. Therefore, to ensure that all COPCs are identified and are representative of more recent groundwater conditions, the groundwater data were carefully scrutinized. Analytical data were compiled, and COPCs were selected for groundwater as follows:

- For VOCs and SVOCs:
  - Only analytical data from temporary wells and monitoring wells were considered. This approach is consistent with DTSC's vapor intrusion guidance (DTSC, 2011a), which states that the use of hydropunch samples is not recommended for evaluating the vapor intrusion pathway.
  - For each well, only the last four sampling events, whether quarterly or annually, were considered.
  - If a chemical was detected at least once during the last four sampling events at that well, then it was identified as a COPC.
  - If a chemical was analyzed for previously and detected, but never analyzed for again at that location and not detected at any other location, that chemical was selected as a COPC.
  - If a chemical was analyzed for previously and not detected, and never analyzed for again at that location and not detected at any other location, that chemical was not selected as a COPC.

- If a chemical was detected during previous sampling events, but was not detected in the last four sampling events of interest, that chemical was not selected as a COPC, as long as the detection limits for the more recent samples were less than the detected value.
- If a chemical was detected during previous sampling events as an estimated value (i.e., "J"), but was not detected during the last four sampling events of interest, but the detection limits for the more recent samples were greater than the "J" detected value, the chemical was selected as a COPC.

- For metals:
  - Metals were selected as COPCs based on the results of an ambient screening . Details of the ambient screening are provided in Section 8 of the RI/FS.

Table 3-3 summarizes the COPCs in groundwater at each of the subareas.

3.1.3 Soil Gas

For soil gas, any compound detected in the historic data (1996, 1999, 2004, and 2010) was identified as a COPC. Petroleum hydrocarbon-related constituents (e.g., benzene, toluene, ethylbenzene, and xylenes), as well as several chlorinated VOCs, have been detected in soil gas. Table 3-4 summarizes the COPCs in soil gas at each of the subareas.

3.2 Exposure Assessment

This section evaluates the ways in which people may come in contact with COPCs at the site, currently or in the future. The exposure assessment is a multistep process conducted to estimate the magnitude, frequency, duration, and routes of current and reasonably anticipated future human exposure to COPCs associated with IR Site 6. First, individuals using the site or who may potentially use the site in the future are identified (i.e., "receptors"). Second, exposure pathways by which these receptors may come into contact with COPCs are identified. Finally, the chemical concentration at the point of exposure (i.e., the exposure point concentration [EPC]) and the daily intake rates associated with each exposure pathway are quantified. The following sections describe the receptors and exposure pathways and the methodology used to calculate EPCs and daily intake.

3.2.1 Receptors and Exposure Pathways

Currently, no receptors are present at IR Site 6, other than authorized environmental workers. The main portion of the site is being used as a temporary staging area to support the ongoing removal action for low-level radiological waste (LLRW) at IR Site 12. The northeastern subarea of IR Site 6 is currently being used to support ongoing environmental restoration actions at NAVSTA TI. Pavement, concrete, and gravel at IR Site 6 prevent direct contact with chemicals remaining in soil and act as a barrier to prevent the release of particulates and VOCs into ambient air, thus preventing the exposure of environmental workers supporting ongoing investigation work at NAVSTA TI. Therefore, exposures to chemicals in soil, groundwater, and soil gas are only relevant for potential future receptors. As described in the "Design for Development of Treasure Island and Yerba Buena Island ("Design for Development")" (Treasure Island Development Authority [TIDA], 2011), the future development at Treasure Island has been designed as a public open space framework to "*create a contemporary landscape fabric that engages the neighborhoods as well as civic and retail uses with the Bay*." The portion of Treasure Island where IR Site 6 is currently located would be occupied by open space and parklands, which may entail hiking and walking trails, picnic areas, playgrounds, sports fields, concession stand and snack bar, and any other public-park related outdoor area for recreational purposes (Figure 3-1).

Table 3-3. Summary of COPCs in Groundwater

Subarea 1	Subarea 2	Subarea 3
1,1,2-Trichloroethane	1,2-Dichloroethene, total	1,2-Dichloroethene, total
1,3,5-Trimethylbenzene	2-Methylnaphthalene	Acenaphthene
2,4-Dimethylphenol	Acenaphthene	Acetone
2-Butanone	Acenaphthylene	Chloroform
2-Methylnaphthalene	Benzene	cis-1,2-Dichloroethene
2-Methylphenol	Carbon Disulfide	Naphthalene
4-Isopropyltoluene	Chloroethane	Pyrene
4-Methylphenol	Chloromethane	Fluoranthene
Acenaphthene	Chrysene	Arsenic
Acetone	cis-1,2-Dichloroethene	Vanadium
Anthracene	Dibenzofuran	
Arsenic	Ethylbenzene	
Benzene	Fluoranthene	
Beryllium	Fluorene	
Butylbenzylphthalate	Isophorone	
Chloroethane	Methane	
Chloromethane	Naphthalene	
cis-1,2-Dichloroethene	Phenacetin	
Ethene	Phenanthrene	
Ethylbenzene	Pyrene	
Fluoranthene	Toluene	
Fluorene	Trichloroethene	
Iron	Xylenes	
Isopropylbenzene	Arsenic	
Lead	Beryllium	
Manganese	Iron	
Methane	Lead	
MCPP	Manganese	
Methyl Tert-Butyl Ether		
Naphthalene		
n-Butylbenzene		
Phenol		
Propylbenzene		
Pyrene		
sec-Butylbenzene		
tert-Butylbenzene		
Tetrachloroethene		
Toluene		
Trichloroethene		
Xylenes		

Table 3-4. Summary of COPCs in Soil Gas

Subarea 1	Subarea 2	Subarea 3
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon® 113)	1,1,1-Trichloroethane	2-Butanone
2-Butanone	1,2,4-Trimethylbenzene	Benzene
2-Propanol	1,3,5-Trimethylbenzene	Bromodichloromethane
Benzene	2-Butanone	Carbon Disulfide
Carbon Disulfide	4-Methyl-2-Pentanone	Chloroform
Chloroform	Benzene	Ethylbenzene
Ethylbenzene	Bromomethane	Tetrachloroethene
Methyl Tert-Butyl Ether	Carbon Disulfide	Toluene
Methylene Chloride	Chloroform	Trichloroethene
Tetrachloroethene	Chloromethane	Trichlorofluoromethane (Freon® 11)
Toluene	Ethylbenzene	
Trichloroethene	Methylene Chloride	
Trichlorofluoromethane (Freon® 11)	Naphthalene	
Xylenes, Total	Propylbenzene	
	Tetrachloroethene	
	Toluene	
	Trichloroethene	
	Trichlorofluoromethane (Freon® 11)	
	Xylenes	

Figure 3-1. Open Space Designations for Treasure Island and IR Site 6

All likely exposure scenarios that could exist under the intended potential future use of the site are considered in this HHRA. Exposure scenarios are identified by evaluating potential receptors and exposure pathways. Receptors may be exposed to COPCs either directly, through activities that result in contact with contaminated environmental media (e.g., digging in contaminated soil), or indirectly, as a result of chemical migration to locations where contact with receptors can occur (e.g., vapor migration into a house or office building). An exposure pathway defines the most probable pathway in which a receptor may come into contact with contaminated media. In order for an exposure pathway to be complete, the following four elements must be present:

- a source and mechanism of chemical release;
- a retention or transport medium;
- a point of contact between the human receptor and the medium; and
- a route of exposure for the potential human receptor at the contact point.

The exposure pathway must be complete from the source of chemicals in the environment to human receptors in order for chemical intake to occur. If all exposure pathways are incomplete for human receptors, no chemical intake occurs and no human health effects are associated with site-related COPCs.

As stated above, the approved redevelopment plan indicates that the primary planned future use of IR Site 6 is publicly accessible open space and recreational facilities. The development plan also indicates an approximately 0.9-acre area along the eastern boundary of IR Site 6 will be used for public services and institutional purposes to support expansion of the existing wastewater treatment plant (TIDA, 2011). To prepare the HHRA for IR Site 6 (Section 8), hypothetical redevelopment of the entire site into residential or commercial/industrial uses was considered. A construction worker exposure scenario was also evaluated to account for potential workers that may infrequently encounter subsurface soil and groundwater during future redevelopment or site maintenance. Access to TI Site 6 is currently limited to authorized environmental workers. However, exposure of environmental workers at IR Site 6 is minimal and therefore not quantitatively evaluated in the HHRA. A summary of each of the potential receptors that are considered in the HHRA and the associated exposure pathways is provided below and summarized in Table 3-5.

Construction/Excavation Worker. During redevelopment of the property, workers involved in the installation of underground utilities or similar excavation activities may come into contact with COPCs in soil or groundwater. Therefore, an assessment was conducted to evaluate potential risks to a worker who might trench through the area with contaminated soil and groundwater. Exposure to construction/excavation workers was assumed to occur as a result of incidental ingestion of and dermal contact with contaminated soil and inhalation of COPCs in ambient air from soil. In addition, exposure to these workers was assumed to occur via dermal contact with COPCs in groundwater and inhalation of VOCs from groundwater while standing in a trench during trenching activities.

Recreational Users. Recreational use of Northern Shoreline Park may include hiking and walking along the trails, picnicking in designated areas, and playing on playgrounds and sports fields. The recreational users evaluated in the risk assessment include an age-adjusted adult/child receptor (24 years as an adult and 6 years as a child, for a total of 30 years) for exposure to carcinogens and a child receptor (age 0-6 years) for noncarcinogens to depict a scenario resulting in the most conservative cancer and noncancer risks. Exposures to the recreational users were assumed to occur as a result of incidental ingestion of and dermal contact with contaminated soil, inhalation of COPCs in outdoor air from soil via volatilization and fugitive dusts, and inhalation of VOCs in groundwater in outdoor air.

Occupational Worker. Occupational workers in this HHRA are individuals who work largely inside a building (e.g., office workers). An approximately 0.9-acre portion along the southeastern boundary of IR Site 6 (within Subarea 2) is designated for public services and institutional uses, and may be used for a

wastewater treatment plant. In addition, Therefore, the occupational worker is assume to be an anticipated receptor for Subarea 2 based on the proximity to the proposed wastewater treatment plant. In addition, occupational workers may be future receptors for the remainder of IR Site 6, based on the possibility of commercial buildings or other ancillary facilities being constructed at IR Site 6. Although commercial buildings are a permitted use for open space areas at TI under the redevelopment plan, the construction of such buildings is unlikely at IR Site 6 and therefore the occupational worker at areas outside of Subarea 2 is considered hypothetical. The occupational worker receptor evaluated in the risk assessment includes a standard 25-year default commercial scenario for an adult. Exposures were assumed to occur as a result of incidental ingestion of and dermal contact with contaminated soil, inhalation of COPCs in outdoor air from soil via volatilization and fugitive dusts, inhalation of VOCs in groundwater in outdoor air, and inhalation of COPCs in soil gas and groundwater that migrate indoors.

Hypothetical Residents. It is important to note that the property currently is not used for residential housing, nor is it planned to be used for such purposes in the future. However, as an additional measure to assist in making risk management decisions for IR Site 6, a hypothetical residential scenario has been evaluated. The residential receptors evaluated in the risk assessment include a standard default residential scenario for an adult and a child. This exposure scenario evaluated an age-adjusted adult/child receptor (24 years as an adult and 6 years as a child, for a total of 30 years) for exposure to carcinogens and a child receptor (age 0-6 years) for noncarcinogens to depict a scenario resulting in the most conservative cancer and noncancer risks. Exposure to residents was assumed to occur as a result of incidental ingestion of and dermal contact with contaminated soil, inhalation of COPCs in outdoor air from soil via volatilization and fugitive dusts, inhalation of VOCs in groundwater in outdoor air, and inhalation of COPCs in soil gas and groundwater that migrate indoors.

As shown in Table 3-5, receptors may be indirectly exposed to chemicals in groundwater as a result of vapor migration into buildings and to outdoor air. Receptors are not likely to be otherwise exposed to contaminated groundwater because groundwater at the site is not currently used for any purpose (e.g., drinking, showering, cooking, or irrigation) because groundwater at Treasure Island is not recognized as a potential source of drinking water (Water Board, 2001).

3.2.2 Determination of Exposure Point Concentrations

Estimates of chemical concentrations at points of potential exposure are necessary for evaluating chemical intakes by potentially exposed receptors. The concentrations of chemicals in the exposure medium at the exposure point are termed EPCs. EPA guidance uses an average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time" and recommends that the 95% upper confidence limit (UCL) on the average be used "because of the uncertainty associated with estimating the true average concentration at a site…" (EPA, 1989).

For direct contact with soil (e.g., ingestion, dermal contact and inhalation of outdoor air), the EPC was defined as the 95% UCL of the arithmetic mean or maximum observed concentration, whichever was lower (EPA, 2002b). Calculation of the EPCs followed guidance provided by EPA (2002b), using distribution shift tests to determine the underlying population distribution. Specifically, the ProUCL software package (version 4.1.00) developed by EPA (2010b) was used to determine the underlying statistical distributions and to determine the most applicable EPC based on the characteristics of the data. Depending on the statistical distributions identified by the software application, the most appropriate measure of central tendency was selected as the EPC. For those cases when more than one estimate of the 95% UCL was recommended by the software program, the first value was chosen as the 95% UCL. The ProUCL output files, which contain summaries of the statistics (mean, minimum, maximum values) and assumptions of the data distributions for each of the COPCs, are provided in Appendix B. Maximum concentrations detected in the environmental medium were selected as the EPC for those cases in which the 95% UCL was higher. Maximum concentrations detected in soil also were selected as the EPC for those

Table 3-5. Summary of Potential Receptors and Associated Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil (0 to 2 feet bgs)	Soil	Surface soil	Resident[a]	Adult	Ingestion, dermal contact, inhalation of particulates and VOCs in outdoor air	None	There are no current receptors at IR Site 6. The main portion of the site is being used as a temporary staging area to support the ongoing removal action for LLRW at IR Site 12. The northeastern subarea of IR Site 6 is currently being managed by Shaw to support ongoing environmental restoration actions at NAVSTA TI. The presence of pavement, concrete, and gravel prevents direct contact with chemicals remaining in soil and acts as a barrier to prevent the presence of particulates and VOCs in ambient air, thus preventing exposure of environmental workers supporting ongoing investigation work at NAVSTA TI.
					Child			
				Occupational Worker	Adult			
				Construction Worker	Adult			
				Recreational User	Adult			
					Child			
Future	Surface Soil (0 to 2 feet bgs)	Soil	Surface soil	Resident[a]	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
					Child	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
				Occupational Worker	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
				Construction Worker	Adult	Ingestion	None	This pathway is addressed for the subsurface soil depth interval.
						Dermal contact	None	This pathway is addressed for the subsurface soil depth interval.
				Recreational User	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
					Child	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
		Particulates and Vapors	Respirable particulates and VOCs in outdoor air	Resident[a]	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
				Occupational Worker	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
				Construction Worker	Adult	Inhalation	None	This pathway is addressed for the subsurface soil depth interval.
				Recreational User	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with minimal surface regrading.
	Subsurface Soil (0 to 8 feet bgs)	Soil	Combined subsurface and surface Soil	Resident[a]	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
					Child	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Occupational Worker	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Construction Worker	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Recreational User	Adult	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
					Child	Ingestion	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
						Dermal contact	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
		Particulates and Vapors	Respirable particulates and VOCs in outdoor air	Resident[a]	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Occupational Worker	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Construction Worker	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
				Recreational User	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario with significant regrading.

Table 3-5. Summary of Potential Receptors and Associated Exposure Pathways (Continued)

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (Continued)	Soil Gas	Vapors	Vapor intrusion to indoor air	Resident[a]	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario.
				Occupational Worker	Adult	Inhalation	Quant.	The Treasure Island Reuse Plan allows for commercial buildings at IR Site 6. Volatile compounds may migrate into indoor air making this pathway complete.
				Construction Worker	Adult	Inhalation	None	This receptor is evaluated for outdoor exposures only.
				Recreational User	Adult	Inhalation	None	This receptor is evaluated for outdoor exposures only.
					Child	Inhalation	None	This receptor is evaluated for outdoor exposures only.
	Groundwater	Groundwater	Tap water from shallow groundwater	Resident[a]	Adult	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
					Child	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
				Occupational Worker	Adult	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
				Construction Worker	Adult	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	This pathway is considered incomplete for this receptor.
				Recreational User	Adult	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	This pathway is considered incomplete for this receptor.
					Child	Ingestion	None	Groundwater at Treasure Island does not meet requirements as a potable water source. This pathway is considered incomplete.
						Dermal contact while bathing or showering	None	This pathway is considered incomplete for this receptor.
			Groundwater	Resident(a)	Adult	Dermal contact	None	This pathway is considered incomplete for this receptor.
					Child	Dermal contact	None	This pathway is considered incomplete for this receptor.
				Occupational Worker	Adult	Dermal contact	None	This pathway is considered incomplete for this receptor.
				Construction Worker	Adult	Dermal contact	Quant.	May be exposed to groundwater while trenching.
			Outdoor Vapors	Resident[a]	Adult	Inhalation	Quant.	This pathway may be complete; however, exposure is considered to be negligible.
					Child	Inhalation	Quant.	This pathway may be complete; however, exposure is considered to be negligible.
				Occupational Worker	Adult	Inhalation	Quant.	This pathway may be complete; however, exposure is considered to be negligible.
				Construction Worker	Adult	Inhalation	Quant.	Inhalation of chemicals from groundwater may occur during trenching or excavation activities.
				Recreational User	Adult	Inhalation	Quant.	This pathway may be complete; however, exposure is considered to be negligible.
					Child	Inhalation	Quant.	This pathway may be complete; however, exposure is considered to be negligible.

Table 3-5. Summary of Potential Receptors and Associated Exposure Pathways (Continued)

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (Continued)	Groundwater (Continued)	Vapors	Vapor intrusion to indoor air	Resident[a]	Adult	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario.
					Child	Inhalation	Quant.	Pathway would be complete under a redevelopment scenario.
				Occupational Worker	Adult	Inhalation	Quant.	The Treasure Island Reuse Plan allows for commercial buildings at IR Site 6. Volatile compounds may migrate into indoor air making this pathway complete.
				Construction Worker	Adult	Inhalation	None	This receptor is evaluated for outdoor exposures only.
				Recreational User	Adult	Inhalation	None	This receptor is evaluated for outdoor exposures only.
					Child	Inhalation	None	This receptor is evaluated for outdoor exposures only.

Note:
(a) = It is important to note that redevelopment plans for the IR Site 6 portion of Treasure Island will be open space and public services; residential housing is not planned for this area in the future. However, a hypothetical residential scenario has been evaluated as an additional measure to assist in making risk management decisions.

data sets with an insufficient number of samples to reliably calculate a UCL (i.e., less than 10 samples). Throughout the years, xylenes were analyzed as total xylenes, m&p-xylenes, and o-xylenes. The EPC for xylenes was based on the data set with the highest concentrations out of all three analyses.

For groundwater and soil gas, maximum concentrations detected were used as EPCs as a conservative measure and to comply with DTSC risk assessment guidance (DTSC, 2005). The EPCs for each of the COPCs in soil, groundwater, and soil gas are presented in Appendix B.

3.2.2.1 Indoor Air Modeling

The EPCs for inhalation of vapors in indoor air originating in soil gas were estimated using the DTSC-modified Johnson & Ettinger (J&E) vapor intrusion models for soil gas (version 2.0; last modified on February 4, 2009) and groundwater (version 3.0; last modified on February 4, 2009). Maximum concentrations of soil gas were used as input parameters for estimation of indoor air concentrations. Table 3-6 summarizes the J&E input parameters used in this HHRA. Examples of the J&E calculations are provided in Appendix C for one COPC in soil gas and one COPC in groundwater.

Table 3-6. Summary of J&E Input Parameter Values

Input Parameter	Unit	Value	Source
Site-Specific Environmental Measurements			
Soil vapor permeability (k_v)	Square centimeter (cm^2)	0.00000036 (average of samples)	Site-specific[a] (refer to Appendix C)
Total porosity (n^V)	unitless	0.397	Site-specific[a] (refer to Appendix C)
Bulk Density (ρb^A)	Gram per cubic centimeter (cm^3)	1.68	Site-specific[a] (refer to Appendix C)
Soil water-filled porosity (θ_w^V)	unitless	0.031	Site-specific[a] (refer to Appendix C)
Average soil/groundwater temperature (T_s)	°C	24	DTSC
Building Characteristics			
Indoor air exchange rate	1 per hour	0.5	DTSC
Area of crack (A_{crack})	cm^2	5,000	DTSC
Building height (H_B)	meter	2.44	DTSC
Building floor width (W_B)	meter	10	DTSC
Building floor length (L_B)	meter	10	DTSC
DTSC Residential Default Values for Key Parameters			
Building ventilation rate ($Q_{building}$)	cm^3 per second	33,900	DTSC
Average vapor flow rate into building (Q_{soil})	cm^3 per second	83.3	DTSC
Crack to total area ratio (η)	unitless	0.005	DTSC
Indoor attenuation coefficient (α)	unitless	(chemical-specific)	Calculated for each chemical based on DTSC-default input parameters

a. Site-specific soil properties were determined from soil samples collected during the 2010 data gaps investigation.

3.2.2.2 Outdoor Air Modeling

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as provided in guidance from the American Society for Testing and Materials (ASTM) (2002) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb} \qquad \text{(3-1) (ASTM, 2002)}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (milligrams per liter [mg/L])

VF_{wamb} = groundwater-to-outdoor air volatilization factor (milligrams per cubic meter [mg/m^3] air per mg/L water)

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_{ws}^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3} \qquad \text{(3-2) (ASTM, 2002)}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (centimeter per second)

δ_{air} = ambient air mixing zone height (centimeter)

L_{gw} = depth to groundwater (centimeter)

W = width of source area parallel to wind direction (centimeter)

D_{ws}^{eff} = effective diffusivity above the water table (cm^2 per second)

The D_{ws}^{eff} parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009). Chemical-specific values for this parameter are shown in the detailed calculations provided in Appendix D for all of the receptors evaluated in this HHRA. Maximum concentrations of COPCs in groundwater were used as the input groundwater concentration (C_{gw}).

Similarly, the total concentration of a chemical in outdoor air resulting from vapor diffusion from soil and wind suspension of contaminated soil will be calculated by multiplying the chemical's concentration in soil by a soil-to-outdoor air VF and a particulate emission factor (PEF) as follows:

$$C_{air} = \frac{C_s}{(VF + PEF)} \qquad C_{air} = C_s \text{ x} \left(\frac{1}{VF} + \frac{1}{PEF} \right) \qquad \text{(3-3)}$$

where:

C_{air} = concentration of COPC in outdoor air that receptor can be exposed to (mg/m^3)

C_s = soil concentration (milligrams per kilogram [mg/kg])

VF = volatilization factor (cubic meter per kilogram [m^3/kg])

PEF= particulate emission factor (m^3/kg)

A PEF of 1.316×10^9 m^3/kg was used for commercial workers and residents. This value assumes future partially vegetated (50 percent) soil at IR Site 6. A PEF of 1.0×10^6 m^3/kg was used for construction workers as recommended by DTSC (2005) for military facilities. Chemical-specific VFs were obtained from the EPA regional screening level (RSL) table (EPA, 2012).

Detailed calculations showing the derivation of outdoor air concentrations for groundwater and soil are provided in Appendix D. The EPCs identified in Appendix B were used as the concentration input, C_s.

3.2.2.3 Trenching Model

The EPCs for COPCs that volatilize from groundwater to ambient air during trenching activities for the construction worker were estimated following the methodology used by the Virginia Department of Environmental Quality (2007). This approach is based upon a combination of a vadose zone model to estimate volatilization of gases from contaminated groundwater into a trench and a box model to estimate dispersion of the contaminants from the air inside the trench into the above-ground atmosphere. Airborne concentrations within the trench are estimated as follows:

$$C_{air} = C_{gw} \times VF \quad (3\text{-}4)$$

where:

C_{air} = concentration of COPC in trench (microgram per cubic meter [µg/m^3])
C_{gw} = COPC concentration in groundwater (microgram per liter [µg/L])
VF = volatilization factor (liters per cubic meter).

Additional details regarding inhalation of VOCs in ambient air during trenching activities are provided in Appendix D, along with the chemical-specific calculations for estimating air concentrations.

3.2.3 Estimation of Chemical Intake

Intake is estimated by combining EPCs with the variables listed below that describe exposure:

- Rate of contact with the medium
- Frequency of contact
- Duration of contact
- Body weight of the exposed individual

Intake of a chemical as a result of exposure was estimated following EPA guidance (EPA, 1989, 2004, 2005a, 2005b, 2009a, and 2009b) and supplemental guidance provided by DTSC (2005). An intake factor is the amount of a chemical in a quantity of a medium (e.g., soil) taken into the body through an exposure route (e.g., ingestion) and available for absorption. It is expressed in units of milligram of chemical per kilogram body weight per day (mg/kg-day). Intake of a chemical that results in cancer effects is calculated by averaging the dose over a lifetime (70 years × 365 days/year) (EPA, 2005a). The intake factor for cancer effects is termed the lifetime average daily dose (LADD). Intake of COPCs that produce noncancer health effects is averaged over the period of exposure (exposure duration [ED] × 365 days per year). The intake factor for EDs equal to or longer than 7 years is termed the chronic average daily dose (ADD) (EPA, 1989). Intake will be estimated for an adult or child receptor, with appropriate adjustments based on the exposure scenario.

In accordance with EPA guidance addressing the inhalation pathway (EPA, 2009a), inhalation exposures are not derived in terms of intake, but rather in terms of exposure concentrations (ECs) in air expressed as mass per unit volume.

The equations used to calculate LADD/ADD are provided below, while Table D-1 in Appendix D provides the exposure factors used in these equations for each of the receptors. Appendix D also contains all of the detailed calculations for chemical intake for each of the receptors.

Soil Ingestion

$$\text{LADD/ADD} = \frac{C_s \times EF \times ED \times IR_{soil} \times FI}{BW \times AT \times 365 \frac{d}{yr}} \times 10^{6} \frac{kg}{mg} \qquad (3\text{-}5)$$

where:

LADD	=	lifetime average daily dose (mg/kg-day)
ADD	=	average daily dose (mg/kg-day)
C_s	=	chemical concentration in soil (mg/kg)
BW	=	body weight (kilogram)
AT	=	averaging time (years)
EF	=	exposure frequency (days per year)
ED	=	exposure duration (years)
IR_{soil}	=	ingestion rate of soil (milligrams per day)
FI	=	fraction ingested from contaminated source (unitless)

Dermal Contact with Soil

$$\text{LADD/ADD} = \left(\frac{C_s \times EF \times ED \times EV \times SA \times AF \times ABS}{BW \times AT \times 365 \frac{d}{yr}} \right) \times 10^{-6} \frac{kg}{mg} \qquad (3\text{-}6)$$

where:

LADD	=	lifetime average daily dose (mg/kg-day)
ADD	=	average daily dose (mg/kg-day)
C_s	=	chemical concentration in soil (mg/kg)
BW	=	body weight (kilogram)
AT	=	averaging time (years)
EF	=	exposure frequency (days per year) or (events per year)
ED	=	exposure duration (years)
SA	=	skin surface area available for contact (cm^2)
EV	=	dermal contact event frequency (events per day)
AF	=	soil-to-skin adherence factor (milligram per square centimeter per event [mg/cm^2-event])
ABS	=	dermal absorption factor (unitless)

Dermal absorption was evaluated per the methodology in the EPA dermal guidance (EPA, 2004).

Inhalation of Indoor Air and Ambient Air Outdoors

$$EC = \frac{C_{air} \times ET \times EF \times ED}{AT} \qquad (3\text{-}7)$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	concentration of chemical in ambient air (mg/m^3)
EF	=	exposure frequency (days per year)
ED	=	exposure duration (years)
ET	=	exposure time (hours per day per 24 hours per day)
AT	=	averaging time (days)

Dermal Contact with Groundwater

$$LADD/ADD = DAD \qquad (3\text{-}8)$$

where:

$$DAD = \frac{DA_{event} \ x \ EV \ x \ EF \ x \ ED \ x \ SA}{BW \ x \ AT} \qquad (3\text{-}9)$$

where:

LADD	=	lifetime average daily dose (mg/kg-day)
ADD	=	average daily dose (mg/kg-day)
DAD	=	daily dermal absorbed dose (mg/kg-day)
DA_{event}	=	absorbed dose per event (mg/cm^2-event)
SA	=	surface area (cm^2)
EV	=	event frequency (events per day)
EF	=	exposure frequency (days per year)
ED	=	exposure duration (years)
BW	=	body weight (kilograms)
AT	=	averaging time (years)

The calculation of DA_{event} is as follows for organics:

If the exposure time (**t_{event}**), < t*, then:

$$DA_{event} = 2 \, FA \, x \, K_p \, x \, C_w \, x \, CF \sqrt{\frac{6 \, \tau_{event} \ x \ t_{event}}{\pi}} \qquad (3\text{-}10)$$

If the exposure time (**t_{event}**) > t*, then:

$$DA_{event} = FA \ x \ K_p \ x \ C_w \ x \ CF \ x \left[\frac{t_{event}}{1+B} + 2 \, \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad (3\text{-}11)$$

where:

DA_{event}	=	absorbed dose per event (mg/cm^2-event)
FA	=	fraction absorbed water (dimensionless)
K_p	=	permeability constant (centimeters per hour)
C_W	=	concentration in water (mg/L)
τ_{event}	=	lag time per event (hours per event)
t_{event}	=	exposure time (hours per event)
t*	=	time to steady state (hour) = $2.4t_{event}$
B	=	dimensionless ratio of the PC of a chemical through the stratum corneum relative to its permeability constant across the viable epidermis
CF	=	conversion factor (l liter per 1,000 cm^3)

3.2.3.1 Intake for Mutagenic COPCs

Some of the carcinogens evaluated in this HHRA operate by a mutagenic mode of action for carcinogenesis. There is reason to surmise that some chemicals with a mutagenic mode of action, which would be expected to cause irreversible changes to DNA, would exhibit a greater effect in early-life versus later-life exposure (EPA, 2012). Thus, cancer risk to children according to EPA's cancer guidelines (EPA, 2005a and 2005b) include both early-life exposures that may result in the occurrence of cancer during childhood and early-life exposures that may contribute to cancers later in life. Therefore, in keeping with this guidance, separate cancer risk equations, especially for children, are presented for the mutagenic COPCs at IR Site 6, namely the carcinogenic polycyclic aromatic hydrocarbons (PAHs) (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, and indeno[1,2,3-cd]pyrene). Intake equations for ingestion, dermal contact, and inhalation of carcinogenic PAHs in soil for the residential child receptor are as follows:

<u>Incidental ingestion of soil</u>

$$\mathrm{CDI}_{\mathrm{res-sol-mu-ing}}\left(\frac{\mathrm{mg}}{\mathrm{kg}}-\mathrm{day}\right)=\frac{\mathrm{C_{soil}}\left(\frac{\mathrm{mg}}{\mathrm{kg}}\right)\times \mathrm{EF_r}\left(\frac{350\mathrm{days}}{\mathrm{year}}\right)\times \mathrm{IFSM_{adj}}\left(\frac{489.5\ \mathrm{mg}-\mathrm{year}}{\mathrm{Kg}-\mathrm{day}}\right)\times\left(\frac{10^{-6}\mathrm{Kg}}{\mathrm{mg}}\right)}{\mathrm{AT_r}\left(\frac{365\ \mathrm{days}}{\mathrm{year}}\times \mathrm{LT}\ (70\ \mathrm{years})\right)} \tag{3-12}$$

Where:

$$IFSM_{adj-}\left(\frac{489.5\ \mathrm{mg}-\mathrm{Year}}{\mathrm{Kg}-\mathrm{day}}\right) \tag{3-13}$$

$$=\frac{\mathrm{ED_{0-2}(yr)}\times \mathrm{IRS_c}\left(\frac{200\ \mathrm{mg}}{\mathrm{day}}\right)\times 10}{\mathrm{BW_c}(15\ \mathrm{kg})}+\frac{\mathrm{ED_{2-6}(yr)}\times \mathrm{IRS_c}\left(\frac{200\ \mathrm{mg}}{\mathrm{day}}\right)\times 3}{\mathrm{BW_c}(15\ \mathrm{kg})}$$
$$+\frac{\mathrm{CD_{6-16}(yr)}\times \mathrm{IRS_a}\left(\frac{100\ \mathrm{mg}}{\mathrm{day}}\right)\times 3}{\mathrm{BW_a}(70\ \mathrm{kg})}+\frac{\mathrm{CD_{16-30}(yr)}\times \mathrm{IRS_a}\left(\frac{100\ \mathrm{mg}}{\mathrm{day}}\right)\times 1}{\mathrm{BW_a}(70\ \mathrm{kg})}$$

Inhalation of particulates emitted from soil

$$\mathrm{CDI}_{\mathrm{res-sol-mu-inh}}\left(\frac{\mu g}{m^3}\right) = C_{soil}\left(\frac{mg}{kg}\right) \times EF_r\left(\frac{350 days}{year}\right) \times ET_{res}\left(\frac{24\ hours}{day}\right) \times \left(\frac{1\ day}{24\ hours}\right) \times \frac{\begin{pmatrix}(ED_{0-2}(yrs) \times 10) + & (ED_{2-6}(yrs) \times 3) + \\ (ED_{6-16}(yrs) \times 3) + & (ED_{16-30}(yrs) \times 1)\end{pmatrix} \times \left(\frac{1}{VF_s\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF_w\left(\frac{m^3}{kg}\right)}\right)}{AT_r\left(\frac{365\ days}{year} \times LT(70\ years)\right) \times \left(\frac{1\ mg}{1000\mu g}\right)} \quad (3\text{-}14)$$

Dermal contact with soil

$$\mathrm{CDI}_{\mathrm{res-sol-mu-der}}\left(\frac{mg}{kg} - day\right) = \frac{C_{soil}\left(\frac{mg}{kg}\right) \times EF_r\left(\frac{350 days}{year}\right) \times DFSM_{adj}\left(\frac{1445\ mg - Year}{Kg - day}\right) \times ABS_d * \left(\frac{10^{-6} kg}{mg}\right)}{AT_r\left(\frac{365\ days}{year} \times LT\ (70\ years)\right)} \quad (3\text{-}15)$$

Where:

$$DFSM_{adj}\left(\frac{1445\ mg - Year}{Kg - day}\right) = \frac{ED_{0-2}(yr) \times AF_C\left(\frac{0.2\ mg}{cm^2}\right) \times SA_C\left(\frac{2800 cm^2}{day}\right) \times 10}{BW_C(15\ kg)} + \frac{ED_{2-6}(yr) \times AF_C\left(\frac{0.2\ mg}{cm^2}\right) \times SA_C\left(\frac{2800 cm^2}{day}\right) \times 3}{BW_C(15\ kg)} + \frac{ED_{6-16}(yr) \times AF_a\left(\frac{0.07\ mg}{cm^2}\right) \times SA_a\left(\frac{5700 cm^2}{day}\right) \times 3}{BW_a(70\ kg)} + \frac{ED_{16-30}(yr) \times AF_a\left(\frac{0.07\ mg}{cm^2}\right) \times SA_a\left(\frac{5700 cm^2}{day}\right) \times 1}{BW_a(70\ kg)} \quad (3\text{-}16)$$

An assessment for early-life exposure also was conducted for the recreational child using the same equations as the residential child but substituting the recreational-specific exposure factors in Table D-1 of Appendix D.

3.3 Toxicity Assessment

The toxicity assessment determines the relationship between the magnitude of exposure to a COPC and the nature and magnitude of adverse health effects that may result from such exposure. For purposes of this assessment, COPCs are classified into two broad categories: noncarcinogens and carcinogens. Toxicity studies with laboratory animals or epidemiological studies of human populations provide the data used to develop toxicity criteria. In accordance with EPA (1989), cancer slope factors (SF) were developed to evaluate chemicals classified as known or potential human carcinogens and reference doses (RfD) were developed to evaluate noncancer health effects.

To satisfy DTSC requirements, and to ensure consistency with risk assessments conducted for other sites at NAVSTA TI, two sets of risk estimates were prepared: one using both EPA-preferred toxicity values, and one using DTSC-preferred toxicity values. EPA toxicity criteria were selected in accordance with the EPA guidance (EPA, 2003), which recommends a hierarchy of human health toxicity values for use in risk assessments at Superfund sites. The hierarchy is as follows: (1) EPA's Integrated Risk Information System (IRIS); (2) EPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs) developed by the Office of Research and Development, National Center for Environmental Assessment, Superfund Health Risk Technical Support Center; and (3) other sources of information, such as toxicity values from the Cal/EPA and minimal risk levels for noncancer constituents from ATSDR. Tier 2 and 3 toxicity values used were obtained from the EPA RSL table (EPA, 2012).

To satisfy DTSC requirements, SFs for the DTSC risk estimates used the most conservative (health-protective) of EPA and DTSC values. The State of California SFs have been developed by the OEHHA and are available in the OEHHA toxicity database (OEHHA, 2011). In addition to the SFs, OEHHA has developed reference exposure levels (RELs) to assess noncancer endpoints for inhalation exposures (OEHHA, 2011). However, RELs have not been subject to as stringent a peer review as the values listed in IRIS. Therefore, the HHRA used the following prioritization of noncancer toxicity values as follows:

- The EPA IRIS reference concentration (RfC) or inhalation RfD was used if the value is based on an inhalation study.
- The OEHHA REL was used if the EPA IRIS inhalation RfD was extrapolated from an oral study.
- The OEHHA REL was used if no EPA IRIS RfC or inhalation RfD was available.
- Alternative sources (e.g., PPRTVs, Health Effects Assessment Summary Tables, route-extrapolated values, etc.) were used if no EPA IRIS RfC or inhalation RfD value was available and no OEHHA REL was available.

Nondiscrete TPH was evaluated based on its indicator compound components, consistent with state guidance (DTSC, 1993).

For both EPA and Cal/EPA toxicity values, oral toxicity values (both RfDs and SFs) for some chemicals were adjusted to assess dermal exposures. The toxicity values were adjusted to account for the fraction of the chemical absorbed in the gastrointestinal tract, in accordance with EPA Risk Assessment Guidance for Superfund, Part E (EPA, 2004).

Use of Cal/EPA toxicity values in addition to the EPA 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, 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. Route-to-route extrapolation from the oral route to the inhalation route was performed for Cal/EPA toxicity values lacking inhalation values. Table D-2 in Appendix D summarizes the toxicity criteria for both EPA and Cal/EPA values. When no toxicity value was available for a chemical, a value for another chemical was assigned based on chemical or structural similarity, as denoted in Table D-2. The uncertainty associated with these assumptions is addressed in the uncertainty analysis in Section 7.

At the current time, EPA is reassessing the toxicity of dioxins and related compounds. In 2006, the National Academy of Sciences evaluated EPA's 2003 dioxin reassessment and provided comments that are currently being reviewed by EPA. The HHRA for IR Site 6 uses the cancer slope factor obtained from the OEHHA Toxicity Criteria Database for both the EPA and DTSC risk estimates. The use of Cal/EPA slope factors for the EPA risk estimates is consistent with the OSWER directive hierarchy. On February 17, 2012, EPA released the final non-cancer dioxin reassessment (http://epa.gov/superfund/health/contaminants/dioxin/dioxinsoil.html) and published an oral RfD for 2,3,7,8- TCDD in IRIS, which is used here to assess the non-cancer effects from exposure to dioxins.

3.3.1 Lead Toxicity Assessment

EPA has no consensus RfD or SF for inorganic lead, so it is not possible to calculate risk/hazard as it is for the other COPCs. Estimation of exposure to lead is based on blood lead levels using pharmacokinetic models, which are designed to predict the probable blood lead concentrations for receptors that have been exposed to lead through various sources (e.g., air, water, soil). For purposes of this HHRA, exposures to lead were evaluated based on comparisons with EPA and Cal/EPA screening levels for lead as further discussed in Section 3.4.1.

3.4 Risk Characterization

Risk characterization involves estimating the magnitude of the potential adverse health effects associated with the COPCs. It also involves making summary judgments about the nature of the human health threat to the defined receptor populations. The risk characterization combines the results of the dose-response (toxicity assessment) and exposure assessment to calculate cancer risks and noncancer health hazards. In accordance with EPA's guidelines for evaluating the potential toxicity of complex mixtures (EPA, 1986 and 2000), this assessment assumes that the effects of all constituents are additive through a specific pathway within an exposure scenario.

Risks are estimated as probabilities for COPCs that elicit a cancer response. The excess lifetime cancer risk is the incremental increase in the probability of developing cancer associated with exposures to contaminated media at the site. A risk of 10^{-6}, for example, represents the probability that one person in one million exposed to a carcinogen over a lifetime (70 years) will develop cancer. The upper-bound excess lifetime cancer risks derived in this assessment are compared to the regulation of the NCP that includes a risk range of 10^{-4} (one in ten thousand) to 10^{-6} (one in one million) (EPA, 1990). Consistent with the NCP, the 1×10^{-6} cancer risk level is used as the point of departure for risk management decisions; cancer risks below 1×10^{-6} are generally considered *de minimis*. Site-specific factors are typically considered at sites where the cancer risks are between 10^{-4} and 10^{-6}. The upper boundary of the risk management range is not a discrete line at 1×10^{-4}; however, EPA generally uses 1×10^{-4} in making risk management decision.

The excess cancer risk is estimated using SFs where risk is directly related to intake (EPA, 1989):

$$\text{Risk} = \text{SF} \times \text{LADD} \qquad (3\text{–}17)$$

California Regional Water Quality Control Board
San Francisco Bay Region

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Gray Davis
Governor

Date: January 23, 2001
File No. 2169.6013 (SLR)

Ms. Ann Klimek
Environmental Business Line Team Leader
Southwest Division
Naval Facilities Engineering Command
BRAC Operations Office
1230 Columbia Street, Suite 1100
San Diego, CA 92101-8517

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
12	not a potential source of drinking water	Section 2.5.1	Concurrence that Groundwater at the Naval Station Treasure Island, San Francisco Meets the Exemption Criteria in the SWRCB Source of Drinking Water Resolution 88-63. Letter from Curtis Scott, Division Chief, Groundwater Protection and Waste Containment Division, San Francisco Bay Region. To Ann Klimek, Environmental Business Line Team Leader, Naval Facilities Engineering Command, Southwest Division. San Francisco Bay Regional Water Quality Control Board. January 23, 2001.

Subject: Concurrence that Groundwater at the Naval Station Treasure Island, San Francisco, Meet the Exemption Criteria in the SWRCB Sources of Drinking Water Resolution 88-63

Dear Ms. Klimek:

Regional Water Quality Control Board (RWQCB) staff have reviewed your letter to Mr. Chris Maxwell dated March 24, 2000 regarding the Navy's request for written concurrence that groundwater at Treasure Island meets the exemption criteria for State Water Resources Control Board (SWRCB) Resolution No. 88-63. In your letter, the Navy evaluated existing and potential beneficial uses of groundwater at Treasure Island (see letter attached). Based on RWQCB staff review of the data provided, RWQCB staff find that the quality and the hydrogeologic conditions of the groundwater beneath Treasure Island is such that this water is not a potential source of drinking water pursuant to SWRCB Resolution 88-63 and Regional Water Quality Control Board (RWQCB) Resolution No. 89-39.

If you have questions, please feel free to contact Sarah L. Raker of my staff by telephone at (510) 622-2377 or by electronic mail at slr@rb2.swrcb.ca.gov.

Sincerely,

Curtis T. Scott, Division Chief
Groundwater Protection and
Waste Containment Division

Resolution88-63-exemption

cc: Mr. David Rist, Department of Toxic Substances Control
Mr. Phillip Ramsey, U.S. Environmental Protection Agency
Ms. Martha Walters, San Francisco Redevelopment Agency

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
13	characterized	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 3.4.

performed for Cal/EPA toxicity values lacking inhalation values. Table D-2 in Appendix D summarizes the toxicity criteria for both EPA and Cal/EPA values. When no toxicity value was available for a chemical, a value for another chemical was assigned based on chemical or structural similarity, as denoted in Table D-2. The uncertainty associated with these assumptions is addressed in the uncertainty analysis in Section 7.

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Risks are estimated as probabilities for COPCs that elicit a cancer response. The excess lifetime cancer risk is the incremental increase in the probability of developing cancer associated with exposures to contaminated media at the site. A risk of 10^{-6}, for example, represents the probability that one person in one million exposed to a carcinogen over a lifetime (70 years) will develop cancer. The upper-bound excess lifetime cancer risks derived in this assessment are compared to the regulation of the NCP that includes a risk range of 10^{-4} (one in ten thousand) to 10^{-6} (one in one million) (EPA, 1990). Consistent with the NCP, the 1×10^{-6} cancer risk level is used as the point of departure for risk management decisions; cancer risks below 1×10^{-6} are generally considered *de minimis*. Site-specific factors are typically considered at sites where the cancer risks are between 10^{-4} and 10^{-6}. The upper boundary of the risk management range is not a discrete line at 1×10^{-4}; however, EPA generally uses 1×10^{-4} in making risk management decision.

The excess cancer risk is estimated using SFs where risk is directly related to intake (EPA, 1989):

$$\text{Risk} = \text{SF} \times \text{LADD} \qquad (3\text{–}17)$$

and for inhalation:

$$\text{Risk} = \text{URF} \times \text{EC} \qquad (3\text{-}18)$$

where:

Risk	=	excess lifetime cancer risk (probability)
SF	=	slope factor $(\text{mg/kg-day})^{-1}$ or URF $[(\mu\text{g/m}^3)^{-1}]$
LADD	=	lifetime average daily dose (mg/kg-day)
EC	=	exposure concentration (μg/m^3)
URF	=	unit risk factor $(\mu\text{g/m}^3)^{-1}$

To estimate the site total excess cancer risks from all carcinogens, cancer risks from all exposure pathways and for all chemicals are summed.

The potential for noncancer health effects is estimated by comparing the ADD of a chemical with the RfD for the specific route of exposure (e.g., oral). The ratio of the intake to reference dose (ADD/RfD) for an individual chemical is termed the HQ. When an RfD is available for the chemical, these ratios are calculated for each chemical that elicits a noncancer health effect. Typically, chemical-specific HQs are summed to calculate pathway hazard index (HI) values. The HI is calculated by summing all HQs for all noncancer constituents through an exposure pathway:

$$\begin{aligned} HI &= HQ_1 + HQ_2 + \ldots + HQ_j \qquad (3\text{-}19) \\ &= (ADD_1/RfD_1) + (ADD_2/RfD_2) + \ldots + (ADD_j/RfD_j) \end{aligned}$$

where:

HQ_j	=	hazard quotient of the jth chemical
ADD_j	=	average daily dose of the jth chemical
RfD_j	=	reference dose for the jth chemical

To estimate the site total HI, HIs from all exposure pathways are summed.

Similarly, the noncancer HQ for inhalation exposure is:

$$HQ = EC/RfC \qquad (3\text{-}20)$$

where:

EC	=	exposure concentration (mg/m^3)
RfC	=	reference concentration (mg/m^3)

When the HI exceeds unity, there may be a concern for health effects (EPA, 1989). This approach can result in a situation where HI values exceed 1 even though no chemical-specific HQs exceed 1 (i.e., adverse systemic health effects would be expected to occur only if the receptor was exposed to several contaminants simultaneously). In this case, chemicals are segregated by similar effect on a target organ and a separate HI value for each effect/target organ is calculated (EPA, 1989). If any of the separate HI values exceed 1, adverse noncancer health effects are possible. It is important to note, however, that an HI exceeding 1 does not predict a specific disease.

3.4.1 Risk Characterization for Lead

As part of the risk evaluation for lead in soil, EPCs for lead in soil were compared with residential and occupational screening levels summarized in Table 3-7.

Table 3-7. Screening Levels for Lead in Soil

Screening Level (mg/kg)	Residential	Occupational
EPA[(1)]	400	800
Cal/EPA[(2)]	80	320

(1) EPA RSLs (2012)
(2) Cal/EPA OEHHA (2009)

3.4.2 Risk Characterization for Vapor Intrusion

Potential vapor intrusion risks were calculated using both soil gas and groundwater data at the request of DTSC. However, according to the Department of Defense Vapor Intrusion Handbook, soil gas is often the preferred subsurface medium for evaluating the vapor intrusion pathway (Tri-Service Environmental Risk Assessment Workgroup, 2009). Soil gas data represent a direct measurement of the contamination that may intrude into indoor air. In addition, summing the risk from the contribution of both soil gas and groundwater is duplicative in nature. Therefore, total site cancer risk and noncancer health hazard estimates presented in the following subsections for the vapor intrusion pathway for the occupational worker and resident only include the contribution from soil gas. Specific cancer risk and noncancer health hazard estimates were still calculated for the vapor intrusion to indoor pathway for groundwater and primary contributors to excess risk and hazard identified as a courtesy to DTSC.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
14	results	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Sections 4.0, 5.0 and 6.0, and Appendix D.

Section 4.0: RISK/HAZARD RESULTS FOR SUBAREA 1

This section presents the risk characterization results for Subarea 1. The results are presented by receptor for residents, occupational workers, construction/excavation workers, and recreational users for cancer risk and noncancer hazard. There are four sets of results for the resident, occupational worker, and recreational user based on the soil depth (surface soil versus subsurface soil, which includes the 0-to-8-foot-bgs interval) and source of toxicity value (e.g., EPA versus Cal/EPA). The construction/ excavation worker exposure scenario does not include exposure to surface soil; therefore, only two sets of results are provided for this receptor based on source of toxicity value. Table 4-1 presents risk characterization results for all receptors and exposure pathways. Only COPCs with individual cancer risk at or above 1×10^{-6}, using either EPA or Cal/EPA toxicity or an HQ at or above 1 are listed in Table 4-1 and discussed below. COPCs not included in Table 4-1 nor discussed below did not exceed a 1×10^{-6} risk level or an HQ of 1.

4.1 Risk Characterization for Residents

For the surface and subsurface soil scenarios, the total cancer risks for the residential exposure scenarios are 2×10^{-3} and 7×10^{-3} for EPA and Cal/EPA, respectively (refer to the "age-adjusted residential" risks in Table 4-1). Exposure pathways above 1×10^{-6} include direct exposure with soil and vapor intrusion of COPCs in soil gas.

For direct exposure to soil, the only risk driver in surface soil is dioxin TEQ (6×10^{-5}), (Table 4-2). Similarly for subsurface soil, the primary risk driver is dioxin TEQ (3×10^{-5}), with additional contribution from COPCs with individual risk levels greater than 1×10^{-6}, including ethylbenzene, benzene, and naphthalene for both EPA and Cal/EPA (Table 4-2). Chloroform in subsurface soil also posed a risk above 1×10^{-6} based on EPA toxicity only.

Exposure to COPCs in soil gas was the other primary exposure pathway contributing to excess risk (Table 4-1). COPCs with risks above 1×10^{-6} include benzene (2×10^{-3} for EPA and 7×10^{-3} for Cal/EPA) and ethylbenzene (2×10^{-4} for both EPA and Cal/EPA) (Table 4-3). The risk associated with chloroform was at 1×10^{-6} based on EPA toxicity only.

As shown in Table 4-1, the risks associated with the groundwater vapor intrusion pathway are above 1×10^{-6}, but lower than the soil gas indoor air risks. Concentrations of benzene, ethylbenzene, and naphthalene in groundwater contribute to indoor air risks above 1×10^{-6} for both EPA and Cal/EPA (Table 4-4).

For surface soil exposure scenarios, the total noncancer HI for the child resident is 31 for EPA and 33 for Cal/EPA, largely due to inhalation of COPCs from soil gas to indoor air. The primary contributors to the indoor air excess hazard are benzene (HQ=18) and xylenes (HQ=7) for EPA and benzene (HQ=18), toluene (HQ=2), and xylenes (HQ=7) for Cal/EPA (Table 4-3). The HI of 6 for child direct exposure to soil was the result of exposure to dioxin TEQ (HQ=6) (Table 4-2). For subsurface soil exposure scenarios, the total noncancer HI for the child resident is 37 for EPA and 40 for Cal/EPA, largely due to inhalation of COPCs from soil gas to indoor air. The primary contributors to the indoor air excess hazard are benzene (HQ=18) and xylenes (HQ=7) for EPA and benzene (HQ=18), toluene (HQ=2), and xylenes (HQ=7) for Cal/EPA (Table 4-3). The HI of 12 for child direct exposure to soil based on EPA toxicity was the result of exposure to dioxin TEQ (HQ=3), MCPP (HQ=6), and 1,2,4-trimethylbenzene (HQ=1) (Table 4-2). For Cal/EPA toxicity, the HI of 13 for child direct exposure to soil was the result of exposure to dioxin TEQ (HQ=3), MCPP (HQ=6), 1,2,4-trimethylbenzene (HQ=1), and 1,3,5-trimethylbenzene (HQ=1) (Table 4-2).

Table 4-1. Summary of Risk/Hazard for Subarea 1

Exposure Pathway	Subarea 1 - Surface Soil (0-2 feet bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	2.E-05	0.6	4.E-05	6	6.E-05	2.E-05	0.6	NA	NA	1.E-05	0.5	3.E-05	4	5.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	1.E-07	0.004	4.E-08	0.004	2.E-07	4.E-08	0.0009	NA	NA	1.E-08	0.0003	3.E-09	0.0003	1.E-08
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	2.E-03	25	4.E-04	25	2.E-03	1.E-03	18	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	1.E-04	4[3]	4.E-05	4[3]	2.E-04	1.E-04	3[3]	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	2.E-03	26	4.E-04	31	2.E-03	1.E-03	18	NA	NA	1.E-05	0.5	3.E-05	4	5.E-05

Exposure Pathway	Subarea 1 - Surface Soil (0-2 feet bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	2.E-05	0.6	4.E-05	6	6.E-05	2.E-05	0.6	NA	NA	1.E-05	0.5	3.E-05	4	5.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	4.E-07	0.004	1.E-07	0.004	5.E-07	1.E-07	0.0009	NA	NA	3.E-08	0.0003	8.E-09	0.0003	4.E-08
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	5.E-03	27	1.E-03	27	7.E-03	4.E-03	19	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	4.E-04	3[3]	1.E-04	3[3]	5.E-04	3.E-04	2[3]	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	5.E-03	28	1.E-03	33	7.E-03	4.E-03	20	NA	NA	1.E-05	0.5	3.E-05	4	5.E-05

Exposure Pathway	Subarea 1 – Subsurface Soil (0-8 feet bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	2.E-05	3	3.E-05	12	5.E-05	1.E-05	2	2.E-06	5	8.E-06	1	2.E-05	8	3.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	1.E-07	0.004	4.E-08	0.004	2.E-07	4.E-08	0.0009	NA	NA	1.E-08	0.0003	3.E-09	0.0003	1.E-08
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	2.E-03	25	4.E-04	25	2.E-03	1.E-03	18	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	1.E-04	4[3]	4.E-05	4[3]	2.E-04	1.E-04	3[3]	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	7.E-06	10	NA	NA	NA	NA	NA
Inhalation of VOCs While Trenching	NA	NA	NA	NA	NA	NA	NA	6.E-06	5	NA	NA	NA	NA	NA
TOTAL[2]	2.E-03	28	4.E-04	37	2.E-03	1.E-03	19	2.E-05	20	8.E-06	1	2.E-05	8	3.E-05

Exposure Pathways	Subarea 1 – Subsurface Soil (0-8 ft bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	2.E-05	4	3.E-05	13	5.E-05	1.E-05	2	2.E-06	6	9.E-06	1	2.E-05	8	3.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	4.E-07	0.004	1.E-07	0.004	5.E-07	1.E-07	0.0009	NA	NA	3.E-08	0.0003	8.E-09	0.0003	4.E-08
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	5.E-03	27	1.E-03	27	7.E-03	4.E-03	19	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	4.E-04	3[3]	1.E-04	3[3]	5.E-04	3.E-04	2[3]	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	1.E-05	10	NA	NA	NA	NA	NA
Inhalation of Volatile Organic Compounds While Trenching	NA	NA	NA	NA	NA	NA	NA	2.E-05	3	NA	NA	NA	NA	NA
TOTAL[2]	5.E-03	31	1.E-03	40	7.E-03	4.E-03	21	3.E-05	19	9.E-06	1	2.E-05	8	3.E-05

NA=- Exposure pathway is not complete for the receptor listed.
(1) = Direct exposure with soil includes: ingestion, dermal contact, and outdoor inhalation of fugitive dust/volatiles.
(2) = Total risk includes contribution of inhalation of chemicals in indoor air from soil gas, but does not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater.
(3) = The health effects of the primary COPCs contributing to the excess health hazard are not additive as discussed under Table 4-4.

Table 4-2. Subarea 1 Risk Drivers for Soil Direct Contact

Subarea 1 Surface Soil Direct Contact

	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Residential Child				Recreational Child			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	6.E-05	100%	6.E-05	100%	2.E-05	100%	2.E-05	100%	5.E-05	100%	5.E-05	100%	6	96%	6	96%	4	96%	4	96%

Subarea 1 Soil (0-8 ft bgs) Direct Contact

	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Construction Worker				Residential Child				Recreational Child				Construction Worker			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	3.E-05	73%	3.E-05	64%	9.E-06	79%	9.E-06	72%	2.E-05	93%	2.E-05	90%	1.E-06	84%	1.E-06	83%	3	26%	3	24%	2	0.29	2	29%	1	19%	1	18%
Ethylbenzene	5.E-06	10%	5.E-06	9%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Benzene	3.E-06	6%	1.E-05	19%	NA	--	2.E-06	15%	NA	--	1.E-06	4%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Chloroform	2.E-06	5%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Naphthalene	3.E-06	6%	3.E-06	5%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
MCPP	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	6	51%	6	47%	4	0.58	4	57%	3	55%	3	50%
1,2,4-Trimethylbenzene	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	1	10%	1	9%	NA	--	NA	--	NA	--	NA	--
1,3,5-Trimethylbenzene	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	1	8%	NA	--	NA	--	NA	--	NA	--

Note: Only COPCs with a cancer risk at or above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ at or above 1 are listed.
Cont. = Contribution
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

Table 4-3. Subarea 1 Risk Drivers for Soil Gas Vapor Intrusion

Hypothetical Resident								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.
Benzene	2.E-03	88%	7.E-03	96%	18	70%	18	65%
Ethylbenzene	2.E-04	12%	2.E-04	4%	NA	--	NA	--
Chloroform	1.E-06	<0.1%	NA	--	NA	--	NA	--
Toluene	NA	--	NA	--	NA	--	2	7%
Xylenes	NA	--	NA	--	7	28%	7	26%
Occupational Worker								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.
Benzene	1.E-03	88%	4.E-03	96%	13	70%	13	65%
Ethylbenzene	1.E-04	12%	1.E-04	4%	NA	--	NA	--
Chloroform	NA	--	NA	--	NA	--	NA	--
Toluene	NA	--	NA	--	NA	--	1	7%
Xylenes	NA	--	NA	--	5	28%	5	26%

Note: Only COPCs with a cancer risk at or above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ at or above 1 are listed.
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

Table 4-4. Subarea 1 Risk Drivers for Groundwater Vapor Intrusion

Hypothetical Resident								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ(1)	% Cont.	HQ(1)	% Cont.
Benzene	1.E-04	73%	5.E-04	91%	1	35%	1	37%
Ethylbenzene	4.E-05	21%	4.E-05	7%	NA	--	NA	--
Naphthalene	9.E-06	5%	9.E-06	2%	NA	--	NA	--
Xylenes	NA	--	NA	--	1	27%	1	28%
Occupational Worker								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ(1)	% Cont.	HQ(1)	% Cont.
Benzene	8.E-05	73%	3.E-04	91%	NA	--	NA	--
Ethylbenzene	2.E-05	21%	2.E-05	7%	NA	--	NA	--
Naphthalene	6.E-06	21%	6.E-06	2%	NA	--	NA	--

Note: Only COPCs with a cancer risk at or above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ at or above 1 are listed.
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.
(1) The target organs/systems and effects for benzene (blood) and xylenes (neurological) are different. Therefore, the health effects of benzene and xylenes are not additive and the final groundwater to vapor intrusion HI is at 1 for the hypothetical resident and below 1 for the occupational worker.

The groundwater vapor intrusion HI is above 1 for both EPA and Cal/EPA primarily due to the presence of benzene and xylenes. The target organs/systems and effects for benzene (blood) and xylenes (neurological) are different. Therefore, the health effects of benzene and xylenes are not additive and the final groundwater to vapor intrusion HI is at 1 for the hypothetical resident (Table 4-4).

As shown in Table 4-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

4.2 Risk Characterization for Occupational Workers

For the surface and subsurface soil scenarios, the total cancer risks are 1×10^{-3} for EPA and 4×10^{-3} for Cal/EPA (Table 4-1). Exposure pathways above 1×10^{-6} include direct exposure with soil and vapor intrusion of COPCs in soil gas.

The only risk driver in surface soil is dioxin TEQ (2×10^{-5} for EPA and Cal/EPA) (Table 4-2). Similarly, the only risk driver in the subsurface soil is dioxin TEQ (9×10^{-6} for EPA and Cal/EPA) (Table 4-2).

Exposure to COPCs in soil gas was the other exposure pathway contributing to excess risk (Table 4-1). COPCs with risks above 1×10^{-6} include benzene (1×10^{-3} for EPA and 4×10^{-3} for Cal/EPA) and ethylbenzene (1×10^{-4} for both EPA and Cal/EPA) (Table 4-3).

As shown in Table 4-1, the risks associated with the groundwater vapor intrusion pathway are above 1×10^{-6}, but lower than the soil gas indoor air risks. Concentrations of benzene, ethylbenzene, and naphthalene in groundwater contribute to indoor air risks above 1×10^{-6} for both EPA and Cal/EPA (Table 4-4).

The total noncancer HI for occupational workers is approaching 20 for both EPA and Cal/EPA surface and subsurface soil exposure scenarios due to inhalation of COPCs from soil gas to indoor air (HI=18 EPA; HI=19 Cal/EPA). The primary contributors to the indoor air excess hazard are benzene (HQ=13) and xylenes (HQ=5) for EPA and benzene (HQ=13), xylenes (HQ=5), and toluene (HQ=1) for Cal/EPA (Table 4-3).

The groundwater vapor intrusion HI is above 1 for both EPA and Cal/EPA primarily due to the presence of benzene and xylenes. The target organs/systems and effects for benzene (blood) and xylenes (neurological) are different. Therefore, the health effects of benzene and xylenes are not additive and the final groundwater to vapor intrusion HI is at 1 for the occupational worker (Table 4-4).

As shown in Table 4-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

4.3 Risk Characterization for Recreational Users

For the surface soil scenarios, total cancer risks are 5×10^{-5} for both EPA and Cal/EPA, while the subsurface soil scenario risks are 3×10^{-5} for both EPA and Cal/EPA (refer to the "age-adjusted recreational" risks in Table 4-1). The risk driver in surface soil is dioxin TEQ (5×10^{-5}), (Table 4-2). Similarly, risk drivers in the subsurface soil include dioxin TEQ (2×10^{-5}) for EPA and dioxin TEQ (2×10^{-5}) and benzene (1×10^{-6}) for Cal/EPA (Table 4-2).

The total noncancer HI for surface soil exposure scenarios is 4 for the child receptor due to direct contact with dioxin TEQ in soil for both EPA and Cal/EPA (Table 4-2). For subsurface soil

exposure scenarios, an HI of 8 is associated with direct contact of both dioxin TEQ (HQ=2) and MCPP (HQ=4) for both EPA and Cal/EPA (Table 4-2).

As shown in Table 4-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

4.4 Risk Characterization for Construction/Excavation Workers

The total cancer risks are 2×10^{-5} for EPA and 3×10^{-5} for Cal/EPA (Table 4-1). Exposure pathways above 1×10^{-6} include direct exposure with soil and exposures to COPCs in groundwater while trenching. The primary risk driver in soil is dioxin TEQ (1×10^{-6}) for both EPA and Cal/EPA (Table 4-2).

For groundwater exposures to COPCs while trenching, COPCs with risks above 1×10^{-6} for dermal contact with groundwater include benzene and ethylbenzene (Table 4-5). COPCs with risks above 1×10^{-6} for inhalation of VOCs in groundwater while trenching include benzene and naphthalene (Table 4-5).

The total noncancer HI is 20 for EPA and 19 for Cal/EPA (Table 4-1). The HIs of 5 (EPA) and 6 (Cal/EPA) for soil direct contact are largely the result of exposure to MCPP (HQ=3) and dioxin TEQ (HQ=1) for both EPA and Cal/EPA (Table 4-2).

For dermal contact with groundwater (HI=10), primary contributors to excess hazard include benzene (HQ=2), MCPP (HQ=6), and manganese (HQ=1) (Table 4-5). For inhalation of VOCs in groundwater while trenching, the EPA HI of 5 is associated with benzene (HQ=1), 1,1,2-trichloroethane (HQ=2), and naphthalene (HQ=1), while the HI of 3 for Cal/EPA is associated with benzene (HQ=1) and naphthalene (HQ=1) (Table 4-5). The target organs/systems and effects for benzene (blood), 1,1,2-trichloroethane (liver), and naphthalene (nasal) are different. Therefore, the health effects of these COPCs are not additive and the HI associated with the inhalation of VOCs while trenching is 2 for EPA and 1 for Cal/EPA.

Table 4-5. Subarea 1 Risk Drivers for Groundwater Exposures While Trenching

Dermal Contact in Trench								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.
Benzene	5.E-06	64%	9.E-06	75%	2	15%	2	15%
Ethylbenzene	2.E-06	30%	2.E-06	19%	NA	--	NA	--
Manganese	NA	--	NA	--	1	12%	1	12%
MCPP	NA	--	NA	--	6	58%	6	58%
Inhalation in Trench								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ(1)	% Cont.	HQ(1)	% Cont.
Benzene	4.E-06	59%	1.E-05	84%	1	23%	1	32%
1,1,2-Trichloroethane	NA	--	NA	--	2	37%	NA	--
Naphthalene	2.E-06	27%	2.E-06	10%	1	24%	1	34%

Note: Only COPCs with a cancer risk above 1E-06 or an HQ above 1, using either EPA or Cal/EPA toxicity are listed.
Cont. = Contribution
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.
(1) The target organs for benzene (blood), 1,1,2-trichloroethane (liver) and naphthalene (nasal) are not the same; therefore, the health effects are not additive.

Section 5.0: RISK/HAZARD RESULTS FOR SUBAREA 2

This section presents the risk characterization results for Subarea 2. The results are presented by receptor for residents, occupational workers, construction/excavation workers, and recreational users for cancer risk and noncancer hazard. There are four sets of results for the resident, occupational worker, and recreational user based on the soil depth (surface soil versus subsurface soil, which includes the 0-to-8-foot-bgs interval) and source of toxicity value (e.g., EPA versus Cal/EPA). The construction/ excavation worker exposure scenario does not include exposure to surface soil; therefore, only two sets of results are provided for this receptor based on source of toxicity value. An evaluation of lead concentrations in subsurface soil is also provided. Table 5-1 presents the risk characterization results for all receptors and exposure pathways. Only COPCs with a cancer risk above 1×10^{-6} or an HQ above 1, using either EPA or Cal/EPA toxicity are listed in Table 5-1 and discussed below. COPCs not included in Table 5-1 or discussed below did not exceed a 1×10^{-6} risk level or an HQ of 1.

5.1 Risk Characterization for Residents

For the surface soil scenarios, the total cancer risks for the residential exposure scenarios are 1×10^{-4} for both EPA and Cal/EPA. For the subsurface soil scenarios, the total cancer risks for the residential exposure scenarios are 8×10^{-5} for both EPA and Cal/EPA (refer to the "age-adjusted residential" risks in Table 5-1). Exposure pathways above 1×10^{-6} include direct exposure with soil and vapor intrusion of COPCs in soil gas.

The risk driver in surface soil is dioxin TEQ (1×10^{-4}) for both EPA and Cal/EPA, (Table 5-2). Similarly, the risk driver in the subsurface soil is dioxin TEQ (7×10^{-5}) for EPA and Cal/EPA, and to a lesser extent benzo(a)pyrene (2×10^{-6}) and 1-methylnaphthalene (1×10^{-6}) for Cal/EPA (Table 5-2).

Exposure to COPCs in soil gas resulted in risk levels of 1×10^{-6} for EPA and 2×10^{-6} for Cal/EPA (Table 5-1). None of the COPCs in soil gas within Subarea 2 were individually associated with risk levels above 1×10^{-6} or noncancer health hazards above 1.

As shown in Table 5-1, the risks associated with the groundwater vapor intrusion pathway (3×10^{-6} for EPA and 4×10^{-6} for Cal/EPA) are above 1×10^{-6} and higher than the soil gas indoor air risks. Primary contributors to this risk, which include naphthalene for EPA and benzene and naphthalene for Cal/EPA (Table 5-3), all have individual risk levels at 2×10^{-6}.

For surface soil exposure scenarios, the total noncancer HI for the child resident is 10 (Table 5-1), primarily the result of direct exposure to dioxin TEQ in soil (HQ=10) (Table 5-2). For subsurface soil exposure scenarios, the total noncancer HI for the child resident is 8 (Table 5-1), primarily due to direct exposure to dioxin TEQ in soil (HQ=7) (Table 5-2).

As shown in Table 5-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

The lead EPC of 31 mg/kg in subsurface soil at Subarea 2 is well below the more conservative Cal/EPA residential lead screening value of 80 mg/kg (Table 5-4).

Table 5-1. Summary of Risk/Hazard for Subarea 2

Exposure Pathways	Subarea 2 - Surface Soil (0-2 ft bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	3.E-05	1	8.E-05	10	1.E-04	3.E-05	1	NA	NA	2.E-05	0.8	6.E-05	7	8.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	2.E-09	0.0001	6.E-10	0.0001	3.E-09	6.E-10	0.00002	NA	NA	2.E-10	0.00001	4.E-11	0.00001	2.E-10
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	8.E-07	0.05	2.E-07	0.05	1.E-06	6.E-07	0.03	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	2.E-06	0.08	6.E-07	0.08	3.E-06	2.E-06	0.06	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	4.E-05	1	8.E-05	10	1.E-04	3.E-05	1	NA	NA	2.E-05	0.8	6.E-05	7	8.E-05

Exposure Pathways	Subarea 2 - Surface Soil (0-2 ft bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil [1]	3.E-05	1	8.E-05	10	1.E-04	3.E-05	1	NA	NA	2.E-05	0.8	6.E-05	7	8.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	4.E-09	0.0001	9.E-10	0.0001	5.E-09	9.E-10	0.00002	NA	NA	3.E-10	0.00001	7.E-11	0.00001	3.E-10
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	1.E-06	0.05	3.E-07	0.05	2.E-06	9.E-07	0.04	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	4.E-06	0.10	9.E-07	0.10	4.E-06	3.E-06	0.07	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	4.E-05	1	8.E-05	10	1.E-04	3.E-05	1	NA	NA	2.E-05	0.8	6.E-05	7	8.E-05

Exposure Pathways	Subarea 2 – Subsurface Soil (0-8 ft bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil [1]	2.E-05	0.9	5.E-05	8	8.E-05	2.E-05	0.7	3.E-06	2	2.E-05	0.6	4.E-05	5	5.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	2.E-09	0.0001	6.E-10	0.0001	3.E-09	6.E-10	0.00002	NA	NA	2.E-10	0.00001	4.E-11	0.00001	2.E-10
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	8.E-07	0.05	2.E-07	0.05	1.E-06	6.E-07	0.03	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	2.E-06	0.08	6.E-07	0.08	3.E-06	2.E-06	0.06	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	1.E-06	2	NA	NA	NA	NA	NA
Inhalation of VOCs While Trenching	NA	NA	NA	NA	NA	NA	NA	4.E-07	0.3	NA	NA	NA	NA	NA
TOTAL[2]	2.E-05	0.9	5.E-05	8	8.E-05	2.E-05	0.7	5.E-06	5	2.E-05	0.6	4.E-05	5	5.E-05

Table 5-1. Summary of Risk/Hazard for Subarea 2 (Continued)

Exposure Pathways	Subarea 2 – Subsurface Soil (0-8 ft bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	2.E-05	0.9	5.E-05	8	8.E-05	2.E-05	0.7	3.E-06	2	2.E-05	0.6	4.E-05	5	5.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	4.E-09	0.0001	9.E-10	0.0001	5.E-09	9.E-10	0.00002	NA	NA	3.E-10	0.00001	7.E-11	0.00001	3.E-10
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	1.E-06	0.05	3.E-07	0.05	2.E-06	9.E-07	0.04	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	4.E-06	0.10	9.E-07	0.10	4.E-06	3.E-06	0.07	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	1.E-06	2	NA	NA	NA	NA	NA
Inhalation of Volatile Organic Compounds While Trenching	NA	NA	NA	NA	NA	NA	NA	4.E-07	0.3	NA	NA	NA	NA	NA
TOTAL[2]	3.E-05	0.9	6.E-05	8	8.E-05	2.E-05	0.7	5.E-06	5	2.E-05	0.6	4.E-05	5	5.E-05

Notes:
NA = Exposure pathway is not complete for the receptor listed.
(1) Direct exposure with soil includes ingestion, dermal contact, and outdoor inhalation of fugitive dust/volatiles.
(2) Total risk includes contribution of inhalation of chemicals in indoor air from soil gas, but does not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater.

Table 5-2. Subarea 2 Risk Drivers for Soil Direct Contact

Subarea 2 Surface Soil Direct Contact																				
	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Residential Child				Recreational Child			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	1.E-04	99%	1.E-04	99%	3.E-05	99%	3.E-05	99%	8.E-05	99%	8.E-05	99%	10	97%	10	97%	7	97%	7	97%

Subarea 2 Soil (0-8 ft bgs) Direct Contact																												
	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Construction Worker				Residential Child				Recreational Child				Construction Worker			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	7.E-05	96%	7.E-05	93%	2.E-05	96%	2.E-05	96%	5.E-05	96%	5.0E-05	97%	3.E-06	96%	3.E-06	96%	7	85%	7	85%	5	85%	5	85%	2	88%	2	88%
Benzo(a)pyrene	NA	--	2.E-06	2%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
1-Methylnaphthalene	NA	--	1.E-06	2%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--

Note: Only COPCs with a cancer risk above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ above 1 are listed.
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

5.2 Risk Characterization for Occupational Workers

For the surface soil exposure scenarios, the total cancer risks are 3×10^{-5} for both EPA and Cal/EPA. For the subsurface soil exposure scenarios, the total cancer risks are 2×10^{-5}, for both EPA and Cal/EPA (Table 5-1). Direct exposure with soil is the only pathway above 1×10^{-6}.

The risk drivers in surface soil include dioxin TEQ (3×10^{-5}) (Table 5-2). Similarly, the risk driver in the subsurface soil is dioxin TEQ (2×10^{-5}), (Table 5-2).

As shown in Table 5-1, the risks associated with the groundwater vapor intrusion pathway (2×10^{-6} for EPA and 3×10^{-6} for Cal/EPA) are above 1×10^{-6} and higher than the soil gas indoor air risks. Primary contributors to this risk, which include benzene, ethylbenzene, and naphthalene (Table 5-3), all have individual risk levels at 1×10^{-6}.

As shown in Table 5-1, inhalation risks for soil gas to indoor air and inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the noncancer HIs are below 1.

For surface soil exposure scenarios, the total noncancer HI for the occupational receptor is 1 (Table 5-1), primarily the result of direct exposure to dioxin TEQ in soil (HQ=1). For subsurface soil exposure scenarios, the total noncancer HIs are less than 1 for EPA and Cal/EPA.

The lead EPC of 31 mg/kg in subsurface soil at Subarea 2 is below the more conservative Cal/EPA occupational lead screening value of 320 mg/kg (Table 5-4).

5.3 Risk Characterization for Recreational Users

For the surface soil scenarios, the total cancer risks for the recreational exposure scenarios are 8×10^{-5} for both EPA and Cal/EPA. For the subsurface soil scenarios, the total cancer risks for the recreational exposure scenarios are 5×10^{-5} for both EPA and Cal/EPA (refer to the "age-adjusted recreational" risks in Table 5-1). The risk driver in surface soil is dioxin TEQ (8×10^{-5}) (Table 5-2). Similarly, the risk driver in subsurface soil is dioxin TEQ (5×10^{-5}) (Table 5-2).

For surface soil exposure scenarios, the total noncancer HI for the child receptor is 7, primarily the result of direct exposure to dioxin TEQ in soil (HQ=7) (Table 5-2). For subsurface soil exposure scenarios, the total noncancer HI for the child receptor is 5 (Table 5-1), primarily due to direct exposure to dioxin TEQ in soil (HQ=5) (Table 5-2).

As shown in Table 5-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

The EPC of 31 mg/kg in subsurface soil at Subarea 2 is below the more conservative Cal/EPA residential screening value for lead of 80 mg/kg (Table 5-4).

Table 5-3. Subarea 2 Risk Drivers for Groundwater Vapor Intrusion

Hypothetical Resident								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.
Benzene	NA	--	2.E-06	51%	NA	--	NA	--
Naphthalene	2.E-06	73%	2.E-06	46%	NA	--	NA	--
Occupational Worker								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.
Benzene	NA	--	1.E-06	51%	NA	--	NA	--
Naphthalene	1.E-06	73%	1.E-06	46%	NA	--	NA	--

Note: Only COPCs with a cancer risk above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ above 1 are listed.
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

Table 5-4. Subarea 2 Comparison to Lead Screening Values

Medium	EPC (mg/kg)	Screening Level (mg/kg)			
		EPA[(1)]		Cal/EPA[(2)]	
		Residential	Occupational	Residential	Occupational
Soil (0–8 feet bgs)	31	400	800	80	320

Notes:
(1) EPA RSLs (2012)
(2) Cal/EPA OEHHA (2009)

5.4 Risk Characterization for Construction/Excavation Workers

The total cancer risks are 5×10^{-6} for both EPA and Cal/EPA (Table 5-1). The primary exposure pathways contributing to the excess total cancer risk include soil direct contact and groundwater dermal contact. The risk driver for soil direct contact is dioxin TEQ (3×10^{-6}) (Table 5-2). For groundwater, dermal contact with arsenic is 1×10^{-6} (Table 5-5).

The total noncancer HI is 5 for both EPA and Cal/EPA (Table 5-1). Soil direct contact contributes an HI of 2 to the total HI, with dioxin TEQ (HQ=2) as the primary contributor (Table 5-2). Dermal contact with COPCs in groundwater has an HI of 2, with manganese (HQ=1), 2-methylnaphthalene (HQ=0.3), and arsenic (HQ=0.2) as the primary contributors to the excess health hazard (Table 5-5). The target organs/systems and effects for manganese (neurological), 2-methylnaphthalene (nasal) and arsenic (cardiovascular and skin) are not the same; therefore, the health effects are not additive and the trench dermal contact HI is at or less than 1 for each of the target organs.

The EPC of 31 mg/kg for lead in subsurface soil at Subarea 2 is well below the more conservative Cal/EPA screening value for lead of 320 mg/kg (Table 5-4).

Table 5-5. Subarea 2 Risk Drivers for Groundwater Exposures While Trenching

Dermal Contact in Trench								
	EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	HQ(1)	% Cont.	HQ(1)	% Cont.
Arsenic	1.E-06	98%	1.E-06	95%	NA	--	NA	--
Manganese	NA	--	NA	--	1	67%	1	67%

Note: Only COPCs with a cancer risk above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ above 1 are listed.

NA = individual risk <1E-06; individual HQ <1.

-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

(1) Dermal contact with COPCs in groundwater has an HI of 2, with manganese (HQ=1), 2-methylnaphthalene (HQ=0.3), and arsenic (HQ=0.2) as the primary contributors to the excess health hazard. The target organs/systems and effects for manganese (neurological), 2-methylnaphthalene (nasal) and arsenic (cardiovascular and skin) are not the same; therefore, the health effects are not additive and the trench dermal contact HI is at or less than 1 for each of the target organs.

Section 6.0: RISK/HAZARD RESULTS FOR SUBAREA 3

This section presents the risk characterization results for Subarea 3. The results are presented by receptor for residents, occupational workers, construction/excavation workers, and recreational users for cancer risk and noncancer hazard. There are four sets of results for the resident, occupational worker, and recreational user based on the soil depth (surface soil versus subsurface soil, which includes the 0-to-8-foot-bgs interval) and source of toxicity value (e.g., EPA versus Cal/EPA). The construction/ excavation worker exposure scenario does not include exposure to surface soil; therefore, only two sets of results are provided for this receptor based on source of toxicity value. Table 6-1 presents the risk characterization results for all receptors and exposure pathways. Only COPCs with a cancer risk above 1×10^{-6} or an HQ above 1, using either EPA or Cal/EPA toxicity are listed in Table 6-1 and discussed below. COPCs not included in Table 6-1 or discussed below did not exceed a 1×10^{-6} risk level or an HQ of 1.

6.1 Risk Characterization for Residents

For the surface soil exposure scenarios, the total cancer risks are 2×10^{-5} for both EPA and Cal/EPA, while total cancer risks for the subsurface soil exposure scenarios are 1×10^{-5} for both EPA and Cal/EPA (refer to the "age-adjusted residential" risks in Table 6-1). For both sets of results, the only exposure pathway above 1×10^{-6} is direct exposure with soil.

The risk drivers in surface soil include dioxin TEQ (2×10^{-5}) and to a lesser extent, Aroclor 1260 (1×10^{-6}) (Table 6-2) for both EPA and Cal/EPA. The only risk driver in the subsurface soil is dioxin TEQ (9×10^{-6}) (Table 6-2).

As indicated in Table 6-1, total risk includes contribution of inhalation of chemicals in indoor air from soil gas, but does not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater. As shown in Table 6-1, the risks associated with the groundwater vapor intrusion pathway (1×10^{-7} for EPA and 4×10^{-8} for Cal/EPA) are below 1×10^{-6}.

For surface soil exposure scenarios, the total noncancer HI for the child resident is 2 (Table 6-1), primarily the result of direct exposure to dioxin TEQ in soil (HQ=2) (Table 6-2). For subsurface soil exposure scenarios, the total non-cancer HI for the child resident is 3, primarily the result of direct exposure to thallium in soil (HQ=1) in conjunction with dioxin TEQ (HQ=0.8) and manganese (HQ=0.6) (Table 6-2). The target organs/systems and effects for manganese (neurological), thallium (hair loss and liver), and dioxin TEQ (decreased sperm count) are all different; therefore, the subsurface soil segregated HIs are at or below 1.

As shown in Table 6-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

Table 6-1. Summary of Risk/Hazard for Subarea 3

Exposure Pathways	Subarea 3 - Surface Soil (0-2 ft bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	7.E-06	0.2	2.E-05	2	2.E-05	6.E-06	0.2	NA	NA	5.E-06	0.2	1.E-05	1	2.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	1.E-10	7.E-07	2.E-11	7.E-07	1.E-10	2.E-11	2.E-07	NA	NA	7.E-12	5.E-08	2.E-12	5.E-08	9.E-12
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	5.E-07	0.0009	1.E-07	0.0009	6.E-07	4.E-07	0.0006	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	1.E-07	0.0006	2.E-08	0.0006	1.E-07	7.E-08	0.0005	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	8.E-06	0.2	2.E-05	2	2.E-05	7.E-06	0.2	NA	NA	5.E-06	0.2	1.E-05	1	2.E-05

Exposure Pathways	Subarea 3 - Surface Soil (0-2 ft bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI	Risk
Direct Exposure with Soil[1]	7.E-06	0.2	2.E-05	2	2.E-05	6.E-06	0.2	NA	NA	5.E-06	0.2	1.E-05	1	2.E-05
Inhalation of Chemicals from Groundwater in Outdoor Air	3.E-11	7.E-07	9.E-12	7.E-07	4.E-11	9.E-12	2.E-07	NA	NA	3.E-12	5.E-08	6.E-13	5.E-08	3.E-12
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	2.E-07	0.001	4.E-08	0.001	2.E-07	1.E-07	0.0009	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	3.E-08	0.0007	8.E-09	0.0007	4.E-08	2.E-08	0.0005	NA	NA	NA	NA	NA	NA	NA
TOTAL[2]	7.E-06	0.2	2.E-05	2	2.E-05	6.E-06	0.2	NA	NA	5.E-06	0.2	1.E-05	1	2.E-05

Exposure Pathways	Subarea 3 – Subsurface Soil (0-8 ft bgs); EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI[3]	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI[4]	Risk
Direct Exposure with Soil[1]	3.E-06	0.3	7.E-06	3	1.E-05	3.E-06	0.2	4.E-07	6	2.E-06	0.2	5.E-06	2	7.E-06
Inhalation of Chemicals from Groundwater in Outdoor Air	1.E-10	7.E-07	2.E-11	7.E-07	1.E-10	2.E-11	2.E-07	NA	NA	7.E-12	5.E-08	2.E-12	5.E-08	9.E-12
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	5.E-07	0.0009	1.E-07	0.0009	6.E-07	4.E-07	0.0006	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	1.E-07	0.0006	2.E-08	0.0006	1.E-07	7.E-08	0.0005	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	1.E-07	0.02	NA	NA	NA	NA	NA
Inhalation of VOCs While Trenching	NA	NA	NA	NA	NA	NA	NA	6.E-09	0.002	NA	NA	NA	NA	NA
TOTAL[2]	4.E-06	0.3	7.E-06	3	1.E-05	3.E-06	0.2	5.E-07	6	2.E-06	0.2	5.E-06	2	7.E-06

Table 6-1. Summary of Risk/Hazard for Subarea 3 (Continued)

Exposure Pathways	Subarea 3 - Subsurface Soil (0-8 ft bgs); Cal/EPA Toxicity													
	Adult Residential Receptor		Child Residential Receptor		Age-Adjusted Residential Receptor	Occupational Receptor		Construction Worker		Adult Recreational Receptor		Child Recreational Receptor		Age-Adjusted Recreational Receptor
	Risk	HI	Risk	HI[3]	Risk	Risk	HI	Risk	HI	Risk	HI	Risk	HI[4]	Risk
Direct Exposure with Soil[1]	3.E-06	0.3	7.E-06	3	1.E-05	3.E-06	0.2	4.E-07	3	2.E-06	0.2	5.E-06	2	7.E-06
Inhalation of Chemicals from Groundwater in Outdoor Air	3.E-11	7.E-07	9.E-12	7.E-07	4.E-11	9.E-12	2.E-07	NA	NA	3.E-12	5.E-08	6.E-13	5.E-08	3.E-12
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Soil Gas)	2.E-07	0.001	4.E-08	0.001	2.E-07	1.E-07	0.0009	NA	NA	NA	NA	NA	NA	NA
Inhalation of Chemicals in Indoor Air (Vapor Intrusion from Groundwater)	3.E-08	0.0007	8.E-09	0.0007	4.E-08	2.E-08	0.0005	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Chemicals in Groundwater While Trenching	NA	NA	NA	NA	NA	NA	NA	1.E-07	2.E-02	NA	NA	NA	NA	NA
Inhalation of Volatile Organic Compounds While Trenching	NA	NA	NA	NA	NA	NA	NA	4.E-09	0.002	NA	NA	NA	NA	NA
TOTAL[2]	3.E-06	0.3	7.E-06	3	1.E-05	3.E-06	0.2	5.E-07	4	2.E-06	0.2	5.E-06	2	7.E-06

Notes:
NA = Exposure pathway is not complete for the receptor listed.
(1) Direct exposure with soil includes ingestion, dermal contact, and outdoor inhalation of fugitive dust/volatiles.
(2) Total risk includes contribution of inhalation of chemicals in indoor air from soil gas, but does not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater.
(3) For subsurface soil exposure scenarios, the total non-cancer HI for the child resident is 3, primarily the result of direct exposure to thallium in soil (HQ=1) in conjunction with dioxin TEQ (HQ=0.8) and manganese (HQ=0.6). The target organs/systems and effects for manganese , thallium, and dioxin TEQ are different; therefore, the subsurface soil segregated HIs are at or below 1.
(4) For subsurface soil exposure scenarios, the total non-cancer HI for the child recreational receptor is 2, primarily the result of direct exposure to thallium in soil (HQ=0.8) in conjunction with dioxin TEQ (HQ=0.6) and manganese (HQ=0.4). The target organs/systems and effects for manganese , thallium, and dioxin TEQ are different; therefore, the subsurface soil segregated HIs are at or below 1.

Table 6-2. Subarea 3 Risk Drivers for Soil Direct Contact

Subarea 3 Surface Soil Direct Contact																				
	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Residential Child				Recreational Child			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	2.E-05	95%	2.E-05	95%	6.E-06	93%	6.E-06	93%	2.E-05	95%	2.E-05	95%	2	100%	2	100%	1	100%	1	100%
Aroclor 1260	1.E-06	5%	1.E-06	5%	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Subarea 3 Soil (0-8 ft bgs) Direct Contact																				
	Residential Adult + Child Risk				Occupational Worker				Recreational Adult + Child Risk				Residential Child				Construction Worker			
	EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA		EPA		Cal/EPA	
COPC	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	Risk	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.	HQ	% Cont.
Dioxin TEQ	9.E-06	91%	9.E-06	91%	3.E-06	88%	3.E-06	88%	7.E-06	91%	7.E-06	91%	NA	--	NA	--	NA	--	NA	--
Thallium	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	1	41%	1	41%	NA	--	NA	--
Manganese	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--					5	88%	3	81%

Note: Only COPCs with a cancer risk above 1E-06, using either EPA or Cal/EPA toxicity information, or an HQ above 1 are listed.
NA = individual risk <1E-06; individual HQ <1.
-- = COPC is not identified as a risk driver; therefore, the COPC does not contribute significantly to the cancer risk or HQ estimates.

6.2 Risk Characterization for Occupational Workers

For the surface soil exposure scenarios, the total cancer risks are 7×10^{-6} for EPA and 6×10^{-6} for Cal/EPA, while the subsurface soil exposure scenarios are 3×10^{-6} for both EPA and Cal/EPA (Table 6-1). For both sets of results, the only exposure pathway above 1×10^{-6} is direct exposure with soil. The only risk driver in surface and subsurface soil is dioxin TEQ (Table 6-2).

As indicated in Table 6-1, total risk includes contribution of inhalation of chemicals in indoor air from soil gas, but does not include the contribution from groundwater to indoor air because of the duplicative nature of summing indoor air based on soil gas and groundwater. As shown in Table 6-1, the risks associated with the groundwater vapor intrusion pathway (1×10^{-7} for EPA and 4×10^{-8} for Cal/EPA) are below 1×10^{-6}.

As shown in Table 6-1, inhalation risks for soil gas to indoor air and inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA. The risks associated with the groundwater vapor intrusion pathway are below 1×10^{-6}.

Noncancer HIs are below 1 for all exposure pathways.

6.3 Risk Characterization for Recreational Users

For the surface soil scenarios, the total cancer risks for the recreational exposure scenarios are 2×10^{-5} for both EPA and Cal/EPA. The total cancer risks for subsurface soil scenarios are 7×10^{-6} for both EPA and Cal/EPA (refer to the "age-adjusted recreational" risks in Table 6-1). The only exposure pathway above 1×10^{-6} is direct exposure with soil. The risk driver in surface soil and subsurface soil is dioxin TEQ (Table 6-2).

For surface soil exposure scenarios, the total noncancer HI for the child receptor is 1, primarily the result of direct exposure to dioxin TEQ in soil (HQ=1) (Table 6-2). For subsurface soil exposure scenarios, the total noncancer HI for the child receptor is 2 (Table 6-1), primarily the result of direct exposure to thallium in soil (HQ=0.8) in conjunction with dioxin TEQ (HQ=0.6) and manganese (HQ=0.4 (Table 6-2). The target organs/systems and effects for manganese (neurological), thallium (hair loss and liver), and dioxin TEQ (decreased sperm count) are all different; therefore, the subsurface soil segregated HIs are below 1.

As shown in Table 6-1, inhalation risks from groundwater to outdoor air are below 1×10^{-6} for both EPA and Cal/EPA and the HI is less than 1.

6.4 Risk Characterization for Construction/Excavation Workers

The total cancer risks are below 1×10^{-6} at 5×10^{-7} for both EPA and Cal/EPA (Table 6-1). The total noncancer HI is 6 for EPA and 4 for Cal/EPA (Table 6-1), which is attributed entirely to direct contact with manganese in soil (HQ=5 and HQ=3, respectively) (Table 6-2).

APPENDIX D

Detailed Risk Calculations

(Due to size, this appendix is provided on compact disc only.)

TABLE D-

VALUES FOR DAILY INTAKE CALCULATIONS

IR Site 6, NAVSTA Treasure Island

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor Population	Receptor Age	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name[1]
Ingestion	Resident	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	100	U.S. EPA, 1989	Chronic Daily Intake (CDI) (mg/kg/day) =
			FI	Fraction from Source	unitless	1	Assumes 100% exposure is from soil within IR Site 6	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1989	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	200	U.S. EPA, 1991a; DTSC 2011b	Daily Intake (CDI) (mg/kg/day) =
			FI	Fraction from Source	unitless	1	Assumes 100% exposure is from soil within IR Site 6	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	15	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	
	Commercial Worker	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	100	U.S. EPA, 1989	Chronic Daily Intake (CDI) (mg/kg/day) =
			FI	Fraction from Source	unitless	1	Assumes 100% exposure is from soil within IR Site 6	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1989	
			ED	Exposure Duration	years	25	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA, 1989	
	Construction Worker	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	330	U.S. EPA, 2002; DTSC 2011b	Chronic Daily Intake (CDI) (mg/kg/day) =
			FI	Fraction from Source	unitless	1	Assumes 100% exposure is from soil within IR Site 6	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a	
			ED	Exposure Duration	years	1	DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 1992	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	365	U.S. EPA, 1989	
	Recreational Receptor	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	100	U.S. EPA, 1989	Chronic Daily Intake (CDI) (mg/kg/day) =
			FI	Fraction from Source	unitless	1	Professional judgement	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			IR_s	Ingestion rate of Soil	mg/day	200	U.S. EPA, 1991a; DTSC 2011b	Daily Intake (CDI) (mg/kg/day) =
			FS	Fraction from Source	unitless	1	Professional judgement	$(C_S \times IR_s \times CF \times FI \times EF \times ED)/(BW \times AT)$
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.00E-06	--	
			BW	Body Weight	kg	15	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	

TABLE D-1
VALUES FOR DAILY INTAKE CALCULATIONS
IR Site 6, NAVSTA Treasure Island

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor Population	Receptor Age	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name[1]
Dermal Contact	Resident	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.07	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	5,700	DTSC 2011b	
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.2	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	2,900	DTSC 2011b	
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.E-06	--	
			BW	Body Weight	kg	15	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	
	Commercial Worker	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.2	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	5,700	DTSC 2011b	
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	25	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA, 1989	
	Construction Worker	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.8	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	5,700	DTSC 2011b	
			EF	Exposure Frequency	days/year	250	DTSC 2011b	
			ED	Exposure Duration	years	1	DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.E-06	--	
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	365	U.S. EPA, 1989	
	Recreational Receptor	Adult	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.07	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	5,700	DTSC 2011b	
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	70	U.S. EPA, 1991a; DTSC 2011b	
			BW	Body Weight	kg	1.E-06	--	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	C_s	Chemical Concentration in Soil	mg/kg	Site-specific		
			ABSd	Dermal Absorption Factor	unitless	Chemical-specific	U.S. EPA, 2004	Daily Intake (CDI) (mg/kg/day) =
			AF	Adherence Factor	mg/cm^2	0.2	DTSC 2011b	$(C_S$ x ABS x SA x AF x CF x EF x ED)/(BW x AT)
			SA	Surface Area	cm^2/event	2,900	DTSC 2011b	
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			CF	Conversion Factor	kg/mg	1.E-06	--	
			BW	Body Weight	kg	15	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	

TABLE D-1

VALUES FOR DAILY INTAKE CALCULATIONS

IR Site 6, NAVSTA Treasure Island

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor Population	Receptor Age	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name[1]
Inhalation of Particulates/Vapors Originating from Soil (Outdoor Air)	Resident	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	24 hours per day per 24 hours per day	1	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	24 hours per day per 24 hours per day	1	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	
	Commercial Worker	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	25	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	8 hours per day per 24 hours per day	0.33	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA, 1989	
	Construction Worker	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	1	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	8 hours per day per 24 hours per day	0.33	Professional judgement	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	365	U.S. EPA, 1989	
	Recreational Receptor	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	24	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	2 hours per day per 24 hours per day	0.1	Professional judgement	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	8,760	U.S. EPA, 1989	
		Child	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_a	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	Professional judgement	
			ED	Exposure Duration	years	6	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	2 hours per day per 24 hours per day	0.1	Professional judgement	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA, 1989	

1. Please refer to Section 3.2.31 of Appendix I for the intake equations for mutagenic COPCs.

TABLE D-1 (continued)
VALUES FOR DAILY INTAKE CALCULATIONS
IR Site 6, NAVSTA Treasure Island

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name
Dermal Contact	Construction Worker	Adult	C_w	Chemical Concentration in Groundwater	mg/L	Site-specific		
			DAD	Daily Dermal Absorbed Dose	mg/kg-day	Chemical-specific	U.S. EPA, 2004	$DAD = \frac{DA_{event} \ x \ EV \ x \ EF \ x \ ED \ x \ SA}{BW \ x \ AT}$
			DA_{event}	Absorbed Dose per Event	mg/cm^2-event	Chemical-specific	DTSC 2011b	
			SA	Surface Area	cm^2	2,375	DTSC 2011b	
			EF	Exposure Frequency	days/year	250	DTSC 2011b	If ET < t* then:
			ED	Exposure Duration	years	1	DTSC 2011b	$DA_{event} = 2 \ FA \ x \ K_p \ x \ C_w \ x \ CF \sqrt{\frac{6 \tau_{event} \ x \ t_{event}}{\pi}}$
			BW	Body Weight	kg	70	U.S. EPA, 1991a; DTSC 2011b	If ET > t* then:
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	$DA_{event} = FA \ x \ K_p \ x \ C_w \ x \ CF \ x \left[\frac{t_{event}}{1+B} + 2 \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$
			AT-NC	Averaging Time (Noncancer)	days	365	U.S. EPA, 1989	
Volatiles in Trench Air	Construction Worker	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	1	U.S. EPA, 1991a; DTSC 2011b	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			ET	Exposure Time	8 hours per day per 24 hours per day	0.33	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	where Cair will be modeled from Cw
			AT-NC	Averaging Time (Noncancer)	days	365	U.S. EPA, 1989	
Inhalation of Outdoor Air	Resident	Adult and child	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	30	U.S. EPA, 1991a; DTSC 2011b	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			ET	Exposure Time	24 hours per day per 24 hours per day	1	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	where Cair will be modeled from Cw
			AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA, 1989	
	Commercial Worker	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	25	U.S. EPA, 1991a; DTSC 2011b	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			ET	Exposure Time	8 hours per day per 24 hours per day	0.33	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	where Cair will be modeled from Cw
			AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA, 1989	
	Recreational Receptor	Adult and child	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	Professional judgement	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			ED	Exposure Duration	years	30	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	2 hours per day per 24 hours per day	0.1	Professional judgement	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	where Cair will be modeled from Cw
			AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA, 1989	

Table D-1 (continued)

VALUES FOR DAILY INTAKE CALCULATIONS

IR Site 6, NAVSTA Treasure Island

Scenario Timeframe: Future
Medium: Soil Gas
Exposure Medium: Soil Gas/Groundwater

Exposure Route	Receptor Population	Receptor Age	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name
Inhalation of Indoor Air	Resident	Adult and child	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	350	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	30	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	24 hours/day per 24 hours/day	1	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA, 1989	
	Commercial Worker	Adult	EC	Exposure Concentration	mg/m^3	Site-specific	U.S. EPA, 2009	$EC = \frac{C_{air} \times ET \times EF \times ED}{AT}$
			C_{air}	Chemical Concentration in Air	mg/m^3	Chemical-specific		
			EF	Exposure Frequency	days/year	250	U.S. EPA, 1991a; DTSC 2011b	
			ED	Exposure Duration	years	25	U.S. EPA, 1991a; DTSC 2011b	
			ET	Exposure Time	8 hours/day per 24 hours/day	0.33	U.S. EPA, 1991a; DTSC 2011b	
			AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, 1989	
			AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA, 1989	

Table D-2. Summary of Toxicity Values

Chemical	CAS Number	Cancer Class[1]	$Oral_{absorp}$ [2]	$Derm_{absorp}$ [2]	USEPA Oral RfD		USEPA Reference Concentration		USEPA Dermal RfD	USEPA Oral Slope Factor		USEPA Unit Risk Factor		USEPA Dermal Slope Factor	Cal EPA Reference Concentration		Cal EPA Oral Slope Factor		Cal EPA Unit Risk Factor		Cal EPA Dermal Slope Factor
					(mg/kg-day)	Source	(mg/m3)	Source	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	Source	$(ug/m3)^{-1}$	Source	$(mg/kg\text{-}day)^{-1}$	(mg/m3)	Source	$(mg/kg\text{-}day)^{-1}$	Source	$(ug/m3)^{-1}$	Cal EPA	$(mg/kg\text{-}day)^{-1}$
Acenaphthene	83-32-9	NA	1	0.13	6.0E-02	I	NA		6.0E-02	NA		NA		NA	2.1E-01	C	NA		NA		NA
Acenaphthylene	208-96-8	D	1	0.13	6.0E-02	S	NA		6.0E-02	NA		NA		NA	2.1E-01	S	NA		NA		NA
Acetone	67-64-1	NP	1	0	9.0E-01	I	3.1E+01	A	9.0E-01	NA		NA		NA	3.1E+01		NA		NA		NA
Aluminum	7429-90-5	Not in IRIS	1	0	1.0E+00	P	5.0E-03	P	1.0E+00	NA		NA		NA	5.0E-03		NA		NA		NA
Anthracene	120-12-7	D	1	0.13	3.0E-01	I	NA		3.0E-01	NA		NA		NA	1.1E+00	R	NA		NA		NA
Antimony (metallic)	7440-36-0	NA	0.15	0	4.0E-04	I	NA		6.0E-05	NA		NA		NA	NA		NA		NA		NA
Aroclor 1260	11096-82-5	B2	1	0.14	2.0E-05	S	NA		2.0E-05	2.0E+00	I	5.7E-04	I	2.0E+00	7.0E-05	R	2.0E+00		5.7E-04		2.0E+00
Arsenic, Inorganic	7440-38-2	A	1	0.03	3.0E-04	I	1.5E-05	C	3.0E-04	1.5E+00	I	4.3E-03	I	1.5E+00	1.5E-05		1.5E+00		3.3E-03	C	1.5E+00
Benz[a]anthracene	56-55-3	B2	1	0.13	NA		NA		NA	7.3E-01	E	1.1E-04	C	7.3E-01	NA		1.2E+00	C	1.1E-04		1.2E+00
Benzene	71-43-2	A	1	0	4.0E-03	I	3.0E-02	I	4.0E-03	5.5E-02	I	7.8E-06	I	5.5E-02	3.0E-02		1.0E-01	C	2.9E-05	C	1.0E-01
Benzo[a]pyrene	50-32-8	B2	1	0.13	NA		NA		NA	7.3E+00	I	1.1E-03	C	7.3E+00	NA		1.2E+01	C	1.1E-03		1.2E+01
Benzo[b]fluoranthene	205-99-2	B2	1	0.13	NA		NA		NA	7.3E-01	E	1.1E-04	C	7.3E-01	NA		1.2E+00	C	1.1E-04		1.2E+00
Benzo(e)pyrene	192-97-2	Not in IRIS	1	0.13	NA		NA		NA	NA		NA			NA						
Benzo(g,h,i)perylene	191-24-2	D	1	0.13	3.0E-02	S	NA	I	3.0E-02	NA		NA		NA	1.1E-01	C	NA		NA		NA
Benzo[k]fluoranthene	207-08-9	B2	1	0.13	NA		NA		NA	7.3E-02	E	1.1E-04	C	7.3E-02	NA		1.2E+00	C	1.1E-04		1.2E+00
Beryllium and compounds	7440-41-7	B1	0.007	0	2.0E-03	I	2.0E-05	I	1.4E-05	NA		2.4E-03	I	NA	2.0E-05		NA		2.4E-03		NA
Biphenyl, 1,1'-	92-52-4	D	1	0	5.0E-02	I	4.0E-04	P	5.0E-02	8.0E-03	P	NA		8.0E-03	4.0E-04		8.0E-03		2.3E-06	R	8.0E-03
Bis(2-ethylhexyl)phthalate	117-81-7	B2	1	0.1	2.0E-02	I	NA		2.0E-02	1.4E-02	I	2.4E-06	C	1.4E-02	7.0E-02	R	3.0E-03	C	8.4E-03	C	3.0E-03
Butyl Benzyl Phthlate	85-68-7	C	1	0.1	2.0E-01	I	NA		2.0E-01	1.9E-03	P	NA		1.9E-03	7.0E-01	R	1.9E-03	P	5.4E-07	R	1.9E-03
Butylbenzene, n-	104-51-8	Not in IRIS	1	0	5.0E-02	P	NA		5.0E-02	NA		NA		NA	1.4E-01	C	NA		NA		NA
Butylbenzene, sec-	135-98-8	Not in IRIS	1	0	5.0E-02	S	NA		5.0E-02	NA		NA		NA	1.4E-01	S	NA		NA		NA
Butylbenzene, tert-	98-06-6	Not in IRIS	1	0	5.0E-02	S	NA		5.0E-02	NA		NA		NA	1.4E-01	S	NA		NA		NA
Cadmium (Diet)	7440-43-9	B1	0.025	0.001	1.0E-03	I	2.0E-05	C	2.5E-05	NA		1.8E-03	I	NA	2.0E-05		NA		4.2E-03	C	NA
Carbon Disulfide	75-15-0	NA	1	0	1.0E-01	I	7.0E-01	I	1.0E-01	NA		NA		NA	7.0E-01		NA		NA		NA
Chloroform	67-66-3	B2	1	0	1.0E-02	I	9.8E-02	A	1.0E-02	3.1E-02	C	2.3E-05	I	3.1E-02	3.0E-01		3.1E-02	C	5.3E-06	C	3.1E-02
Chloromethane	74-87-3	D	1	0	NA		9.0E-02	I	NA	NA		NA		NA	9.0E-02	I	NA	I	1.8E-06	C	NA
Chlorotoluene, o- (2-Chlorotoluene)	95-49-8	NA	1	0	2.0E-02	I	NA		2.0E-02	NA		NA		NA	7.0E-02	R	NA		NA		NA
Chrysene	218-01-9	B2	1	0.13	NA		NA		NA	7.3E-03	E	1.1E-05	C	7.3E-03	NA		1.2E-01	C	1.1E-05		1.2E-01
Cresol, o- (2-Methylphenol)	95-48-7	C	1	0.1	5.0E-02	I	6.0E-01	C	5.0E-02	NA		NA		NA	6.0E-01	C	NA	I	NA	I	NA
Cresol, p- (4-Methylphenol)	106-44-5	C	1	0.1	1.0E-01	A	6.0E-01	C	5.0E-03	NA		NA		NA	6.0E-01	C	NA	I	NA	I	NA
Cumene (Isopropylbenzene)	98-82-8	D/DI	1	0	1.0E-01	I	4.0E-01	I	1.0E-01	NA		NA		NA	4.0E-01		NA		NA		NA
Cymene (4-Isopropyltoluene)	99-87-6	D	1	0	1.0E-01	S	4.0E-01	S	1.0E-01	NA		NA		NA	4.0E-01		NA		NA		NA
Dibenz[a,h]anthracene	53-70-3	B2	1	0.13	NA		NA		NA	7.3E+00	E	1.2E-03	C	7.3E+00	NA		4.1E+00	C	1.2E-03		4.1E+00
Dibenzofuran	132-64-9	D	1	0	1.0E-03	X	NA		1.0E-03	NA		NA		NA	1.4E-02	C	NA	I	NA	I	NA
Dibenzothiophene	132-65-0	Not in IRIS	1	0	NA		NA		NA	NA		NA									
Dichloroethane, 1,2-	107-06-2	B2	1	0	6.0E-03	X	7.0E-03	P	6.0E-03	9.1E-02	I	2.6E-05	I	9.1E-02	4.0E-01	C	4.7E-02	C	2.1E-05	C	4.7E-02
Dichloroethylene, 1,2- (Mixed Isomers)	540-59-0	DI	1	0	9.0E-03	H	NA		9.0E-03	NA		NA		NA	3.2E-02	R	NA	I	NA	I	NA
Dichloroethylene, 1,2-cis-	156-59-2	DI	1	0	2.0E-03	I	NA		2.0E-03	NA		NA		NA	3.5E-02	C	NA	I	NA	I	NA
Dichloroethylene, 1,2-trans-	156-60-5	DI	1	0	2.0E-02	I	6.0E-02	P	2.0E-02	NA		NA		NA	6.0E-02	P	NA	I	NA	I	NA
Diflubenzuron	35367-38-5	D	1	0.1	2.0E-02	I	NA		2.0E-02	NA		NA		NA	7.0E-02	R	NA	I	NA	I	NA
Dimethylnaphthalene, 2,6-	581-42-0	Not in IRIS	1	0.1	NA		NA		NA	NA		NA		NA	NA		NA		NA		NA
Dimethylphenol, 2,4-	105-67-9	NA	1	0.1	2.0E-02	I	NA		2.0E-02	NA		NA		NA	7.0E-02	R	NA	I	NA	I	NA
Ethyl Chloride	75-00-3	NA	1	0	NA		1.0E+01	I	NA	NA		NA		NA	3.0E+01	C	NA	I	8.3E-07	C	NA
Ethylbenzene	100-41-4	D	1	0	1.0E-01	I	1.0E+00	I	1.0E-01	1.1E-02	C	2.5E-06	C	1.1E-02	1.0E+00		1.1E-02		2.5E-06		1.1E-02
Fluoranthene	206-44-0	D	1	0.13	4.0E-02	I	NA		4.0E-02	NA		NA		NA	NA		NA		NA		NA
Fluorene	86-73-7	D	1	0.13	4.0E-02	I	NA		4.0E-02	NA		NA		NA	1.4E-01	C	NA		NA		NA
Hexachloroethane	67-72-1	C	1	0.1	7.0E-04	I	3.0E-02	I	7.0E-04	4.0E-02	I	1.1E-05	C	4.0E-02	3.5E-03	C	3.9E-02	C	1.1E-05	C	3.9E-02
Indeno[1,2,3-cd]pyrene	193-39-5	B2	1	0.13	NA		NA		NA	7.3E-01	E	1.1E-04	C	7.3E-01	NA		1.2E+00	C	1.1E-04		1.2E+00
Iron	7439-89-6	Not in IRIS	1	0	7.0E-01	P	NA		7.0E-01	NA		NA		NA	NA		NA		NA		NA
Isophorone	78-59-1	C	1	0.1	2.0E-01	I	2.0E+00	C	2.0E-01	9.5E-04	I	NA		9.5E-04	2.0E+00	C	9.5E-04	I	2.7E-07	R	9.5E-04

Table D-2. Summary of Toxicity Values

Chemical	CAS Number	Cancer Class[1]	$Oral_{absorp}$ [2]	$Derm_{absorp}$ [2]	USEPA Oral RfD		USEPA Reference Concentration		USEPA Dermal RfD	USEPA Oral Slope Factor		USEPA Unit Risk Factor		USEPA Dermal Slope Factor	Cal EPA Reference Concentration		Cal EPA Oral Slope Factor		Cal EPA Unit Risk Factor		Cal EPA Dermal Slope Factor
					(mg/kg-day)	Source	(mg/m3)	Source	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	Source	$(ug/m3)^{-1}$	Source	$(mg/kg\text{-}day)^{-1}$	(mg/m3)	Source	$(mg/kg\text{-}day)^{-1}$	Source	$(ug/m3)^{-1}$	Cal EPA	$(mg/kg\text{-}day)^{-1}$
Manganese (Non-diet)	7439-96-5	D	0.04	0	2.4E-02	I	5.0E-05	I	9.6E-04	NA		NA		NA	5.0E-05	I	NA	I	NA	I	NA
MCPP	93-65-2	NA	1	0.1	1.0E-03	I	NA		1.0E-03	NA		NA		NA	3.5E-03	R	NA		NA		NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	DI	1	0	6.0E-01	I	5.0E+00	I	6.0E-01	NA		NA		NA	5.0E+00	I	NA	I	NA	I	NA
Methyl tert-Butyl Ether (MTBE)	1634-04-4	NA	1	0	NA		3.0E+00	I	NA	1.8E-03	C	2.6E-07	C	1.8E-03	3.0E+00		1.8E-03		2.6E-07		1.8E-03
Methylnaphthalene, 1-	90-12-0	Not in IRIS	1	0.13	7.0E-02	A	NA	I	7.0E-02	2.9E-02	P	NA		2.9E-02	2.5E-01	R	2.9E-02		8.3E-06	R	2.9E-02
Methylnaphthalene, 2-	91-57-6	DI	1	0.13	4.0E-03	I	NA	I	4.0E-03	NA		NA		NA	1.4E-02		NA		NA		NA
Molybdenum	7439-98-7	NA	1	0	5.0E-03	I	NA	I	5.0E-03	NA		NA		NA	NA	I	NA	I	NA	I	NA
Naphthalene	91-20-3	C	1	0.13	2.0E-02	I	3.0E-03	I	2.0E-02	NA		3.4E-05	C	NA	3.0E-03		NA		3.4E-05		NA
Nickel Soluble Salts	7440-02-0	NA	0.04	0	2.0E-02	I	9.0E-05	A	8.0E-04	NA		2.6E-04	C	NA	5.0E-05		NA		2.6E-04		NA
Nitrosodiphenylamine, N-	86-30-6	B2	1	0.1	NA		NA	I	NA	4.9E-03	I	2.6E-06	C	4.9E-03	NA	I	9.0E-03	C	2.6E-06	C	9.0E-03
Phenacetin	62-44-2	Not in IRIS	1	0.1	NA		NA	I	NA	2.2E-03	C	6.3E-07	C	2.2E-03	NA	I	2.2E-03	C	6.3E-07	C	2.2E-03
Phenanthrene	85-01-8	D	1	0.13	3.0E-01	S	NA		3.0E-01	NA		NA		NA	1.1E+00	R	NA		NA		NA
Phenol	108-95-2	D	1	0.1	3.0E-01	I	2.0E-01	C	3.0E-01	NA		NA		NA	2.0E-01		NA		NA		NA
Propyl benzene	103-65-1	Not in IRIS	1	0.1	1.0E-01	P	1.0E+00	P	1.0E-01	NA		NA		NA	1.4E-01	C	NA		NA		NA
Pyrene	129-00-0	D	1	0.13	3.0E-02	I	NA		3.0E-02	NA		NA		NA	1.1E-01	C	NA		NA		NA
Perylene	198-55-0	Not in IRIS	1	0.13	3.0E-02	S	NA		3.0E-02	NA		NA		NA	1.1E-01	S	NA		NA		NA
Silver	7440-22-4	D	0.04	0	5.0E-03	I	NA	I	2.0E-04	NA		NA		NA	NA		NA		NA		NA
Styrene	100-42-5	NA	1	0	2.0E-01	I	1.0E+00	I	2.0E-01	NA		NA		NA	9.0E-01	C	NA		NA		NA
TCDD, 2,3,7,8-	1746-01-6	B2	1	0.03	7.0E-10	I	4.0E-08	C	7.0E-10	1.3E+05	C	3.8E+01	C	1.3E+05	4.0E-08		1.3E+05		3.8E+01		1.3E+05
Tetrachloroethylene	127-18-4	NA	1	0	6.0E-03	I	4.0E-02	I	6.0E-03	2.0E-03	I	2.6E-07	I	2.0E-03	3.5E-02	C	5.4E-01	C	5.9E-06	C	5.4E-01
Thallium (Soluble Salts)	7440-28-0	D	1	0	1.0E-05	P	NA	I	1.0E-05	NA		NA		NA	NA		NA		NA		NA
Toluene	108-88-3	D	1	0	8.0E-02	I	5.0E+00	I	8.0E-02	NA		NA		NA	3.0E-01	C	NA		NA		NA
Trichloroethane, 1,1,2-	79-00-5	C	1	0	4.0E-03	I	2.0E-04	P	4.0E-03	5.7E-02	I	1.6E-05	I	5.7E-02	1.4E-02	C	7.2E-02	C	1.6E-05	I	7.2E-02
Trichloroethene	79-01-6	Not in IRIS	1	0	5.0E-04	I	2.0E-03	I	5.0E-04	4.6E-02	I	4.1E-06	I	4.6E-02	2.0E-03	C	5.9E-03	C	4.1E-06	C	5.9E-03
Trimethylbenzene, 1,2,4-	95-63-6	Not in IRIS	1	0	NA		7.0E-03	P	NA	NA		NA		NA	7.0E-03	C	NA		NA		NA
Trimethylbenzene, 1,3,5-	108-67-8	Not in IRIS	1	0	1.0E-02	P	NA	I	1.0E-02	NA		NA		NA	6.0E-03	C	NA		NA		NA
Trimethylnaphthalene, 1,6,7-	2245-38-7	Not in IRIS	NA	NA	NA		NA		NA	NA		NA		NA	NA		NA		NA		NA
Vanadium	NA	Not in IRIS	1	0	5.0E-03	S	NA	I	5.0E-03	NA		NA		NA	NA		NA		NA		NA
Vinyl Acetate	108-05-4	NA	1	0	1.0E+00	H	2.0E-01	I	1.0E+00	NA		NA		NA	2.0E-01	I	NA		NA		NA
Xylenes	1330-20-7	DI	1	0	2.0E-01	I	1.0E-01	I	2.0E-01	NA		NA		NA	1.0E-01		NA		NA		NA

Acronyms/Abbreviations:

ATSDR – Agency for Toxic Substances and Disease Registry
Cal EPA – California Environmental Protection Agency
CAS – chemical abstract services number
H- Health Effects Assessment Summary Table
I - Integrated Risk Information System
NA- not available
Y - New York
A - Agency for Toxic Substnaces and Disease Registry
C - Cal EPA
E = Environmental Criteria and Assessment Office
J - New Jersey Department of Environmental Protection (http://www.state.nj.us/dep/dsr/chromium/soil-cleanup-derivation.pdf)
S- Surrogate value

U.S. EPA – United States Environmental Protection Agency
$(mg/kg\text{-}day)^{-1}$ – kilogram-day per milligrams
mg/kg-day – milligrams per kilogram-day
RfD – reference dose
P – Provisional Peer Reviewed Toxicity Values
R - route to route extrapolation

(1) Source: Integrated Risk Information System (IRIS):
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)
DI - data inadequate Using the Proposed Guidelines for Carcinogen Risk Assessment (EPA, 1996)
(2) Source: USEPA Regional Screening Level Table (2011)

COPC w/out Toxicity Value	Surrogate Compound for Non-cancer Toxicity
acenaphthylene	acenaphthene
benzo(g,h,i)perylene	pyrene
perylene	pyrene
sec -butylbenzene	n-butylbenzene
tert-butylbenzene	n-butylbenzene
p-isopropyltoluene	cumene (isopropylbenzene)
phenanthrene	anthracene
m-, o-, and p-xylene	xylenes
Aroclor-1260	Aroclor-1254

Subarea 1: Cancer Risk and Noncancer Health Hazard Calculations

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
Silver	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Xylenes	1.53E-04	5.24E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.73E-05	2.08E-06	2.61E-09	1.94E-05	5.56E-01	6.65E-02	5.01E-06	6.22E-01
Ethylbenzene	2.58E-11	NA	6.74E-10	7.00E-10	6.85E-08	0.00E+00	7.86E-07	8.54E-07
Iron	NA	NA	NA	0.00E+00	2.50E-02	0.00E+00	NA	2.50E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.60E-06	6.38E-07	1.23E-09	2.24E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.93E-05	5.15E-05	NA	1.51E-04
Silver	NA	NA	NA	0.00E+00	3.84E-04	0.00E+00	NA	3.84E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.95E-07	0.00E+00	6.58E-05	6.61E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.73E-05	2.08E-06	3.40E-09	1.94E-05	5.81E-01	6.66E-02	7.90E-05	6.48E-01

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

	PEF
Source: USEPA RSL June 2011	**(m³/kg)**
For all COPC	1.36E+09

		Reference Dose			Slope Factor		
	EPC	**Oral RfD**	**Reference Concentration**	**Dermal RfD**	**Oral SF**	**Unit Risk Factor**	**Dermal SF**
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	**VF**
Source: USEPA RSL June 2011	**m³/kg**
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	7.11E-07	2.44E-07
Phenanthrene	7.11E-07	2.44E-07
Perylene	7.11E-07	2.44E-07
Benzo(g,h,i)perylene	7.11E-07	2.44E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	5.47E-07	1.87E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Acenaphthene	7.11E-07	2.44E-07
~Anthracene	7.11E-07	2.44E-07
~Benz[a]anthracene	7.11E-07	2.44E-07
~Benzo[a]pyrene	7.11E-07	2.44E-07
~Benzo[b]fluoranthene	7.11E-07	2.44E-07
~Benzo[k]fluoranthene	7.11E-07	2.44E-07
~Chrysene	7.11E-07	2.44E-07
~Fluoranthene	7.11E-07	2.44E-07
~Fluorene	7.11E-07	2.44E-07
~Indeno[1,2,3-cd]pyrene	7.11E-07	2.44E-07
~Methylnaphthalene, 1-	7.11E-07	2.44E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
~Naphthalene	7.11E-07	2.44E-07
~Pyrene	7.11E-07	2.44E-07
Propyl benzene	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Acetone	6.52E-05	2.24E-05
sec-Butylbenzene	7.05E-10	2.42E-10
tert-Butylbenzene	7.05E-10	2.42E-10
4-Isopropyltoluene	7.05E-10	2.42E-10
Acenaphthylene	6.35E-06	2.18E-06
Phenanthrene	7.05E-10	2.42E-10
Perylene	7.05E-10	2.42E-10
Benzo(g,h,i)perylene	7.05E-10	2.42E-10
Aluminum	7.05E-10	2.42E-10
Antimony	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Benzene	2.52E-04	8.63E-05
Beryllium	7.05E-10	2.42E-10
Biphenyl, 1,1'-	7.80E-06	2.67E-06
Butylbenzene, n-	1.09E-04	3.75E-05
Carbon Disulfide	7.61E-04	2.61E-04
Chloroform	3.39E-04	1.16E-04
Chlorotoluene, o-	1.10E-04	3.76E-05
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Cumene	1.44E-04	4.92E-05
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
Iron	7.05E-10	2.42E-10
MCPP	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Mercury	7.05E-10	2.42E-10
MTBE	1.82E-04	6.23E-05
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Acenaphthene	6.35E-06	2.18E-06
~Anthracene	1.70E-06	5.84E-07
~Benz[a]anthracene	7.05E-10	2.42E-10
~Benzo[a]pyrene	7.05E-10	2.42E-10
~Benzo[b]fluoranthene	7.05E-10	2.42E-10
~Benzo[k]fluoranthene	7.05E-10	2.42E-10
~Chrysene	7.05E-10	2.42E-10
~Fluoranthene	7.05E-10	2.42E-10
~Fluorene	3.17E-06	1.09E-06
~Indeno[1,2,3-cd]pyrene	7.05E-10	2.42E-10
~Methylnaphthalene, 1-	1.52E-05	5.21E-06
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
~Naphthalene	1.92E-05	6.59E-06
~Pyrene	7.05E-10	2.42E-10
Propyl benzene	1.27E-04	4.37E-05
Silver	7.05E-10	2.42E-10
Styrene	9.49E-05	3.26E-05
Thallium	7.05E-10	2.42E-10
Toluene	2.08E-04	7.13E-05
Trimethylbenzene, 1,2,4-	1.13E-04	3.86E-05
Trimethylbenzene, 1,3,5-	1.35E-04	4.62E-05
Vanadium	7.05E-10	2.42E-10
Xylene, m-	1.63E-04	5.58E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	2.13E-08	0.00E+00	2.95E-08	5.08E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	9.21E-05	0.00E+00	NA	9.21E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	2.47E-05	0.00E+00	NA	2.47E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	2.30E-05	0.00E+00	2.96E-09	2.30E-05
Acenaphthylene	NA	NA	NA	0.00E+00	4.22E-07	2.19E-07	NA	6.41E-07
Phenanthrene	NA	NA	NA	0.00E+00	1.53E-06	7.91E-07	NA	2.32E-06
Perylene	NA	NA	NA	0.00E+00	3.20E-07	1.66E-07	NA	4.85E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.51E-07	7.82E-08	NA	2.29E-07
Aluminum	NA	NA	NA	0.00E+00	8.58E-03	0.00E+00	8.83E-04	9.46E-03
Antimony	NA	NA	NA	0.00E+00	5.82E-02	0.00E+00	NA	5.82E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	7.93E-08	NA	2.07E-06	2.15E-06	1.05E-03	0.00E+00	2.58E-02	2.68E-02
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Biphenyl, 1,1'-	1.01E-10	NA	NA	1.01E-10	7.40E-07	0.00E+00	5.26E-04	5.27E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.47E-04	0.00E+00	NA	2.47E-04
Carbon Disulfide	NA	NA	NA	0.00E+00	9.04E-08	0.00E+00	7.18E-06	7.27E-06
Chloroform	9.42E-09	NA	1.73E-06	1.74E-06	8.86E-05	0.00E+00	2.24E-03	2.33E-03
Chlorotoluene, o-	NA	NA	NA	0.00E+00	2.19E-04	0.00E+00	NA	2.19E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	9.30E-05	0.00E+00	2.44E-03	2.53E-03
~TCDD, 2,3,7,8-	9.46E-06	1.13E-06	1.42E-09	1.06E-05	3.03E-01	3.63E-02	2.73E-06	3.40E-01
Ethylbenzene	1.32E-07	NA	3.44E-06	3.57E-06	3.50E-04	0.00E+00	4.01E-03	4.36E-03
Iron	NA	NA	NA	0.00E+00	3.52E-02	0.00E+00	NA	3.52E-02
MCPP	NA	NA	NA	0.00E+00	5.08E-01	2.03E-01	NA	7.11E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.86E-12	NA	3.56E-11	3.75E-11	NA	NA	1.33E-07	1.33E-07
Molybdenum	NA	NA	NA	0.00E+00	1.04E-03	0.00E+00	NA	1.04E-03
Nickel	NA	NA	9.30E-09	9.30E-09	1.01E-02	0.00E+00	1.16E-03	1.13E-02
Phenol	NA	NA	NA	0.00E+00	2.83E-06	1.13E-06	2.18E-09	3.96E-06
~Acenaphthene	NA	NA	NA	0.00E+00	5.64E-07	2.93E-07	NA	8.56E-07
~Anthracene	NA	NA	NA	0.00E+00	1.09E-07	5.64E-08	NA	1.65E-07
~Benz[a]anthracene	4.87E-09	2.53E-09	3.78E-13	7.39E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	2.37E-08	1.23E-08	1.83E-12	3.59E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	3.43E-09	1.78E-09	2.66E-13	5.21E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.03E-10	5.34E-11	7.98E-14	1.56E-10	NA	NA	NA	0.00E+00
~Chrysene	7.41E-11	3.84E-11	5.74E-14	1.13E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	8.29E-07	4.30E-07	NA	1.26E-06
~Fluorene	NA	NA	NA	0.00E+00	2.24E-06	1.16E-06	NA	3.40E-06
~Indeno[1,2,3-cd]pyrene	1.45E-09	7.52E-10	1.12E-13	2.20E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	4.49E-09	2.33E-09	NA	6.83E-09	6.46E-06	3.35E-06	NA	9.81E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.21E-04	4.78E-04	NA	1.40E-03
~Naphthalene	NA	NA	2.17E-06	2.17E-06	6.64E-04	3.45E-04	6.21E-02	6.31E-02
~Pyrene	NA	NA	NA	0.00E+00	3.95E-06	2.05E-06	NA	6.00E-06
Propyl benzene	NA	NA	NA	0.00E+00	3.38E-04	1.35E-04	3.14E-03	3.61E-03
Silver	NA	NA	NA	0.00E+00	3.56E-04	0.00E+00	NA	3.56E-04
Styrene	NA	NA	NA	0.00E+00	4.73E-08	0.00E+00	6.55E-07	7.02E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	3.98E-04	0.00E+00	9.68E-04	1.37E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	1.18E+00	1.18E+00
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	5.69E-03	0.00E+00	NA	5.69E-03
Vanadium	NA	NA	NA	0.00E+00	7.95E-03	0.00E+00	NA	7.95E-03
Xylene, m-	NA	NA	NA	0.00E+00	8.42E-04	0.00E+00	2.00E-01	2.01E-01
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	9.72E-06	1.15E-06	9.42E-06	2.03E-05	9.44E-01	2.40E-01	1.48E+00	2.67E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
Silver	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Xylenes	1.53E-04	5.24E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.73E-05	2.08E-06	2.61E-09	1.94E-05	5.56E-01	6.65E-02	5.01E-06	6.22E-01
Ethylbenzene	2.58E-11	NA	6.74E-10	7.00E-10	6.85E-08	0.00E+00	7.86E-07	8.54E-07
Iron	NA	NA	NA	0.00E+00	2.50E-02	0.00E+00	NA	2.50E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.60E-06	6.38E-07	1.23E-09	2.24E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.93E-05	5.15E-05	NA	1.51E-04
Silver	NA	NA	NA	0.00E+00	3.84E-04	0.00E+00	NA	3.84E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.95E-07	0.00E+00	6.58E-05	6.61E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.73E-05	2.08E-06	3.40E-09	1.94E-05	5.81E-01	6.66E-02	7.90E-05	6.48E-01

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)

FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)

BW = Body weight (kg)
AT = Averaging time (days)

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	7.11E-07	2.44E-07
Phenanthrene	7.11E-07	2.44E-07
Perylene	7.11E-07	2.44E-07
Benzo(g,h,i)perylene	7.11E-07	2.44E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	5.47E-07	1.87E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Acenaphthene	7.11E-07	2.44E-07
~Anthracene	7.11E-07	2.44E-07
~Benz[a]anthracene	7.11E-07	2.44E-07
~Benzo[a]pyrene	7.11E-07	2.44E-07
~Benzo[b]fluoranthene	7.11E-07	2.44E-07
~Benzo[k]fluoranthene	7.11E-07	2.44E-07
~Chrysene	7.11E-07	2.44E-07
~Fluoranthene	7.11E-07	2.44E-07
~Fluorene	7.11E-07	2.44E-07
~Indeno[1,2,3-cd]pyrene	7.11E-07	2.44E-07
~Methylnaphthalene, 1-	7.11E-07	2.44E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
~Naphthalene	7.11E-07	2.44E-07
~Pyrene	7.11E-07	2.44E-07
Propyl benzene	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	6.52E-05	2.24E-05
sec-Butylbenzene	7.05E-10	2.42E-10
tert-Butylbenzene	7.05E-10	2.42E-10
4-Isopropyltoluene	7.05E-10	2.42E-10
Acenaphthylene	6.35E-06	2.18E-06
Phenanthrene	7.05E-10	2.42E-10
Perylene	7.05E-10	2.42E-10
Benzo(g,h,i)perylene	7.05E-10	2.42E-10
Aluminum	7.05E-10	2.42E-10
Antimony	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Benzene	2.52E-04	8.63E-05
Beryllium	7.05E-10	2.42E-10
Biphenyl, 1,1'-	7.80E-06	2.67E-06
Butylbenzene, n-	1.09E-04	3.75E-05
Carbon Disulfide	7.61E-04	2.61E-04
Chloroform	3.39E-04	1.16E-04
Chlorotoluene, o-	1.10E-04	3.76E-05
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Cumene	1.44E-04	4.92E-05
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
Iron	7.05E-10	2.42E-10
MCPP	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Mercury	7.05E-10	2.42E-10
MTBE	1.82E-04	6.23E-05
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Acenaphthene	6.35E-06	2.18E-06
~Anthracene	1.70E-06	5.84E-07
~Benz[a]anthracene	7.05E-10	2.42E-10
~Benzo[a]pyrene	7.05E-10	2.42E-10
~Benzo[b]fluoranthene	7.05E-10	2.42E-10
~Benzo[k]fluoranthene	7.05E-10	2.42E-10
~Chrysene	7.05E-10	2.42E-10
~Fluoranthene	7.05E-10	2.42E-10
~Fluorene	3.17E-06	1.09E-06
~Indeno[1,2,3-cd]pyrene	7.05E-10	2.42E-10
~Methylnaphthalene, 1-	1.52E-05	5.21E-06
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
~Naphthalene	1.92E-05	6.59E-06
~Pyrene	7.05E-10	2.42E-10
Propyl benzene	1.27E-04	4.37E-05
Silver	7.05E-10	2.42E-10
Styrene	9.49E-05	3.26E-05
Thallium	7.05E-10	2.42E-10
Toluene	2.08E-04	7.13E-05
Trimethylbenzene, 1,2,4-	1.13E-04	3.86E-05
Trimethylbenzene, 1,3,5-	1.35E-04	4.62E-05
Vanadium	7.05E-10	2.42E-10
Xylene, m-	1.63E-04	5.58E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	Ingestion	Dermal	Inhalation	Total	Ingestion	Dermal	Inhalation	Total
Acetone	NA	NA	NA	0.00E+00	2.13E-08	0.00E+00	2.95E-08	5.08E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	9.21E-05	0.00E+00	1.69E-08	9.21E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	2.47E-05	0.00E+00	4.54E-09	2.47E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	2.30E-05	0.00E+00	2.96E-09	2.30E-05
Acenaphthylene	NA	NA	NA	0.00E+00	4.22E-07	2.19E-07	5.59E-07	1.20E-06
Phenanthrene	NA	NA	NA	0.00E+00	1.53E-06	7.91E-07	2.14E-10	2.32E-06
Perylene	NA	NA	NA	0.00E+00	3.20E-07	1.66E-07	4.49E-11	4.85E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.51E-07	7.82E-08	2.12E-11	2.29E-07
Aluminum	NA	NA	NA	0.00E+00	8.58E-03	0.00E+00	8.83E-04	9.46E-03
Antimony	NA	NA	NA	0.00E+00	5.82E-02	0.00E+00	NA	5.82E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.44E-07	NA	7.68E-06	7.83E-06	1.05E-03	0.00E+00	2.58E-02	2.68E-02
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Biphenyl, 1,1'-	1.01E-10	NA	1.66E-10	2.67E-10	7.40E-07	0.00E+00	1.17E-06	1.91E-06
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.47E-04	0.00E+00	7.03E-03	7.28E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	9.04E-08	0.00E+00	7.18E-06	7.27E-06
Chloroform	9.42E-09	NA	3.98E-07	4.08E-07	8.86E-05	0.00E+00	2.24E-03	2.33E-03
Chlorotoluene, o-	NA	NA	NA	0.00E+00	2.19E-04	0.00E+00	5.02E-03	5.23E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	9.30E-05	0.00E+00	2.44E-03	2.53E-03
Dioxin TEQ	9.46E-06	1.13E-06	1.42E-09	1.06E-05	3.03E-01	3.63E-02	2.73E-06	3.40E-01
Ethylbenzene	1.32E-07	NA	3.44E-06	3.57E-06	3.50E-04	0.00E+00	4.01E-03	4.36E-03
Iron	NA	NA	NA	0.00E+00	3.52E-02	0.00E+00	NA	3.52E-02
MCPP	NA	NA	NA	0.00E+00	5.08E-01	2.03E-01	7.47E-05	7.11E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.86E-12	NA	3.56E-11	3.75E-11	NA	NA	1.33E-07	1.33E-07
Molybdenum	NA	NA	NA	0.00E+00	1.04E-03	0.00E+00	NA	1.04E-03
Nickel	NA	NA	9.30E-09	9.30E-09	1.01E-02	0.00E+00	2.09E-03	1.22E-02
Phenol	NA	NA	NA	0.00E+00	2.83E-06	1.13E-06	2.18E-09	3.96E-06
~Acenaphthene	NA	NA	NA	0.00E+00	5.64E-07	2.93E-07	7.47E-07	1.60E-06
~Anthracene	NA	NA	NA	0.00E+00	1.09E-07	5.64E-08	3.69E-08	2.02E-07
~Benz[a]anthracene	8.00E-09	4.15E-09	3.78E-13	1.22E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	3.89E-08	2.02E-08	1.83E-12	5.91E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	5.64E-09	2.92E-09	2.66E-13	8.56E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.69E-09	8.77E-10	7.98E-14	2.57E-09	NA	NA	NA	0.00E+00
~Chrysene	1.22E-09	6.31E-10	5.74E-14	1.85E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	8.29E-07	4.30E-07	NA	1.26E-06
~Fluorene	NA	NA	NA	0.00E+00	2.24E-06	1.16E-06	1.48E-06	4.88E-06
~Indeno[1,2,3-cd]pyrene	2.38E-09	1.24E-09	1.12E-13	3.62E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	4.49E-09	2.33E-09	1.43E-08	2.11E-08	6.46E-06	3.35E-06	2.01E-05	2.99E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.21E-04	4.78E-04	NA	1.40E-03
~NAphthalene	NA	NA	2.17E-06	2.17E-06	6.64E-04	3.45E-04	6.21E-02	6.31E-02
~Pyrene	NA	NA	NA	0.00E+00	3.95E-06	2.05E-06	5.54E-10	6.00E-06
Propyl benzene	NA	NA	NA	0.00E+00	3.38E-04	1.35E-04	2.24E-02	2.29E-02
Silver	NA	NA	NA	0.00E+00	3.56E-04	0.00E+00	NA	3.56E-04
Styrene	NA	NA	NA	0.00E+00	4.73E-08	0.00E+00	7.28E-07	7.75E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	3.98E-04	0.00E+00	1.61E-02	1.65E-02
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	1.18E+00	1.18E+00
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	5.69E-03	0.00E+00	9.33E-01	9.38E-01
Vanadium	NA	NA	NA	0.00E+00	7.95E-03	0.00E+00	NA	7.95E-03
Xylene, m-	NA	NA	NA	0.00E+00	8.42E-04	0.00E+00	2.00E-01	2.01E-01
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	9.81E-06	1.17E-06	1.37E-05	2.47E-05	9.44E-01	2.40E-01	2.46E+00	3.65E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Methylnaphthalene, 2-	4.82E-06	4.13E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
Silver	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Xylenes	1.53E-04	1.31E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.05E-05	3.52E-06	6.52E-10	4.40E-05	5.19E+00	4.51E-01	5.01E-06	5.64E+00
Ethylbenzene	6.03E-11	NA	1.68E-10	2.29E-10	6.39E-07	0.00E+00	7.86E-07	1.43E-06
Iron	NA	NA	NA	0.00E+00	2.34E-01	0.00E+00	NA	2.34E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.49E-05	4.33E-06	1.23E-09	1.92E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.27E-04	3.49E-04	NA	1.28E-03
Silver	NA	NA	NA	0.00E+00	3.58E-03	0.00E+00	NA	3.58E-03
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.75E-06	0.00E+00	6.58E-05	6.85E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.05E-05	3.52E-06	8.51E-10	4.40E-05	5.43E+00	4.52E-01	7.90E-05	5.88E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

	PEF
Source: USEPA RSL June 2011	**(m³/kg)**
For all COPC	1.36E+09

		Reference Dose			Slope Factor		
	EPC	Oral RfD	Reference Concentration	Dermal RfD	Oral SF	Unit Risk Factor	Dermal SF
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	**VF**
Source: USEPA RSL June 2011	**m³/kg**
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Cont
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	1.28E-05	1.10E-06
For PAHs	NA	6.71E-06

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	6.71E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	4.82E-06	4.13E-07
Phenanthrene	4.82E-06	4.13E-07
Perylene	4.82E-06	4.13E-07
Benzo(g,h,i)perylene	4.82E-06	4.13E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.71E-06	3.18E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Acenaphthene	4.82E-06	4.13E-07
~Anthracene	4.82E-06	4.13E-07
~Benz[a]anthracene	4.82E-06	6.57E-07
~Benzo[a]pyrene	4.82E-06	6.57E-07
~Benzo[b]fluoranthene	4.82E-06	6.57E-07
~Benzo[k]fluoranthene	4.82E-06	6.57E-07
~Chrysene	4.82E-06	6.57E-07
~Fluoranthene	4.82E-06	4.13E-07
~Fluorene	4.82E-06	4.13E-07
~Indeno[1,2,3-cd]pyrene	4.82E-06	6.57E-07
~Methylnaphthalene, 1-	4.82E-06	4.13E-07
~Methylnaphthalene, 2-	4.82E-06	4.13E-07
~Naphthalene	4.82E-06	4.13E-07
~Pyrene	4.82E-06	4.13E-07
Propyl benzene	3.71E-06	3.18E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Acetone	6.52E-05	5.59E-06
sec-Butylbenzene	7.05E-10	6.04E-11
tert-Butylbenzene	7.05E-10	6.04E-11
4-Isopropyltoluene	7.05E-10	6.04E-11
Acenaphthylene	6.35E-06	5.44E-07
Phenanthrene	7.05E-10	6.04E-11
Perylene	7.05E-10	6.04E-11
Benzo(g,h,i)perylene	7.05E-10	6.04E-11
Aluminum	7.05E-10	6.04E-11
Antimony	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Benzene	2.52E-04	2.16E-05
Beryllium	7.05E-10	6.04E-11
Biphenyl, 1,1'-	7.80E-06	6.68E-07
Butylbenzene, n-	1.09E-04	9.37E-06
Carbon Disulfide	7.61E-04	6.52E-05
Chloroform	3.39E-04	2.90E-05
Chlorotoluene, o-	1.10E-04	9.40E-06
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Cumene	1.44E-04	1.23E-05
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
Iron	7.05E-10	6.04E-11
MCPP	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Mercury	7.05E-10	6.04E-11
MTBE	1.82E-04	1.56E-05
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Acenaphthene	6.35E-06	5.44E-07
~Anthracene	1.70E-06	1.46E-07
~Benz[a]anthracene	7.05E-10	7.66E-10
~Benzo[a]pyrene	7.05E-10	7.66E-10
~Benzo[b]fluoranthene	7.05E-10	7.66E-10
~Benzo[k]fluoranthene	7.05E-10	7.66E-10
~Chrysene	7.05E-10	7.66E-10
~Fluoranthene	7.05E-10	6.04E-11
~Fluorene	3.17E-06	2.71E-07
~Indeno[1,2,3-cd]pyrene	7.05E-10	7.66E-10
~Methylnaphthalene, 1-	1.52E-05	1.30E-06
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
~Naphthalene	1.92E-05	1.65E-06
~Pyrene	7.05E-10	6.04E-11
Propyl benzene	1.27E-04	1.09E-05
Silver	7.05E-10	6.04E-11
Styrene	9.49E-05	8.14E-06
Thallium	7.05E-10	6.04E-11
Toluene	2.08E-04	1.78E-05
Trimethylbenzene, 1,2,4-	1.13E-04	9.65E-06
Trimethylbenzene, 1,3,5-	1.35E-04	1.15E-05
Vanadium	7.05E-10	6.04E-11
Xylene, m-	1.63E-04	1.40E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	1.99E-07	0.00E+00	2.95E-08	2.28E-07
sec-Butylbenzene	NA	NA	NA	0.00E+00	8.59E-04	0.00E+00	NA	8.59E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	2.31E-04	0.00E+00	NA	2.31E-04
4-Isopropyltoluene	NA	NA	NA	0.00E+00	2.15E-04	0.00E+00	2.96E-09	2.15E-04
Acenaphthylene	NA	NA	NA	0.00E+00	3.94E-06	1.49E-06	NA	5.43E-06
Phenanthrene	NA	NA	NA	0.00E+00	1.42E-05	5.37E-06	NA	1.96E-05
Perylene	NA	NA	NA	0.00E+00	2.98E-06	1.12E-06	NA	4.11E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.41E-06	5.30E-07	NA	1.94E-06
Aluminum	NA	NA	NA	0.00E+00	8.01E-02	0.00E+00	8.83E-04	8.09E-02
Antimony	NA	NA	NA	0.00E+00	5.43E-01	0.00E+00	NA	5.43E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.85E-07	NA	5.17E-07	7.02E-07	9.81E-03	0.00E+00	2.58E-02	3.56E-02
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Biphenyl, 1,1'-	2.37E-10	NA	NA	2.37E-10	6.90E-06	0.00E+00	5.26E-04	5.33E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.30E-03	0.00E+00	NA	2.30E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	8.44E-07	0.00E+00	7.18E-06	8.02E-06
Chloroform	2.20E-08	NA	4.32E-07	4.54E-07	8.27E-04	0.00E+00	2.24E-03	3.06E-03
Chlorotoluene, o-	NA	NA	NA	0.00E+00	2.05E-03	0.00E+00	NA	2.05E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	8.68E-04	0.00E+00	2.44E-03	3.30E-03
Dioxin TEQ	2.21E-05	1.92E-06	3.56E-10	2.40E-05	2.83E+00	2.46E-01	2.73E-06	3.08E+00
Ethylbenzene	3.08E-07	NA	8.60E-07	1.17E-06	3.27E-03	0.00E+00	4.01E-03	7.28E-03
Iron	NA	NA	NA	0.00E+00	3.29E-01	0.00E+00	NA	3.29E-01
MCPP	NA	NA	NA	0.00E+00	4.74E+00	1.38E+00	NA	6.12E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	4.34E-12	NA	8.90E-12	1.32E-11	NA	NA	1.33E-07	1.33E-07
Molybdenum	NA	NA	NA	0.00E+00	9.72E-03	0.00E+00	NA	9.72E-03
Nickel	NA	NA	2.33E-09	2.33E-09	9.46E-02	0.00E+00	1.16E-03	9.58E-02
Phenol	NA	NA	NA	0.00E+00	2.64E-05	7.65E-06	2.18E-09	3.40E-05
~Acenaphthene	NA	NA	NA	0.00E+00	5.26E-06	1.98E-06	NA	7.25E-06
~Anthracene	NA	NA	NA	0.00E+00	1.01E-06	3.82E-07	NA	1.40E-06
~Benz[a]anthracene	6.95E-08	6.81E-09	1.20E-12	7.63E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	3.38E-07	3.31E-08	5.81E-12	3.71E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	4.90E-08	4.79E-09	8.42E-13	5.37E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.47E-09	1.44E-10	2.53E-13	1.61E-09	NA	NA	NA	0.00E+00
~Chrysene	1.06E-09	1.04E-10	1.82E-13	1.16E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	7.74E-06	2.92E-06	NA	1.07E-05
~Fluorene	NA	NA	NA	0.00E+00	2.09E-05	7.88E-06	NA	2.88E-05
~Indeno[1,2,3-cd]pyrene	2.07E-08	2.03E-09	3.56E-13	2.27E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.05E-08	3.95E-09	NA	1.44E-08	6.03E-05	2.27E-05	NA	8.30E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	8.60E-03	3.24E-03	NA	1.18E-02
~Naphthalene	NA	NA	5.43E-07	5.43E-07	6.20E-03	2.34E-03	6.21E-02	7.07E-02
~Pyrene	NA	NA	NA	0.00E+00	3.69E-05	1.39E-05	NA	5.08E-05
Propyl benzene	NA	NA	NA	0.00E+00	3.15E-03	9.14E-04	3.14E-03	7.20E-03
Silver	NA	NA	NA	0.00E+00	3.32E-03	0.00E+00	NA	3.32E-03
Styrene	NA	NA	NA	0.00E+00	4.41E-07	0.00E+00	6.55E-07	1.10E-06
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	3.72E-03	0.00E+00	9.68E-04	4.68E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	1.18E+00	1.18E+00
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	5.31E-02	0.00E+00	NA	5.31E-02
Vanadium	NA	NA	NA	0.00E+00	7.42E-02	0.00E+00	NA	7.42E-02
Xylene, m-	NA	NA	NA	0.00E+00	7.86E-03	0.00E+00	2.00E-01	2.08E-01
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.31E-05	1.97E-06	2.36E-06	2.74E-05	8.81E+00	1.63E+00	1.48E+00	1.19E+01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Methylnaphthalene, 2-	4.82E-06	4.13E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
Silver	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Xylenes	1.53E-04	1.31E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.05E-05	3.52E-06	6.52E-10	4.40E-05	5.19E+00	4.51E-01	5.01E-06	5.64E+00
Ethylbenzene	6.03E-11	NA	1.68E-10	2.29E-10	6.39E-07	0.00E+00	7.86E-07	1.43E-06
Iron	NA	NA	NA	0.00E+00	2.34E-01	0.00E+00	NA	2.34E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.49E-05	4.33E-06	1.23E-09	1.92E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	9.27E-04	3.49E-04	NA	1.28E-03
Silver	NA	NA	NA	0.00E+00	3.58E-03	0.00E+00	NA	3.58E-03
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.75E-06	0.00E+00	6.58E-05	6.85E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.05E-05	3.52E-06	8.51E-10	4.40E-05	5.43E+00	4.52E-01	7.90E-05	5.88E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
	1.28E-05	1.10E-06

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
	NA	6.71E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	4.65E-06	3.99E-07
Phenanthrene	4.65E-06	3.99E-07
Perylene	4.65E-06	3.99E-07
Benzo(g,h,i)perylene	4.65E-06	3.99E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.07E-06	9.21E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.07E-06	9.21E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.58E-06	3.07E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.58E-06	3.07E-07
~Acenaphthene	4.65E-06	3.99E-07
~Anthracene	4.65E-06	3.99E-07
~Benz[a]anthracene	4.65E-06	6.57E-07
~Benzo[a]pyrene	4.65E-06	6.57E-07
~Benzo[b]fluoranthene	4.65E-06	6.57E-07
~Benzo[k]fluoranthene	4.65E-06	6.57E-07
~Chrysene	4.65E-06	6.57E-07
~Fluoranthene	4.65E-06	3.99E-07
~Fluorene	4.65E-06	3.99E-07
~Indeno[1,2,3-cd]pyrene	4.65E-06	6.57E-07
~Methylnaphthalene, 1-	4.65E-06	3.99E-07
~Methylnaphthalene, 2-	4.65E-06	3.99E-07
~Naphthalene	4.65E-06	3.99E-07
~Pyrene	4.65E-06	3.99E-07
Propyl benzene	3.58E-06	3.07E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	6.52E-05	5.59E-06
sec-Butylbenzene	7.05E-10	6.04E-11
tert-Butylbenzene	7.05E-10	6.04E-11
4-Isopropyltoluene	7.05E-10	6.04E-11
Acenaphthylene	6.35E-06	5.44E-07
Phenanthrene	7.05E-10	6.04E-11
Perylene	7.05E-10	6.04E-11
Benzo(g,h,i)perylene	7.05E-10	6.04E-11
Aluminum	7.05E-10	6.04E-11
Antimony	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Benzene	2.52E-04	2.16E-05
Beryllium	7.05E-10	6.04E-11
Biphenyl, 1,1'-	7.80E-06	6.68E-07
Butylbenzene, n-	1.09E-04	9.37E-06
Carbon Disulfide	7.61E-04	6.52E-05
Chloroform	3.39E-04	2.90E-05
Chlorotoluene, o-	1.10E-04	9.40E-06
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Cumene	1.44E-04	1.23E-05
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
Iron	7.05E-10	6.04E-11
MCPP	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Mercury	7.05E-10	6.04E-11
MTBE	1.82E-04	1.56E-05
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Acenaphthene	6.35E-06	5.44E-07
~Anthracene	1.70E-06	1.46E-07
~Benz[a]anthracene	7.05E-10	7.66E-10
~Benzo[a]pyrene	7.05E-10	7.66E-10
~Benzo[b]fluoranthene	7.05E-10	7.66E-10
~Benzo[k]fluoranthene	7.05E-10	7.66E-10
~Chrysene	7.05E-10	7.66E-10
~Fluoranthene	7.05E-10	6.04E-11
~Fluorene	3.17E-06	2.71E-07
~Indeno[1,2,3-cd]pyrene	7.05E-10	7.66E-10
~Methylnaphthalene, 1-	1.52E-05	1.30E-06
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
~Naphthalene	1.92E-05	1.65E-06
~Pyrene	7.05E-10	6.04E-11
Propyl benzene	1.27E-04	1.09E-05
Silver	7.05E-10	6.04E-11
Styrene	9.49E-05	8.14E-06
Thallium	7.05E-10	6.04E-11
Toluene	2.08E-04	1.78E-05
Trimethylbenzene, 1,2,4-	1.13E-04	9.65E-06
Trimethylbenzene, 1,3,5-	1.35E-04	1.15E-05
Vanadium	7.05E-10	6.04E-11
Xylene, m-	1.63E-04	1.40E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	1.99E-07	0.00E+00	2.95E-08	2.28E-07
sec-Butylbenzene	NA	NA	NA	0.00E+00	8.59E-04	0.00E+00	1.69E-08	8.59E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	2.31E-04	0.00E+00	4.54E-09	2.31E-04
4-Isopropyltoluene	NA	NA	NA	0.00E+00	2.15E-04	0.00E+00	2.96E-09	2.15E-04
Acenaphthylene	NA	NA	NA	0.00E+00	3.94E-06	1.43E-06	5.59E-07	5.94E-06
Phenanthrene	NA	NA	NA	0.00E+00	1.42E-05	5.18E-06	2.14E-10	1.94E-05
Perylene	NA	NA	NA	0.00E+00	2.98E-06	1.09E-06	4.49E-11	4.07E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.41E-06	5.12E-07	2.12E-11	1.92E-06
Aluminum	NA	NA	NA	0.00E+00	8.01E-02	0.00E+00	8.83E-04	8.09E-02
Antimony	NA	NA	NA	0.00E+00	5.43E-01	0.00E+00	NA	5.43E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	3.36E-07	NA	1.92E-06	2.26E-06	9.81E-03	0.00E+00	2.58E-02	3.56E-02
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Biphenyl, 1,1'-	2.37E-10	NA	4.15E-11	2.78E-10	6.90E-06	0.00E+00	1.17E-06	8.07E-06
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.30E-03	0.00E+00	7.03E-03	9.33E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	8.44E-07	0.00E+00	7.18E-06	8.02E-06
Chloroform	2.20E-08	NA	9.96E-08	1.22E-07	8.27E-04	0.00E+00	2.24E-03	3.06E-03
Chlorotoluene, o-	NA	NA	NA	0.00E+00	2.05E-03	0.00E+00	5.02E-03	7.06E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	8.68E-04	0.00E+00	2.44E-03	3.30E-03
Dioxin TEQ	2.21E-05	1.85E-06	3.56E-10	2.39E-05	2.83E+00	2.38E-01	2.73E-06	3.07E+00
Ethylbenzene	3.08E-07	NA	8.60E-07	1.17E-06	3.27E-03	0.00E+00	4.01E-03	7.28E-03
Iron	NA	NA	NA	0.00E+00	3.29E-01	0.00E+00	NA	3.29E-01
MCPP	NA	NA	NA	0.00E+00	4.74E+00	1.33E+00	7.47E-05	6.07E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	4.34E-12	NA	8.90E-12	1.32E-11	NA	NA	1.33E-07	1.33E-07
Molybdenum	NA	NA	NA	0.00E+00	9.72E-03	0.00E+00	NA	9.72E-03
Nickel	NA	NA	2.33E-09	2.33E-09	9.46E-02	0.00E+00	2.09E-03	9.67E-02
Phenol	NA	NA	NA	0.00E+00	2.64E-05	7.39E-06	2.18E-09	3.38E-05
~Acenaphthene	NA	NA	NA	0.00E+00	5.26E-06	1.92E-06	7.47E-07	7.93E-06
~Anthracene	NA	NA	NA	0.00E+00	1.01E-06	3.69E-07	3.69E-08	1.42E-06
~Benz[a]anthracene	1.14E-07	1.12E-08	1.20E-12	1.25E-07	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	5.55E-07	5.44E-08	5.81E-12	6.10E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	8.05E-08	7.88E-09	8.43E-13	8.84E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	2.41E-08	2.37E-09	2.53E-13	2.65E-08	NA	NA	NA	0.00E+00
~Chrysene	1.74E-08	1.70E-09	1.82E-13	1.91E-08	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	7.74E-06	2.82E-06	NA	1.06E-05
~Fluorene	NA	NA	NA	0.00E+00	2.09E-05	7.61E-06	1.48E-06	3.00E-05
~Indeno[1,2,3-cd]pyrene	3.40E-08	3.33E-09	3.56E-13	3.74E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.05E-08	3.82E-09	3.57E-09	1.79E-08	6.03E-05	2.19E-05	2.01E-05	1.02E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	8.60E-03	3.13E-03	NA	1.17E-02
~NAphthalene	NA	NA	5.43E-07	5.43E-07	6.20E-03	2.26E-03	6.21E-02	7.06E-02
~Pyrene	NA	NA	NA	0.00E+00	3.69E-05	1.34E-05	5.54E-10	5.03E-05
Propyl benzene	NA	NA	NA	0.00E+00	3.15E-03	8.82E-04	2.24E-02	2.65E-02
Silver	NA	NA	NA	0.00E+00	3.32E-03	0.00E+00	NA	3.32E-03
Styrene	NA	NA	NA	0.00E+00	4.41E-07	0.00E+00	7.28E-07	1.17E-06
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	3.72E-03	0.00E+00	1.61E-02	1.98E-02
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	1.18E+00	1.18E+00
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	5.31E-02	0.00E+00	9.33E-01	9.86E-01
Vanadium	NA	NA	NA	0.00E+00	7.42E-02	0.00E+00	NA	7.42E-02
Xylene, m-	NA	NA	NA	0.00E+00	7.86E-03	0.00E+00	2.00E-01	2.08E-01
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.36E-05	1.94E-06	3.43E-06	2.90E-05	8.81E+00	1.57E+00	2.46E+00	1.28E+01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8ft bgs); USEPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
For all chemicals	NA	6.71E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
~Benz[a]anthracene	NA	6.57E-07
~Benzo[a]pyrene	NA	6.57E-07
~Benzo[b]fluoranthene	NA	6.57E-07
~Benzo[k]fluoranthene	NA	6.57E-07
~Chrysene	NA	6.57E-07
~Indeno[1,2,3-cd]pyrene	NA	6.57E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
~Benz[a]anthracene	NA	7.66E-10
~Benzo[a]pyrene	NA	7.66E-10
~Benzo[b]fluoranthene	NA	7.66E-10
~Benzo[k]fluoranthene	NA	7.66E-10
~Chrysene	NA	7.66E-10
~Indeno[1,2,3-cd]pyrene	NA	7.66E-10

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	6.95E-08	6.81E-09	1.20E-12	7.63E-08
~Benzo[a]pyrene	3.38E-07	3.31E-08	5.81E-12	3.71E-07
~Benzo[b]fluoranthene	4.90E-08	4.79E-09	8.42E-13	5.37E-08
~Benzo[k]fluoranthene	1.47E-09	1.44E-10	2.53E-13	1.61E-09
~Chrysene	1.06E-09	1.04E-10	1.82E-13	1.16E-09
~Indeno[1,2,3-cd]pyrene	2.07E-08	2.03E-09	3.56E-13	2.27E-08
Total	4.79E-07	4.70E-08	8.64E-12	5.26E-07

Child Residential Exposure Scenario - Mutagenic Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8ft bgs); Cal/EPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
For all chemicals	NA	6.71E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
~Benz[a]anthracene	NA	6.57E-07
~Benzo[a]pyrene	NA	6.57E-07
~Benzo[b]fluoranthene	NA	6.57E-07
~Benzo[k]fluoranthene	NA	6.57E-07
~Chrysene	NA	6.57E-07
~Indeno[1,2,3-cd]pyrene	NA	6.57E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
~Benz[a]anthracene	NA	7.66E-10
~Benzo[a]pyrene	NA	7.66E-07
~Benzo[b]fluoranthene	NA	7.66E-07
~Benzo[k]fluoranthene	NA	7.66E-07
~Chrysene	NA	7.66E-07
~Indeno[1,2,3-cd]pyrene	NA	7.66E-07

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	1.14E-07	1.12E-08	1.20E-12	1.25E-07
~Benzo[a]pyrene	5.55E-07	5.44E-08	5.81E-09	6.15E-07
~Benzo[b]fluoranthene	8.05E-08	7.88E-09	8.43E-10	8.92E-08
~Benzo[k]fluoranthene	2.41E-08	2.36E-09	2.53E-10	2.68E-08
~Chrysene	1.74E-08	1.70E-09	1.82E-10	1.93E-08
~Indeno[1,2,3-cd]pyrene	3.40E-08	3.33E-09	3.56E-10	3.77E-08
Total	8.26E-07	8.09E-08	7.45E-09	9.14E-07

Child Recreational Exposure Scenario - Mutagenic Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8ft bgs); USEPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	NA	4.79E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
~Benz[a]anthracene	NA	4.69E-07
~Benzo[a]pyrene	NA	4.69E-07
~Benzo[b]fluoranthene	NA	4.69E-07
~Benzo[k]fluoranthene	NA	4.69E-07
~Chrysene	NA	4.69E-07
~Indeno[1,2,3-cd]pyrene	NA	4.69E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens	**Carcinogens (kg/m3)**
~Benz[a]anthracene	NA	5.70E-11
~Benzo[a]pyrene	NA	5.70E-11
~Benzo[b]fluoranthene	NA	5.70E-11
~Benzo[k]fluoranthene	NA	5.70E-11
~Chrysene	NA	5.70E-11
~Indeno[1,2,3-cd]pyrene	NA	5.70E-11

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	4.97E-08	4.86E-09	8.90E-14	5.45E-08
~Benzo[a]pyrene	2.41E-07	2.36E-08	4.32E-13	2.65E-07
~Benzo[b]fluoranthene	3.50E-08	3.42E-09	6.27E-14	3.84E-08
~Benzo[k]fluoranthene	1.05E-09	1.03E-10	1.88E-14	1.15E-09
~Chrysene	7.55E-10	7.40E-11	1.35E-14	8.29E-10
~Indeno[1,2,3-cd]pyrene	1.48E-08	1.45E-09	2.65E-14	1.62E-08
Total	3.42E-07	3.35E-08	6.43E-13	3.76E-07

Child Recreational Exposure Scenario - Mutagenic Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8ft bgs); Cal/EPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
For all chemicals	NA	4.79E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
~Benz[a]anthracene	NA	4.69E-07
~Benzo[a]pyrene	NA	4.69E-07
~Benzo[b]fluoranthene	NA	4.69E-07
~Benzo[k]fluoranthene	NA	4.69E-07
~Chrysene	NA	4.69E-07
~Indeno[1,2,3-cd]pyrene	NA	4.69E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens	Carcinogens (kg/m3)
~Benz[a]anthracene	NA	5.70E-11
~Benzo[a]pyrene	NA	5.70E-11
~Benzo[b]fluoranthene	NA	5.70E-11
~Benzo[k]fluoranthene	NA	5.70E-11
~Chrysene	NA	5.70E-11
~Indeno[1,2,3-cd]pyrene	NA	5.70E-11

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	8.16E-08	7.99E-09	8.90E-14	8.96E-08
~Benzo[a]pyrene	3.97E-07	3.88E-08	4.32E-13	4.35E-07
~Benzo[b]fluoranthene	5.75E-08	5.63E-09	6.27E-14	6.31E-08
~Benzo[k]fluoranthene	1.72E-08	1.69E-09	1.88E-14	1.89E-08
~Chrysene	1.24E-08	1.22E-09	1.35E-14	1.36E-08
~Indeno[1,2,3-cd]pyrene	2.43E-08	2.38E-09	2.65E-14	2.67E-08
Total	5.90E-07	5.78E-08	6.43E-13	6.47E-07

Subarea 1 Inhalation of ambient air for the Resident adult and child - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	1.4E-02	350	30	1.00	10950	25550	8.6E-06	8.28E-10
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	NA	0.0E+00	6.0E-02	350	30	1.00	10950	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	6.0E-03	350	30	1.00	10950	25550	1.6E-05	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	350	30	1.00	10950	25550	9.5E-09	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	1.4E-02	350	30	1.00	10950	25550	1.5E-05	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	2.1E-01	350	30	1.00	10950	25550	2.5E-09	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	350	30	1.00	10950	25550	2.2E-09	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	2.9E-05	3.0E-02	350	30	1.00	10950	25550	1.3E-03	4.91E-07
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	8.3E-07	1.0E+01	350	30	1.00	10950	25550	8.6E-09	3.06E-11
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	350	30	1.00	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	1.8E-06	9.0E-02	350	30	1.00	10950	25550	2.7E-07	1.86E-11
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	3.5E-02	350	30	1.00	10950	25550	1.3E-06	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	350	30	1.00	10950	25550	3.5E-05	3.80E-08
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	1.4E-01	350	30	1.00	10950	25550	1.4E-09	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	350	30	1.00	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	350	30	1.00	10950	25550	5.6E-04	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	350	30	1.00	10950	25550	2.1E-08	6.91E-12
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	350	30	1.00	10950	25550	2.3E-04	9.85E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.4E-01	350	30	1.00	10950	25550	9.7E-08	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.4E-01	350	30	1.00	10950	25550	1.9E-06	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	1.1E-01	350	30	1.00	10950	25550	2.7E-10	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.4E-01	350	30	1.00	10950	25550	4.5E-07	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.4E-01	350	30	1.00	10950	25550	3.0E-07	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	5.9E-06	3.5E-02	350	30	1.00	10950	25550	6.0E-06	5.35E-10
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	3.0E-01	350	30	1.00	10950	25550	3.6E-04	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	350	30	1.00	10950	25550	4.2E-05	1.49E-10
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	350	30	1.00	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	350	30	1.00	10950	25550	1.0E-03	NA

Total	3.60E-03	5.40E-07

Subarea 1 Inhalation of ambient air for the Resident adult and child - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	2.0E-04	350	30	1.00	10950	25550	6.0E-04	8.28E-10
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	#VALUE!	2.6E-05	7.0E-03	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	#VALUE!	0.0E+00	6.0E-02	350	30	1.00	10950	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	350	30	1.00	10950	25550	9.5E-09	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	350	30	1.00	10950	25550	2.2E-09	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	7.8E-06	3.0E-02	350	30	1.00	10950	25550	1.3E-03	1.32E-07
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	0.0E+00	1.0E+01	350	30	1.00	10950	25550	8.6E-09	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	350	30	1.00	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	0.0E+00	9.0E-02	350	30	1.00	10950	25550	2.7E-07	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	350	30	1.00	10950	25550	3.5E-05	3.80E-08
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	#VALUE!	1.1E-05	3.0E-02	350	30	1.00	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	350	30	1.00	10950	25550	5.6E-04	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	350	30	1.00	10950	25550	2.1E-08	6.91E-12
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	350	30	1.00	10950	25550	2.3E-04	9.85E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.0E+00	350	30	1.00	10950	25550	1.4E-08	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.0E+00	350	30	1.00	10950	25550	2.6E-07	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.0E+00	350	30	1.00	10950	25550	6.3E-08	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.0E+00	350	30	1.00	10950	25550	4.3E-08	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	2.6E-07	4.0E-02	350	30	1.00	10950	25550	5.3E-06	2.36E-11
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	5.0E+00	350	30	1.00	10950	25550	2.1E-05	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	350	30	1.00	10950	25550	4.2E-05	1.49E-10
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	#VALUE!	0.0E+00	2.0E-01	350	30	1.00	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	350	30	1.00	10950	25550	1.0E-03	NA

Total	3.83E-03	1.81E-07

(1) based on properties for trans-1,2-DCE.

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
Silver	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Xylenes	3.60E-05	1.29E-05
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.29E-05	4.41E-06	6.41E-10	1.73E-05	3.97E-01	1.36E-01	1.18E-06	5.33E-01
Ethylbenzene	1.92E-11	NA	1.65E-10	1.85E-10	4.89E-08	0.00E+00	1.85E-07	2.34E-07
Iron	NA	NA	NA	0.00E+00	1.79E-02	0.00E+00	NA	1.79E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.14E-06	1.30E-06	2.91E-10	2.44E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.09E-05	1.05E-04	NA	1.76E-04
Silver	NA	NA	NA	0.00E+00	2.74E-04	0.00E+00	NA	2.74E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.10E-07	0.00E+00	1.55E-05	1.57E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.29E-05	4.41E-06	8.36E-10	1.73E-05	4.15E-01	1.36E-01	1.86E-05	5.51E-01

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Occupational Exposure Scenario - Calculation of Risk Due to Soil Co
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	9.78E-07	3.49E-07

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	1.45E-06	5.18E-07
Phenanthrene	1.45E-06	5.18E-07
Perylene	1.45E-06	5.18E-07
Benzo(g,h,i)perylene	1.45E-06	5.18E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	1.12E-06	3.98E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Acenaphthene	1.45E-06	5.18E-07
~Anthracene	1.45E-06	5.18E-07
~Benz[a]anthracene	1.45E-06	5.18E-07
~Benzo[a]pyrene	1.45E-06	5.18E-07
~Benzo[b]fluoranthene	1.45E-06	5.18E-07
~Benzo[k]fluoranthene	1.45E-06	5.18E-07
~Chrysene	1.45E-06	5.18E-07
~Fluoranthene	1.45E-06	5.18E-07
~Fluorene	1.45E-06	5.18E-07
~Indeno[1,2,3-cd]pyrene	1.45E-06	5.18E-07
~Methylnaphthalene, 1-	1.45E-06	5.18E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
~Naphthalene	1.45E-06	5.18E-07
~Pyrene	1.45E-06	5.18E-07
Propyl benzene	1.12E-06	3.98E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Acetone	1.54E-05	5.49E-06
sec-Butylbenzene	1.66E-10	5.94E-11
tert-Butylbenzene	1.66E-10	5.94E-11
4-Isopropyltoluene	1.66E-10	5.94E-11
Acenaphthylene	1.50E-06	5.35E-07
Phenanthrene	1.66E-10	5.94E-11
Perylene	1.66E-10	5.94E-11
Benzo(g,h,i)perylene	1.66E-10	5.94E-11
Aluminum	1.66E-10	5.94E-11
Antimony	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Benzene	5.93E-05	2.12E-05
Beryllium	1.66E-10	5.94E-11
Biphenyl, 1,1'-	1.84E-06	6.56E-07
Butylbenzene, n-	2.58E-05	9.20E-06
Carbon Disulfide	1.79E-04	6.41E-05
Chloroform	7.99E-05	2.85E-05
Chlorotoluene, o-	2.59E-05	9.24E-06
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Cumene	3.38E-05	1.21E-05
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
Iron	1.66E-10	5.94E-11
MCPP	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Mercury	1.66E-10	5.94E-11
MTBE	4.28E-05	1.53E-05
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Acenaphthene	1.50E-06	5.35E-07
~Anthracene	4.02E-07	1.43E-07
~Benz[a]anthracene	1.66E-10	5.94E-11
~Benzo[a]pyrene	1.66E-10	5.94E-11
~Benzo[b]fluoranthene	1.66E-10	5.94E-11
~Benzo[k]fluoranthene	1.66E-10	5.94E-11
~Chrysene	1.66E-10	5.94E-11
~Fluoranthene	1.66E-10	5.94E-11
~Fluorene	7.46E-07	2.66E-07
~Indeno[1,2,3-cd]pyrene	1.66E-10	5.94E-11
~Methylnaphthalene, 1-	3.58E-06	1.28E-06
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
~Naphthalene	4.53E-06	1.62E-06
~Pyrene	1.66E-10	5.94E-11
Propyl benzene	3.00E-05	1.07E-05
Silver	1.66E-10	5.94E-11
Styrene	2.24E-05	7.99E-06
Thallium	1.66E-10	5.94E-11
Toluene	4.90E-05	1.75E-05
Trimethylbenzene, 1,2,4-	2.65E-05	9.47E-06
Trimethylbenzene, 1,3,5-	3.17E-05	1.13E-05
Vanadium	1.66E-10	5.94E-11
Xylene, m-	3.84E-05	1.37E-05
Zinc	1.66E-10	5.94E-11

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	1.52E-08	0.00E+00	6.94E-09	2.22E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.58E-05	0.00E+00	NA	6.58E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.77E-05	0.00E+00	NA	1.77E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.64E-05	0.00E+00	6.98E-10	1.64E-05
Acenaphthylene	NA	NA	NA	0.00E+00	3.02E-07	4.47E-07	NA	7.49E-07
Phenanthrene	NA	NA	NA	0.00E+00	1.09E-06	1.61E-06	NA	2.70E-06
Perylene	NA	NA	NA	0.00E+00	2.28E-07	3.38E-07	NA	5.67E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.08E-07	1.60E-07	NA	2.67E-07
Aluminum	NA	NA	NA	0.00E+00	6.13E-03	0.00E+00	2.08E-04	6.34E-03
Antimony	NA	NA	NA	0.00E+00	4.16E-02	0.00E+00	NA	4.16E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	5.90E-08	NA	5.07E-07	5.66E-07	7.51E-04	0.00E+00	6.07E-03	6.82E-03
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Biphenyl, 1,1'-	7.55E-11	NA	NA	7.55E-11	5.28E-07	0.00E+00	1.24E-04	1.25E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.76E-04	0.00E+00	NA	1.76E-04
Carbon Disulfide	NA	NA	NA	0.00E+00	6.46E-08	0.00E+00	1.69E-06	1.76E-06
Chloroform	7.01E-09	NA	4.24E-07	4.31E-07	6.33E-05	0.00E+00	5.27E-04	5.91E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.57E-04	0.00E+00	NA	1.57E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.64E-05	0.00E+00	5.74E-04	6.41E-04
Dioxin TEQ	7.04E-06	2.41E-06	3.50E-10	9.45E-06	2.17E-01	7.41E-02	6.44E-07	2.91E-01
Ethylbenzene	9.82E-08	NA	8.45E-07	9.43E-07	2.50E-04	0.00E+00	9.46E-04	1.20E-03
Iron	NA	NA	NA	0.00E+00	2.52E-02	0.00E+00	NA	2.52E-02
MCPP	NA	NA	NA	0.00E+00	3.63E-01	4.14E-01	NA	7.77E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.38E-12	NA	8.75E-12	1.01E-11	NA	NA	3.14E-08	3.14E-08
Molybdenum	NA	NA	NA	0.00E+00	7.44E-04	0.00E+00	NA	7.44E-04
Nickel	NA	NA	2.28E-09	2.28E-09	7.24E-03	0.00E+00	2.73E-04	7.51E-03
Phenol	NA	NA	NA	0.00E+00	2.02E-06	2.30E-06	5.14E-10	4.32E-06
~Acenaphthene	NA	NA	NA	0.00E+00	4.03E-07	5.97E-07	NA	1.00E-06
~Anthracene	NA	NA	NA	0.00E+00	7.76E-08	1.15E-07	NA	1.93E-07
~Benz[a]anthracene	3.62E-09	5.37E-09	9.27E-14	8.99E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	1.76E-08	2.61E-08	4.51E-13	4.37E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	2.55E-09	3.78E-09	6.53E-14	6.33E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	7.65E-11	1.13E-10	1.96E-14	1.90E-10	NA	NA	NA	0.00E+00
~Chrysene	5.51E-11	8.17E-11	1.41E-14	1.37E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.92E-07	8.77E-07	NA	1.47E-06
~Fluorene	NA	NA	NA	0.00E+00	1.60E-06	2.37E-06	NA	3.97E-06
~Indeno[1,2,3-cd]pyrene	1.08E-09	1.60E-09	2.76E-14	2.68E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.34E-09	4.96E-09	NA	8.30E-09	4.61E-06	6.84E-06	NA	1.14E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.58E-04	9.75E-04	NA	1.63E-03
~NAphthalene	NA	NA	5.34E-07	5.34E-07	4.75E-04	7.03E-04	1.46E-02	1.58E-02
~Pyrene	NA	NA	NA	0.00E+00	2.82E-06	4.18E-06	NA	7.00E-06
Propyl benzene	NA	NA	NA	0.00E+00	2.41E-04	2.75E-04	7.40E-04	1.26E-03
Silver	NA	NA	NA	0.00E+00	2.54E-04	0.00E+00	NA	2.54E-04
Styrene	NA	NA	NA	0.00E+00	3.38E-08	0.00E+00	1.54E-07	1.88E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.84E-04	0.00E+00	2.28E-04	5.13E-04
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	2.78E-01	2.78E-01
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	4.07E-03	0.00E+00	NA	4.07E-03
Vanadium	NA	NA	NA	0.00E+00	5.68E-03	0.00E+00	NA	5.68E-03
Xylene, m-	NA	NA	NA	0.00E+00	6.02E-04	0.00E+00	4.72E-02	4.78E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	7.23E-06	2.45E-06	2.31E-06	1.20E-05	6.74E-01	4.90E-01	3.50E-01	1.51E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
Silver	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Xylenes	3.60E-05	1.29E-05
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.29E-05	4.41E-06	6.41E-10	1.73E-05	3.97E-01	1.36E-01	1.18E-06	5.33E-01
Ethylbenzene	1.92E-11	NA	1.65E-10	1.85E-10	4.89E-08	0.00E+00	1.85E-07	2.34E-07
Iron	NA	NA	NA	0.00E+00	1.79E-02	0.00E+00	NA	1.79E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.14E-06	1.30E-06	2.91E-10	2.44E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.09E-05	1.05E-04	NA	1.76E-04
Silver	NA	NA	NA	0.00E+00	2.74E-04	0.00E+00	NA	2.74E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.10E-07	0.00E+00	1.55E-05	1.57E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.29E-05	4.41E-06	8.36E-10	1.73E-05	4.15E-01	1.36E-01	1.86E-05	5.51E-01

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)

FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)

BW = Body weight (kg)
AT = Averaging time (days)

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	9.78E-07	3.49E-07

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	1.45E-06	5.18E-07
Phenanthrene	1.45E-06	5.18E-07
Perylene	1.45E-06	5.18E-07
Benzo(g,h,i)perylene	1.45E-06	5.18E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	1.12E-06	3.98E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Acenaphthene	1.45E-06	5.18E-07
~Anthracene	1.45E-06	5.18E-07
~Benz[a]anthracene	1.45E-06	5.18E-07
~Benzo[a]pyrene	1.45E-06	5.18E-07
~Benzo[b]fluoranthene	1.45E-06	5.18E-07
~Benzo[k]fluoranthene	1.45E-06	5.18E-07
~Chrysene	1.45E-06	5.18E-07
~Fluoranthene	1.45E-06	5.18E-07
~Fluorene	1.45E-06	5.18E-07
~Indeno[1,2,3-cd]pyrene	1.45E-06	5.18E-07
~Methylnaphthalene, 1-	1.45E-06	5.18E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
~Naphthalene	1.45E-06	5.18E-07
~Pyrene	1.45E-06	5.18E-07
Propyl benzene	1.12E-06	3.98E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	1.54E-05	5.49E-06
sec-Butylbenzene	1.66E-10	5.94E-11
tert-Butylbenzene	1.66E-10	5.94E-11
4-Isopropyltoluene	1.66E-10	5.94E-11
Acenaphthylene	1.50E-06	5.35E-07
Phenanthrene	1.66E-10	5.94E-11
Perylene	1.66E-10	5.94E-11
Benzo(g,h,i)perylene	1.66E-10	5.94E-11
Aluminum	1.66E-10	5.94E-11
Antimony	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Benzene	5.93E-05	2.12E-05
Beryllium	1.66E-10	5.94E-11
Biphenyl, 1,1'-	1.84E-06	6.56E-07
Butylbenzene, n-	2.58E-05	9.20E-06
Carbon Disulfide	1.79E-04	6.41E-05
Chloroform	7.99E-05	2.85E-05
Chlorotoluene, o-	2.59E-05	9.24E-06
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Cumene	3.38E-05	1.21E-05
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
Iron	1.66E-10	5.94E-11
MCPP	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Mercury	1.66E-10	5.94E-11
MTBE	4.28E-05	1.53E-05
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Acenaphthene	1.50E-06	5.35E-07
~Anthracene	4.02E-07	1.43E-07
~Benz[a]anthracene	1.66E-10	5.94E-11
~Benzo[a]pyrene	1.66E-10	5.94E-11
~Benzo[b]fluoranthene	1.66E-10	5.94E-11
~Benzo[k]fluoranthene	1.66E-10	5.94E-11
~Chrysene	1.66E-10	5.94E-11
~Fluoranthene	1.66E-10	5.94E-11
~Fluorene	7.46E-07	2.66E-07
~Indeno[1,2,3-cd]pyrene	1.66E-10	5.94E-11
~Methylnaphthalene, 1-	3.58E-06	1.28E-06
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
~Naphthalene	4.53E-06	1.62E-06
~Pyrene	1.66E-10	5.94E-11
Propyl benzene	3.00E-05	1.07E-05
Silver	1.66E-10	5.94E-11
Styrene	2.24E-05	7.99E-06
Thallium	1.66E-10	5.94E-11
Toluene	4.90E-05	1.75E-05
Trimethylbenzene, 1,2,4-	2.65E-05	9.47E-06
Trimethylbenzene, 1,3,5-	3.17E-05	1.13E-05
Vanadium	1.66E-10	5.94E-11
Xylene, m-	3.84E-05	1.37E-05
Zinc	1.66E-10	5.94E-11

Occupational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	Ingestion	Dermal	Inhalation	Total	Ingestion	Dermal	Inhalation	Total
Acetone	NA	NA	NA	0.00E+00	1.52E-08	0.00E+00	6.94E-09	2.22E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.58E-05	0.00E+00	3.99E-09	6.58E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.77E-05	0.00E+00	1.07E-09	1.77E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.64E-05	0.00E+00	6.98E-10	1.64E-05
Acenaphthylene	NA	NA	NA	0.00E+00	3.02E-07	4.47E-07	1.32E-07	8.81E-07
Phenanthrene	NA	NA	NA	0.00E+00	1.09E-06	1.61E-06	5.05E-11	2.70E-06
Perylene	NA	NA	NA	0.00E+00	2.28E-07	3.38E-07	1.06E-11	5.67E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.08E-07	1.60E-07	4.99E-12	2.67E-07
Aluminum	NA	NA	NA	0.00E+00	6.13E-03	0.00E+00	2.08E-04	6.34E-03
Antimony	NA	NA	NA	0.00E+00	4.16E-02	0.00E+00	NA	4.16E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.07E-07	NA	1.89E-06	1.99E-06	7.51E-04	0.00E+00	6.07E-03	6.82E-03
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Biphenyl, 1,1'-	7.55E-11	NA	4.08E-11	1.16E-10	5.28E-07	0.00E+00	2.76E-07	8.04E-07
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.76E-04	0.00E+00	1.66E-03	1.83E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	6.46E-08	0.00E+00	1.69E-06	1.76E-06
Chloroform	7.01E-09	NA	9.78E-08	1.05E-07	6.33E-05	0.00E+00	5.27E-04	5.91E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.57E-04	0.00E+00	1.18E-03	1.34E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.64E-05	0.00E+00	5.74E-04	6.41E-04
Dioxin TEQ	7.04E-06	2.41E-06	3.50E-10	9.45E-06	2.17E-01	7.41E-02	6.44E-07	2.91E-01
Ethylbenzene	9.82E-08	NA	8.45E-07	9.43E-07	2.50E-04	0.00E+00	9.46E-04	1.20E-03
Iron	NA	NA	NA	0.00E+00	2.52E-02	0.00E+00	NA	2.52E-02
MCPP	NA	NA	NA	0.00E+00	3.63E-01	4.14E-01	1.76E-05	7.77E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.38E-12	NA	8.75E-12	1.01E-11	NA	NA	3.14E-08	3.14E-08
Molybdenum	NA	NA	NA	0.00E+00	7.44E-04	0.00E+00	NA	7.44E-04
Nickel	NA	NA	2.28E-09	2.28E-09	7.24E-03	0.00E+00	4.92E-04	7.73E-03
Phenol	NA	NA	NA	0.00E+00	2.02E-06	2.30E-06	5.14E-10	4.32E-06
~Acenaphthene	NA	NA	NA	0.00E+00	4.03E-07	5.97E-07	1.76E-07	1.18E-06
~Anthracene	NA	NA	NA	0.00E+00	7.76E-08	1.15E-07	8.69E-09	2.01E-07
~Benz[a]anthracene	5.95E-09	8.82E-09	9.27E-14	1.48E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	2.89E-08	4.29E-08	4.51E-13	7.18E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	4.19E-09	6.21E-09	6.53E-14	1.04E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.26E-09	1.86E-09	1.96E-14	3.12E-09	NA	NA	NA	0.00E+00
~Chrysene	9.06E-10	1.34E-09	1.41E-14	2.25E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.92E-07	8.77E-07	NA	1.47E-06
~Fluorene	NA	NA	NA	0.00E+00	1.60E-06	2.37E-06	3.49E-07	4.32E-06
~Indeno[1,2,3-cd]pyrene	1.77E-09	2.63E-09	2.76E-14	4.40E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.34E-09	4.96E-09	3.50E-09	1.18E-08	4.61E-06	6.84E-06	4.73E-06	1.62E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.58E-04	9.75E-04	NA	1.63E-03
~NAphthalene	NA	NA	5.34E-07	5.34E-07	4.75E-04	7.03E-04	1.46E-02	1.58E-02
~Pyrene	NA	NA	NA	0.00E+00	2.82E-06	4.18E-06	1.31E-10	7.00E-06
Propyl benzene	NA	NA	NA	0.00E+00	2.41E-04	2.75E-04	5.29E-03	5.80E-03
Silver	NA	NA	NA	0.00E+00	2.54E-04	0.00E+00	NA	2.54E-04
Styrene	NA	NA	NA	0.00E+00	3.38E-08	0.00E+00	1.72E-07	2.05E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.84E-04	0.00E+00	3.80E-03	4.09E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	2.78E-01	2.78E-01
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	4.07E-03	0.00E+00	2.20E-01	2.24E-01
Vanadium	NA	NA	NA	0.00E+00	5.68E-03	0.00E+00	NA	5.68E-03
Xylene, m-	NA	NA	NA	0.00E+00	6.02E-04	0.00E+00	4.72E-02	4.78E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	7.30E-06	2.48E-06	3.37E-06	1.31E-05	6.74E-01	4.90E-01	5.81E-01	1.75E+00

Subarea 1 Inhalation of ambient air for Occupational Worker - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	2.0E-04	250	25	0.33	9125	25550	1.4E-04	1.64E-10
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	#VALUE!	2.6E-05	7.0E-03	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	#VALUE!	0.0E+00	6.0E-02	250	25	0.33	9125	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	250	25	0.33	9125	25550	2.3E-09	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	250	25	0.33	9125	25550	5.3E-10	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	7.8E-06	3.0E-02	250	25	0.33	9125	25550	3.1E-04	2.62E-08
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	0.0E+00	1.0E+01	250	25	0.33	9125	25550	2.1E-09	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	250	25	0.33	9125	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	0.0E+00	9.0E-02	250	25	0.33	9125	25550	6.4E-08	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	250	25	0.33	9125	25550	8.4E-06	7.53E-09
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	#VALUE!	1.1E-05	3.0E-02	250	25	0.33	9125	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	250	25	0.33	9125	25550	1.3E-04	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	250	25	0.33	9125	25550	4.9E-09	1.37E-12
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	250	25	0.33	9125	25550	5.4E-05	1.95E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.0E+00	250	25	0.33	9125	25550	3.2E-09	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.0E+00	250	25	0.33	9125	25550	6.3E-08	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.0E+00	250	25	0.33	9125	25550	1.5E-08	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.0E+00	250	25	0.33	9125	25550	1.0E-08	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	2.6E-07	4.0E-02	250	25	0.33	9125	25550	1.3E-06	4.68E-12
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	5.0E+00	250	25	0.33	9125	25550	5.1E-06	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	250	25	0.33	9125	25550	1.0E-05	2.95E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	#VALUE!	0.0E+00	2.0E-01	250	25	0.33	9125	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	250	25	0.33	9125	25550	2.4E-04	NA

Total	9.11E-04	3.59E-08

Subarea 1 Inhalation of ambient air for Occupational Worker - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	1.4E-02	250	25	0.33	9125	25550	2.1E-06	1.64E-10
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	#VALUE!	2.1E-05	4.0E-01	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	#VALUE!	0.0E+00	6.0E-02	250	25	0.33	9125	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	6.0E-03	250	25	0.33	9125	25550	3.7E-06	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	250	25	0.33	9125	25550	2.3E-09	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	1.4E-02	250	25	0.33	9125	25550	3.7E-06	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	2.1E-01	250	25	0.33	9125	25550	6.0E-10	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	250	25	0.33	9125	25550	5.3E-10	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	2.9E-05	3.0E-02	250	25	0.33	9125	25550	3.1E-04	9.74E-08
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	8.3E-07	1.0E+01	250	25	0.33	9125	25550	2.1E-09	6.08E-12
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	250	25	0.33	9125	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	1.8E-06	9.0E-02	250	25	0.33	9125	25550	6.4E-08	3.70E-12
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	3.5E-02	250	25	0.33	9125	25550	3.2E-07	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	250	25	0.33	9125	25550	8.4E-06	7.53E-09
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	1.4E-01	250	25	0.33	9125	25550	3.3E-10	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	#VALUE!	1.1E-05	3.5E-03	250	25	0.33	9125	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	250	25	0.33	9125	25550	1.3E-04	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	250	25	0.33	9125	25550	4.9E-09	1.37E-12
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	250	25	0.33	9125	25550	5.4E-05	1.95E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.4E-01	250	25	0.33	9125	25550	2.3E-08	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.4E-01	250	25	0.33	9125	25550	4.5E-07	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	1.1E-01	250	25	0.33	9125	25550	6.4E-11	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.4E-01	250	25	0.33	9125	25550	1.1E-07	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.4E-01	250	25	0.33	9125	25550	7.2E-08	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	5.9E-06	3.5E-02	250	25	0.33	9125	25550	1.4E-06	1.06E-10
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	3.0E-01	250	25	0.33	9125	25550	8.5E-05	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	250	25	0.33	9125	25550	1.0E-05	2.95E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	#VALUE!	0.0E+00	2.0E-01	250	25	0.33	9125	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	250	25	0.33	9125	25550	2.4E-04	NA

Total	8.58E-04	1.07E-07

Subarea 1 - Residential Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,2-Trichloro-1,2,2-trifluoroethane	2.5	NA	1.4E-07
Benzene	310000	6.5E-03	1.8E+01
Carbon disulfide	6.4	NA	1.6E-05
Chloroform	84.6	3.4E-07	5.0E-04
Ethylbenzene	140000	2.4E-04	2.3E-01
Methylene chloride	7.6	5.7E-09	3.3E-05
Methylethylketone (2-butanone)	11	NA	3.6E-06
MTBE	0.87	1.7E-10	5.1E-07
Xylene	420000	NA	7.1E+00
Tetrachloroethylene	12.44	5.0E-08	5.7E-04
Toluene	350000	NA	2.0E+00
Trichloroethylene	8.4	2.4E-08	6.9E-03
Trichlorofluoromethane	67	NA	1.6E-04
Total		6.8E-03	2.7E+01

Subarea 1 - Residential USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,2-Trichloro-1,2,2-trifluoroethane	2.5	NA	1.4E-07
Benzene	310000	1.8E-03	1.8E+01
Carbon disulfide	6.4	NA	1.6E-05
Chloroform	84.6	1.5E-06	1.5E-03
Ethylbenzene	140000	2.4E-04	2.3E-01
Methylene chloride	7.6	2.7E-09	1.3E-05
Methylethylketone (2-butanone)	11	NA	3.6E-06
MTBE	0.87	1.7E-10	5.1E-07
Xylene	420000	NA	7.1E+00
Tetrachloroethylene	12.44	2.2E-09	5.0E-04
Toluene	350000	NA	1.2E-01
Trichloroethylene	8.4	2.4E-08	6.9E-03
Trichlorofluoromethane	67	NA	1.6E-04
Total		2.0E-03	2.5E+01

Subarea 1 - Occupational Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,2-Trichloro-1,2,2-trifluoroethane	2.5	NA	9.7E-08
Benzene	310000	3.9E-03	1.3E+01
Carbon disulfide	6.4	NA	1.2E-05
Chloroform	84.6	2.0E-07	3.6E-04
Ethylbenzene	140000	1.4E-04	1.6E-01
Methylene chloride	7.6	3.4E-09	2.4E-05
Methylethylketone (2-butanone)	11	NA	2.6E-06
MTBE	0.87	1.0E-10	3.7E-07
Xylene	420000	NA	5.1E+00
Tetrachloroethylene	12.44	3.0E-08	4.1E-04
Toluene	350000	NA	1.4E+00
Trichloroethylene	8.4	1.4E-08	4.9E-03
Trichlorofluoromethane	67	NA	1.2E-04
Total		4.0E-03	1.9E+01

Subarea 1 - Occupational USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
MTBE	0.87	1.0E-10	3.7E-07
1,1,2-Trichloro-1,2,2-trifluoroethane	2.5	NA	9.7E-08
Carbon disulfide	6.4	NA	1.2E-05
Methylene chloride	7.6	1.6E-09	9.6E-06
Trichloroethylene	8.4	1.4E-08	4.9E-03
Methylethylketone (2-butanone)	11	NA	2.6E-06
Tetrachloroethylene	12.44	1.3E-09	3.6E-04
Trichlorofluoromethane	67	NA	1.2E-04
Chloroform	84.6	8.8E-07	1.1E-03
Ethylbenzene	140000	1.4E-04	1.6E-01
Benzene	310000	1.0E-03	1.3E+01
Toluene	350000	NA	8.5E-02
Xylene	420000	NA	5.1E+00
Total		1.2E-03	1.8E+01

Subarea 1 Residential Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
1,1,2-Trichloroethane	31	7.9E-07	8.3E-03
1,3,5-Trimethylbenzene	6.7	NA	1.5E-02
2-Methylnaphthalene	99	NA	1.4E-02
Acenaphthene	0.4	NA	2.2E-06
Acetone	45	NA	1.6E-06
Benzene	2100	4.8E-04	1.3E+00
Chloroethane (ethyl chloride)	1	2.9E-08	8.0E-06
cis-1,2-Dichloroethylene	3.8	NA	1.3E-03
Cumene (isopropylbenzene0	84	NA	5.4E-01
Ethylbenzene	1600	3.7E-05	3.4E-02
Fluorene	0.2	NA	1.1E-06
Methylene chloride	0.6	2.4E-09	1.4E-05
Methylethylketone (2-butanone)	35	NA	7.6E-06
MTBE	16	6.6E-09	2.0E-05
Naphthalene	310	9.2E-06	2.1E-01
n-Butylbenzene	0.49	NA	9.4E-05
n-Propylbenzene	11	NA	1.8E-03
o-Xylene	5800	NA	9.8E-01
Pyrene	0.1	NA	2.0E-07
sec-Butylbenzene	2.1	NA	2.6E-04
tert-Butylbenzene	1.7	NA	3.0E-04
Tetrachloroethylene	4.4	5.2E-07	5.9E-03
Toluene	4900	NA	3.5E-01
Trichloroethylene	2.8	1.5E-07	4.1E-02
Total		5.3E-04	3.5E+00

Subarea 1 Residential USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
1,1,2-Trichloroethane	31	7.9E-07	5.8E-01
1,3,5-Trimethylbenzene	6.7	NA	NA
2-Methylnaphthalene	99	NA	NA
Acenaphthene	0.4	NA	NA
Acetone	45	NA	1.6E-06
Benzene	2100	1.3E-04	1.3E+00
Chloroethane (ethyl chloride)	1	NA	8.0E-06
cis-1,2-Dichloroethylene	3.8	NA	NA
Cumene (isopropylbenzene0	84	NA	5.4E-01
Ethylbenzene	1600	3.7E-05	3.4E-02
Fluorene	0.2	NA	NA
Methylene chloride	0.6	2.4E-09	1.4E-05
Methylethylketone (2-butanone)	35	NA	7.6E-06
MTBE	16	6.6E-09	2.0E-05
Naphthalene	310	9.2E-06	2.1E-01
n-Butylbenzene	0.49	NA	1.3E-05
n-Propylbenzene	11	NA	2.6E-04
o-Xylene	5800	NA	9.8E-01
Pyrene	0.1	NA	NA
sec-Butylbenzene	2.1	NA	3.6E-05
tert-Butylbenzene	1.7	NA	4.2E-05
Tetrachloroethylene	4.4	2.3E-08	5.2E-03
Toluene	4900	NA	2.1E-02
Trichloroethylene	2.8	1.5E-07	4.1E-02
Total		1.8E-04	3.7E+00

Subarea 1 Occupational Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
1,1,2-Trichloroethane	31	4.7E-07	5.9E-03
1,3,5-Trimethylbenzene	6.7	NA	1.1E-02
2-Methylnaphthalene	99	NA	1.0E-02
Acenaphthene	0.4	NA	1.6E-06
Acetone	45	NA	1.1E-06
Benzene	2100	2.9E-04	9.2E-01
Chloroethane (ethyl chloride)	1	1.7E-08	5.7E-06
cis-1,2-Dichloroethylene	3.8	NA	9.4E-04
Cumene (isopropylbenzene0	84	NA	3.9E-01
Ethylbenzene	1600	2.2E-05	2.5E-02
Fluorene	0.2	NA	8.1E-07
Methylene chloride	0.6	1.4E-09	1.0E-05
Methylethylketone (2-butanone)	35	NA	5.4E-06
MTBE	16	3.9E-09	1.4E-05
Naphthalene	310	5.5E-06	1.5E-01
n-Butylbenzene	0.49	NA	6.7E-05
n-Propylbenzene	11	NA	1.3E-03
o-Xylene	5800	NA	7.0E-01
Pyrene	0.1	NA	1.4E-07
sec-Butylbenzene	2.1	NA	1.8E-04
tert-Butylbenzene	1.7	NA	2.1E-04
Tetrachloroethylene	4.4	3.1E-07	4.2E-03
Toluene	4900	NA	2.5E-01
Trichloroethylene	2.8	8.7E-08	3.0E-02
Total		3.1E-04	2.5E+00

Subarea 1 Occupational USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
1,1,2-Trichloroethane	31	4.7E-07	4.1E-01
1,3,5-Trimethylbenzene	6.7	NA	NA
2-Methylnaphthalene	99	NA	NA
Acenaphthene	0.4	NA	NA
Acetone	45	NA	1.1E-06
Benzene	2100	7.7E-05	9.2E-01
Chloroethane (ethyl chloride)	1	NA	5.7E-06
cis-1,2-Dichloroethylene	3.8	NA	NA
Cumene (isopropylbenzene0	84	NA	3.9E-01
Ethylbenzene	1600	2.2E-05	2.5E-02
Fluorene	0.2	NA	NA
Methylene chloride	0.6	1.4E-09	1.0E-05
Methylethylketone (2-butanone)	35	NA	5.4E-06
MTBE	16	3.9E-09	1.4E-05
Naphthalene	310	5.5E-06	1.5E-01
n-Butylbenzene	0.49	NA	9.4E-06
n-Propylbenzene	11	NA	1.8E-04
o-Xylene	5800	NA	7.0E-01
Pyrene	0.1	NA	NA
sec-Butylbenzene	2.1	NA	2.6E-05
tert-Butylbenzene	1.7	NA	3.0E-05
Tetrachloroethylene	4.4	1.4E-08	3.7E-03
Toluene	4900	NA	1.5E-02
Trichloroethylene	2.8	8.7E-08	3.0E-02
Total		1.0E-04	2.6E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
Silver	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Xylenes	1.09E-05	3.75E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.24E-05	1.48E-06	1.86E-10	1.39E-05	3.97E-01	4.75E-02	3.58E-07	4.44E-01
Ethylbenzene	1.85E-11	NA	4.81E-11	6.66E-11	4.89E-08	0.00E+00	5.61E-08	1.05E-07
Iron	NA	NA	NA	0.00E+00	1.79E-02	0.00E+00	NA	1.79E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.14E-06	4.55E-07	8.81E-11	1.60E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.09E-05	3.68E-05	NA	1.08E-04
Silver	NA	NA	NA	0.00E+00	2.74E-04	0.00E+00	NA	2.74E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.10E-07	0.00E+00	4.70E-06	4.91E-06
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.24E-05	1.48E-06	2.43E-10	1.39E-05	4.15E-01	4.76E-02	5.64E-06	4.63E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	5.08E-07	1.74E-07
Phenanthrene	5.08E-07	1.74E-07
Perylene	5.08E-07	1.74E-07
Benzo(g,h,i)perylene	5.08E-07	1.74E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.90E-07	1.34E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Acenaphthene	5.08E-07	1.74E-07
~Anthracene	5.08E-07	1.74E-07
~Benz[a]anthracene	5.08E-07	1.74E-07
~Benzo[a]pyrene	5.08E-07	1.74E-07
~Benzo[b]fluoranthene	5.08E-07	1.74E-07
~Benzo[k]fluoranthene	5.08E-07	1.74E-07
~Chrysene	5.08E-07	1.74E-07
~Fluoranthene	5.08E-07	1.74E-07
~Fluorene	5.08E-07	1.74E-07
~Indeno[1,2,3-cd]pyrene	5.08E-07	1.74E-07
~Methylnaphthalene, 1-	5.08E-07	1.74E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
~Naphthalene	5.08E-07	1.74E-07
~Pyrene	5.08E-07	1.74E-07
Propyl benzene	3.90E-07	1.34E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Acetone	4.66E-06	1.60E-06
sec-Butylbenzene	5.04E-11	1.73E-11
tert-Butylbenzene	5.04E-11	1.73E-11
4-Isopropyltoluene	5.04E-11	1.73E-11
Acenaphthylene	4.54E-07	1.56E-07
Phenanthrene	5.04E-11	1.73E-11
Perylene	5.04E-11	1.73E-11
Benzo(g,h,i)perylene	5.04E-11	1.73E-11
Aluminum	5.04E-11	1.73E-11
Antimony	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Benzene	1.80E-05	6.16E-06
Beryllium	5.04E-11	1.73E-11
Biphenyl, 1,1'-	5.57E-07	1.91E-07
Butylbenzene, n-	7.81E-06	2.68E-06
Carbon Disulfide	5.44E-05	1.86E-05
Chloroform	2.42E-05	8.30E-06
Chlorotoluene, o-	7.84E-06	2.69E-06
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Cumene	1.03E-05	3.52E-06
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
Iron	5.04E-11	1.73E-11
MCPP	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Mercury	5.04E-11	1.73E-11
MTBE	1.30E-05	4.45E-06
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Acenaphthene	4.54E-07	1.56E-07
~Anthracene	1.22E-07	4.17E-08
~Benz[a]anthracene	5.04E-11	1.73E-11
~Benzo[a]pyrene	5.04E-11	1.73E-11
~Benzo[b]fluoranthene	5.04E-11	1.73E-11
~Benzo[k]fluoranthene	5.04E-11	1.73E-11
~Chrysene	5.04E-11	1.73E-11
~Fluoranthene	5.04E-11	1.73E-11
~Fluorene	2.26E-07	7.75E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	1.73E-11
~Methylnaphthalene, 1-	1.09E-06	3.72E-07
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
~Naphthalene	1.37E-06	4.71E-07
~Pyrene	5.04E-11	1.73E-11
Propyl benzene	9.10E-06	3.12E-06
Silver	5.04E-11	1.73E-11
Styrene	6.78E-06	2.33E-06
Thallium	5.04E-11	1.73E-11
Toluene	1.49E-05	5.09E-06
Trimethylbenzene, 1,2,4-	8.04E-06	2.76E-06
Trimethylbenzene, 1,3,5-	9.62E-06	3.30E-06
Vanadium	5.04E-11	1.73E-11
Xylene, m-	1.16E-05	3.99E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	1.52E-08	0.00E+00	2.10E-09	1.73E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.58E-05	0.00E+00	NA	6.58E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.77E-05	0.00E+00	NA	1.77E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.64E-05	0.00E+00	2.12E-10	1.64E-05
Acenaphthylene	NA	NA	NA	0.00E+00	3.02E-07	1.56E-07	NA	4.58E-07
Phenanthrene	NA	NA	NA	0.00E+00	1.09E-06	5.65E-07	NA	1.65E-06
Perylene	NA	NA	NA	0.00E+00	2.28E-07	1.18E-07	NA	3.47E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.08E-07	5.58E-08	NA	1.63E-07
Aluminum	NA	NA	NA	0.00E+00	6.13E-03	0.00E+00	6.31E-05	6.19E-03
Antimony	NA	NA	NA	0.00E+00	4.16E-02	0.00E+00	NA	4.16E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	5.66E-08	NA	1.48E-07	2.04E-07	7.51E-04	0.00E+00	1.84E-03	2.59E-03
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Biphenyl, 1,1'-	7.25E-11	NA	NA	7.25E-11	5.28E-07	0.00E+00	3.76E-05	3.81E-05
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.76E-04	0.00E+00	NA	1.76E-04
Carbon Disulfide	NA	NA	NA	0.00E+00	6.46E-08	0.00E+00	5.13E-07	5.77E-07
Chloroform	6.73E-09	NA	1.23E-07	1.30E-07	6.33E-05	0.00E+00	1.60E-04	2.23E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.57E-04	0.00E+00	NA	1.57E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.64E-05	0.00E+00	1.74E-04	2.40E-04
Dioxin TEQ	6.76E-06	8.09E-07	1.02E-10	7.57E-06	2.17E-01	2.59E-02	1.95E-07	2.43E-01
Ethylbenzene	9.42E-08	NA	2.46E-07	3.40E-07	2.50E-04	0.00E+00	2.87E-04	5.37E-04
Iron	NA	NA	NA	0.00E+00	2.52E-02	0.00E+00	NA	2.52E-02
MCPP	NA	NA	NA	0.00E+00	3.63E-01	1.45E-01	NA	5.08E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.33E-12	NA	2.54E-12	3.87E-12	NA	NA	9.51E-09	9.51E-09
Molybdenum	NA	NA	NA	0.00E+00	7.44E-04	0.00E+00	NA	7.44E-04
Nickel	NA	NA	6.64E-10	6.64E-10	7.24E-03	0.00E+00	8.28E-05	7.32E-03
Phenol	NA	NA	NA	0.00E+00	2.02E-06	8.06E-07	1.56E-10	2.82E-06
~Acenaphthene	NA	NA	NA	0.00E+00	4.03E-07	2.09E-07	NA	6.12E-07
~Anthracene	NA	NA	NA	0.00E+00	7.76E-08	4.03E-08	NA	1.18E-07
~Benz[a]anthracene	3.48E-09	1.80E-09	2.70E-14	5.28E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	1.69E-08	8.76E-09	1.31E-13	2.57E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	2.45E-09	1.27E-09	1.90E-14	3.72E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	7.35E-11	3.81E-11	5.70E-15	1.12E-10	NA	NA	NA	0.00E+00
~Chrysene	5.29E-11	2.74E-11	4.10E-15	8.03E-11	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.92E-07	3.07E-07	NA	8.99E-07
~Fluorene	NA	NA	NA	0.00E+00	1.60E-06	8.30E-07	NA	2.43E-06
~Indeno[1,2,3-cd]pyrene	1.04E-09	5.37E-10	8.03E-15	1.57E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.21E-09	1.67E-09	NA	4.88E-09	4.61E-06	2.39E-06	NA	7.01E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.58E-04	3.41E-04	NA	9.99E-04
~NAphthalene	NA	NA	1.55E-07	1.55E-07	4.75E-04	2.46E-04	4.44E-03	5.16E-03
~Pyrene	NA	NA	NA	0.00E+00	2.82E-06	1.46E-06	NA	4.28E-06
Propyl benzene	NA	NA	NA	0.00E+00	2.41E-04	9.62E-05	2.24E-04	5.62E-04
Silver	NA	NA	NA	0.00E+00	2.54E-04	0.00E+00	NA	2.54E-04
Styrene	NA	NA	NA	0.00E+00	3.38E-08	0.00E+00	4.68E-08	8.06E-08
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.84E-04	0.00E+00	6.91E-05	3.54E-04
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	8.43E-02	8.43E-02
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	4.07E-03	0.00E+00	NA	4.07E-03
Vanadium	NA	NA	NA	0.00E+00	5.68E-03	0.00E+00	NA	5.68E-03
Xylene, m-	NA	NA	NA	0.00E+00	6.02E-04	0.00E+00	1.43E-02	1.49E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	6.94E-06	8.23E-07	6.73E-07	8.44E-06	6.74E-01	1.71E-01	1.06E-01	9.52E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
Silver	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Xylenes	1.09E-05	3.75E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.24E-05	1.48E-06	1.86E-10	1.39E-05	3.97E-01	4.75E-02	3.58E-07	4.44E-01
Ethylbenzene	1.85E-11	NA	4.81E-11	6.66E-11	4.89E-08	0.00E+00	5.61E-08	1.05E-07
Iron	NA	NA	NA	0.00E+00	1.79E-02	0.00E+00	NA	1.79E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.14E-06	4.55E-07	8.81E-11	1.60E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.09E-05	3.68E-05	NA	1.08E-04
Silver	NA	NA	NA	0.00E+00	2.74E-04	0.00E+00	NA	2.74E-04
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	2.10E-07	0.00E+00	4.70E-06	4.91E-06
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.24E-05	1.48E-06	2.43E-10	1.39E-05	4.15E-01	4.76E-02	5.64E-06	4.63E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)

FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)

BW = Body weight (kg)
AT = Averaging time (days)

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	5.08E-07	1.74E-07
Phenanthrene	5.08E-07	1.74E-07
Perylene	5.08E-07	1.74E-07
Benzo(g,h,i)perylene	5.08E-07	1.74E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.90E-07	1.34E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Acenaphthene	5.08E-07	1.74E-07
~Anthracene	5.08E-07	1.74E-07
~Benz[a]anthracene	5.08E-07	1.74E-07
~Benzo[a]pyrene	5.08E-07	1.74E-07
~Benzo[b]fluoranthene	5.08E-07	1.74E-07
~Benzo[k]fluoranthene	5.08E-07	1.74E-07
~Chrysene	5.08E-07	1.74E-07
~Fluoranthene	5.08E-07	1.74E-07
~Fluorene	5.08E-07	1.74E-07
~Indeno[1,2,3-cd]pyrene	5.08E-07	1.74E-07
~Methylnaphthalene, 1-	5.08E-07	1.74E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
~Naphthalene	5.08E-07	1.74E-07
~Pyrene	5.08E-07	1.74E-07
Propyl benzene	3.90E-07	1.34E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	4.66E-06	1.60E-06
sec-Butylbenzene	5.04E-11	1.73E-11
tert-Butylbenzene	5.04E-11	1.73E-11
4-Isopropyltoluene	5.04E-11	1.73E-11
Acenaphthylene	4.54E-07	1.56E-07
Phenanthrene	5.04E-11	1.73E-11
Perylene	5.04E-11	1.73E-11
Benzo(g,h,i)perylene	5.04E-11	1.73E-11
Aluminum	5.04E-11	1.73E-11
Antimony	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Benzene	1.80E-05	6.16E-06
Beryllium	5.04E-11	1.73E-11
Biphenyl, 1,1'-	5.57E-07	1.91E-07
Butylbenzene, n-	7.81E-06	2.68E-06
Carbon Disulfide	5.44E-05	1.86E-05
Chloroform	2.42E-05	8.30E-06
Chlorotoluene, o-	7.84E-06	2.69E-06
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Cumene	1.03E-05	3.52E-06
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
Iron	5.04E-11	1.73E-11
MCPP	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Mercury	5.04E-11	1.73E-11
MTBE	1.30E-05	4.45E-06
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Acenaphthene	4.54E-07	1.56E-07
~Anthracene	1.22E-07	4.17E-08
~Benz[a]anthracene	5.04E-11	1.73E-11
~Benzo[a]pyrene	5.04E-11	1.73E-11
~Benzo[b]fluoranthene	5.04E-11	1.73E-11
~Benzo[k]fluoranthene	5.04E-11	1.73E-11
~Chrysene	5.04E-11	1.73E-11
~Fluoranthene	5.04E-11	1.73E-11
~Fluorene	2.26E-07	7.75E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	1.73E-11
~Methylnaphthalene, 1-	1.09E-06	3.72E-07
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
~Naphthalene	1.37E-06	4.71E-07
~Pyrene	5.04E-11	1.73E-11
Propyl benzene	9.10E-06	3.12E-06
Silver	5.04E-11	1.73E-11
Styrene	6.78E-06	2.33E-06
Thallium	5.04E-11	1.73E-11
Toluene	1.49E-05	5.09E-06
Trimethylbenzene, 1,2,4-	8.04E-06	2.76E-06
Trimethylbenzene, 1,3,5-	9.62E-06	3.30E-06
Vanadium	5.04E-11	1.73E-11
Xylene, m-	1.16E-05	3.99E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	Ingestion	Dermal	Inhalation	Total	Ingestion	Dermal	Inhalation	Total
Acetone	NA	NA	NA	0.00E+00	1.52E-08	0.00E+00	2.10E-09	1.73E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.58E-05	0.00E+00	1.21E-09	6.58E-05
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.77E-05	0.00E+00	3.24E-10	1.77E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.64E-05	0.00E+00	2.12E-10	1.64E-05
Acenaphthylene	NA	NA	NA	0.00E+00	3.02E-07	1.56E-07	4.00E-08	4.98E-07
Phenanthrene	NA	NA	NA	0.00E+00	1.09E-06	5.65E-07	1.53E-11	1.65E-06
Perylene	NA	NA	NA	0.00E+00	2.28E-07	1.18E-07	3.20E-12	3.47E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.08E-07	5.58E-08	1.51E-12	1.63E-07
Aluminum	NA	NA	NA	0.00E+00	6.13E-03	0.00E+00	6.31E-05	6.19E-03
Antimony	NA	NA	NA	0.00E+00	4.16E-02	0.00E+00	NA	4.16E-02
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.03E-07	NA	5.49E-07	6.52E-07	7.51E-04	0.00E+00	1.84E-03	2.59E-03
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Biphenyl, 1,1'-	7.25E-11	NA	1.19E-11	8.43E-11	5.28E-07	0.00E+00	8.35E-08	6.12E-07
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.76E-04	0.00E+00	5.02E-04	6.78E-04
Carbon Disulfide	NA	NA	NA	0.00E+00	6.46E-08	0.00E+00	5.13E-07	5.77E-07
Chloroform	6.73E-09	NA	2.85E-08	3.52E-08	6.33E-05	0.00E+00	1.60E-04	2.23E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.57E-04	0.00E+00	3.58E-04	5.15E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.64E-05	0.00E+00	1.74E-04	2.40E-04
Dioxin TEQ	6.76E-06	8.09E-07	1.02E-10	7.57E-06	2.17E-01	2.59E-02	1.95E-07	2.43E-01
Ethylbenzene	9.42E-08	NA	2.46E-07	3.40E-07	2.50E-04	0.00E+00	2.87E-04	5.37E-04
Iron	NA	NA	NA	0.00E+00	2.52E-02	0.00E+00	NA	2.52E-02
MCPP	NA	NA	NA	0.00E+00	3.63E-01	1.45E-01	5.34E-06	5.08E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.33E-12	NA	2.54E-12	3.87E-12	NA	NA	9.51E-09	9.51E-09
Molybdenum	NA	NA	NA	0.00E+00	7.44E-04	0.00E+00	NA	7.44E-04
Nickel	NA	NA	6.64E-10	6.64E-10	7.24E-03	0.00E+00	1.49E-04	7.39E-03
Phenol	NA	NA	NA	0.00E+00	2.02E-06	8.06E-07	1.56E-10	2.82E-06
~Acenaphthene	NA	NA	NA	0.00E+00	4.03E-07	2.09E-07	5.34E-08	6.65E-07
~Anthracene	NA	NA	NA	0.00E+00	7.76E-08	4.03E-08	2.63E-09	1.21E-07
~Benz[a]anthracene	5.72E-09	2.97E-09	2.70E-14	8.68E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	2.78E-08	1.44E-08	1.31E-13	4.22E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	4.03E-09	2.09E-09	1.90E-14	6.11E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.21E-09	6.26E-10	5.70E-15	1.83E-09	NA	NA	NA	0.00E+00
~Chrysene	8.70E-10	4.51E-10	4.10E-15	1.32E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.92E-07	3.07E-07	NA	8.99E-07
~Fluorene	NA	NA	NA	0.00E+00	1.60E-06	8.30E-07	1.06E-07	2.54E-06
~Indeno[1,2,3-cd]pyrene	1.70E-09	8.83E-10	8.03E-15	2.59E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.21E-09	1.67E-09	1.02E-09	5.90E-09	4.61E-06	2.39E-06	1.43E-06	8.44E-06
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.58E-04	3.41E-04	NA	9.99E-04
~NAphthalene	NA	NA	1.55E-07	1.55E-07	4.75E-04	2.46E-04	4.44E-03	5.16E-03
~Pyrene	NA	NA	NA	0.00E+00	2.82E-06	1.46E-06	3.96E-11	4.28E-06
Propyl benzene	NA	NA	NA	0.00E+00	2.41E-04	9.62E-05	1.60E-03	1.94E-03
Silver	NA	NA	NA	0.00E+00	2.54E-04	0.00E+00	NA	2.54E-04
Styrene	NA	NA	NA	0.00E+00	3.38E-08	0.00E+00	5.20E-08	8.57E-08
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.84E-04	0.00E+00	1.15E-03	1.44E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	8.43E-02	8.43E-02
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	4.07E-03	0.00E+00	6.66E-02	7.07E-02
Vanadium	NA	NA	NA	0.00E+00	5.68E-03	0.00E+00	NA	5.68E-03
Xylene, m-	NA	NA	NA	0.00E+00	6.02E-04	0.00E+00	1.43E-02	1.49E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	7.01E-06	8.32E-07	9.80E-07	8.82E-06	6.74E-01	1.71E-01	1.76E-01	1.02E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
Silver	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Xylenes	1.09E-05	9.36E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.89E-05	2.51E-06	4.66E-11	3.14E-05	3.71E+00	3.22E-01	3.58E-07	4.03E+00
Ethylbenzene	4.31E-11	NA	1.20E-11	5.51E-11	4.57E-07	0.00E+00	5.61E-08	5.13E-07
Iron	NA	NA	NA	0.00E+00	1.67E-01	0.00E+00	NA	1.67E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.07E-05	3.09E-06	8.81E-11	1.37E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.62E-04	2.50E-04	NA	9.12E-04
Silver	NA	NA	NA	0.00E+00	2.56E-03	0.00E+00	NA	2.56E-03
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	1.96E-06	0.00E+00	4.70E-06	6.66E-06
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.89E-05	2.51E-06	6.08E-11	3.14E-05	3.88E+00	3.23E-01	5.64E-06	4.20E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~NAphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~NAphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Child Recreational Exposure Scenario - Calculation of Risk Due to S
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	9.13E-06	7.83E-07

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	4.79E-06

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	3.44E-06	2.95E-07
Phenanthrene	3.44E-06	2.95E-07
Perylene	3.44E-06	2.95E-07
Benzo(g,h,i)perylene	3.44E-06	2.95E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	2.65E-06	2.27E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Acenaphthene	3.44E-06	2.95E-07
~Anthracene	3.44E-06	2.95E-07
~Benz[a]anthracene	3.44E-06	4.69E-07
~Benzo[a]pyrene	3.44E-06	4.69E-07
~Benzo[b]fluoranthene	3.44E-06	4.69E-07
~Benzo[k]fluoranthene	3.44E-06	4.69E-07
~Chrysene	3.44E-06	4.69E-07
~Fluoranthene	3.44E-06	2.95E-07
~Fluorene	3.44E-06	2.95E-07
~Indeno[1,2,3-cd]pyrene	3.44E-06	4.69E-07
~Methylnaphthalene, 1-	3.44E-06	2.95E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
~NAphthalene	3.44E-06	2.95E-07
~Pyrene	3.44E-06	2.95E-07
Propyl benzene	2.65E-06	2.27E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Acetone	4.66E-06	3.99E-07
sec-Butylbenzene	5.04E-11	4.32E-12
tert-Butylbenzene	5.04E-11	4.32E-12
4-Isopropyltoluene	5.04E-11	4.32E-12
Acenaphthylene	4.54E-07	3.89E-08
Phenanthrene	5.04E-11	4.32E-12
Perylene	5.04E-11	4.32E-12
Benzo(g,h,i)perylene	5.04E-11	4.32E-12
Aluminum	5.04E-11	4.32E-12
Antimony	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Benzene	1.80E-05	1.54E-06
Beryllium	5.04E-11	4.32E-12
Biphenyl, 1,1'-	5.57E-07	4.77E-08
Butylbenzene, n-	7.81E-06	6.69E-07
Carbon Disulfide	5.44E-05	4.66E-06
Chloroform	2.42E-05	2.07E-06
Chlorotoluene, o-	7.84E-06	6.72E-07
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Cumene	1.03E-05	8.79E-07
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
Iron	5.04E-11	4.32E-12
MCPP	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Mercury	5.04E-11	4.32E-12
MTBE	1.30E-05	1.11E-06
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Acenaphthene	4.54E-07	3.89E-08
~Anthracene	1.22E-07	1.04E-08
~Benz[a]anthracene	5.04E-11	5.70E-11
~Benzo[a]pyrene	5.04E-11	5.70E-11
~Benzo[b]fluoranthene	5.04E-11	5.70E-11
~Benzo[k]fluoranthene	5.04E-11	5.70E-11
~Chrysene	5.04E-11	5.70E-11
~Fluoranthene	5.04E-11	4.32E-12
~Fluorene	2.26E-07	1.94E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	5.70E-11
~Methylnaphthalene, 1-	1.09E-06	9.30E-08
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
~NAphthalene	1.37E-06	1.18E-07
~Pyrene	5.04E-11	4.32E-12
Propyl benzene	9.10E-06	7.80E-07
Silver	5.04E-11	4.32E-12
Styrene	6.78E-06	5.81E-07
Thallium	5.04E-11	4.32E-12
Toluene	1.49E-05	1.27E-06
Trimethylbenzene, 1,2,4-	8.04E-06	6.89E-07
Trimethylbenzene, 1,3,5-	9.62E-06	8.25E-07
Vanadium	5.04E-11	4.32E-12
Xylene, m-	1.16E-05	9.97E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	1.42E-07	0.00E+00	2.10E-09	1.44E-07
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.14E-04	0.00E+00	NA	6.14E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.65E-04	0.00E+00	NA	1.65E-04
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.53E-04	0.00E+00	2.12E-10	1.53E-04
Acenaphthylene	NA	NA	NA	0.00E+00	2.82E-06	1.06E-06	NA	3.88E-06
Phenanthrene	NA	NA	NA	0.00E+00	1.02E-05	3.83E-06	NA	1.40E-05
Perylene	NA	NA	NA	0.00E+00	2.13E-06	8.03E-07	NA	2.93E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.00E-06	3.79E-07	NA	1.38E-06
Aluminum	NA	NA	NA	0.00E+00	5.72E-02	0.00E+00	6.31E-05	5.73E-02
Antimony	NA	NA	NA	0.00E+00	3.88E-01	0.00E+00	NA	3.88E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.32E-07	NA	3.69E-08	1.69E-07	7.01E-03	0.00E+00	1.84E-03	8.85E-03
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Biphenyl, 1,1'-	1.69E-10	NA	NA	1.69E-10	4.93E-06	0.00E+00	3.76E-05	4.25E-05
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.64E-03	0.00E+00	NA	1.64E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	6.03E-07	0.00E+00	5.13E-07	1.12E-06
Chloroform	1.57E-08	NA	3.09E-08	4.66E-08	5.91E-04	0.00E+00	1.60E-04	7.51E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.46E-03	0.00E+00	NA	1.46E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.20E-04	0.00E+00	1.74E-04	7.94E-04
Dioxin TEQ	1.58E-05	1.37E-06	2.54E-11	1.71E-05	2.02E+00	1.76E-01	1.95E-07	2.20E+00
Ethylbenzene	2.20E-07	NA	6.15E-08	2.81E-07	2.33E-03	0.00E+00	2.87E-04	2.62E-03
Iron	NA	NA	NA	0.00E+00	2.35E-01	0.00E+00	NA	2.35E-01
MCPP	NA	NA	NA	0.00E+00	3.39E+00	9.83E-01	NA	4.37E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	3.10E-12	NA	6.36E-13	3.74E-12	NA	NA	9.51E-09	9.51E-09
Molybdenum	NA	NA	NA	0.00E+00	6.94E-03	0.00E+00	NA	6.94E-03
Nickel	NA	NA	1.66E-10	1.66E-10	6.76E-02	0.00E+00	8.28E-05	6.77E-02
Phenol	NA	NA	NA	0.00E+00	1.88E-05	5.46E-06	1.56E-10	2.43E-05
~Acenaphthene	NA	NA	NA	0.00E+00	3.76E-06	1.42E-06	NA	5.18E-06
~Anthracene	NA	NA	NA	0.00E+00	7.25E-07	2.73E-07	NA	9.98E-07
~Benz[a]anthracene	4.97E-08	4.86E-09	8.90E-14	5.45E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	2.41E-07	2.36E-08	4.32E-13	2.65E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	3.50E-08	3.42E-09	6.27E-14	3.84E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.05E-09	1.03E-10	1.88E-14	1.15E-09	NA	NA	NA	0.00E+00
~Chrysene	7.55E-10	7.40E-11	1.35E-14	8.29E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.53E-06	2.08E-06	NA	7.61E-06
~Fluorene	NA	NA	NA	0.00E+00	1.49E-05	5.63E-06	NA	2.06E-05
~Indeno[1,2,3-cd]pyrene	1.48E-08	1.45E-09	2.65E-14	1.62E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	7.49E-09	2.82E-09	NA	1.03E-08	4.31E-05	1.62E-05	NA	5.93E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.14E-03	2.32E-03	NA	8.46E-03
~Naphthalene	NA	NA	3.88E-08	3.88E-08	4.43E-03	1.67E-03	4.44E-03	1.05E-02
~Pyrene	NA	NA	NA	0.00E+00	2.63E-05	9.93E-06	NA	3.63E-05
Propyl benzene	NA	NA	NA	0.00E+00	2.25E-03	6.53E-04	2.24E-04	3.13E-03
Silver	NA	NA	NA	0.00E+00	2.37E-03	0.00E+00	NA	2.37E-03
Styrene	NA	NA	NA	0.00E+00	3.15E-07	0.00E+00	4.68E-08	3.62E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.66E-03	0.00E+00	6.91E-05	2.72E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	8.43E-02	8.43E-02
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	3.79E-02	0.00E+00	NA	3.79E-02
Vanadium	NA	NA	NA	0.00E+00	5.30E-02	0.00E+00	NA	5.30E-02
Xylene, m-	NA	NA	NA	0.00E+00	5.62E-03	0.00E+00	1.43E-02	1.99E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.65E-05	1.41E-06	1.68E-07	1.81E-05	6.30E+00	1.16E+00	1.06E-01	7.56E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor		
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Dioxin TEQ	0.000284	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	0.005	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	12800	7.0E-01	NA	7.00E-01	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.35	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Methylnaphthalene, 2-	0.29	4.0E-03	NA	4.00E-03	NA	NA	NA
Silver	1.4	5.0E-03	NA	2.00E-04	NA	NA	NA
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA
Xylenes	0.043	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Source: USEPA RSL June 2011	VF
	m^3/kg
Volatile Organic Compounds	
Aluminum	
Arsenic	
Barium	
Beryllium	
Chromium	
Cobalt	
Copper	
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
Manganese	
Nickel	
Phenol	
~Methylnaphthalene, 2-	6.2E+04
Silver	
Vanadium	
Xylenes	6.3E+03
Zinc	

	PEF
	(m^3/kg)
For all Chemicals of Concern	1.36E+09

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal = (IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$\textbf{IFderm} = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
Silver	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
Silver	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Xylenes	1.09E-05	9.36E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 Surface Soil

Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.89E-05	2.51E-06	4.66E-11	3.14E-05	3.71E+00	3.22E-01	3.58E-07	4.03E+00
Ethylbenzene	4.31E-11	NA	1.20E-11	5.51E-11	4.57E-07	0.00E+00	5.61E-08	5.13E-07
Iron	NA	NA	NA	0.00E+00	1.67E-01	0.00E+00	NA	1.67E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.07E-05	3.09E-06	8.81E-11	1.37E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.62E-04	2.50E-04	NA	9.12E-04
Silver	NA	NA	NA	0.00E+00	2.56E-03	0.00E+00	NA	2.56E-03
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	NA	NA	NA	0.00E+00	1.96E-06	0.00E+00	4.70E-06	6.66E-06
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.89E-05	2.51E-06	6.08E-11	3.14E-05	3.88E+00	3.23E-01	5.64E-06	4.20E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.36E+09

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
	9.13E-06	7.83E-07

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	4.79E-06

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA = Surface area (cm²)
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
EF = Exposure frequency (days/yr)
CF = Conversion factor (kg/mg)
ED = Exposure duration (yrs)
BW = Body weight (kg)
AF = Adherence factor (mg/cm²)
AT = Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	3.44E-06	2.95E-07
Phenanthrene	3.44E-06	2.95E-07
Perylene	3.44E-06	2.95E-07
Benzo(g,h,i)perylene	3.44E-06	2.95E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	2.65E-06	2.27E-07
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Acenaphthene	3.44E-06	2.95E-07
~Anthracene	3.44E-06	2.95E-07
~Benz[a]anthracene	3.44E-06	4.69E-07
~Benzo[a]pyrene	3.44E-06	4.69E-07
~Benzo[b]fluoranthene	3.44E-06	4.69E-07
~Benzo[k]fluoranthene	3.44E-06	4.69E-07
~Chrysene	3.44E-06	4.69E-07
~Fluoranthene	3.44E-06	2.95E-07
~Fluorene	3.44E-06	2.95E-07
~Indeno[1,2,3-cd]pyrene	3.44E-06	4.69E-07
~Methylnaphthalene, 1-	3.44E-06	2.95E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
~Naphthalene	3.44E-06	2.95E-07
~Pyrene	3.44E-06	2.95E-07
Propyl benzene	2.65E-06	2.27E-07
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/EPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	4.66E-06	3.99E-07
sec-Butylbenzene	5.04E-11	4.32E-12
tert-Butylbenzene	5.04E-11	4.32E-12
4-Isopropyltoluene	5.04E-11	4.32E-12
Acenaphthylene	4.54E-07	3.89E-08
Phenanthrene	5.04E-11	4.32E-12
Perylene	5.04E-11	4.32E-12
Benzo(g,h,i)perylene	5.04E-11	4.32E-12
Aluminum	5.04E-11	4.32E-12
Antimony	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Benzene	1.80E-05	1.54E-06
Beryllium	5.04E-11	4.32E-12
Biphenyl, 1,1'-	5.57E-07	4.77E-08
Butylbenzene, n-	7.81E-06	6.69E-07
Carbon Disulfide	5.44E-05	4.66E-06
Chloroform	2.42E-05	2.07E-06
Chlorotoluene, o-	7.84E-06	6.72E-07
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Cumene	1.03E-05	8.79E-07
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
Iron	5.04E-11	4.32E-12
MCPP	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Mercury	5.04E-11	4.32E-12
MTBE	1.30E-05	1.11E-06
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Acenaphthene	4.54E-07	3.89E-08
~Anthracene	1.22E-07	1.04E-08
~Benz[a]anthracene	5.04E-11	5.70E-11
~Benzo[a]pyrene	5.04E-11	5.70E-11
~Benzo[b]fluoranthene	5.04E-11	5.70E-11
~Benzo[k]fluoranthene	5.04E-11	5.70E-11
~Chrysene	5.04E-11	5.70E-11
~Fluoranthene	5.04E-11	4.32E-12
~Fluorene	2.26E-07	1.94E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	5.70E-11
~Methylnaphthalene, 1-	1.09E-06	9.30E-08
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
~Naphthalene	1.37E-06	1.18E-07
~Pyrene	5.04E-11	4.32E-12
Propyl benzene	9.10E-06	7.80E-07
Silver	5.04E-11	4.32E-12
Styrene	6.78E-06	5.81E-07
Thallium	5.04E-11	4.32E-12
Toluene	1.49E-05	1.27E-06
Trimethylbenzene, 1,2,4-	8.04E-06	6.89E-07
Trimethylbenzene, 1,3,5-	9.62E-06	8.25E-07
Vanadium	5.04E-11	4.32E-12
Xylene, m-	1.16E-05	9.97E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs)

Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	Ingestion	Dermal	Inhalation	Total	Ingestion	Dermal	Inhalation	Total
Acetone	NA	NA	NA	0.00E+00	1.42E-07	0.00E+00	2.10E-09	1.44E-07
sec-Butylbenzene	NA	NA	NA	0.00E+00	6.14E-04	0.00E+00	1.21E-09	6.14E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	1.65E-04	0.00E+00	3.24E-10	1.65E-04
4-Isopropyltoluene	NA	NA	NA	0.00E+00	1.53E-04	0.00E+00	2.12E-10	1.53E-04
Acenaphthylene	NA	NA	NA	0.00E+00	2.82E-06	1.06E-06	4.00E-08	3.92E-06
Phenanthrene	NA	NA	NA	0.00E+00	1.02E-05	3.83E-06	1.53E-11	1.40E-05
Perylene	NA	NA	NA	0.00E+00	2.13E-06	8.03E-07	3.20E-12	2.93E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.00E-06	3.79E-07	1.51E-12	1.38E-06
Aluminum	NA	NA	NA	0.00E+00	5.72E-02	0.00E+00	6.31E-05	5.73E-02
Antimony	NA	NA	NA	0.00E+00	3.88E-01	0.00E+00	NA	3.88E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	2.40E-07	NA	1.37E-07	3.78E-07	7.01E-03	0.00E+00	1.84E-03	8.85E-03
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Biphenyl, 1,1'-	1.69E-10	NA	2.96E-12	1.72E-10	4.93E-06	0.00E+00	8.35E-08	5.02E-06
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.64E-03	0.00E+00	5.02E-04	2.15E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	6.03E-07	0.00E+00	5.13E-07	1.12E-06
Chloroform	1.57E-08	NA	7.11E-09	2.28E-08	5.91E-04	0.00E+00	1.60E-04	7.51E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	1.46E-03	0.00E+00	3.58E-04	1.82E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	6.20E-04	0.00E+00	1.74E-04	7.94E-04
Dioxin TEQ	1.58E-05	1.37E-06	2.54E-11	1.71E-05	2.02E+00	1.76E-01	1.95E-07	2.20E+00
Ethylbenzene	2.20E-07	NA	6.15E-08	2.81E-07	2.33E-03	0.00E+00	2.87E-04	2.62E-03
Iron	NA	NA	NA	0.00E+00	2.35E-01	0.00E+00	NA	2.35E-01
MCPP	NA	NA	NA	0.00E+00	3.39E+00	9.83E-01	5.34E-06	4.37E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	3.10E-12	NA	6.36E-13	3.74E-12	NA	NA	9.51E-09	9.51E-09
Molybdenum	NA	NA	NA	0.00E+00	6.94E-03	0.00E+00	NA	6.94E-03
Nickel	NA	NA	1.66E-10	1.66E-10	6.76E-02	0.00E+00	1.49E-04	6.77E-02
Phenol	NA	NA	NA	0.00E+00	1.88E-05	5.46E-06	1.56E-10	2.43E-05
~Acenaphthene	NA	NA	NA	0.00E+00	3.76E-06	1.42E-06	5.34E-08	5.23E-06
~Anthracene	NA	NA	NA	0.00E+00	7.25E-07	2.73E-07	2.63E-09	1.00E-06
~Benz[a]anthracene	8.16E-08	7.99E-09	8.90E-14	8.96E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	3.97E-07	3.88E-08	4.33E-13	4.35E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	5.75E-08	5.63E-09	6.27E-14	6.31E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.72E-08	1.69E-09	1.88E-14	1.89E-08	NA	NA	NA	0.00E+00
~Chrysene	1.24E-08	1.22E-09	1.35E-14	1.36E-08	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.53E-06	2.08E-06	NA	7.61E-06
~Fluorene	NA	NA	NA	0.00E+00	1.49E-05	5.63E-06	1.06E-07	2.07E-05
~Indeno[1,2,3-cd]pyrene	2.43E-08	2.38E-09	2.65E-14	2.67E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	7.49E-09	2.82E-09	2.55E-10	1.06E-08	4.31E-05	1.62E-05	1.43E-06	6.07E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	6.14E-03	2.32E-03	NA	8.46E-03
~NAphthalene	NA	NA	3.88E-08	3.88E-08	4.43E-03	1.67E-03	4.44E-03	1.05E-02
~Pyrene	NA	NA	NA	0.00E+00	2.63E-05	9.93E-06	3.96E-11	3.63E-05
Propyl benzene	NA	NA	NA	0.00E+00	2.25E-03	6.53E-04	1.60E-03	4.51E-03
Silver	NA	NA	NA	0.00E+00	2.37E-03	0.00E+00	NA	2.37E-03
Styrene	NA	NA	NA	0.00E+00	3.15E-07	0.00E+00	5.20E-08	3.67E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	2.66E-03	0.00E+00	1.15E-03	3.81E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	8.43E-02	8.43E-02
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	3.79E-02	0.00E+00	6.66E-02	1.05E-01
Vanadium	NA	NA	NA	0.00E+00	5.30E-02	0.00E+00	NA	5.30E-02
Xylene, m-	NA	NA	NA	0.00E+00	5.62E-03	0.00E+00	1.43E-02	1.99E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.68E-05	1.43E-06	2.45E-07	1.85E-05	6.30E+00	1.16E+00	1.76E-01	7.63E+00

Subarea 1 Inhalation of ambient air for the Recreational User - CalEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	1.4E-02	250	30	0.10	10950	25550	6.4E-07	6.16E-11
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	NA	0.0E+00	6.0E-02	250	30	0.10	10950	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	6.0E-03	250	30	0.10	10950	25550	1.2E-06	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	250	30	0.10	10950	25550	7.1E-10	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	1.4E-02	250	30	0.10	10950	25550	1.1E-06	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	2.1E-01	250	30	0.10	10950	25550	1.9E-10	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	250	30	0.10	10950	25550	1.6E-10	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	2.9E-05	3.0E-02	250	30	0.10	10950	25550	9.8E-05	3.65E-08
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	8.3E-07	1.0E+01	250	30	0.10	10950	25550	6.4E-10	2.28E-12
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	250	30	0.10	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	1.8E-06	9.0E-02	250	30	0.10	10950	25550	2.0E-08	1.39E-12
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	3.5E-02	250	30	0.10	10950	25550	1.0E-07	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	250	30	0.10	10950	25550	2.6E-06	2.82E-09
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	1.4E-01	250	30	0.10	10950	25550	1.0E-10	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	250	30	0.10	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	250	30	0.10	10950	25550	4.2E-05	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	250	30	0.10	10950	25550	1.5E-09	5.14E-13
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	250	30	0.10	10950	25550	1.7E-05	7.33E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.4E-01	250	30	0.10	10950	25550	7.2E-09	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.4E-01	250	30	0.10	10950	25550	1.4E-07	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	1.1E-01	250	30	0.10	10950	25550	2.0E-11	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.4E-01	250	30	0.10	10950	25550	3.4E-08	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.4E-01	250	30	0.10	10950	25550	2.3E-08	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	5.9E-06	3.5E-02	250	30	0.10	10950	25550	4.5E-07	3.98E-11
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	3.0E-01	250	30	0.10	10950	25550	2.6E-05	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	250	30	0.10	10950	25550	3.1E-06	1.11E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	30	0.10	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	250	30	0.10	10950	25550	7.6E-05	NA

Total	2.68E-04	4.02E-08

Subarea 1 Inhalation of ambient air for the Recreational User - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	0.031	4.06E-06	1.26E-07	1.6E-05	2.0E-04	250	30	0.10	10950	25550	4.5E-05	6.16E-11
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	#VALUE!	2.6E-05	7.0E-03	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	ND	2.64E-05	#VALUE!	0.0E+00	6.0E-02	250	30	0.10	10950	25550	NA	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	0.0067	1.45E-05	9.73E-08	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	0.035	1.41E-06	4.94E-08	0.0E+00	5.0E+00	250	30	0.10	10950	25550	7.1E-10	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.099	2.28E-06	2.26E-07	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.0004	1.37E-06	5.49E-10	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.045	1.59E-06	7.16E-08	0.0E+00	3.1E+01	250	30	0.10	10950	25550	1.6E-10	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	2.1	1.96E-05	4.12E-05	7.8E-06	3.0E-02	250	30	0.10	10950	25550	9.8E-05	9.82E-09
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.001	9.00E-05	9.00E-08	0.0E+00	1.0E+01	250	30	0.10	10950	25550	6.4E-10	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	250	30	0.10	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0006	4.20E-05	2.52E-08	0.0E+00	9.0E-02	250	30	0.10	10950	25550	2.0E-08	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0038	1.29E-05	4.91E-08	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	1.6	2.31E-05	3.69E-05	2.5E-06	1.0E+00	250	30	0.10	10950	25550	2.6E-06	2.82E-09
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.0002	9.97E-07	1.99E-10	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	#VALUE!	1.1E-05	0.0E+00	250	30	0.10	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	0.084	2.78E-03	2.34E-04	0.0E+00	4.0E-01	250	30	0.10	10950	25550	4.2E-05	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	0.016	4.04E-06	6.47E-08	2.6E-07	3.0E+00	250	30	0.10	10950	25550	1.5E-09	5.14E-13
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.31	2.27E-06	7.05E-07	3.4E-05	3.0E-03	250	30	0.10	10950	25550	1.7E-05	7.33E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	0.00049	2.90E-05	1.42E-08	0.0E+00	1.0E+00	250	30	0.10	10950	25550	1.0E-09	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	0.011	2.50E-05	2.75E-07	0.0E+00	1.0E+00	250	30	0.10	10950	25550	2.0E-08	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0001	2.93E-07	2.93E-11	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	0.0021	3.15E-05	6.62E-08	0.0E+00	1.0E+00	250	30	0.10	10950	25550	4.7E-09	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	0.0017	2.61E-05	4.44E-08	0.0E+00	1.0E+00	250	30	0.10	10950	25550	3.2E-09	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	0.0044	5.02E-05	2.21E-07	2.6E-07	4.0E-02	250	30	0.10	10950	25550	3.9E-07	1.75E-12
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	4.9	2.27E-05	1.11E-04	0.0E+00	5.0E+00	250	30	0.10	10950	25550	1.6E-06	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.0028	3.15E-05	8.82E-08	4.1E-06	2.0E-03	250	30	0.10	10950	25550	3.1E-06	1.11E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	#VALUE!	0.0E+00	2.0E-01	250	30	0.10	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	5.8	1.83E-05	1.06E-04	0.0E+00	1.0E-01	250	30	0.10	10950	25550	7.6E-05	NA

Total	2.85E-04	1.35E-08

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination

Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.00E+06

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	NA	5.0E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	NA	5.0E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.0E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	NA	6.0E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	NA	3.0E-01	NA	NA	NA
Perylene	0.007	3.0E-02	NA	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	NA	3.0E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	5.5E-02	7.8E-06	5.50E-02
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	4.0E-04	5.00E-02	8.0E-03	NA	8.00E-03
Butylbenzene, n-	9	5.0E-02	NA	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	2.3E-05	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	NA	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	NA	1.00E-03	NA	NA	NA
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	NA	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	NA	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[a]pyrene	0.0069	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00
~Benzo[b]fluoranthene	0.01	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Benzo[k]fluoranthene	0.003	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02
~Chrysene	0.0216	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	NA	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01
~Methylnaphthalene, 1-	0.33	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	NA	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	1.0E+00	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	NA	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

A. INGESTION PATHWAY

Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)

ED = Exposure duration (yrs)

FI = Fraction soil ingested (unitless)

CF1 = Conversion factor (kg/mg)

BW = Body weight (kg)

AT = Averaging time (days)

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

B. DERMAL PATHWAY

Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	5.80E-06	8.29E-08
Phenanthrene	5.80E-06	8.29E-08
Perylene	5.80E-06	8.29E-08
Benzo(g,h,i)perylene	5.80E-06	8.29E-08
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	4.46E-06	6.37E-08
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Acenaphthene	5.80E-06	8.29E-08
~Anthracene	5.80E-06	8.29E-08
~Benz[a]anthracene	5.80E-06	8.29E-08
~Benzo[a]pyrene	5.80E-06	8.29E-08
~Benzo[b]fluoranthene	5.80E-06	8.29E-08
~Benzo[k]fluoranthene	5.80E-06	8.29E-08
~Chrysene	5.80E-06	8.29E-08
~Fluoranthene	5.80E-06	8.29E-08
~Fluorene	5.80E-06	8.29E-08
~Indeno[1,2,3-cd]pyrene	5.80E-06	8.29E-08
~Methylnaphthalene, 1-	5.80E-06	8.29E-08
~Methylnaphthalene, 2-	5.80E-06	8.29E-08
~Naphthalene	5.80E-06	8.29E-08
~Pyrene	5.80E-06	8.29E-08
Propyl benzene	4.46E-06	6.37E-08
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

C. INHALATION PATHWAY

Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	1.56E-05	2.23E-07
sec-Butylbenzene	2.26E-07	3.23E-09
tert-Butylbenzene	2.26E-07	3.23E-09
4-Isopropyltoluene	2.26E-07	3.23E-09
Acenaphthylene	1.72E-06	2.46E-08
Phenanthrene	2.26E-07	3.23E-09
Perylene	2.26E-07	3.23E-09
Benzo(g,h,i)perylene	2.26E-07	3.23E-09
Aluminum	2.26E-07	3.23E-09
Antimony	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Benzene	5.96E-05	8.51E-07
Beryllium	2.26E-07	3.23E-09
Biphenyl, 1,1'-	2.06E-06	2.95E-08
Butylbenzene, n-	2.60E-05	3.71E-07
Carbon Disulfide	1.80E-04	2.57E-06
Chloroform	8.01E-05	1.14E-06
Chlorotoluene, o-	2.61E-05	3.73E-07
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Cumene	3.41E-05	4.87E-07
Dioxin TEQ	2.26E-07	3.23E-09
Ethylbenzene	3.73E-05	5.33E-07
Iron	2.26E-07	3.23E-09
MCPP	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Mercury	2.26E-07	3.23E-09
MTBE	4.30E-05	6.15E-07
Molybdenum	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Acenaphthene	1.72E-06	2.46E-08
~Anthracene	6.27E-07	8.96E-09
~Benz[a]anthracene	2.26E-07	3.23E-09
~Benzo[a]pyrene	2.26E-07	3.23E-09
~Benzo[b]fluoranthene	2.26E-07	3.23E-09
~Benzo[k]fluoranthene	2.26E-07	3.23E-09
~Chrysene	2.26E-07	3.23E-09
~Fluoranthene	2.26E-07	3.23E-09
~Fluorene	9.72E-07	1.39E-08
~Indeno[1,2,3-cd]pyrene	2.26E-07	3.23E-09
~Methylnaphthalene, 1-	3.81E-06	5.44E-08
~Methylnaphthalene, 2-	3.85E-06	5.50E-08
~Naphthalene	4.76E-06	6.79E-08
~Pyrene	2.26E-07	3.23E-09
Propyl benzene	3.02E-05	4.32E-07
Silver	2.26E-07	3.23E-09
Styrene	2.26E-05	3.23E-07
Thallium	2.26E-07	3.23E-09
Toluene	4.93E-05	7.04E-07
Trimethylbenzene, 1,2,4-	2.68E-05	3.82E-07
Trimethylbenzene, 1,3,5-	3.20E-05	4.57E-07
Vanadium	2.26E-07	3.23E-09
Xylene, m-	3.86E-05	5.51E-07
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs); USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Ingestion**	**Dermal**	**Inhalation**	**Total**
Acetone	NA	NA	NA	0.00E+00	5.02E-08	0.00E+00	7.05E-09	5.73E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	2.17E-04	0.00E+00	NA	2.17E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	5.83E-05	0.00E+00	NA	5.83E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	5.42E-05	0.00E+00	9.49E-07	5.52E-05
Acenaphthylene	NA	NA	NA	0.00E+00	9.96E-07	1.79E-06	NA	2.78E-06
Phenanthrene	NA	NA	NA	0.00E+00	3.59E-06	6.46E-06	NA	1.01E-05
Perylene	NA	NA	NA	0.00E+00	7.53E-07	1.35E-06	NA	2.11E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	3.55E-07	6.38E-07	NA	9.93E-07
Aluminum	NA	NA	NA	0.00E+00	2.02E-02	0.00E+00	2.83E-01	3.03E-01
Antimony	NA	NA	NA	0.00E+00	1.37E-01	0.00E+00	NA	1.37E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	7.79E-09	NA	2.04E-08	2.82E-08	2.48E-03	0.00E+00	6.09E-03	8.57E-03
Beryllium	NA	NA	1.63E-09	1.63E-09	3.39E-04	0.00E+00	2.37E-03	2.71E-03
Biphenyl, 1,1'-	9.96E-12	NA	NA	9.96E-12	1.74E-06	0.00E+00	1.39E-04	1.41E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	5.81E-04	0.00E+00	NA	5.81E-04
Carbon Disulfide	NA	NA	NA	0.00E+00	2.13E-07	0.00E+00	1.69E-06	1.91E-06
Chloroform	9.25E-10	NA	1.70E-08	1.80E-08	2.09E-04	0.00E+00	5.29E-04	7.38E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	5.17E-04	0.00E+00	NA	5.17E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	2.19E-04	0.00E+00	5.78E-04	7.97E-04
Dioxin TEQ	9.29E-07	3.85E-07	1.90E-08	1.33E-06	7.15E-01	2.96E-01	8.76E-04	1.01E+00
Ethylbenzene	1.30E-08	NA	3.40E-08	4.70E-08	8.25E-04	0.00E+00	9.52E-04	1.78E-03
Iron	NA	NA	NA	0.00E+00	8.30E-02	0.00E+00	NA	8.30E-02
MCPP	NA	NA	NA	0.00E+00	1.20E+00	1.66E+00	NA	2.85E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.83E-13	NA	3.52E-13	5.34E-13	NA	NA	3.16E-08	3.16E-08
Molybdenum	NA	NA	NA	0.00E+00	2.45E-03	0.00E+00	NA	2.45E-03
Nickel	NA	NA	1.24E-07	1.24E-07	2.39E-02	0.00E+00	3.72E-01	3.96E-01
Phenol	NA	NA	NA	0.00E+00	6.66E-06	9.21E-06	7.00E-07	1.66E-05
~Acenaphthene	NA	NA	NA	0.00E+00	1.33E-06	2.39E-06	NA	3.72E-06
~Anthracene	NA	NA	NA	0.00E+00	2.56E-07	4.60E-07	NA	7.16E-07
~Benz[a]anthracene	4.78E-10	8.59E-10	5.04E-12	1.34E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	2.32E-09	4.17E-09	2.45E-11	6.52E-09	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	3.37E-10	6.05E-10	3.55E-12	9.45E-10	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.01E-11	1.81E-11	1.07E-12	2.93E-11	NA	NA	NA	0.00E+00
~Chrysene	7.27E-12	1.31E-11	7.67E-13	2.11E-11	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	1.95E-06	3.51E-06	NA	5.46E-06
~Fluorene	NA	NA	NA	0.00E+00	5.28E-06	9.48E-06	NA	1.48E-05
~Indeno[1,2,3-cd]pyrene	1.42E-10	2.56E-10	1.50E-12	4.00E-10	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	4.41E-10	7.93E-10	NA	1.23E-09	1.52E-05	2.73E-05	NA	4.26E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.17E-03	3.90E-03	NA	6.07E-03
~NAphthalene	NA	NA	2.24E-08	2.24E-08	1.57E-03	2.81E-03	1.54E-02	1.98E-02
~Pyrene	NA	NA	NA	0.00E+00	9.31E-06	1.67E-05	NA	2.60E-05
Propyl benzene	NA	NA	NA	0.00E+00	7.96E-04	1.10E-03	7.45E-04	2.64E-03
Silver	NA	NA	NA	0.00E+00	8.40E-04	0.00E+00	NA	8.40E-04
Styrene	NA	NA	NA	0.00E+00	1.11E-07	0.00E+00	1.56E-07	2.67E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	9.39E-04	0.00E+00	2.29E-04	1.17E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	2.81E-01	2.81E-01
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	1.34E-02	0.00E+00	NA	1.34E-02
Vanadium	NA	NA	NA	0.00E+00	1.87E-02	0.00E+00	NA	1.87E-02
Xylene, m-	NA	NA	NA	0.00E+00	1.99E-03	0.00E+00	4.75E-02	4.95E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	9.55E-07	3.92E-07	2.39E-07	1.59E-06	2.23E+00	1.96E+00	1.01E+00	5.20E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/TPA Toxicity

Source: USEPA RSL June 2011	PEF (m^3/kg)
For all COPC	1.00E+06

Chemical	EPC (mg/kg)	Reference Dose: Oral RfD (mg/kg-day)	Reference Dose: Reference Concentration (mg/m3)	Reference Dose: Dermal RfD (mg/kg-day)	Slope Factor: Oral SF $(mg/kg\text{-}day)^{-1}$	Slope Factor: Unit Risk Factor $(ug/m3)^{-1}$	Slope Factor: Dermal SF $(mg/kg\text{-}day)^{-1}$
Acetone	0.014	9.0E-01	3.1E+01	9.00E-01	NA	NA	NA
sec-Butylbenzene	3.36	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
tert-Butylbenzene	0.902	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
4-Isopropyltoluene	1.68	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Acenaphthylene	0.0185	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
Phenanthrene	0.334	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
Perylene	0.007	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Benzo(g,h,i)perylene	0.0033	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Aluminum	6262	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA
Antimony	17	4.0E-04	NA	6.00E-05	NA	NA	NA
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA
Benzene	3.07	4.0E-03	3.0E-02	4.00E-03	1.0E-01	2.9E-05	1.00E-01
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA
Biphenyl, 1,1'-	0.027	5.0E-02	1.8E-01	5.00E-02	8.0E-03	2.3E-06	8.00E-03
Butylbenzene, n-	9	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA
Carbon Disulfide	0.0066	1.0E-01	7.0E-01	1.00E-01	NA	NA	NA
Chloroform	0.647	1.0E-02	9.8E-02	1.00E-02	3.1E-02	5.3E-06	3.10E-02
Chlorotoluene, o-	3.2	2.0E-02	7.0E-02	2.00E-02	NA	NA	NA
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA
Cumene	6.79	1.0E-01	4.0E-01	1.00E-01	NA	NA	NA
Dioxin TEQ	0.000155	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05
Ethylbenzene	25.54	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02
Iron	17998	7.0E-01	NA	7.00E-01	NA	NA	NA
MCPP	371	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA
Mercury		3.0E-04	3.0E-05	2.10E-05	NA	NA	NA
MTBE	0.0022	NA	3.0E+00	NA	1.8E-03	2.6E-07	1.80E-03
Molybdenum	3.8	5.0E-03	NA	5.00E-03	NA	NA	NA
Nickel	148	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA
Phenol	0.619	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA
~Acenaphthene	0.0247	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA
~Anthracene	0.0238	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA
~Benz[a]anthracene	0.0142	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[a]pyrene	0.0069	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01
~Benzo[b]fluoranthene	0.01	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Benzo[k]fluoranthene	0.003	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Chrysene	0.0216	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01
~Fluoranthene	0.0242	4.0E-02	NA	4.00E-02	NA	NA	NA
~Fluorene	0.0654	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA
~Indeno[1,2,3-cd]pyrene	0.00423	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00
~Methylnaphthalene, 1-	0.33	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02
~Methylnaphthalene, 2-	2.69	4.0E-03	NA	4.00E-03	NA	NA	NA
~Naphthalene	9.7	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA
~Pyrene	0.0865	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA
Propyl benzene	24.65	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA
Silver	1.3	5.0E-03	NA	2.00E-04	NA	NA	NA
Styrene	0.0069	2.0E-01	9.0E-01	2.00E-01	NA	NA	NA
Thallium		1.0E-05	NA	1.00E-05	NA	NA	NA
Toluene	23.26	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA
Trimethylbenzene, 1,2,4-	73.41	NA	7.0E-03	NA	NA	NA	NA
Trimethylbenzene, 1,3,5-	41.55	1.0E-02	6.0E-03	1.00E-02	NA	NA	NA
Vanadium	29	5.0E-03	NA	5.00E-03	NA	NA	NA
Xylene, m-	123	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA

Volatilization Factor (VF)	VF
Source: USEPA RSL June 2011	m^3/kg
COPC	
Acetone	1.5E+04
sec-Butylbenzene	8.8E+03
tert-Butylbenzene	8.8E+03
4-Isopropyltoluene	6.7E+03
Acenaphthylene	1.5E+05
Phenanthrene	5.6E+05
Perylene	2.6E+06
Benzo(g,h,i)perylene	2.6E+06
Aluminum	
Antimony	
Arsenic	
Barium	
Benzene	3.8E+03
Beryllium	
Biphenyl, 1,1'-	1.2E+05
Butylbenzene, n-	8.8E+03
Carbon Disulfide	1.3E+03
Chloroform	2.8E+03
Chlorotoluene, o-	8.7E+03
Chromium	
Cobalt	
Copper	
Cumene	6.7E+03
Dioxin TEQ	
Ethylbenzene	6.1E+03
Iron	
MCPP	
Manganese	
Mercury	
MTBE	5.3E+03
Molybdenum	
Nickel	
Phenol	
~Acenaphthene	1.5E+05
~Anthracene	5.6E+05
~Benz[a]anthracene	
~Benzo[a]pyrene	
~Benzo[b]fluoranthene	
~Benzo[k]fluoranthene	
~Chrysene	
~Fluoranthene	
~Fluorene	3.0E+05
~Indeno[1,2,3-cd]pyrene	
~Methylnaphthalene, 1-	6.3E+04
~Methylnaphthalene, 2-	6.2E+04
~Naphthalene	5.0E+04
~Pyrene	2.6E+06
Propyl benzene	7.5E+03
Silver	
Styrene	1.0E+04
Thallium	
Toluene	4.6E+03
Trimethylbenzene, 1,2,4-	8.5E+03
Trimethylbenzene, 1,3,5-	7.1E+03
Vanadium	
Xylene, m-	5.9E+03
Zinc	

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/TPA Toxicity
A. INGESTION PATHWAY
Equation: **IForal =** **(IR x EF x ED x FI x CF)/(BW x AT)**

Where:

IForal = Ingestion intake factor (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)

FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)

BW = Body weight (kg)
AT = Averaging time (days)

IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/TPA Toxicity
B. DERMAL PATHWAY
Equation:

$$\mathbf{IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)}$$

Where:

IFderm = ake factor for dermal contact (kg/kg-day)

SA =	Surface area (cm²)	$Derm_{absorp}$ =	Dermal Absorption factor (unitless)
EF =	Exposure frequency (days/yr)	CF =	Conversion factor (kg/mg)
ED =	Exposure duration (yrs)	BW =	Body weight (kg)
AF =	Adherence factor (mg/cm²)	AT =	Averaging time (days)

Chemical	**IFderm**	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
Acetone	0.00E+00	0.00E+00
sec-Butylbenzene	0.00E+00	0.00E+00
tert-Butylbenzene	0.00E+00	0.00E+00
4-Isopropyltoluene	0.00E+00	0.00E+00
Acenaphthylene	5.80E-06	8.29E-08
Phenanthrene	5.80E-06	8.29E-08
Perylene	5.80E-06	8.29E-08
Benzo(g,h,i)perylene	5.80E-06	8.29E-08
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Biphenyl, 1,1'-	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	0.00E+00
Chloroform	0.00E+00	0.00E+00
Chlorotoluene, o-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Ethylbenzene	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	4.46E-06	6.37E-08
Manganese	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
MTBE	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Acenaphthene	5.80E-06	8.29E-08
~Anthracene	5.80E-06	8.29E-08
~Benz[a]anthracene	5.80E-06	8.29E-08
~Benzo[a]pyrene	5.80E-06	8.29E-08
~Benzo[b]fluoranthene	5.80E-06	8.29E-08
~Benzo[k]fluoranthene	5.80E-06	8.29E-08
~Chrysene	5.80E-06	8.29E-08
~Fluoranthene	5.80E-06	8.29E-08
~Fluorene	5.80E-06	8.29E-08
~Indeno[1,2,3-cd]pyrene	5.80E-06	8.29E-08
~Methylnaphthalene, 1-	5.80E-06	8.29E-08
~Methylnaphthalene, 2-	5.80E-06	8.29E-08
~Naphthalene	5.80E-06	8.29E-08
~Pyrene	5.80E-06	8.29E-08
Propyl benzene	4.46E-06	6.37E-08
Silver	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Trimethylbenzene, 1,2,4-	0.00E+00	0.00E+00
Trimethylbenzene, 1,3,5-	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/TPA Toxicity
C. INHALATION PATHWAY
Equation:

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/kg-day)

EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Acetone	1.56E-05	2.23E-07
sec-Butylbenzene	2.26E-07	3.23E-09
tert-Butylbenzene	2.26E-07	3.23E-09
4-Isopropyltoluene	2.26E-07	3.23E-09
Acenaphthylene	1.72E-06	2.46E-08
Phenanthrene	2.26E-07	3.23E-09
Perylene	2.26E-07	3.23E-09
Benzo(g,h,i)perylene	2.26E-07	3.23E-09
Aluminum	2.26E-07	3.23E-09
Antimony	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Benzene	5.96E-05	8.51E-07
Beryllium	2.26E-07	3.23E-09
Biphenyl, 1,1'-	2.06E-06	2.95E-08
Butylbenzene, n-	2.60E-05	3.71E-07
Carbon Disulfide	1.80E-04	2.57E-06
Chloroform	8.01E-05	1.14E-06
Chlorotoluene, o-	2.61E-05	3.73E-07
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Cumene	3.41E-05	4.87E-07
Dioxin TEQ	2.26E-07	3.23E-09
Ethylbenzene	3.73E-05	5.33E-07
Iron	2.26E-07	3.23E-09
MCPP	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Mercury	2.26E-07	3.23E-09
MTBE	4.30E-05	6.15E-07
Molybdenum	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Acenaphthene	1.72E-06	2.46E-08
~Anthracene	6.27E-07	8.96E-09
~Benz[a]anthracene	2.26E-07	3.23E-09
~Benzo[a]pyrene	2.26E-07	3.23E-09
~Benzo[b]fluoranthene	2.26E-07	3.23E-09
~Benzo[k]fluoranthene	2.26E-07	3.23E-09
~Chrysene	2.26E-07	3.23E-09
~Fluoranthene	2.26E-07	3.23E-09
~Fluorene	9.72E-07	1.39E-08
~Indeno[1,2,3-cd]pyrene	2.26E-07	3.23E-09
~Methylnaphthalene, 1-	3.81E-06	5.44E-08
~Methylnaphthalene, 2-	3.85E-06	5.50E-08
~Naphthalene	4.76E-06	6.79E-08
~Pyrene	2.26E-07	3.23E-09
Propyl benzene	3.02E-05	4.32E-07
Silver	2.26E-07	3.23E-09
Styrene	2.26E-05	3.23E-07
Thallium	2.26E-07	3.23E-09
Toluene	4.93E-05	7.04E-07
Trimethylbenzene, 1,2,4-	2.68E-05	3.82E-07
Trimethylbenzene, 1,3,5-	3.20E-05	4.57E-07
Vanadium	2.26E-07	3.23E-09
Xylene, m-	3.86E-05	5.51E-07
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 1 All Soil (0-8 ft bgs)
Cal/TPA Toxicity
SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
Adult	Ingestion	Dermal	Inhalation	Total	Ingestion	Dermal	Inhalation	Total
Acetone	NA	NA	NA	0.00E+00	5.02E-08	0.00E+00	7.05E-09	5.73E-08
sec-Butylbenzene	NA	NA	NA	0.00E+00	2.17E-04	0.00E+00	5.42E-06	2.22E-04
tert-Butylbenzene	NA	NA	NA	0.00E+00	5.83E-05	0.00E+00	1.46E-06	5.97E-05
4-Isopropyltoluene	NA	NA	NA	0.00E+00	5.42E-05	0.00E+00	9.49E-07	5.52E-05
Acenaphthylene	NA	NA	NA	0.00E+00	9.96E-07	1.79E-06	1.52E-07	2.94E-06
Phenanthrene	NA	NA	NA	0.00E+00	3.59E-06	6.46E-06	6.86E-08	1.01E-05
Perylene	NA	NA	NA	0.00E+00	7.53E-07	1.35E-06	1.44E-08	2.12E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	3.55E-07	6.38E-07	6.78E-09	1.00E-06
Aluminum	NA	NA	NA	0.00E+00	2.02E-02	0.00E+00	2.83E-01	3.03E-01
Antimony	NA	NA	NA	0.00E+00	1.37E-01	0.00E+00	NA	1.37E-01
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.42E-08	NA	7.57E-08	8.99E-08	2.48E-03	0.00E+00	6.09E-03	8.57E-03
Beryllium	NA	NA	1.63E-09	1.63E-09	3.39E-04	0.00E+00	2.37E-03	2.71E-03
Biphenyl, 1,1'-	9.96E-12	NA	1.83E-12	1.18E-11	1.74E-06	0.00E+00	3.10E-07	2.05E-06
Butylbenzene, n-	NA	NA	NA	0.00E+00	5.81E-04	0.00E+00	1.67E-03	2.25E-03
Carbon Disulfide	NA	NA	NA	0.00E+00	2.13E-07	0.00E+00	1.69E-06	1.91E-06
Chloroform	9.25E-10	NA	3.92E-09	4.85E-09	2.09E-04	0.00E+00	5.29E-04	7.38E-04
Chlorotoluene, o-	NA	NA	NA	0.00E+00	5.17E-04	0.00E+00	1.19E-03	1.71E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Cumene	NA	NA	NA	0.00E+00	2.19E-04	0.00E+00	5.78E-04	7.97E-04
Dioxin TEQ	9.29E-07	3.85E-07	1.90E-08	1.33E-06	7.15E-01	2.96E-01	8.76E-04	1.01E+00
Ethylbenzene	1.30E-08	NA	3.40E-08	4.70E-08	8.25E-04	0.00E+00	9.52E-04	1.78E-03
Iron	NA	NA	NA	0.00E+00	8.30E-02	0.00E+00	NA	8.30E-02
MCPP	NA	NA	NA	0.00E+00	1.20E+00	1.66E+00	2.40E-02	2.88E+00
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MTBE	1.83E-13	NA	3.52E-13	5.34E-13	NA	NA	3.16E-08	3.16E-08
Molybdenum	NA	NA	NA	0.00E+00	2.45E-03	0.00E+00	NA	2.45E-03
Nickel	NA	NA	1.24E-07	1.24E-07	2.39E-02	0.00E+00	6.69E-01	6.93E-01
Phenol	NA	NA	NA	0.00E+00	6.66E-06	9.21E-06	7.00E-07	1.66E-05
~Acenaphthene	NA	NA	NA	0.00E+00	1.33E-06	2.39E-06	2.03E-07	3.92E-06
~Anthracene	NA	NA	NA	0.00E+00	2.56E-07	4.60E-07	1.36E-08	7.30E-07
~Benz[a]anthracene	7.86E-10	1.41E-09	5.04E-12	2.20E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	3.82E-09	6.86E-09	2.45E-11	1.07E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	5.54E-10	9.94E-10	3.55E-12	1.55E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.66E-10	2.98E-10	1.07E-12	4.65E-10	NA	NA	NA	0.00E+00
~Chrysene	1.20E-10	2.15E-10	7.67E-13	3.35E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	1.95E-06	3.51E-06	NA	5.46E-06
~Fluorene	NA	NA	NA	0.00E+00	5.28E-06	9.48E-06	4.54E-07	1.52E-05
~Indeno[1,2,3-cd]pyrene	2.34E-10	4.21E-10	1.50E-12	6.56E-10	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	4.41E-10	7.93E-10	1.49E-10	1.38E-09	1.52E-05	2.73E-05	5.03E-06	4.76E-05
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.17E-03	3.90E-03	NA	6.07E-03
~NAphthalene	NA	NA	2.24E-08	2.24E-08	1.57E-03	2.81E-03	1.54E-02	1.98E-02
~Pyrene	NA	NA	NA	0.00E+00	9.31E-06	1.67E-05	1.78E-07	2.62E-05
Propyl benzene	NA	NA	NA	0.00E+00	7.96E-04	1.10E-03	5.32E-03	7.22E-03
Silver	NA	NA	NA	0.00E+00	8.40E-04	0.00E+00	NA	8.40E-04
Styrene	NA	NA	NA	0.00E+00	1.11E-07	0.00E+00	1.73E-07	2.85E-07
Thallium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	NA	NA	NA	0.00E+00	9.39E-04	0.00E+00	3.82E-03	4.76E-03
Trimethylbenzene, 1,2,4-	NA	NA	NA	0.00E+00	NA	NA	2.81E-01	2.81E-01
Trimethylbenzene, 1,3,5-	NA	NA	NA	0.00E+00	1.34E-02	0.00E+00	2.21E-01	2.35E-01
Vanadium	NA	NA	NA	0.00E+00	1.87E-02	0.00E+00	NA	1.87E-02
Xylene, m-	NA	NA	NA	0.00E+00	1.99E-03	0.00E+00	4.75E-02	4.95E-02
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	9.64E-07	3.96E-07	2.81E-07	1.64E-06	2.23E+00	1.96E+00	1.56E+00	5.75E+00

Inhalation while Trenching - Cal EPA Subarea 1

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	1.6E-03	1.6E-05	1.4E-02	250	1	0.33	365	25550	2.6E-02	8.2E-08
1,2-Dichloroethane	ND	2.1E-05	4.0E-01	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	ND	0.0E+00	3.2E-02	250	1	0.33	365	25550	NA	NA
1,3,5-Trimethylbenzene	3.8E-04	0.0E+00	6.0E-03	250	1	0.33	365	25550	1.4E-02	NA
2-Butanone	1.2E-03	0.0E+00	5.0E+00	250	1	0.33	365	25550	5.5E-05	NA
2-Methylnaphthalene	4.6E-03	0.0E+00	1.4E-02	250	1	0.33	365	25550	7.6E-02	NA
Acenaphthene	1.5E-05	0.0E+00	2.1E-01	250	1	0.33	365	25550	1.6E-05	NA
Acetone	1.4E-03	0.0E+00	3.1E+01	250	1	0.33	365	25550	1.0E-05	NA
Benzene	1.5E-01	2.9E-05	3.0E-02	250	1	0.33	365	25550	1.1E+00	1.4E-05
Chloroethane	7.6E-05	8.3E-07	1.0E+01	250	1	0.33	365	25550	1.7E-06	2.1E-10
Chloroform	ND	5.3E-06	3.0E-01	250	1	0.33	365	25550	NA	NA
Chloromethane	5.2E-05	1.8E-06	9.0E-02	250	1	0.33	365	25550	1.3E-04	3.0E-10
cis-1,2-Dichloroethene	2.4E-04	0.0E+00	3.5E-02	250	1	0.33	365	25550	1.5E-03	NA
Ethylbenzene	9.5E-02	2.5E-06	1.0E+00	250	1	0.33	365	25550	2.2E-02	7.8E-07
Fluorene	5.2E-06	0.0E+00	1.4E-01	250	1	0.33	365	25550	8.4E-06	NA
Hexachloroethane	ND	1.1E-05	3.5E-03	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	4.7E-03	0.0E+00	4.0E-01	250	1	0.33	365	25550	2.7E-03	NA
MTBE	9.6E-04	2.6E-07	3.0E+00	250	1	0.33	365	25550	7.3E-05	8.2E-10
Naphthalene	1.5E-02	3.4E-05	3.0E-03	250	1	0.33	365	25550	1.2E+00	1.7E-06
n-Butylbenzene	2.6E-05	0.0E+00	1.4E-01	250	1	0.33	365	25550	4.3E-05	NA
n-Propylbenzene	6.2E-04	0.0E+00	1.4E-01	250	1	0.33	365	25550	1.0E-03	NA
Pyrene	7.5E-07	0.0E+00	1.1E-01	250	1	0.33	365	25550	1.6E-06	NA
sec-Butylbenzene	1.1E-04	0.0E+00	1.4E-01	250	1	0.33	365	25550	1.8E-04	NA
tert-Butylbenzene	9.0E-05	0.0E+00	1.4E-01	250	1	0.33	365	25550	1.5E-04	NA
Tetrachloroethene	2.1E-04	5.9E-06	3.5E-02	250	1	0.33	365	25550	1.4E-03	4.1E-09
Toluene	3.1E-01	0.0E+00	3.0E-01	250	1	0.33	365	25550	2.4E-01	NA
Trichloroethene (TCE)	1.5E-04	4.1E-06	2.0E-03	250	1	0.33	365	25550	1.7E-02	2.0E-09
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	3.4E-01	0.0E+00	1.0E-01	250	1	0.33	365	25550	7.9E-01	NA

Total	3.4E+00	1.6E-05

Inhalation while Trenching - USEPA - Subarea 1

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	1.6E-03	1.6E-05	2.0E-04	250	1	0.33	365	25550	1.8E+00	8.2E-08
1,2-Dichloroethane	ND	2.6E-05	7.0E-03	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	ND	0.0E+00	6.0E-02	250	1	0.33	365	25550	NA	NA
1,3,5-Trimethylbenzene	3.8E-04	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
2-Butanone	1.2E-03	0.0E+00	5.0E+00	250	1	0.33	365	25550	5.5E-05	NA
2-Methylnaphthalene	4.6E-03	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acenaphthene	1.5E-05	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acetone	1.4E-03	0.0E+00	3.1E+01	250	1	0.33	365	25550	1.0E-05	NA
Benzene	1.5E-01	7.8E-06	3.0E-02	250	1	0.33	365	25550	1.1E+00	3.7E-06
Chloroethane	7.6E-05	0.0E+00	1.0E+01	250	1	0.33	365	25550	1.7E-06	NA
Chloroform	ND	2.3E-05	9.8E-02	250	1	0.33	365	25550	NA	NA
Chloromethane	5.2E-05	0.0E+00	9.0E-02	250	1	0.33	365	25550	1.3E-04	NA
cis-1,2-Dichloroethene	2.4E-04	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Ethylbenzene	9.5E-02	2.5E-06	1.0E+00	250	1	0.33	365	25550	2.2E-02	7.8E-07
Fluorene	5.2E-06	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Hexachloroethane	ND	1.1E-05	3.0E-02	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	4.7E-03	0.0E+00	4.0E-01	250	1	0.33	365	25550	2.7E-03	NA
MTBE	9.6E-04	2.6E-07	3.0E+00	250	1	0.33	365	25550	7.3E-05	8.2E-10
Naphthalene	1.5E-02	3.4E-05	3.0E-03	250	1	0.33	365	25550	1.2E+00	1.7E-06
n-Butylbenzene	2.6E-05	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
n-Propylbenzene	6.2E-04	0.0E+00	1.0E+00	250	1	0.33	365	25550	1.4E-04	NA
Pyrene	7.5E-07	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
sec-Butylbenzene	1.1E-04	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
tert-Butylbenzene	9.0E-05	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Tetrachloroethene	2.1E-04	2.6E-07	4.0E-02	250	1	0.33	365	25550	1.2E-03	1.8E-10
Toluene	3.1E-01	0.0E+00	5.0E+00	250	1	0.33	365	25550	1.4E-02	NA
Trichloroethene (TCE)	1.5E-04	4.1E-06	2.0E-03	250	1	0.33	365	25550	1.7E-02	2.0E-09
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	3.4E-01	0.0E+00	1.0E-01	250	1	0.33	365	25550	7.9E-01	NA

Total	4.9E+00	6.2E-06

DERMAL CONTACT WITH GROUND WATER
Construction worker Cal EPA - Subarea 1

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $DA_{event} = 2\, FA \times K_p \times C_w \times CF \sqrt{\frac{6\, \tau_{event} \times t_{event}}{\pi}}$

If ET > t*, then: $DA_{event} = FA \times K_p \times C_w \times CF \times \left[\frac{t_{event}}{1+B} + 2\, \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	CAL-EPA Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	0.016	0.001	1	3.27E-01	4.59E-07	2375	1	250	1	70	25550	1.52E-07	1.80E-03	2.74E-10
Benzene	78	5.10E-02	0.69	8	1.50E-02	2.1	0.001	1	2.87E-01	2.59E-04	2375	1	250	1	70	25550	8.59E-05	1.00E-01	8.59E-06
Toluene	92	1.14E-01	0.83	8	3.10E-02	4.9	0.001	1	3.44E-01	1.21E-03	2375	1	250	1	70	25550	4.01E-04	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	5.8	0.001	1	4.34E-01	2.35E-03	2375	1	250	1	70	25550	7.79E-04	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	1.6	0.001	1	4.34E-01	6.05E-04	2375	1	250	1	70	25550	2.01E-04	1.10E-02	2.21E-06
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	0.031	0.001	1	5.83E-01	1.78E-06	2375	1	250	1	70	25550	5.91E-07	7.20E-02	4.26E-08
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	0.099	0.001	1	6.55E-01	6.76E-05	2375	1	250	1	70	25550	2.24E-05	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.0004	0.001	1	7.65E-01	2.68E-07	2375	1	250	1	70	25550	8.88E-08	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.70E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.10E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	0.0067	0.001	1	4.93E-01	3.15E-06	2375	1	250	1	70	25550	1.05E-06	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	0.001	0.001	1	2.41E-01	5.09E-08	2375	1	250	1	70	25550	1.69E-08	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	0.0002	0.001	1	8.93E-01	1.72E-07	2375	1	250	1	70	25550	5.71E-08	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	0.035	0.001	1	2.66E-01	2.86E-07	2375	1	250	1	70	25550	9.49E-08	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.90E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	0.045	0.001	1	2.22E-01	1.94E-07	2375	1	250	1	70	25550	6.45E-08	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	0.0006	0.001	1	2.01E-01	1.65E-08	2375	1	250	1	70	25550	5.48E-09	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0038	0.001	1	3.66E-01	3.53E-07	2375	1	250	1	70	25550	1.17E-07	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.0001	0.001	1	1.42E+00	1.79E-07	2375	1	250	1	70	25550	5.95E-08	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	0.084	0.001	1	4.93E-01	5.38E-05	2375	1	250	1	70	25550	1.79E-05	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.31	0.001	1	5.47E-01	1.16E-04	2375	1	250	1	70	25550	3.85E-05	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	0.00049	0.001	1	5.91E-01	6.69E-07	2375	1	250	1	70	25550	2.22E-07	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	0.0044	0.001	1	8.93E-01	1.30E-06	2375	1	250	1	70	25550	4.31E-07	5.40E-01	2.33E-07
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	0.011	0.001	1	4.93E-01	7.31E-06	2375	1	250	1	70	25550	2.43E-06	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	0.0021	0.001	1	5.91E-01	3.58E-06	2375	1	250	1	70	25550	1.19E-06	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	0.0017	0.001	1	5.91E-01	1.68E-06	2375	1	250	1	70	25550	5.59E-07	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	ND	0.001	1	3.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	0.0028	0.001	1	5.69E-01	2.96E-07	2375	1	250	1	70	25550	9.81E-08	5.90E-03	5.79E-10
Chrysene	228	2.73E+00	4.77	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.20E-01	ND
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	0.007	0.001	1	5.06E-01	9.42E-08	2375	1	250	1	70	25550	3.13E-08	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	0.075	0.001	1	4.23E-01	4.99E-06	2375	1	250	1	70	25550	1.66E-06	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	0.0093	0.001	1	5.91E-01	9.12E-06	2375	1	250	1	70	25550	3.03E-06	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	0.012	0.001	1	4.23E-01	7.98E-07	2375	1	250	1	70	25550	2.65E-07	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	0.00008	0.001	1	1.04E+00	9.04E-08	2375	1	250	1	70	25550	3.00E-08	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	0.0003	0.001	1	5.87E+00	2.19E-07	2375	1	250	1	70	25550	7.26E-08	1.90E-03	1.38E-10
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	25550	6.48E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	0.044	0.001	1	3.53E-01	1.63E-06	2375	1	250	1	70	25550	5.40E-07	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.108	0.001	1	2.87E-01	8.64E-07	2375	1	250	1	70	25550	2.87E-07	1.50E+00	4.30E-07
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	0.00065	0.001	1	1.18E-01	5.20E-09	2375	1	250	1	70	25550	1.73E-09	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	46.9	0.001	1	2.16E-01	3.75E-04	2375	1	250	1	70	25550	1.25E-04	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	5.93	0.001	1	2.13E-01	4.74E-05	2375	1	250	1	70	25550	1.57E-05	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.00E-03	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.50E-04	ND
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.00E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.20E-03	ND
MCPP	214.65	7.38E-02	4.01	8	1.31E-02	1.7	0.001	1	1.67E+00	2.46E-04	2375	1	250	1	70	25550	8.16E-05	NA	ND
ND - not detected/not determined																		total risk	1.15E-05

BB - below background

DERMAL CONTACT WITH GROUND WATER
Construction worker Cal EPA - Subarea 1

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	0.016	0.001	1	3.27E-01	4.59E-07	2375	1	250	1	70	365	1.07E-05	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	2.1	0.001	1	2.87E-01	2.59E-04	2375	1	250	1	70	365	6.01E-03	4.00E-03	1.50E+00
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	4.9	0.001	1	3.44E-01	1.21E-03	2375	1	250	1	70	365	2.80E-02	8.00E-02	3.51E-01
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	5.8	0.001	1	4.34E-01	2.35E-03	2375	1	250	1	70	365	5.46E-02	2.00E-01	2.73E-01
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	1.6	0.001	1	4.34E-01	6.05E-04	2375	1	250	1	70	365	1.41E-02	1.00E-01	1.41E-01
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	0.031	0.001	1	5.83E-01	1.78E-06	2375	1	250	1	70	365	4.14E-05	4.00E-03	1.03E-02
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	0.099	0.001	1	6.55E-01	6.76E-05	2375	1	250	1	70	365	1.57E-03	4.00E-03	3.93E-01
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.0004	0.001	1	7.65E-01	2.68E-07	2375	1	250	1	70	365	6.22E-06	6.00E-02	1.04E-04
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	0.0067	0.001	1	4.93E-01	3.15E-06	2375	1	250	1	70	365	7.32E-05	1.00E-02	7.32E-03
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	0.001	0.001	1	2.41E-01	5.09E-08	2375	1	250	1	70	365	1.18E-06	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	0.0002	0.001	1	8.93E-01	1.72E-07	2375	1	250	1	70	365	4.00E-06	4.00E-02	9.99E-05
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	0.035	0.001	1	2.66E-01	2.86E-07	2375	1	250	1	70	365	6.64E-06	6.00E-01	1.11E-05
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	0.045	0.001	1	2.22E-01	1.94E-07	2375	1	250	1	70	365	4.52E-06	9.00E-01	5.02E-06
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	0.0006	0.001	1	2.01E-01	1.65E-08	2375	1	250	1	70	365	3.84E-07	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0038	0.001	1	3.66E-01	3.53E-07	2375	1	250	1	70	365	8.20E-06	2.00E-03	4.10E-03
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.0001	0.001	1	1.42E+00	1.79E-07	2375	1	250	1	70	365	4.17E-06	3.00E-02	1.39E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	0.084	0.001	1	4.93E-01	5.38E-05	2375	1	250	1	70	365	1.25E-03	1.00E-01	1.25E-02
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.31	0.001	1	5.47E-01	1.16E-04	2375	1	250	1	70	365	2.69E-03	2.00E-02	1.35E-01
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	0.00049	0.001	1	5.91E-01	6.69E-07	2375	1	250	1	70	365	1.55E-05	5.00E-02	3.11E-04
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	0.0044	0.001	1	8.93E-01	1.30E-06	2375	1	250	1	70	365	3.02E-05	6.00E-03	5.03E-03
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	0.011	0.001	1	4.93E-01	7.31E-06	2375	1	250	1	70	365	1.70E-04	1.00E-01	1.70E-03
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	0.0021	0.001	1	5.91E-01	3.58E-06	2375	1	250	1	70	365	8.32E-05	5.00E-02	1.66E-03
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	0.0017	0.001	1	5.91E-01	1.68E-06	2375	1	250	1	70	365	3.91E-05	5.00E-02	7.83E-04
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	ND	0.001	1	3.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	0.0028	0.001	1	5.69E-01	2.96E-07	2375	1	250	1	70	365	6.87E-06	5.00E-04	1.37E-02
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	0.007	0.001	1	5.06E-01	9.42E-08	2375	1	250	1	70	365	2.19E-06	2.00E-02	1.09E-04
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	0.075	0.001	1	4.23E-01	4.99E-06	2375	1	250	1	70	365	1.16E-04	5.00E-02	2.32E-03
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	0.0093	0.001	1	5.91E-01	9.12E-06	2375	1	250	1	70	365	2.12E-04	1.00E-01	2.12E-03
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	0.012	0.001	1	4.23E-01	7.98E-07	2375	1	250	1	70	365	1.85E-05	1.00E-01	1.85E-04
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	0.00008	0.001	1	1.04E+00	9.04E-08	2375	1	250	1	70	365	2.10E-06	3.00E-01	7.01E-06
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	0.0003	0.001	1	5.87E+00	2.19E-07	2375	1	250	1	70	365	5.08E-06	2.00E-01	2.54E-05
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	365	4.54E-06	4.00E-02	1.13E-04
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	0.044	0.001	1	3.53E-01	1.63E-06	2375	1	250	1	70	365	3.78E-05	3.00E-01	1.26E-04
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.108	0.001	1	2.87E-01	8.64E-07	2375	1	250	1	70	365	2.01E-05	3.00E-04	6.69E-02
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	0.00065	0.001	1	1.18E-01	5.20E-09	2375	1	250	1	70	365	1.21E-07	1.40E-05	8.63E-03
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	46.9	0.001	1	2.16E-01	3.75E-04	2375	1	250	1	70	365	8.72E-03	7.00E-01	1.25E-02
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	5.93	0.001	1	2.13E-01	4.74E-05	2375	1	250	1	70	365	1.10E-03	9.60E-04	1.15E+00
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-02	ND
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-03	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
MCPP	214.65	7.38E-02	4.01E+00	8	1.31E-02	1.7	0.001	1	1.67E+00	2.46E-04	2375	1	250	1	70	365	5.71E-03	1.00E-03	5.71E+00
ND - not detected/not determined																		HI	9.81E+00

BB - below background

DERMAL CONTACT WITH GROUND WATER
Construction worker USEPA - Subarea 1

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $$DA_{event} = 2\,FA\,x\,K_p\,x\,C_w\,x\,CF\sqrt{\frac{6\,\tau_{event}\ x\ t_{event}}{\pi}}$$

If ET > t*, then: $$DA_{event} = FA\ x\ K_p\ x\ C_w\ x\ CF\ x\left[\frac{t_{event}}{1+B} + 2\,\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	USEPA Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	0.016	0.001	1	3.27E-01	4.59E-07	2375	1	250	1	70	25550	1.52E-07	1.80E-03	2.74E-10
Benzene	78	5.10E-02	0.69	8	1.50E-02	2.1	0.001	1	2.87E-01	2.59E-04	2375	1	250	1	70	25550	8.59E-05	5.50E-02	4.73E-06
Toluene	92	1.14E-01	0.83	8	3.10E-02	4.9	0.001	1	3.44E-01	1.21E-03	2375	1	250	1	70	25550	4.01E-04	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	5.8	0.001	1	4.34E-01	2.35E-03	2375	1	250	1	70	25550	7.79E-04	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	1.6	0.001	1	4.34E-01	6.05E-04	2375	1	250	1	70	25550	2.01E-04	1.10E-02	2.21E-06
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	0.031	0.001	1	5.83E-01	1.78E-06	2375	1	250	1	70	25550	5.91E-07	5.70E-02	3.37E-08
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	0.099	0.001	1	6.55E-01	6.76E-05	2375	1	250	1	70	25550	2.24E-05	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.0004	0.001	1	7.65E-01	2.68E-07	2375	1	250	1	70	25550	8.88E-08	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.10E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.10E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	0.0067	0.001	1	4.93E-01	3.15E-06	2375	1	250	1	70	25550	1.05E-06	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	0.001	0.001	1	2.41E-01	5.09E-08	2375	1	250	1	70	25550	1.69E-08	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	0.0002	0.001	1	8.93E-01	1.72E-07	2375	1	250	1	70	25550	5.71E-08	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	0.035	0.001	1	2.66E-01	2.86E-07	2375	1	250	1	70	25550	9.49E-08	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.00E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	0.045	0.001	1	2.22E-01	1.94E-07	2375	1	250	1	70	25550	6.45E-08	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	0.0006	0.001	1	2.01E-01	1.65E-08	2375	1	250	1	70	25550	5.48E-09	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0038	0.001	1	3.66E-01	3.53E-07	2375	1	250	1	70	25550	1.17E-07	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.0001	0.001	1	1.42E+00	1.79E-07	2375	1	250	1	70	25550	5.95E-08	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	0.084	0.001	1	4.93E-01	5.38E-05	2375	1	250	1	70	25550	1.79E-05	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.31	0.001	1	5.47E-01	1.16E-04	2375	1	250	1	70	25550	3.85E-05	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	0.00049	0.001	1	5.91E-01	6.69E-07	2375	1	250	1	70	25550	2.22E-07	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	0.0044	0.001	1	8.93E-01	1.30E-06	2375	1	250	1	70	25550	4.31E-07	2.00E-03	8.63E-10
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	0.011	0.001	1	4.93E-01	7.31E-06	2375	1	250	1	70	25550	2.43E-06	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	0.0021	0.001	1	5.91E-01	3.58E-06	2375	1	250	1	70	25550	1.19E-06	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	0.0017	0.001	1	5.91E-01	1.68E-06	2375	1	250	1	70	25550	5.59E-07	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	ND	0.001	1	3.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	0.0028	0.001	1	5.69E-01	2.96E-07	2375	1	250	1	70	25550	9.81E-08	4.60E-02	4.51E-09
Chrysene	228	2.73E+00	4.77	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	7.30E-03	ND
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	0.007	0.001	1	5.06E-01	9.42E-08	2375	1	250	1	70	25550	3.13E-08	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	0.075	0.001	1	4.23E-01	4.99E-06	2375	1	250	1	70	25550	1.66E-06	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	0.0093	0.001	1	5.91E-01	9.12E-06	2375	1	250	1	70	25550	3.03E-06	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	0.012	0.001	1	4.23E-01	7.98E-07	2375	1	250	1	70	25550	2.65E-07	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	0.00008	0.001	1	1.04E+00	9.04E-08	2375	1	250	1	70	25550	3.00E-08	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	0.0003	0.001	1	5.87E+00	2.19E-07	2375	1	250	1	70	25550	7.26E-08	1.90E-03	1.38E-10
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	25550	6.48E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	0.044	0.001	1	3.53E-01	1.63E-06	2375	1	250	1	70	25550	5.40E-07	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.108	0.001	1	2.87E-01	8.64E-07	2375	1	250	1	70	25550	2.87E-07	1.50E+00	4.30E-07
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	0.00065	0.001	1	1.18E-01	5.20E-09	2375	1	250	1	70	25550	1.73E-09	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	46.9	0.001	1	2.16E-01	3.75E-04	2375	1	250	1	70	25550	1.25E-04	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	5.93	0.001	1	2.13E-01	4.74E-05	2375	1	250	1	70	25550	1.57E-05	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.40E-02	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.50E-04	ND
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.90E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.20E-03	ND
MCPP	214.65	7.38E-02	4.01	8	1.31E-02	1.7	0.001	1	1.67E+00	2.46E-04	2375	1	250	1	70	25550	8.16E-05	NA	ND
ND - not detected/not determined																		total risk	7.40E-06

BB - below background

DERMAL CONTACT WITH GROUND WATER
Construction worker USEPA -Subarea 1

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	0.016	0.001	1	3.27E-01	4.59E-07	2375	1	250	1	70	365	1.07E-05	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	2.1	0.001	1	2.87E-01	2.59E-04	2375	1	250	1	70	365	6.01E-03	4.00E-03	1.50E+00
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	4.9	0.001	1	3.44E-01	1.21E-03	2375	1	250	1	70	365	2.80E-02	8.00E-02	3.51E-01
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	5.8	0.001	1	4.34E-01	2.35E-03	2375	1	250	1	70	365	5.46E-02	2.00E-01	2.73E-01
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	1.6	0.001	1	4.34E-01	6.05E-04	2375	1	250	1	70	365	1.41E-02	1.00E-01	1.41E-01
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	0.031	0.001	1	5.83E-01	1.78E-06	2375	1	250	1	70	365	4.14E-05	4.00E-03	1.03E-02
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	0.099	0.001	1	6.55E-01	6.76E-05	2375	1	250	1	70	365	1.57E-03	4.00E-03	3.93E-01
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.0004	0.001	1	7.65E-01	2.68E-07	2375	1	250	1	70	365	6.22E-06	6.00E-02	1.04E-04
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	0.0067	0.001	1	4.93E-01	3.15E-06	2375	1	250	1	70	365	7.32E-05	1.00E-02	7.32E-03
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	0.001	0.001	1	2.41E-01	5.09E-08	2375	1	250	1	70	365	1.18E-06	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	0.0002	0.001	1	8.93E-01	1.72E-07	2375	1	250	1	70	365	4.00E-06	4.00E-02	9.99E-05
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	0.035	0.001	1	2.66E-01	2.86E-07	2375	1	250	1	70	365	6.64E-06	6.00E-01	1.11E-05
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	0.045	0.001	1	2.22E-01	1.94E-07	2375	1	250	1	70	365	4.52E-06	9.00E-01	5.02E-06
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	0.0006	0.001	1	2.01E-01	1.65E-08	2375	1	250	1	70	365	3.84E-07	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0038	0.001	1	3.66E-01	3.53E-07	2375	1	250	1	70	365	8.20E-06	2.00E-03	4.10E-03
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.0001	0.001	1	1.42E+00	1.79E-07	2375	1	250	1	70	365	4.17E-06	3.00E-02	1.39E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	0.084	0.001	1	4.93E-01	5.38E-05	2375	1	250	1	70	365	1.25E-03	1.00E-01	1.25E-02
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.31	0.001	1	5.47E-01	1.16E-04	2375	1	250	1	70	365	2.69E-03	2.00E-02	1.35E-01
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	0.00049	0.001	1	5.91E-01	6.69E-07	2375	1	250	1	70	365	1.55E-05	5.00E-02	3.11E-04
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	0.0044	0.001	1	8.93E-01	1.30E-06	2375	1	250	1	70	365	3.02E-05	6.00E-03	5.03E-03
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	0.011	0.001	1	4.93E-01	7.31E-06	2375	1	250	1	70	365	1.70E-04	1.00E-01	1.70E-03
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	0.0021	0.001	1	5.91E-01	3.58E-06	2375	1	250	1	70	365	8.32E-05	5.00E-02	1.66E-03
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	0.0017	0.001	1	5.91E-01	1.68E-06	2375	1	250	1	70	365	3.91E-05	5.00E-02	7.83E-04
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	ND	0.001	1	3.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	0.0028	0.001	1	5.69E-01	2.96E-07	2375	1	250	1	70	365	6.87E-06	5.00E-04	1.37E-02
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	0.007	0.001	1	5.06E-01	9.42E-08	2375	1	250	1	70	365	2.19E-06	2.00E-02	1.09E-04
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	0.075	0.001	1	4.23E-01	4.99E-06	2375	1	250	1	70	365	1.16E-04	5.00E-02	2.32E-03
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	0.0093	0.001	1	5.91E-01	9.12E-06	2375	1	250	1	70	365	2.12E-04	1.00E-01	2.12E-03
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	0.012	0.001	1	4.23E-01	7.98E-07	2375	1	250	1	70	365	1.85E-05	1.00E-01	1.85E-04
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	0.00008	0.001	1	1.04E+00	9.04E-08	2375	1	250	1	70	365	2.10E-06	3.00E-01	7.01E-06
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	0.0003	0.001	1	5.87E+00	2.19E-07	2375	1	250	1	70	365	5.08E-06	2.00E-01	2.54E-05
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	365	4.54E-06	4.00E-02	1.13E-04
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	0.044	0.001	1	3.53E-01	1.63E-06	2375	1	250	1	70	365	3.78E-05	3.00E-01	1.26E-04
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.108	0.001	1	2.87E-01	8.64E-07	2375	1	250	1	70	365	2.01E-05	3.00E-04	6.69E-02
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	0.00065	0.001	1	1.18E-01	5.20E-09	2375	1	250	1	70	365	1.21E-07	1.40E-05	8.63E-03
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	46.9	0.001	1	2.16E-01	3.75E-04	2375	1	250	1	70	365	8.72E-03	7.00E-01	1.25E-02
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	5.93	0.001	1	2.13E-01	4.74E-05	2375	1	250	1	70	365	1.10E-03	9.60E-04	1.15E+00
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-02	ND
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-03	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
MCPP	214.65	7.38E-02	4.01E+00	8	1.31E-02	1.7	0.001	1	1.67E+00	2.46E-04	2375	1	250	1	70	365	5.71E-03	1.00E-03	5.71E+00
ND - not detected/not determined																			
BB - below background																		HI	9.81E+00

Subarea 2: Cancer Risk and Noncancer Health Hazard Calculations

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA		2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	3.05E-05	3.65E-06	4.59E-09	3.42E-05	9.78E-01	1.17E-01	8.81E-06	1.10E+00
Iron	NA	NA	NA	0.00E+00	2.88E-02	0.00E+00	NA	2.88E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	6.85E-06	2.73E-06	5.29E-09	9.59E-06
~Aroclor 1260	1.28E-07	7.14E-08	1.87E-11	1.99E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	3.07E-05	3.73E-06	4.73E-09	3.44E-05	1.01E+00	1.17E-01	1.62E-05	1.12E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	of Concern	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	5.47E-07	1.87E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	5.47E-07	1.87E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
~Acenaphthene	7.11E-07	2.44E-07
~Anthracene	7.11E-07	2.44E-07
~Benz[a]anthracene	7.11E-07	2.44E-07
~Benzo[a]pyrene	7.11E-07	2.44E-07
~Benzo[b]fluoranthene	7.11E-07	2.44E-07
~Benzo[k]fluoranthene	7.11E-07	2.44E-07
~Chrysene	7.11E-07	2.44E-07
~Fluoranthene	7.11E-07	2.44E-07
~Fluorene	7.11E-07	2.44E-07
~Indeno[1,2,3-cd]pyrene	7.11E-07	2.44E-07
~Methylnaphthalene, 1-	7.11E-07	2.44E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
~Naphthalene	7.11E-07	2.44E-07
~Pyrene	7.11E-07	2.44E-07
Propyl benzene	5.47E-07	1.87E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contar
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	7.05E-10	2.42E-10
Acenaphthylene	6.35E-06	2.18E-06
Phenanthrene	7.05E-10	2.42E-10
Perylene	7.05E-10	2.42E-10
Benzo(g,h,i)perylene	7.05E-10	2.42E-10
Aluminum	7.05E-10	2.42E-10
Antimony	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Butylbenzene, n-	1.09E-04	3.75E-05
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
~Dibenzofuran	4.55E-06	1.56E-06
Iron	7.05E-10	2.42E-10
MCPP	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
~Acenaphthene	6.35E-06	2.18E-06
~Anthracene	1.70E-06	5.84E-07
~Benz[a]anthracene	7.05E-10	2.42E-10
~Benzo[a]pyrene	7.05E-10	2.42E-10
~Benzo[b]fluoranthene	7.05E-10	2.42E-10
~Benzo[k]fluoranthene	7.05E-10	2.42E-10
~Chrysene	7.05E-10	2.42E-10
~Fluoranthene	7.05E-10	2.42E-10
~Fluorene	3.17E-06	1.09E-06
~Indeno[1,2,3-cd]pyrene	7.05E-10	2.42E-10
~Methylnaphthalene, 1-	1.52E-05	5.21E-06
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
~Naphthalene	1.92E-05	6.59E-06
~Pyrene	7.05E-10	2.42E-10
Propyl benzene	1.27E-04	4.37E-05
Thallium	7.05E-10	2.42E-10
Toluene	2.08E-04	7.13E-05
Vanadium	7.05E-10	2.42E-10
Xylene, m-	1.63E-04	5.58E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.45E-06	0.00E+00	NA	1.45E-06
Acenaphthylene	NA	NA	NA	0.00E+00	1.18E-05	0.00E+00	NA	1.18E-05
Phenanthrene	NA	NA	NA	0.00E+00	6.80E-05	0.00E+00	NA	6.80E-05
Perylene	NA	NA	NA	0.00E+00	5.94E-07	2.37E-07	NA	8.30E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	6.85E-08	0.00E+00	NA	6.85E-08
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.25E-06	0.00E+00	NA	2.25E-06
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.01E-05	2.41E-06	3.03E-09	2.26E-05	6.46E-01	7.73E-02	5.82E-06	7.23E-01
Ethylbenzene	1.05E-09	0.00E+00	2.74E-08	2.84E-08	2.78E-06	0.00E+00	3.19E-05	3.47E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	4.11E-06	0.00E+00	NA	4.11E-06
Iron	NA	NA	NA	0.00E+00	2.76E-02	0.00E+00	NA	2.76E-02
MCPP	NA	NA	NA	0.00E+00	5.75E-05	2.30E-05	NA	8.05E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	3.04E-06	1.21E-06	2.35E-09	4.26E-06
~Aroclor 1260	1.63E-07	9.13E-08	2.40E-11	2.55E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	5.59E-06	2.90E-06	NA	8.50E-06
~Anthracene	NA	NA	NA	0.00E+00	3.93E-07	2.04E-07	NA	5.96E-07
~Benz[a]anthracene	1.10E-08	5.69E-09	8.51E-13	1.67E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	5.49E-08	2.85E-08	4.25E-12	8.33E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.10E-08	5.69E-09	8.51E-13	1.67E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	7.89E-10	4.09E-10	6.12E-13	1.20E-09	NA	NA	NA	0.00E+00
~Chrysene	5.14E-10	2.67E-10	3.99E-13	7.81E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	8.22E-06	4.26E-06	NA	1.25E-05
~Fluorene	NA	NA	NA	0.00E+00	8.25E-05	4.28E-05	NA	1.25E-04
~Indeno[1,2,3-cd]pyrene	3.09E-09	1.60E-09	2.39E-13	4.69E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.50E-07	7.77E-08	NA	2.28E-07	2.15E-04	1.12E-04	NA	3.27E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	3.28E-03	1.70E-03	NA	4.99E-03
~Naphthalene	NA	NA	4.01E-07	4.01E-07	1.23E-04	6.36E-05	1.15E-02	1.17E-02
~Pyrene	NA	NA	NA	0.00E+00	2.24E-05	1.16E-05	NA	3.40E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.51E-06	6.01E-07	1.40E-05	1.61E-05
Thallium	NA	NA	NA	0.00E+00	8.77E-02	0.00E+00	NA	8.77E-02
Toluene	NA	NA	NA	0.00E+00	1.52E-06	0.00E+00	3.70E-06	5.23E-06
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	3.01E-06	0.00E+00	7.16E-04	7.19E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.05E-05	2.62E-06	4.32E-07	2.36E-05	7.65E-01	7.93E-02	1.22E-02	8.57E-01

Adult Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Adult Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	3.05E-05	3.65E-06	4.59E-09	3.42E-05	9.78E-01	1.17E-01	8.81E-06	1.10E+00
Iron	NA	NA	NA	0.00E+00	2.88E-02	0.00E+00	NA	2.88E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	6.85E-06	2.73E-06	5.29E-09	9.59E-06
~Aroclor 1260	1.28E-07	7.14E-08	1.87E-11	1.99E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	3.07E-05	3.73E-06	4.73E-09	3.44E-05	1.01E+00	1.17E-01	1.62E-05	1.12E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Co
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contaminatior
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	7.11E-07	2.44E-07
Benzo(g,h,i)perylene	7.11E-07	2.44E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	5.47E-07	1.87E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
~Acenaphthene	7.11E-07	2.44E-07
~Anthracene	7.11E-07	2.44E-07
~Benz[a]anthracene	7.11E-07	2.44E-07
~Benzo[a]pyrene	7.11E-07	2.44E-07
~Benzo[b]fluoranthene	7.11E-07	2.44E-07
~Benzo[k]fluoranthene	7.11E-07	2.44E-07
~Chrysene	7.11E-07	2.44E-07
~Fluoranthene	7.11E-07	2.44E-07
~Fluorene	7.11E-07	2.44E-07
~Indeno[1,2,3-cd]pyrene	7.11E-07	2.44E-07
~Methylnaphthalene, 1-	7.11E-07	2.44E-07
~Methylnaphthalene, 2-	7.11E-07	2.44E-07
~Naphthalene	7.11E-07	2.44E-07
~Pyrene	7.11E-07	2.44E-07
Propyl benzene	5.47E-07	1.87E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contami
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	7.05E-10	2.42E-10
Acenaphthylene	6.35E-06	2.18E-06
Phenanthrene	7.05E-10	2.42E-10
Perylene	7.05E-10	2.42E-10
Benzo(g,h,i)perylene	7.05E-10	2.42E-10
Aluminum	7.05E-10	2.42E-10
Antimony	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Beryllium	7.05E-10	2.42E-10
Butylbenzene, n-	1.09E-04	3.75E-05
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Ethylbenzene	1.57E-04	5.39E-05
~Dibenzofuran	4.55E-06	1.56E-06
Iron	7.05E-10	2.42E-10
MCPP	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
~Acenaphthene	6.35E-06	2.18E-06
~Anthracene	1.70E-06	5.84E-07
~Benz[a]anthracene	7.05E-10	2.42E-10
~Benzo[a]pyrene	7.05E-10	2.42E-10
~Benzo[b]fluoranthene	7.05E-10	2.42E-10
~Benzo[k]fluoranthene	7.05E-10	2.42E-10
~Chrysene	7.05E-10	2.42E-10
~Fluoranthene	7.05E-10	2.42E-10
~Fluorene	3.17E-06	1.09E-06
~Indeno[1,2,3-cd]pyrene	7.05E-10	2.42E-10
~Methylnaphthalene, 1-	1.52E-05	5.21E-06
~Methylnaphthalene, 2-	1.54E-05	5.27E-06
~Naphthalene	1.92E-05	6.59E-06
~Pyrene	7.05E-10	2.42E-10
Propyl benzene	1.27E-04	4.37E-05
Thallium	7.05E-10	2.42E-10
Toluene	2.08E-04	7.13E-05
Vanadium	7.05E-10	2.42E-10
Xylene, m-	1.63E-04	5.58E-05
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

	Risk				Hazard			
Chemical	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.45E-06	0.00E+00	2.67E-10	1.45E-06
Acenaphthylene	NA	NA	NA	0.00E+00	1.18E-05	0.00E+00	1.56E-05	2.73E-05
Phenanthrene	NA	NA	NA	0.00E+00	6.80E-05	0.00E+00	9.55E-09	6.80E-05
Perylene	NA	NA	NA	0.00E+00	5.94E-07	3.08E-07	8.33E-11	9.02E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	6.85E-08	3.55E-08	9.61E-12	1.04E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.22E-10	1.22E-10	1.44E-04	0.00E+00	7.40E-06	1.51E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.25E-06	0.00E+00	6.40E-05	6.63E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.01E-05	2.41E-06	3.03E-09	2.26E-05	6.46E-01	7.73E-02	5.82E-06	7.23E-01
Ethylbenzene	1.05E-09	0.00E+00	2.74E-08	2.84E-08	2.78E-06	0.00E+00	3.19E-05	3.47E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	4.11E-06	0.00E+00	9.74E-07	5.08E-06
Iron	NA	NA	NA	0.00E+00	2.76E-02	0.00E+00	NA	2.76E-02
MCPP	NA	NA	NA	0.00E+00	5.75E-05	2.30E-05	8.46E-09	8.05E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	3.04E-06	1.21E-06	2.35E-09	4.26E-06
~Aroclor 1260	1.63E-07	9.13E-08	2.40E-11	2.55E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	5.59E-06	2.90E-06	7.41E-06	1.59E-05
~Anthracene	NA	NA	NA	0.00E+00	3.93E-07	2.04E-07	1.33E-07	7.30E-07
~Benz[a]anthracene	1.80E-08	9.35E-09	8.51E-13	2.74E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	9.02E-08	4.68E-08	4.25E-12	1.37E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.80E-08	9.35E-09	8.51E-13	2.74E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.30E-08	6.72E-09	6.12E-13	1.97E-08	NA	NA	NA	0.00E+00
~Chrysene	8.45E-09	4.39E-09	3.99E-13	1.28E-08	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	8.22E-06	4.26E-06	NA	1.25E-05
~Fluorene	NA	NA	NA	0.00E+00	8.25E-05	4.28E-05	5.45E-05	1.80E-04
~Indeno[1,2,3-cd]pyrene	5.07E-09	2.63E-09	2.39E-13	7.70E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.50E-07	7.77E-08	4.76E-07	7.03E-07	2.15E-04	1.12E-04	6.69E-04	9.96E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	3.28E-03	1.70E-03	NA	4.99E-03
~Naphthalene	NA	NA	4.01E-07	4.01E-07	1.23E-04	6.36E-05	1.15E-02	1.17E-02
~Pyrene	NA	NA	NA	0.00E+00	2.24E-05	1.16E-05	3.14E-09	3.40E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.51E-06	6.01E-07	1.00E-04	1.02E-04
Thallium	NA	NA	NA	0.00E+00	8.77E-02	0.00E+00	NA	8.77E-02
Toluene	NA	NA	NA	0.00E+00	1.52E-06	0.00E+00	6.17E-05	6.32E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	3.01E-06	0.00E+00	7.16E-04	7.19E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.06E-05	2.66E-06	9.07E-07	2.42E-05	7.65E-01	7.93E-02	1.32E-02	8.58E-01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA		2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	7.12E-05	6.20E-06	1.15E-09	7.74E-05	9.13E+00	7.95E-01	8.81E-06	9.93E+00
Iron	NA	NA	NA	0.00E+00	2.68E-01	0.00E+00	NA	2.68E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	6.39E-05	1.85E-05	5.29E-09	8.25E-05
~Aroclor 1260	2.98E-07	1.21E-07	4.68E-12	4.19E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	7.15E-05	6.32E-06	1.18E-09	7.79E-05	9.40E+00	7.95E-01	1.62E-05	1.02E+01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	of Concern	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	6.71E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	3.71E-06	3.18E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.71E-06	3.18E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
~Acenaphthene	4.82E-06	4.13E-07
~Anthracene	4.82E-06	4.13E-07
~Benz[a]anthracene	4.82E-06	6.57E-07
~Benzo[a]pyrene	4.82E-06	6.57E-07
~Benzo[b]fluoranthene	4.82E-06	6.57E-07
~Benzo[k]fluoranthene	4.82E-06	6.57E-07
~Chrysene	4.82E-06	6.57E-07
~Fluoranthene	4.82E-06	4.13E-07
~Fluorene	4.82E-06	4.13E-07
~Indeno[1,2,3-cd]pyrene	4.82E-06	6.57E-07
~Methylnaphthalene, 1-	4.82E-06	4.13E-07
~Methylnaphthalene, 2-	4.82E-06	4.13E-07
~Naphthalene	4.82E-06	4.13E-07
~Pyrene	4.82E-06	4.13E-07
Propyl benzene	3.71E-06	3.18E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contan
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	7.05E-10	6.04E-11
Acenaphthylene	6.35E-06	5.44E-07
Phenanthrene	7.05E-10	6.04E-11
Perylene	7.05E-10	6.04E-11
Benzo(g,h,i)perylene	7.05E-10	6.04E-11
Aluminum	7.05E-10	6.04E-11
Antimony	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Butylbenzene, n-	1.09E-04	9.37E-06
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
~Dibenzofuran	4.55E-06	3.90E-07
Iron	7.05E-10	6.04E-11
MCPP	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
~Acenaphthene	6.35E-06	5.44E-07
~Anthracene	1.70E-06	1.46E-07
~Benz[a]anthracene	7.05E-10	7.66E-10
~Benzo[a]pyrene	7.05E-10	7.66E-10
~Benzo[b]fluoranthene	7.05E-10	7.66E-10
~Benzo[k]fluoranthene	7.05E-10	7.66E-10
~Chrysene	7.05E-10	7.66E-10
~Fluoranthene	7.05E-10	6.04E-11
~Fluorene	3.17E-06	2.71E-07
~Indeno[1,2,3-cd]pyrene	7.05E-10	7.66E-10
~Methylnaphthalene, 1-	1.52E-05	1.30E-06
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
~Naphthalene	1.92E-05	1.65E-06
~Pyrene	7.05E-10	6.04E-11
Propyl benzene	1.27E-04	1.09E-05
Thallium	7.05E-10	6.04E-11
Toluene	2.08E-04	1.78E-05
Vanadium	7.05E-10	6.04E-11
Xylene, m-	1.63E-04	1.40E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.36E-05	0.00E+00	NA	1.36E-05
Acenaphthylene	NA	NA	NA	0.00E+00	1.10E-04	0.00E+00	NA	1.10E-04
Phenanthrene	NA	NA	NA	0.00E+00	6.35E-04	0.00E+00	NA	6.35E-04
Perylene	NA	NA	NA	0.00E+00	5.54E-06	1.61E-06	NA	7.15E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	6.39E-07	0.00E+00	NA	6.39E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.10E-05	0.00E+00	NA	2.10E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.70E-05	4.09E-06	7.58E-10	5.11E-05	6.03E+00	5.24E-01	5.82E-06	6.55E+00
Ethylbenzene	2.45E-09	0.00E+00	6.84E-09	9.29E-09	2.60E-05	0.00E+00	3.19E-05	5.79E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	3.84E-05	0.00E+00	NA	3.84E-05
Iron	NA	NA	NA	0.00E+00	2.57E-01	0.00E+00	NA	2.57E-01
MCPP	NA	NA	NA	0.00E+00	5.37E-04	1.56E-04	NA	6.93E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.84E-05	8.23E-06	2.35E-09	3.66E-05
~Aroclor 1260	3.81E-07	1.55E-07	5.99E-12	5.36E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	5.22E-05	1.97E-05	NA	7.19E-05
~Anthracene	NA	NA	NA	0.00E+00	3.67E-06	1.38E-06	NA	5.05E-06
~Benz[a]anthracene	1.57E-07	1.53E-08	2.70E-12	1.72E-07	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	7.84E-07	7.67E-08	1.35E-11	8.60E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.57E-07	1.53E-08	2.70E-12	1.72E-07	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.13E-08	1.10E-09	1.94E-12	1.24E-08	NA	NA	NA	0.00E+00
~Chrysene	7.35E-09	7.19E-10	1.26E-12	8.07E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	7.67E-05	2.89E-05	NA	1.06E-04
~Fluorene	NA	NA	NA	0.00E+00	7.70E-04	2.90E-04	NA	1.06E-03
~Indeno[1,2,3-cd]pyrene	4.41E-08	4.32E-09	7.58E-13	4.84E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.50E-07	1.32E-07	NA	4.81E-07	2.01E-03	7.57E-04	NA	2.77E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	3.07E-02	1.16E-02	NA	4.22E-02
~Naphthalene	NA	NA	1.00E-07	1.00E-07	1.14E-03	4.31E-04	1.15E-02	1.30E-02
~Pyrene	NA	NA	NA	0.00E+00	2.09E-04	7.87E-05	NA	2.88E-04
Propyl benzene	NA	NA	NA	0.00E+00	1.41E-05	4.08E-06	1.40E-05	3.22E-05
Thallium	NA	NA	NA	0.00E+00	8.18E-01	0.00E+00	NA	8.18E-01
Toluene	NA	NA	NA	0.00E+00	1.42E-05	0.00E+00	3.70E-06	1.79E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.81E-05	0.00E+00	7.16E-04	7.44E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.89E-05	4.49E-06	1.08E-07	5.35E-05	7.14E+00	5.38E-01	1.22E-02	7.69E+00

Child Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Child Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Resident Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	7.12E-05	6.20E-06	1.15E-09	7.74E-05	9.13E+00	7.95E-01	8.81E-06	9.93E+00
Iron	NA	NA	NA	0.00E+00	2.68E-01	0.00E+00	NA	2.68E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	6.39E-05	1.85E-05	5.29E-09	8.25E-05
~Aroclor 1260	2.98E-07	1.21E-07	4.68E-12	4.19E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	7.15E-05	6.32E-06	1.18E-09	7.79E-05	9.40E+00	7.95E-01	1.62E-05	1.02E+01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	6.71E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contaminatio
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	4.82E-06	4.13E-07
Benzo(g,h,i)perylene	4.82E-06	4.13E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.71E-06	3.18E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
~Acenaphthene	4.82E-06	4.13E-07
~Anthracene	4.82E-06	4.13E-07
~Benz[a]anthracene	4.82E-06	6.57E-07
~Benzo[a]pyrene	4.82E-06	6.57E-07
~Benzo[b]fluoranthene	4.82E-06	6.57E-07
~Benzo[k]fluoranthene	4.82E-06	6.57E-07
~Chrysene	4.82E-06	6.57E-07
~Fluoranthene	4.82E-06	4.13E-07
~Fluorene	4.82E-06	4.13E-07
~Indeno[1,2,3-cd]pyrene	4.82E-06	6.57E-07
~Methylnaphthalene, 1-	4.82E-06	4.13E-07
~Methylnaphthalene, 2-	4.82E-06	4.13E-07
~Naphthalene	4.82E-06	4.13E-07
~Pyrene	4.82E-06	4.13E-07
Propyl benzene	3.71E-06	3.18E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contam
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	7.05E-10	6.04E-11
Acenaphthylene	6.35E-06	5.44E-07
Phenanthrene	7.05E-10	6.04E-11
Perylene	7.05E-10	6.04E-11
Benzo(g,h,i)perylene	7.05E-10	6.04E-11
Aluminum	7.05E-10	6.04E-11
Antimony	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Beryllium	7.05E-10	6.04E-11
Butylbenzene, n-	1.09E-04	9.37E-06
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Ethylbenzene	1.57E-04	1.35E-05
~Dibenzofuran	4.55E-06	3.90E-07
Iron	7.05E-10	6.04E-11
MCPP	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
~Acenaphthene	6.35E-06	5.44E-07
~Anthracene	1.70E-06	1.46E-07
~Benz[a]anthracene	7.05E-10	7.66E-10
~Benzo[a]pyrene	7.05E-10	7.66E-10
~Benzo[b]fluoranthene	7.05E-10	7.66E-10
~Benzo[k]fluoranthene	7.05E-10	7.66E-10
~Chrysene	7.05E-10	7.66E-10
~Fluoranthene	7.05E-10	6.04E-11
~Fluorene	3.17E-06	2.71E-07
~Indeno[1,2,3-cd]pyrene	7.05E-10	7.66E-10
~Methylnaphthalene, 1-	1.52E-05	1.30E-06
~Methylnaphthalene, 2-	1.54E-05	1.32E-06
~Naphthalene	1.92E-05	1.65E-06
~Pyrene	7.05E-10	6.04E-11
Propyl benzene	1.27E-04	1.09E-05
Thallium	7.05E-10	6.04E-11
Toluene	2.08E-04	1.78E-05
Vanadium	7.05E-10	6.04E-11
Xylene, m-	1.63E-04	1.40E-05
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.36E-05	0.00E+00	2.67E-10	1.36E-05
Acenaphthylene	NA	NA	NA	0.00E+00	1.10E-04	0.00E+00	1.56E-05	1.25E-04
Phenanthrene	NA	NA	NA	0.00E+00	6.35E-04	0.00E+00	9.55E-09	6.35E-04
Perylene	NA	NA	NA	0.00E+00	5.54E-06	2.09E-06	8.33E-11	7.63E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	6.39E-07	2.41E-07	9.61E-12	8.80E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	3.05E-11	3.05E-11	1.34E-03	0.00E+00	7.40E-06	1.35E-03
Butylbenzene, n-	NA	NA	NA	0.00E+00	2.10E-05	0.00E+00	6.40E-05	8.50E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.70E-05	4.09E-06	7.58E-10	5.11E-05	6.03E+00	5.24E-01	5.82E-06	6.55E+00
Ethylbenzene	2.45E-09	0.00E+00	6.84E-09	9.29E-09	2.60E-05	0.00E+00	3.19E-05	5.79E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	3.84E-05	0.00E+00	9.74E-07	3.93E-05
Iron	NA	NA	NA	0.00E+00	2.57E-01	0.00E+00	NA	2.57E-01
MCPP	NA	NA	NA	0.00E+00	5.37E-04	1.56E-04	8.46E-09	6.93E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.84E-05	8.23E-06	2.35E-09	3.66E-05
~Aroclor 1260	3.81E-07	1.55E-07	5.99E-12	5.36E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	5.22E-05	1.97E-05	7.41E-06	7.93E-05
~Anthracene	NA	NA	NA	0.00E+00	3.67E-06	1.38E-06	1.33E-07	5.18E-06
~Benz[a]anthracene	2.58E-07	2.52E-08	2.70E-12	2.83E-07	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	1.29E-06	1.26E-07	1.35E-11	1.41E-06	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	2.58E-07	2.52E-08	2.70E-12	2.83E-07	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.85E-07	1.81E-08	1.94E-12	2.03E-07	NA	NA	NA	0.00E+00
~Chrysene	1.21E-07	1.18E-08	1.26E-12	1.33E-07	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	7.67E-05	2.89E-05	NA	1.06E-04
~Fluorene	NA	NA	NA	0.00E+00	7.70E-04	2.90E-04	5.45E-05	1.12E-03
~Indeno[1,2,3-cd]pyrene	7.25E-08	7.10E-09	7.58E-13	7.96E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	3.50E-07	1.32E-07	1.19E-07	6.00E-07	2.01E-03	7.57E-04	6.69E-04	3.44E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	3.07E-02	1.16E-02	NA	4.22E-02
~Naphthalene	NA	NA	1.00E-07	1.00E-07	1.14E-03	4.31E-04	1.15E-02	1.30E-02
~Pyrene	NA	NA	NA	0.00E+00	2.09E-04	7.87E-05	3.14E-09	2.88E-04
Propyl benzene	NA	NA	NA	0.00E+00	1.41E-05	4.08E-06	1.00E-04	1.18E-04
Thallium	NA	NA	NA	0.00E+00	8.18E-01	0.00E+00	NA	8.18E-01
Toluene	NA	NA	NA	0.00E+00	1.42E-05	0.00E+00	6.17E-05	7.59E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.81E-05	0.00E+00	7.16E-04	7.44E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.99E-05	4.59E-06	2.27E-07	5.47E-05	7.14E+00	5.38E-01	1.32E-02	7.69E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination - Mutagenic Equations

Area 2; All Soil (0-8ft bgs)

USEPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	NA	6.71E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
~Benz[a]anthracene	NA	6.57E-07
~Benzo[a]pyrene	NA	6.57E-07
~Benzo[b]fluoranthene	NA	6.57E-07
~Benzo[k]fluoranthene	NA	6.57E-07
~Chrysene	NA	6.57E-07
~Indeno[1,2,3-cd]pyrene	NA	6.57E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	**Carcinogens (kg/m3)**
~Benz[a]anthracene	NA	7.66E-10
~Benzo[a]pyrene	NA	7.66E-10
~Benzo[b]fluoranthene	NA	7.66E-10
~Benzo[k]fluoranthene	NA	7.66E-10
~Chrysene	NA	7.66E-10
~Indeno[1,2,3-cd]pyrene	NA	7.66E-10

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	1.57E-07	1.53E-08	2.69E-12	1.72E-07
~Benzo[a]pyrene	7.83E-07	7.67E-08	1.35E-11	8.60E-07
~Benzo[b]fluoranthene	1.57E-07	1.53E-08	2.69E-12	1.72E-07
~Benzo[k]fluoranthene	1.13E-08	1.10E-09	1.94E-12	1.24E-08
~Chrysene	7.34E-09	7.19E-10	1.26E-12	8.06E-09
~Indeno[1,2,3-cd]pyrene	4.41E-08	4.31E-09	7.58E-13	4.84E-08
Total	1.16E-06	1.14E-07	2.28E-11	1.27E-06

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination - Mutagenic Equations

Area 2; All Soil (0-8ft bgs)

Cal/EPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	NA	6.71E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
~Benz[a]anthracene	NA	6.57E-07
~Benzo[a]pyrene	NA	6.57E-07
~Benzo[b]fluoranthene	NA	6.57E-07
~Benzo[k]fluoranthene	NA	6.57E-07
~Chrysene	NA	6.57E-07
~Indeno[1,2,3-cd]pyrene	NA	6.57E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	**Carcinogens (kg/m3)**
~Benz[a]anthracene	NA	7.66E-10
~Benzo[a]pyrene	NA	7.66E-10
~Benzo[b]fluoranthene	NA	7.66E-10
~Benzo[k]fluoranthene	NA	7.66E-10
~Chrysene	NA	7.66E-10
~Indeno[1,2,3-cd]pyrene	NA	7.66E-10

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	2.58E-07	2.52E-08	2.69E-12	2.83E-07
~Benzo[a]pyrene	1.29E-06	1.26E-07	1.35E-11	1.41E-06
~Benzo[b]fluoranthene	2.58E-07	2.52E-08	2.69E-12	2.83E-07
~Benzo[k]fluoranthene	1.85E-07	1.81E-08	1.94E-12	2.03E-07
~Chrysene	1.21E-07	1.18E-08	1.26E-12	1.33E-07
~Indeno[1,2,3-cd]pyrene	7.24E-08	7.09E-09	7.58E-13	7.95E-08
Total	2.18E-06	2.14E-07	2.28E-11	2.39E-06

Subarea 2 Inhalation of ambient air for the Resident adult and child - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	350	30	1.00	10950	25550	4.2E-07	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	350	30	1.00	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	350	30	1.00	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	1.4E-02	350	30	1.00	10950	25550	1.1E-05	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	2.1E-01	350	30	1.00	10950	25550	1.9E-08	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	350	30	1.00	10950	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	2.9E-05	3.0E-02	350	30	1.00	10950	25550	6.3E-06	2.34E-09
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	8.3E-07	1.0E+01	350	30	1.00	10950	25550	6.9E-09	2.45E-11
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	350	30	1.00	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	1.8E-06	9.0E-02	350	30	1.00	10950	25550	3.6E-07	2.49E-11
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	3.5E-02	350	30	1.00	10950	25550	3.2E-07	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	350	30	1.00	10950	25550	1.3E-08	1.42E-11
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	1.4E-01	350	30	1.00	10950	25550	8.2E-08	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	350	30	1.00	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	350	30	1.00	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	350	30	1.00	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	350	30	1.00	10950	25550	4.9E-05	2.16E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	1.1E-01	350	30	1.00	10950	25550	8.0E-10	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	350	30	1.00	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	3.0E-01	350	30	1.00	10950	25550	1.5E-07	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	350	30	1.00	10950	25550	3.0E-05	1.06E-10
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	350	30	1.00	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	350	30	1.00	10950	25550	5.3E-07	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	350	30	1.00	10950	25550	1.1E-06	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	350	30	1.00	10950	25550	NA	9.05E-14

Total	1.00E-04	4.67E-09

Subarea 2 Inhalation of ambient air for the Resident adult and child - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	350	30	1.00	10950	25550	4.2E-07	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	350	30	1.00	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	350	30	1.00	10950	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	7.8E-06	3.0E-02	350	30	1.00	10950	25550	6.3E-06	6.28E-10
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	0.0E+00	1.0E+01	350	30	1.00	10950	25550	6.9E-09	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	350	30	1.00	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	0.0E+00	9.0E-02	350	30	1.00	10950	25550	3.6E-07	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	350	30	1.00	10950	25550	1.3E-08	1.42E-11
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	350	30	1.00	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	350	30	1.00	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	350	30	1.00	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	350	30	1.00	10950	25550	4.9E-05	2.16E-09
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	350	30	1.00	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	5.0E+00	350	30	1.00	10950	25550	8.7E-09	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	350	30	1.00	10950	25550	3.0E-05	1.06E-10
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	350	30	1.00	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	350	30	1.00	10950	25550	5.3E-07	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	350	30	1.00	10950	25550	1.1E-06	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	350	30	1.00	10950	25550	NA	9.05E-14

Total	8.83E-05	2.91E-09

Soil Gas Vapor Intrusion

Subarea 2 Residential Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,1-Trichloroethane	9.2	NA	3.0E-06
1,2,4-Trimethylbenzene	65	NA	1.4E-02
1,3,5-Trimethylbenzene	18	NA	4.5E-03
Benzene	20	4.2E-07	1.1E-03
Carbon disulfide	11	NA	2.8E-05
Chloroform	5	2.0E-08	3.0E-05
Ethylbenzene	12	2.1E-08	1.9E-05
Methyl bromide	2.4	NA	7.7E-04
Methyl chloride (chloromethane)	10	1.4E-08	2.1E-04
Methylene chloride	3.4	2.6E-09	1.5E-05
Methylethylketone (2-butanone)	27	NA	8.9E-06
Methylisobutylketone (4-methyl-2-pentanone)	1.6	NA	8.6E-07
Naphthalene	34	7.4E-07	1.7E-02
n-Propylbenzene	7.5	NA	8.0E-05
o-Xylene	25	NA	4.2E-04
p-Xylene	58	NA	9.5E-04
Tetrachloroethylene	78	3.2E-07	3.6E-03
Toluene	29	NA	1.6E-04
Trichloroethylene	8.1	2.3E-08	6.7E-03
Trichlorofluoromethane	320	NA	7.7E-04
Total		1.6E-06	5.0E-02

Subarea 2 Residential USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,1-Trichloroethane	9.2	NA	3.0E-06
1,2,4-Trimethylbenzene	65	NA	1.4E-02
1,3,5-Trimethylbenzene	18	NA	NA
Benzene	20	1.1E-07	1.1E-03
Carbon disulfide	11	NA	2.8E-05
Chloroform	5	8.7E-08	9.1E-05
Ethylbenzene	12	2.1E-08	1.9E-05
Methyl bromide	2.4	NA	7.7E-04
Methyl chloride (chloromethane)	10	NA	2.1E-04
Methylene chloride	3.4	1.2E-09	6.0E-06
Methylethylketone (2-butanone)	27	NA	8.9E-06
Methylisobutylketone (4-methyl-2-pentanone)	1.6	NA	8.6E-07
Naphthalene	34	7.4E-07	1.7E-02
n-Propylbenzene	7.5	NA	1.1E-05
o-Xylene	25	NA	4.2E-04
p-Xylene	58	NA	9.5E-04
Tetrachloroethylene	78	1.4E-08	3.1E-03
Toluene	29	NA	9.8E-06
Trichloroethylene	8.1	2.3E-08	6.7E-03
Trichlorofluoromethane	320	NA	7.7E-04
Total		1.0E-06	4.5E-02

Subarea 2 Industrial Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,1-Trichloroethane	9.2	NA	2.2E-06
1,2,4-Trimethylbenzene	65	NA	1.0E-02
1,3,5-Trimethylbenzene	18	NA	3.2E-03
Benzene	20	2.5E-07	8.1E-04
Carbon disulfide	11	NA	2.0E-05
Chloroform	5	1.2E-08	2.1E-05
Ethylbenzene	12	1.2E-08	1.4E-05
Methyl bromide	2.4	NA	5.5E-04
Methyl chloride (chloromethane)	10	8.5E-09	1.5E-04
Methylene chloride	3.4	1.5E-09	1.1E-05
Methylethylketone (2-butanone)	27	NA	6.4E-06
Methylisobutylketone (4-methyl-2-pentanone)	1.6	NA	6.2E-07
Naphthalene	34	4.4E-07	1.2E-02
n-Propylbenzene	7.5	NA	5.7E-05
o-Xylene	25	NA	3.0E-04
p-Xylene	58	NA	6.8E-04
Tetrachloroethylene	78	1.9E-07	2.5E-03
Toluene	29	NA	1.2E-04
Trichloroethylene	8.1	1.4E-08	4.8E-03
Trichlorofluoromethane	320	NA	5.5E-04
Total		9.3E-07	3.6E-02

Subarea 2 Industrial USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
1,1,1-Trichloroethane	9.2	NA	2.2E-06
1,2,4-Trimethylbenzene	65	NA	1.0E-02
1,3,5-Trimethylbenzene	18	NA	
Benzene	20	6.8E-08	8.1E-04
Carbon disulfide	11	NA	2.0E-05
Chloroform	5	5.2E-08	6.5E-05
Ethylbenzene	12	1.2E-08	1.4E-05
Methyl bromide	2.4	NA	5.5E-04
Methyl chloride (chloromethane)	10	NA	1.5E-04
Methylene chloride	3.4	7.2E-10	4.3E-06
Methylethylketone (2-butanone)	27	NA	6.4E-06
Methylisobutylketone (4-methyl-2-pentanone)	1.6	NA	6.2E-07
Naphthalene	34	4.4E-07	1.2E-02
n-Propylbenzene	7.5	NA	8.0E-06
o-Xylene	25	NA	3.0E-04
p-Xylene	58	NA	6.8E-04
Tetrachloroethylene	78	8.3E-09	2.2E-03
Toluene	29	NA	7.0E-06
Trichloroethylene	8.1	1.4E-08	4.8E-03
Trichlorofluoromethane	320	NA	5.5E-04
Total		6.0E-07	3.2E-02

Groundwater Vapor Intrusion

Subarea 2 Residential Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
2-Methylnaphthalene	71	NA	1.0E-02
Acenaphthene	3	NA	1.7E-05
Benzene	10	2.3E-06	6.1E-03
Carbon disulfide	7.5	NA	1.2E-03
Chloroethane (ethyl chloride)	0.8	2.3E-08	6.4E-06
Chrysene	0.06	2.0E-10	NA
cis-1,2-Dichloroethylene	0.9	NA	3.1E-04
Ethylbenzene	0.6	1.4E-08	1.3E-05
Fluorene	12	NA	6.8E-05
Methylene chloride	0.8	3.2E-09	1.9E-05
Naphthalene	68	2.0E-06	4.6E-02
o-Xylene	3	NA	5.1E-04
Pyrene	0.3	NA	5.9E-07
Toluene	2	NA	1.4E-04
trans-1,2-Dichloroethylene	1	NA	4.2E-04
Trichloroethylene	2	1.0E-07	3.0E-02
Total		4.5E-06	9.5E-02

Subarea 2 Residential USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
2-Methylnaphthalene	71	NA	NA
Acenaphthene	3	NA	NA
Benzene	10	6.1E-07	6.1E-03
Carbon disulfide	7.5	NA	1.2E-03
Chloroethane (ethyl chloride)	0.8	NA	6.4E-06
Chrysene	0.06	2.0E-10	NA
cis-1,2-Dichloroethylene	0.9	NA	NA
Ethylbenzene	0.6	1.4E-08	1.3E-05
Fluorene	12	NA	NA
Methylene chloride	0.8	3.2E-09	1.9E-05
Naphthalene	68	2.0E-06	4.6E-02
o-Xylene	3	NA	5.1E-04
Pyrene	0.3	NA	NA
Toluene	2	NA	8.5E-06
trans-1,2-Dichloroethylene	1	NA	4.2E-04
Trichloroethylene	2	1.0E-07	3.0E-02
Total		2.8E-06	8.4E-02

Subarea 1 Occupational Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
2-Methylnaphthalene	71	NA	7.3E-03
Acenaphthene	3	NA	1.2E-05
Benzene	10	1.4E-06	4.4E-03
Carbon disulfide	7.5	NA	8.5E-04
Chloroethane (ethyl chloride)	0.8	1.4E-08	4.6E-06
Chrysene	0.06	1.2E-10	NA
cis-1,2-Dichloroethylene	0.9	NA	2.2E-04
Ethylbenzene	0.6	8.2E-09	9.2E-06
Fluorene	12	NA	4.9E-05
Methylene chloride	0.8	1.9E-09	1.3E-05
Naphthalene	68	1.2E-06	3.3E-02
o-Xylene	3	NA	3.6E-04
Pyrene	0.3	NA	4.2E-07
Toluene	2	NA	1.0E-04
trans-1,2-Dichloroethylene	1	NA	3.0E-04
Trichloroethylene	2	6.2E-08	2.1E-02
Total		2.7E-06	6.8E-02

Subarea 1 Occupational USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
2-Methylnaphthalene	71	NA	NA
Acenaphthene	3	NA	NA
Benzene	10	3.7E-07	4.4E-03
Carbon disulfide	7.5	NA	8.5E-04
Chloroethane (ethyl chloride)	0.8	NA	4.6E-06
Chrysene	0.06	1.2E-10	NA
cis-1,2-Dichloroethylene	0.9	NA	NA
Ethylbenzene	0.6	8.2E-09	9.2E-06
Fluorene	12	NA	NA
Methylene chloride	0.8	1.9E-09	1.3E-05
Naphthalene	68	1.2E-06	3.3E-02
o-Xylene	3	NA	3.6E-04
Pyrene	0.3	NA	NA
Toluene	2	NA	6.1E-06
trans-1,2-Dichloroethylene	1	NA	3.0E-04
Trichloroethylene	2	6.2E-08	2.1E-02
Total		1.6E-06	6.0E-02

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA		2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.27E-05	7.77E-06	1.13E-09	3.05E-05	6.99E-01	2.39E-01	2.08E-06	9.38E-01
Iron	NA	NA	NA	0.00E+00	2.05E-02	0.00E+00	NA	2.05E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.89E-06	5.58E-06	1.25E-09	1.05E-05
~Aroclor 1260	9.51E-08	1.52E-07	4.60E-12	2.47E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.28E-05	7.92E-06	1.16E-09	3.07E-05	7.20E-01	2.39E-01	3.82E-06	9.59E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	of Concern	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	1.12E-06	3.98E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	1.12E-06	3.98E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
~Acenaphthene	1.45E-06	5.18E-07
~Anthracene	1.45E-06	5.18E-07
~Benz[a]anthracene	1.45E-06	5.18E-07
~Benzo[a]pyrene	1.45E-06	5.18E-07
~Benzo[b]fluoranthene	1.45E-06	5.18E-07
~Benzo[k]fluoranthene	1.45E-06	5.18E-07
~Chrysene	1.45E-06	5.18E-07
~Fluoranthene	1.45E-06	5.18E-07
~Fluorene	1.45E-06	5.18E-07
~Indeno[1,2,3-cd]pyrene	1.45E-06	5.18E-07
~Methylnaphthalene, 1-	1.45E-06	5.18E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
~Naphthalene	1.45E-06	5.18E-07
~Pyrene	1.45E-06	5.18E-07
Propyl benzene	1.12E-06	3.98E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Co
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	1.66E-10	5.94E-11
Acenaphthylene	1.50E-06	5.35E-07
Phenanthrene	1.66E-10	5.94E-11
Perylene	1.66E-10	5.94E-11
Benzo(g,h,i)perylene	1.66E-10	5.94E-11
Aluminum	1.66E-10	5.94E-11
Antimony	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Butylbenzene, n-	2.58E-05	9.20E-06
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
~Dibenzofuran	1.07E-06	3.83E-07
Iron	1.66E-10	5.94E-11
MCPP	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
~Acenaphthene	1.50E-06	5.35E-07
~Anthracene	4.02E-07	1.43E-07
~Benz[a]anthracene	1.66E-10	5.94E-11
~Benzo[a]pyrene	1.66E-10	5.94E-11
~Benzo[b]fluoranthene	1.66E-10	5.94E-11
~Benzo[k]fluoranthene	1.66E-10	5.94E-11
~Chrysene	1.66E-10	5.94E-11
~Fluoranthene	1.66E-10	5.94E-11
~Fluorene	7.46E-07	2.66E-07
~Indeno[1,2,3-cd]pyrene	1.66E-10	5.94E-11
~Methylnaphthalene, 1-	3.58E-06	1.28E-06
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
~Naphthalene	4.53E-06	1.62E-06
~Pyrene	1.66E-10	5.94E-11
Propyl benzene	3.00E-05	1.07E-05
Thallium	1.66E-10	5.94E-11
Toluene	4.90E-05	1.75E-05
Vanadium	1.66E-10	5.94E-11
Xylene, m-	3.84E-05	1.37E-05
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.04E-06	0.00E+00	NA	1.04E-06
Acenaphthylene	NA	NA	NA	0.00E+00	8.40E-06	0.00E+00	NA	8.40E-06
Phenanthrene	NA	NA	NA	0.00E+00	4.86E-05	0.00E+00	NA	4.86E-05
Perylene	NA	NA	NA	0.00E+00	4.24E-07	4.83E-07	NA	9.07E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.89E-08	0.00E+00	NA	4.89E-08
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.60E-06	0.00E+00	NA	1.60E-06
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.50E-05	5.13E-06	7.44E-10	2.01E-05	4.61E-01	1.58E-01	1.37E-06	6.19E-01
Ethylbenzene	7.80E-10	0.00E+00	6.72E-09	7.50E-09	1.99E-06	0.00E+00	7.52E-06	9.51E-06
~Dibenzofuran	NA	NA	NA	0.00E+00	2.94E-06	0.00E+00	NA	2.94E-06
Iron	NA	NA	NA	0.00E+00	1.97E-02	0.00E+00	NA	1.97E-02
MCPP	NA	NA	NA	0.00E+00	4.11E-05	4.68E-05	NA	8.79E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.17E-06	2.48E-06	5.53E-10	4.65E-06
~Aroclor 1260	1.22E-07	1.94E-07	5.89E-12	3.16E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	4.00E-06	5.92E-06	NA	9.92E-06
~Anthracene	NA	NA	NA	0.00E+00	2.80E-07	4.16E-07	NA	6.96E-07
~Benz[a]anthracene	8.16E-09	1.21E-08	2.09E-13	2.03E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	4.08E-08	6.05E-08	1.04E-12	1.01E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	8.16E-09	1.21E-08	2.09E-13	2.03E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	5.87E-10	8.70E-10	1.50E-13	1.46E-09	NA	NA	NA	0.00E+00
~Chrysene	3.83E-10	5.67E-10	9.79E-14	9.50E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.87E-06	8.70E-06	NA	1.46E-05
~Fluorene	NA	NA	NA	0.00E+00	5.90E-05	8.74E-05	NA	1.46E-04
~Indeno[1,2,3-cd]pyrene	2.30E-09	3.40E-09	5.88E-14	5.70E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.11E-07	1.65E-07	NA	2.77E-07	1.54E-04	2.28E-04	NA	3.82E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.35E-03	3.48E-03	NA	5.82E-03
~Naphthalene	NA	NA	9.85E-08	9.85E-08	8.76E-05	1.30E-04	2.70E-03	2.92E-03
~Pyrene	NA	NA	NA	0.00E+00	1.60E-05	2.37E-05	NA	3.97E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.08E-06	1.23E-06	3.30E-06	5.61E-06
Thallium	NA	NA	NA	0.00E+00	6.26E-02	0.00E+00	NA	6.26E-02
Toluene	NA	NA	NA	0.00E+00	1.09E-06	0.00E+00	8.73E-07	1.96E-06
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.15E-06	0.00E+00	1.69E-04	1.71E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.53E-05	5.58E-06	1.06E-07	2.10E-05	5.46E-01	1.62E-01	2.89E-03	7.11E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.27E-05	7.77E-06	1.13E-09	3.05E-05	6.99E-01	2.39E-01	2.08E-06	9.38E-01
Iron	NA	NA	NA	0.00E+00	2.05E-02	0.00E+00	NA	2.05E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.89E-06	5.58E-06	1.25E-09	1.05E-05
~Aroclor 1260	9.51E-08	1.52E-07	4.60E-12	2.47E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.28E-05	7.92E-06	1.16E-09	3.07E-05	7.20E-01	2.39E-01	3.82E-06	9.59E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamin
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	1.45E-06	5.18E-07
Benzo(g,h,i)perylene	1.45E-06	5.18E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	1.12E-06	3.98E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
~Acenaphthene	1.45E-06	5.18E-07
~Anthracene	1.45E-06	5.18E-07
~Benz[a]anthracene	1.45E-06	5.18E-07
~Benzo[a]pyrene	1.45E-06	5.18E-07
~Benzo[b]fluoranthene	1.45E-06	5.18E-07
~Benzo[k]fluoranthene	1.45E-06	5.18E-07
~Chrysene	1.45E-06	5.18E-07
~Fluoranthene	1.45E-06	5.18E-07
~Fluorene	1.45E-06	5.18E-07
~Indeno[1,2,3-cd]pyrene	1.45E-06	5.18E-07
~Methylnaphthalene, 1-	1.45E-06	5.18E-07
~Methylnaphthalene, 2-	1.45E-06	5.18E-07
~Naphthalene	1.45E-06	5.18E-07
~Pyrene	1.45E-06	5.18E-07
Propyl benzene	1.12E-06	3.98E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Con
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	1.66E-10	5.94E-11
Acenaphthylene	1.50E-06	5.35E-07
Phenanthrene	1.66E-10	5.94E-11
Perylene	1.66E-10	5.94E-11
Benzo(g,h,i)perylene	1.66E-10	5.94E-11
Aluminum	1.66E-10	5.94E-11
Antimony	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Beryllium	1.66E-10	5.94E-11
Butylbenzene, n-	2.58E-05	9.20E-06
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Ethylbenzene	3.71E-05	1.32E-05
~Dibenzofuran	1.07E-06	3.83E-07
Iron	1.66E-10	5.94E-11
MCPP	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
~Acenaphthene	1.50E-06	5.35E-07
~Anthracene	4.02E-07	1.43E-07
~Benz[a]anthracene	1.66E-10	5.94E-11
~Benzo[a]pyrene	1.66E-10	5.94E-11
~Benzo[b]fluoranthene	1.66E-10	5.94E-11
~Benzo[k]fluoranthene	1.66E-10	5.94E-11
~Chrysene	1.66E-10	5.94E-11
~Fluoranthene	1.66E-10	5.94E-11
~Fluorene	7.46E-07	2.66E-07
~Indeno[1,2,3-cd]pyrene	1.66E-10	5.94E-11
~Methylnaphthalene, 1-	3.58E-06	1.28E-06
~Methylnaphthalene, 2-	3.62E-06	1.29E-06
~Naphthalene	4.53E-06	1.62E-06
~Pyrene	1.66E-10	5.94E-11
Propyl benzene	3.00E-05	1.07E-05
Thallium	1.66E-10	5.94E-11
Toluene	4.90E-05	1.75E-05
Vanadium	1.66E-10	5.94E-11
Xylene, m-	3.84E-05	1.37E-05
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

	Risk				Hazard			
Chemical	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.04E-06	0.00E+00	6.29E-11	1.04E-06
Acenaphthylene	NA	NA	NA	0.00E+00	8.40E-06	0.00E+00	3.67E-06	1.21E-05
Phenanthrene	NA	NA	NA	0.00E+00	4.86E-05	0.00E+00	2.25E-09	4.86E-05
Perylene	NA	NA	NA	0.00E+00	4.24E-07	6.28E-07	1.96E-11	1.05E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.89E-08	7.25E-08	2.27E-12	1.21E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.99E-11	2.99E-11	1.03E-04	0.00E+00	1.75E-06	1.04E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.60E-06	0.00E+00	1.51E-05	1.67E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.50E-05	5.13E-06	7.44E-10	2.01E-05	4.61E-01	1.58E-01	1.37E-06	6.19E-01
Ethylbenzene	7.80E-10	0.00E+00	6.72E-09	7.50E-09	1.99E-06	0.00E+00	7.52E-06	9.51E-06
~Dibenzofuran	NA	NA	NA	0.00E+00	2.94E-06	0.00E+00	2.30E-07	3.17E-06
Iron	NA	NA	NA	0.00E+00	1.97E-02	0.00E+00	NA	1.97E-02
MCPP	NA	NA	NA	0.00E+00	4.11E-05	4.68E-05	1.99E-09	8.79E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.17E-06	2.48E-06	5.53E-10	4.65E-06
~Aroclor 1260	1.22E-07	1.94E-07	5.89E-12	3.16E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	4.00E-06	5.92E-06	1.75E-06	1.17E-05
~Anthracene	NA	NA	NA	0.00E+00	2.80E-07	4.16E-07	3.14E-08	7.28E-07
~Benz[a]anthracene	1.34E-08	1.99E-08	2.09E-13	3.33E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	6.71E-08	9.94E-08	1.04E-12	1.67E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.34E-08	1.99E-08	2.09E-13	3.33E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	9.64E-09	1.43E-08	1.50E-13	2.39E-08	NA	NA	NA	0.00E+00
~Chrysene	6.29E-09	9.32E-09	9.79E-14	1.56E-08	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.87E-06	8.70E-06	NA	1.46E-05
~Fluorene	NA	NA	NA	0.00E+00	5.90E-05	8.74E-05	1.28E-05	1.59E-04
~Indeno[1,2,3-cd]pyrene	3.77E-09	5.59E-09	5.88E-14	9.37E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.11E-07	1.65E-07	1.17E-07	3.93E-07	1.54E-04	2.28E-04	1.58E-04	5.39E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.35E-03	3.48E-03	NA	5.82E-03
~Naphthalene	NA	NA	9.85E-08	9.85E-08	8.76E-05	1.30E-04	2.70E-03	2.92E-03
~Pyrene	NA	NA	NA	0.00E+00	1.60E-05	2.37E-05	7.40E-10	3.97E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.08E-06	1.23E-06	2.36E-05	2.59E-05
Thallium	NA	NA	NA	0.00E+00	6.26E-02	0.00E+00	NA	6.26E-02
Toluene	NA	NA	NA	0.00E+00	1.09E-06	0.00E+00	1.45E-05	1.56E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.15E-06	0.00E+00	1.69E-04	1.71E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.53E-05	5.65E-06	2.23E-07	2.12E-05	5.46E-01	1.62E-01	3.11E-03	7.11E-01

Subarea 2 Inhalation of ambient air for Occupational Worker - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	250	25	0.33	9125	25550	1.0E-07	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	250	25	0.33	9125	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	25	0.33	9125	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	1.4E-02	250	25	0.33	9125	25550	2.6E-06	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	2.1E-01	250	25	0.33	9125	25550	4.5E-09	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	250	25	0.33	9125	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	2.9E-05	3.0E-02	250	25	0.33	9125	25550	1.5E-06	4.64E-10
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	8.3E-07	1.0E+01	250	25	0.33	9125	25550	1.6E-09	4.86E-12
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	250	25	0.33	9125	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	1.8E-06	9.0E-02	250	25	0.33	9125	25550	8.5E-08	4.93E-12
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	3.5E-02	250	25	0.33	9125	25550	7.6E-08	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	250	25	0.33	9125	25550	3.2E-09	2.82E-12
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	1.4E-01	250	25	0.33	9125	25550	2.0E-08	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	250	25	0.33	9125	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	25	0.33	9125	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	25	0.33	9125	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	250	25	0.33	9125	25550	1.2E-05	4.29E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	1.1E-01	250	25	0.33	9125	25550	1.9E-10	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	250	25	0.33	9125	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	3.0E-01	250	25	0.33	9125	25550	3.5E-08	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	250	25	0.33	9125	25550	7.2E-06	2.11E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	25	0.33	9125	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	250	25	0.33	9125	25550	1.3E-07	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	250	25	0.33	9125	25550	2.6E-07	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	250	25	0.33	9125	25550	NA	1.80E-14

Total	2.38E-05	9.26E-10

Subarea 2 Inhalation of ambient air for Occupational Worker - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	250	25	0.33	9125	25550	1.0E-07	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	25	0.33	9125	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	250	25	0.33	9125	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	7.8E-06	3.0E-02	250	25	0.33	9125	25550	1.5E-06	1.25E-10
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	0.0E+00	1.0E+01	250	25	0.33	9125	25550	1.6E-09	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	250	25	0.33	9125	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	0.0E+00	9.0E-02	250	25	0.33	9125	25550	8.5E-08	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	250	25	0.33	9125	25550	3.2E-09	2.82E-12
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	250	25	0.33	9125	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	25	0.33	9125	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	25	0.33	9125	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	250	25	0.33	9125	25550	1.2E-05	4.29E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	250	25	0.33	9125	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	5.0E+00	250	25	0.33	9125	25550	2.1E-09	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	250	25	0.33	9125	25550	7.2E-06	2.11E-11
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	25	0.33	9125	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	250	25	0.33	9125	25550	1.3E-07	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	250	25	0.33	9125	25550	2.6E-07	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	250	25	0.33	9125	25550	NA	1.80E-14

Total	2.10E-05	5.77E-10

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA		2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.18E-05	2.61E-06	3.28E-10	2.44E-05	6.99E-01	8.37E-02	6.30E-07	7.83E-01
Iron	NA	NA	NA	0.00E+00	2.05E-02	0.00E+00	NA	2.05E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.89E-06	1.95E-06	3.78E-10	6.84E-06
~Aroclor 1260	9.12E-08	5.10E-08	1.34E-12	1.42E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.19E-05	2.66E-06	3.38E-10	2.46E-05	7.20E-01	8.37E-02	1.16E-06	8.03E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF	PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals of Concern 1.36E+09
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05	
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06	
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum		
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony		
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium		
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium		
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper		
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ		
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03	
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05	
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron		
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP		
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese		
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel		
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol		
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260		
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05	
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05	
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene		
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene		
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene		
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene		
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene		
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene		
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05	
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene		
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04	
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04	
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04	
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06	
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03	
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium		
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium		
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc		

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	3.90E-07	1.34E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.90E-07	1.34E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
~Acenaphthene	5.08E-07	1.74E-07
~Anthracene	5.08E-07	1.74E-07
~Benz[a]anthracene	5.08E-07	1.74E-07
~Benzo[a]pyrene	5.08E-07	1.74E-07
~Benzo[b]fluoranthene	5.08E-07	1.74E-07
~Benzo[k]fluoranthene	5.08E-07	1.74E-07
~Chrysene	5.08E-07	1.74E-07
~Fluoranthene	5.08E-07	1.74E-07
~Fluorene	5.08E-07	1.74E-07
~Indeno[1,2,3-cd]pyrene	5.08E-07	1.74E-07
~Methylnaphthalene, 1-	5.08E-07	1.74E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
~Naphthalene	5.08E-07	1.74E-07
~Pyrene	5.08E-07	1.74E-07
Propyl benzene	3.90E-07	1.34E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Conta
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	5.04E-11	1.73E-11
Acenaphthylene	4.54E-07	1.56E-07
Phenanthrene	5.04E-11	1.73E-11
Perylene	5.04E-11	1.73E-11
Benzo(g,h,i)perylene	5.04E-11	1.73E-11
Aluminum	5.04E-11	1.73E-11
Antimony	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Butylbenzene, n-	7.81E-06	2.68E-06
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
~Dibenzofuran	3.25E-07	1.11E-07
Iron	5.04E-11	1.73E-11
MCPP	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
~Acenaphthene	4.54E-07	1.56E-07
~Anthracene	1.22E-07	4.17E-08
~Benz[a]anthracene	5.04E-11	1.73E-11
~Benzo[a]pyrene	5.04E-11	1.73E-11
~Benzo[b]fluoranthene	5.04E-11	1.73E-11
~Benzo[k]fluoranthene	5.04E-11	1.73E-11
~Chrysene	5.04E-11	1.73E-11
~Fluoranthene	5.04E-11	1.73E-11
~Fluorene	2.26E-07	7.75E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	1.73E-11
~Methylnaphthalene, 1-	1.09E-06	3.72E-07
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
~Naphthalene	1.37E-06	4.71E-07
~Pyrene	5.04E-11	1.73E-11
Propyl benzene	9.10E-06	3.12E-06
Thallium	5.04E-11	1.73E-11
Toluene	1.49E-05	5.09E-06
Vanadium	5.04E-11	1.73E-11
Xylene, m-	1.16E-05	3.99E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.04E-06	0.00E+00	NA	1.04E-06
Acenaphthylene	NA	NA	NA	0.00E+00	8.40E-06	0.00E+00	NA	8.40E-06
Phenanthrene	NA	NA	NA	0.00E+00	4.86E-05	0.00E+00	NA	4.86E-05
Perylene	NA	NA	NA	0.00E+00	4.24E-07	1.69E-07	NA	5.93E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.89E-08	0.00E+00	NA	4.89E-08
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.60E-06	0.00E+00	NA	1.60E-06
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.44E-05	1.72E-06	2.17E-10	1.61E-05	4.61E-01	5.52E-02	4.15E-07	5.16E-01
Ethylbenzene	7.49E-10	0.00E+00	1.95E-09	2.70E-09	1.99E-06	0.00E+00	2.28E-06	4.27E-06
~Dibenzofuran	NA	NA	NA	0.00E+00	2.94E-06	0.00E+00	NA	2.94E-06
Iron	NA	NA	NA	0.00E+00	1.97E-02	0.00E+00	NA	1.97E-02
MCPP	NA	NA	NA	0.00E+00	4.11E-05	1.64E-05	NA	5.75E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.17E-06	8.67E-07	1.68E-10	3.04E-06
~Aroclor 1260	1.17E-07	6.52E-08	1.71E-12	1.82E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	4.00E-06	2.07E-06	NA	6.07E-06
~Anthracene	NA	NA	NA	0.00E+00	2.80E-07	1.45E-07	NA	4.26E-07
~Benz[a]anthracene	7.84E-09	4.06E-09	6.08E-14	1.19E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	3.92E-08	2.03E-08	3.04E-13	5.95E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	7.84E-09	4.06E-09	6.08E-14	1.19E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	5.63E-10	2.92E-10	4.37E-14	8.55E-10	NA	NA	NA	0.00E+00
~Chrysene	3.67E-10	1.91E-10	2.85E-14	5.58E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.87E-06	3.05E-06	NA	8.92E-06
~Fluorene	NA	NA	NA	0.00E+00	5.90E-05	3.06E-05	NA	8.95E-05
~Indeno[1,2,3-cd]pyrene	2.20E-09	1.14E-09	1.71E-14	3.35E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.07E-07	5.55E-08	NA	1.63E-07	1.54E-04	7.98E-05	NA	2.34E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.35E-03	1.22E-03	NA	3.56E-03
~Naphthalene	NA	NA	2.86E-08	2.86E-08	8.76E-05	4.54E-05	8.19E-04	9.52E-04
~Pyrene	NA	NA	NA	0.00E+00	1.60E-05	8.29E-06	NA	2.43E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.08E-06	4.29E-07	1.00E-06	2.51E-06
Thallium	NA	NA	NA	0.00E+00	6.26E-02	0.00E+00	NA	6.26E-02
Toluene	NA	NA	NA	0.00E+00	1.09E-06	0.00E+00	2.64E-07	1.35E-06
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.15E-06	0.00E+00	5.12E-05	5.33E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.47E-05	1.87E-06	3.08E-08	1.66E-05	5.46E-01	5.66E-02	8.75E-04	6.04E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.18E-05	2.61E-06	3.28E-10	2.44E-05	6.99E-01	8.37E-02	6.30E-07	7.83E-01
Iron	NA	NA	NA	0.00E+00	2.05E-02	0.00E+00	NA	2.05E-02
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.89E-06	1.95E-06	3.78E-10	6.84E-06
~Aroclor 1260	9.12E-08	5.10E-08	1.34E-12	1.42E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.19E-05	2.66E-06	3.38E-10	2.46E-05	7.20E-01	8.37E-02	1.16E-06	8.03E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil C
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contaminati
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	5.08E-07	1.74E-07
Benzo(g,h,i)perylene	5.08E-07	1.74E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	3.90E-07	1.34E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
~Acenaphthene	5.08E-07	1.74E-07
~Anthracene	5.08E-07	1.74E-07
~Benz[a]anthracene	5.08E-07	1.74E-07
~Benzo[a]pyrene	5.08E-07	1.74E-07
~Benzo[b]fluoranthene	5.08E-07	1.74E-07
~Benzo[k]fluoranthene	5.08E-07	1.74E-07
~Chrysene	5.08E-07	1.74E-07
~Fluoranthene	5.08E-07	1.74E-07
~Fluorene	5.08E-07	1.74E-07
~Indeno[1,2,3-cd]pyrene	5.08E-07	1.74E-07
~Methylnaphthalene, 1-	5.08E-07	1.74E-07
~Methylnaphthalene, 2-	5.08E-07	1.74E-07
~Naphthalene	5.08E-07	1.74E-07
~Pyrene	5.08E-07	1.74E-07
Propyl benzene	3.90E-07	1.34E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contar
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	5.04E-11	1.73E-11
Acenaphthylene	4.54E-07	1.56E-07
Phenanthrene	5.04E-11	1.73E-11
Perylene	5.04E-11	1.73E-11
Benzo(g,h,i)perylene	5.04E-11	1.73E-11
Aluminum	5.04E-11	1.73E-11
Antimony	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Beryllium	5.04E-11	1.73E-11
Butylbenzene, n-	7.81E-06	2.68E-06
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Ethylbenzene	1.12E-05	3.85E-06
~Dibenzofuran	3.25E-07	1.11E-07
Iron	5.04E-11	1.73E-11
MCPP	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
~Acenaphthene	4.54E-07	1.56E-07
~Anthracene	1.22E-07	4.17E-08
~Benz[a]anthracene	5.04E-11	1.73E-11
~Benzo[a]pyrene	5.04E-11	1.73E-11
~Benzo[b]fluoranthene	5.04E-11	1.73E-11
~Benzo[k]fluoranthene	5.04E-11	1.73E-11
~Chrysene	5.04E-11	1.73E-11
~Fluoranthene	5.04E-11	1.73E-11
~Fluorene	2.26E-07	7.75E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	1.73E-11
~Methylnaphthalene, 1-	1.09E-06	3.72E-07
~Methylnaphthalene, 2-	1.10E-06	3.76E-07
~Naphthalene	1.37E-06	4.71E-07
~Pyrene	5.04E-11	1.73E-11
Propyl benzene	9.10E-06	3.12E-06
Thallium	5.04E-11	1.73E-11
Toluene	1.49E-05	5.09E-06
Vanadium	5.04E-11	1.73E-11
Xylene, m-	1.16E-05	3.99E-06
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

	Risk				Hazard			
Chemical	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	1.04E-06	0.00E+00	1.91E-11	1.04E-06
Acenaphthylene	NA	NA	NA	0.00E+00	8.40E-06	0.00E+00	1.11E-06	9.51E-06
Phenanthrene	NA	NA	NA	0.00E+00	4.86E-05	0.00E+00	6.82E-10	4.86E-05
Perylene	NA	NA	NA	0.00E+00	4.24E-07	2.20E-07	5.95E-12	6.44E-07
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.89E-08	2.54E-08	6.87E-13	7.43E-08
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	8.70E-12	8.70E-12	1.03E-04	0.00E+00	5.29E-07	1.03E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.60E-06	0.00E+00	4.57E-06	6.18E-06
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.44E-05	1.72E-06	2.17E-10	1.61E-05	4.61E-01	5.52E-02	4.15E-07	5.16E-01
Ethylbenzene	7.49E-10	0.00E+00	1.95E-09	2.70E-09	1.99E-06	0.00E+00	2.28E-06	4.27E-06
~Dibenzofuran	NA	NA	NA	0.00E+00	2.94E-06	0.00E+00	6.96E-08	3.00E-06
Iron	NA	NA	NA	0.00E+00	1.97E-02	0.00E+00	NA	1.97E-02
MCPP	NA	NA	NA	0.00E+00	4.11E-05	1.64E-05	6.04E-10	5.75E-05
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.17E-06	8.67E-07	1.68E-10	3.04E-06
~Aroclor 1260	1.17E-07	6.52E-08	1.71E-12	1.82E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	4.00E-06	2.07E-06	5.29E-07	6.60E-06
~Anthracene	NA	NA	NA	0.00E+00	2.80E-07	1.45E-07	9.52E-09	4.36E-07
~Benz[a]anthracene	1.29E-08	6.68E-09	6.08E-14	1.96E-08	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	6.44E-08	3.34E-08	3.04E-13	9.78E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.29E-08	6.68E-09	6.08E-14	1.96E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	9.26E-09	4.80E-09	4.37E-14	1.41E-08	NA	NA	NA	0.00E+00
~Chrysene	6.04E-09	3.13E-09	2.85E-14	9.17E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.87E-06	3.05E-06	NA	8.92E-06
~Fluorene	NA	NA	NA	0.00E+00	5.90E-05	3.06E-05	3.89E-06	9.34E-05
~Indeno[1,2,3-cd]pyrene	3.62E-09	1.88E-09	1.71E-14	5.50E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.07E-07	5.55E-08	3.40E-08	1.97E-07	1.54E-04	7.98E-05	4.78E-05	2.81E-04
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.35E-03	1.22E-03	NA	3.56E-03
~Naphthalene	NA	NA	2.86E-08	2.86E-08	8.76E-05	4.54E-05	8.19E-04	9.52E-04
~Pyrene	NA	NA	NA	0.00E+00	1.60E-05	8.29E-06	2.24E-10	2.43E-05
Propyl benzene	NA	NA	NA	0.00E+00	1.08E-06	4.29E-07	7.15E-06	8.65E-06
Thallium	NA	NA	NA	0.00E+00	6.26E-02	0.00E+00	NA	6.26E-02
Toluene	NA	NA	NA	0.00E+00	1.09E-06	0.00E+00	4.41E-06	5.50E-06
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.15E-06	0.00E+00	5.12E-05	5.33E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.47E-05	1.90E-06	6.48E-08	1.67E-05	5.46E-01	5.66E-02	9.43E-04	6.04E-01

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA		2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
USEPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	5.09E-05	4.43E-06	8.20E-11	5.53E-05	6.52E+00	5.68E-01	6.30E-07	7.09E+00
Iron	NA	NA	NA	0.00E+00	1.92E-01	0.00E+00	NA	1.92E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.57E-05	1.32E-05	3.78E-10	5.89E-05
~Aroclor 1260	2.13E-07	8.64E-08	3.35E-13	2.99E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	5.11E-05	4.51E-06	8.45E-11	5.56E-05	6.72E+00	5.68E-01	1.16E-06	7.28E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	of Concern	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	4.79E-06

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	2.65E-06	2.27E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	2.65E-06	2.27E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
~Acenaphthene	3.44E-06	2.95E-07
~Anthracene	3.44E-06	2.95E-07
~Benz[a]anthracene	3.44E-06	4.69E-07
~Benzo[a]pyrene	3.44E-06	4.69E-07
~Benzo[b]fluoranthene	3.44E-06	4.69E-07
~Benzo[k]fluoranthene	3.44E-06	4.69E-07
~Chrysene	3.44E-06	4.69E-07
~Fluoranthene	3.44E-06	2.95E-07
~Fluorene	3.44E-06	2.95E-07
~Indeno[1,2,3-cd]pyrene	3.44E-06	4.69E-07
~Methylnaphthalene, 1-	3.44E-06	2.95E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
~Naphthalene	3.44E-06	2.95E-07
~Pyrene	3.44E-06	2.95E-07
Propyl benzene	2.65E-06	2.27E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Conta
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	5.04E-11	4.32E-12
Acenaphthylene	4.54E-07	3.89E-08
Phenanthrene	5.04E-11	4.32E-12
Perylene	5.04E-11	4.32E-12
Benzo(g,h,i)perylene	5.04E-11	4.32E-12
Aluminum	5.04E-11	4.32E-12
Antimony	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Butylbenzene, n-	7.81E-06	6.69E-07
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
~Dibenzofuran	3.25E-07	2.78E-08
Iron	5.04E-11	4.32E-12
MCPP	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
~Acenaphthene	4.54E-07	3.89E-08
~Anthracene	1.22E-07	1.04E-08
~Benz[a]anthracene	5.04E-11	5.70E-11
~Benzo[a]pyrene	5.04E-11	5.70E-11
~Benzo[b]fluoranthene	5.04E-11	5.70E-11
~Benzo[k]fluoranthene	5.04E-11	5.70E-11
~Chrysene	5.04E-11	5.70E-11
~Fluoranthene	5.04E-11	4.32E-12
~Fluorene	2.26E-07	1.94E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	5.70E-11
~Methylnaphthalene, 1-	1.09E-06	9.30E-08
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
~Naphthalene	1.37E-06	1.18E-07
~Pyrene	5.04E-11	4.32E-12
Propyl benzene	9.10E-06	7.80E-07
Thallium	5.04E-11	4.32E-12
Toluene	1.49E-05	1.27E-06
Vanadium	5.04E-11	4.32E-12
Xylene, m-	1.16E-05	9.97E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	9.68E-06	0.00E+00	NA	9.68E-06
Acenaphthylene	NA	NA	NA	0.00E+00	7.84E-05	0.00E+00	NA	7.84E-05
Phenanthrene	NA	NA	NA	0.00E+00	4.54E-04	0.00E+00	NA	4.54E-04
Perylene	NA	NA	NA	0.00E+00	3.96E-06	1.15E-06	NA	5.11E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.57E-07	0.00E+00	NA	4.57E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.50E-05	0.00E+00	NA	1.50E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	3.36E-05	2.92E-06	5.41E-11	3.65E-05	4.31E+00	3.75E-01	4.15E-07	4.68E+00
Ethylbenzene	1.75E-09	0.00E+00	4.88E-10	2.24E-09	1.85E-05	0.00E+00	2.28E-06	2.08E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	2.74E-05	0.00E+00	NA	2.74E-05
Iron	NA	NA	NA	0.00E+00	1.84E-01	0.00E+00	NA	1.84E-01
MCPP	NA	NA	NA	0.00E+00	3.84E-04	1.11E-04	NA	4.95E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.03E-05	5.88E-06	1.68E-10	2.62E-05
~Aroclor 1260	2.72E-07	1.11E-07	4.28E-13	3.83E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	3.73E-05	1.41E-05	NA	5.13E-05
~Anthracene	NA	NA	NA	0.00E+00	2.62E-06	9.87E-07	NA	3.60E-06
~Benz[a]anthracene	1.12E-07	1.10E-08	2.01E-13	1.23E-07	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	5.59E-07	5.48E-08	1.00E-12	6.14E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.12E-07	1.10E-08	2.01E-13	1.23E-07	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	8.04E-09	7.87E-10	1.44E-13	8.83E-09	NA	NA	NA	0.00E+00
~Chrysene	5.25E-09	5.14E-10	9.41E-14	5.76E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.48E-05	2.07E-05	NA	7.55E-05
~Fluorene	NA	NA	NA	0.00E+00	5.50E-04	2.07E-04	NA	7.58E-04
~Indeno[1,2,3-cd]pyrene	3.15E-08	3.08E-09	5.64E-14	3.46E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	2.50E-07	9.41E-08	NA	3.44E-07	1.44E-03	5.41E-04	NA	1.98E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.19E-02	8.25E-03	NA	3.01E-02
~Naphthalene	NA	NA	7.16E-09	7.16E-09	8.17E-04	3.08E-04	8.19E-04	1.94E-03
~Pyrene	NA	NA	NA	0.00E+00	1.49E-04	5.62E-05	NA	2.05E-04
Propyl benzene	NA	NA	NA	0.00E+00	1.00E-05	2.91E-06	1.00E-06	1.40E-05
Thallium	NA	NA	NA	0.00E+00	5.84E-01	0.00E+00	NA	5.84E-01
Toluene	NA	NA	NA	0.00E+00	1.02E-05	0.00E+00	2.64E-07	1.04E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.01E-05	0.00E+00	5.12E-05	7.13E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	3.49E-05	3.21E-06	7.71E-09	3.81E-05	5.10E+00	3.84E-01	8.75E-04	5.49E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	
Dioxin TEQ	0.0005	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	
Iron	14700	7.0E-01	NA	7.00E-01	NA	NA	NA	
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	
Phenol	1.5	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	
~Aroclor 1260	0.136	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

IForal = (IR x EF x ED x FI x CF)/(BW x AT)

Where:

IForal = Ingestion intake factor (kg/kg-day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
FI = Fraction soil ingested (unitless)
CF1 = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)
IR = Soil ingestion rate (mg/day)

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

$$IFderm = (SA \times EF \times ED \times AF \times FDerm \times Derm_{absorp} \times CF) / (BW \times AT)$$

Where:

IFderm = Intake factor for dermal contact (kg/kg-day)
SA = Surface area (cm²)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
AF = Adherence factor (mg/cm²)
FDerm = Fraction of contaminated soil contacted
$Derm_{absorp}$ = Dermal Absorption factor (unitless)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

IFinh = (EF x ED x ET x (1/PEF+1/VF)) / (AT)

Where:

IFinh = Intake factor for inhalation (kg/m3)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
ET = Exposure time (hours/hours)
PEF = Particulate emission factor(m^3/kg)
VF = Volatile emission factor (m^3/kg)
AT = Averaging time (days)

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2 Surface Soil
Cal/EPA Toxicity

Chemical	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	5.09E-05	4.43E-06	8.20E-11	5.53E-05	6.52E+00	5.68E-01	6.30E-07	7.09E+00
Iron	NA	NA	NA	0.00E+00	1.92E-01	0.00E+00	NA	1.92E-01
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	4.57E-05	1.32E-05	3.78E-10	5.89E-05
~Aroclor 1260	2.13E-07	8.64E-08	3.35E-13	2.99E-07	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	5.11E-05	4.51E-06	8.45E-11	5.56E-05	6.72E+00	5.68E-01	1.16E-06	7.28E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.36E+09
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

A1. Mutagenic INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all COPC	NA	4.79E-06

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contaminati
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	3.44E-06	2.95E-07
Benzo(g,h,i)perylene	3.44E-06	2.95E-07
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	2.65E-06	2.27E-07
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
~Acenaphthene	3.44E-06	2.95E-07
~Anthracene	3.44E-06	2.95E-07
~Benz[a]anthracene	3.44E-06	4.69E-07
~Benzo[a]pyrene	3.44E-06	4.69E-07
~Benzo[b]fluoranthene	3.44E-06	4.69E-07
~Benzo[k]fluoranthene	3.44E-06	4.69E-07
~Chrysene	3.44E-06	4.69E-07
~Fluoranthene	3.44E-06	2.95E-07
~Fluorene	3.44E-06	2.95E-07
~Indeno[1,2,3-cd]pyrene	3.44E-06	4.69E-07
~Methylnaphthalene, 1-	3.44E-06	2.95E-07
~Methylnaphthalene, 2-	3.44E-06	2.95E-07
~Naphthalene	3.44E-06	2.95E-07
~Pyrene	3.44E-06	2.95E-07
Propyl benzene	2.65E-06	2.27E-07
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00

Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contan
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	5.04E-11	4.32E-12
Acenaphthylene	4.54E-07	3.89E-08
Phenanthrene	5.04E-11	4.32E-12
Perylene	5.04E-11	4.32E-12
Benzo(g,h,i)perylene	5.04E-11	4.32E-12
Aluminum	5.04E-11	4.32E-12
Antimony	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Beryllium	5.04E-11	4.32E-12
Butylbenzene, n-	7.81E-06	6.69E-07
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Ethylbenzene	1.12E-05	9.62E-07
~Dibenzofuran	3.25E-07	2.78E-08
Iron	5.04E-11	4.32E-12
MCPP	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
~Acenaphthene	4.54E-07	3.89E-08
~Anthracene	1.22E-07	1.04E-08
~Benz[a]anthracene	5.04E-11	5.70E-11
~Benzo[a]pyrene	5.04E-11	5.70E-11
~Benzo[b]fluoranthene	5.04E-11	5.70E-11
~Benzo[k]fluoranthene	5.04E-11	5.70E-11
~Chrysene	5.04E-11	5.70E-11
~Fluoranthene	5.04E-11	4.32E-12
~Fluorene	2.26E-07	1.94E-08
~Indeno[1,2,3-cd]pyrene	5.04E-11	5.70E-11
~Methylnaphthalene, 1-	1.09E-06	9.30E-08
~Methylnaphthalene, 2-	1.10E-06	9.41E-08
~Naphthalene	1.37E-06	1.18E-07
~Pyrene	5.04E-11	4.32E-12
Propyl benzene	9.10E-06	7.80E-07
Thallium	5.04E-11	4.32E-12
Toluene	1.49E-05	1.27E-06
Vanadium	5.04E-11	4.32E-12
Xylene, m-	1.16E-05	9.97E-07
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

	Risk				Hazard			
Chemical	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	9.68E-06	0.00E+00	1.91E-11	9.68E-06
Acenaphthylene	NA	NA	NA	0.00E+00	7.84E-05	0.00E+00	1.11E-06	7.95E-05
Phenanthrene	NA	NA	NA	0.00E+00	4.54E-04	0.00E+00	6.82E-10	4.54E-04
Perylene	NA	NA	NA	0.00E+00	3.96E-06	1.49E-06	5.95E-12	5.45E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	4.57E-07	1.72E-07	6.87E-13	6.29E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	2.18E-12	2.18E-12	9.59E-04	0.00E+00	5.29E-07	9.59E-04
Butylbenzene, n-	NA	NA	NA	0.00E+00	1.50E-05	0.00E+00	4.57E-06	1.96E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	3.36E-05	2.92E-06	5.41E-11	3.65E-05	4.31E+00	3.75E-01	4.15E-07	4.68E+00
Ethylbenzene	1.75E-09	0.00E+00	4.88E-10	2.24E-09	1.85E-05	0.00E+00	2.28E-06	2.08E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	2.74E-05	0.00E+00	6.96E-08	2.75E-05
Iron	NA	NA	NA	0.00E+00	1.84E-01	0.00E+00	NA	1.84E-01
MCPP	NA	NA	NA	0.00E+00	3.84E-04	1.11E-04	6.04E-10	4.95E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	2.03E-05	5.88E-06	1.68E-10	2.62E-05
~Aroclor 1260	2.72E-07	1.11E-07	4.28E-13	3.83E-07	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	3.73E-05	1.41E-05	5.29E-07	5.19E-05
~Anthracene	NA	NA	NA	0.00E+00	2.62E-06	9.87E-07	9.52E-09	3.61E-06
~Benz[a]anthracene	1.84E-07	1.80E-08	2.01E-13	2.02E-07	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	1.50E-07	9.00E-08	1.00E-12	2.40E-07	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	3.01E-08	1.80E-08	2.01E-13	4.81E-08	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	2.16E-08	1.29E-08	1.44E-13	3.45E-08	NA	NA	NA	0.00E+00
~Chrysene	1.41E-08	8.44E-09	9.41E-14	2.25E-08	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	5.48E-05	2.07E-05	NA	7.55E-05
~Fluorene	NA	NA	NA	0.00E+00	5.50E-04	2.07E-04	3.89E-06	7.62E-04
~Indeno[1,2,3-cd]pyrene	8.45E-09	5.07E-09	5.64E-14	1.35E-08	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	2.50E-07	9.41E-08	8.49E-09	3.52E-07	1.44E-03	5.41E-04	4.78E-05	2.02E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	2.19E-02	8.25E-03	NA	3.01E-02
~Naphthalene	NA	NA	7.16E-09	7.16E-09	8.17E-04	3.08E-04	8.19E-04	1.94E-03
~Pyrene	NA	NA	NA	0.00E+00	1.49E-04	5.62E-05	2.24E-10	2.05E-04
Propyl benzene	NA	NA	NA	0.00E+00	1.00E-05	2.91E-06	7.15E-06	2.01E-05
Thallium	NA	NA	NA	0.00E+00	5.84E-01	0.00E+00	NA	5.84E-01
Toluene	NA	NA	NA	0.00E+00	1.02E-05	0.00E+00	4.41E-06	1.46E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	2.01E-05	0.00E+00	5.12E-05	7.13E-05
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00

Total	3.45E-05	3.28E-06	1.62E-08	3.78E-05	5.10E+00	3.84E-01	9.43E-04	5.49E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination - Mutagenic Equations
Area 2; All Soil (0-8ft bgs)

USEPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
For all chemicals	NA	4.79E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
~Benz[a]anthracene	NA	4.69E-07
~Benzo[a]pyrene	NA	4.69E-07
~Benzo[b]fluoranthene	NA	4.69E-07
~Benzo[k]fluoranthene	NA	4.69E-07
~Chrysene	NA	4.69E-07
~Indeno[1,2,3-cd]pyrene	NA	4.69E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens	Carcinogens (kg/m3)
~Benz[a]anthracene	NA	5.70E-11
~Benzo[a]pyrene	NA	5.70E-11
~Benzo[b]fluoranthene	NA	5.70E-11
~Benzo[k]fluoranthene	NA	5.70E-11
~Chrysene	NA	5.70E-11
~Indeno[1,2,3-cd]pyrene	NA	5.70E-11

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	1.12E-07	1.10E-08	2.00E-13	1.23E-07
~Benzo[a]pyrene	5.59E-07	5.48E-08	1.00E-12	6.14E-07
~Benzo[b]fluoranthene	1.12E-07	1.10E-08	2.00E-13	1.23E-07
~Benzo[k]fluoranthene	8.04E-09	7.88E-10	1.44E-13	8.83E-09
~Chrysene	5.24E-09	5.14E-10	9.40E-14	5.76E-09
~Indeno[1,2,3-cd]pyrene	3.15E-08	3.08E-09	5.64E-14	3.46E-08
Total	8.28E-07	8.11E-08	1.70E-12	9.09E-07

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination - Mutagenic Equations
Area 2; All Soil (0-8ft bgs)

CalEPA Toxicity

A. MUTAGENIC INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	NA	4.79E-06

B. MUTAGENIC DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
~Benz[a]anthracene	NA	4.69E-07
~Benzo[a]pyrene	NA	4.69E-07
~Benzo[b]fluoranthene	NA	4.69E-07
~Benzo[k]fluoranthene	NA	4.69E-07
~Chrysene	NA	4.69E-07
~Indeno[1,2,3-cd]pyrene	NA	4.69E-07

C. MUTAGENIC INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens	**Carcinogens (kg/m3)**
~Benz[a]anthracene	NA	5.70E-11
~Benzo[a]pyrene	NA	5.70E-11
~Benzo[b]fluoranthene	NA	5.70E-11
~Benzo[k]fluoranthene	NA	5.70E-11
~Chrysene	NA	5.70E-11
~Indeno[1,2,3-cd]pyrene	NA	5.70E-11

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

COPC	Risk			
	Ingestion	Dermal	Inhalation	Total
~Benz[a]anthracene	1.84E-07	1.80E-08	2.00E-13	2.02E-07
~Benzo[a]pyrene	9.20E-07	9.01E-08	1.00E-12	1.01E-06
~Benzo[b]fluoranthene	1.84E-07	1.80E-08	2.00E-13	2.02E-07
~Benzo[k]fluoranthene	1.32E-07	1.29E-08	1.44E-13	1.45E-07
~Chrysene	8.62E-08	8.44E-09	9.40E-14	9.47E-08
~Indeno[1,2,3-cd]pyrene	5.17E-08	5.07E-09	5.64E-14	5.68E-08
Total	1.56E-06	1.53E-07	1.70E-12	1.71E-06

Subarea 2 Inhalation of ambient air for the Recreational User - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	250	30	0.10	10950	25550	3.1E-08	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	30	0.10	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	250	30	0.10	10950	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	7.8E-06	3.0E-02	250	30	0.10	10950	25550	4.7E-07	4.7E-11
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	0.0E+00	1.0E+01	250	30	0.10	10950	25550	5.1E-10	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	2.3E-05	9.8E-02	250	30	0.10	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	0.0E+00	9.0E-02	250	30	0.10	10950	25550	2.7E-08	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	250	30	0.10	10950	25550	9.9E-10	1.1E-12
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	250	30	0.10	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	30	0.10	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	30	0.10	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	250	30	0.10	10950	25550	3.7E-06	1.6E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	250	30	0.10	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	5.0E+00	250	30	0.10	10950	25550	6.5E-10	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	250	30	0.10	10950	25550	2.2E-06	7.9E-12
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	30	0.10	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	250	30	0.10	10950	25550	3.9E-08	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	250	30	0.10	10950	25550	8.2E-08	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	250	30	0.10	10950	25550	NA	6.7E-15

Total	6.6E-06	2.2E-10

Subarea 2 Inhalation of ambient air for the Recreational User - CalEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.001	2.64E-05	2.64E-08	0.0E+00	6.0E-02	250	30	0.10	10950	25550	3.1E-08	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	250	30	0.10	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	30	0.10	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	0.071	2.28E-06	1.62E-07	0.0E+00	1.4E-02	250	30	0.10	10950	25550	8.2E-07	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.003	1.37E-06	4.12E-09	0.0E+00	2.1E-01	250	30	0.10	10950	25550	1.4E-09	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	ND	1.59E-06	NA	0.0E+00	3.1E+01	250	30	0.10	10950	25550	NA	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	0.01	1.96E-05	1.96E-07	2.9E-05	3.0E-02	250	30	0.10	10950	25550	4.7E-07	1.7E-10
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	0.0008	9.00E-05	7.20E-08	8.3E-07	1.0E+01	250	30	0.10	10950	25550	5.1E-10	1.8E-12
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	ND	1.57E-05	NA	5.3E-06	3.0E-01	250	30	0.10	10950	25550	NA	NA
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	0.0008	4.20E-05	3.36E-08	1.8E-06	9.0E-02	250	30	0.10	10950	25550	2.7E-08	1.8E-12
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0009	1.29E-05	1.16E-08	0.0E+00	3.5E-02	250	30	0.10	10950	25550	2.4E-08	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	0.0006	2.31E-05	1.39E-08	2.5E-06	1.0E+00	250	30	0.10	10950	25550	9.9E-10	1.1E-12
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	0.012	9.97E-07	1.20E-08	0.0E+00	1.4E-01	250	30	0.10	10950	25550	6.1E-09	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	250	30	0.10	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	30	0.10	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	30	0.10	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.068	2.27E-06	1.55E-07	3.4E-05	3.0E-03	250	30	0.10	10950	25550	3.7E-06	1.6E-10
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.0003	2.93E-07	8.80E-11	0.0E+00	1.1E-01	250	30	0.10	10950	25550	6.0E-11	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	250	30	0.10	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	0.002	2.27E-05	4.55E-08	0.0E+00	3.0E-01	250	30	0.10	10950	25550	1.1E-08	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	0.002	3.15E-05	6.30E-08	4.1E-06	2.0E-03	250	30	0.10	10950	25550	2.2E-06	7.9E-12
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	30	0.10	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	0.003	1.83E-05	5.49E-08	0.0E+00	1.0E-01	250	30	0.10	10950	25550	3.9E-08	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	0.0075	1.07E-04	8.01E-07	0.0E+00	7.0E-01	250	30	0.10	10950	25550	8.2E-08	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	0.00006	3.34E-07	2.00E-11	1.1E-05	0.0E+00	250	30	0.10	10950	25550	NA	6.7E-15

Total	7.4E-06	3.5E-10

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC (mg/kg)	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m³/kg		(m³/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**(mg/kg-day)$^{-1}$**	**(ug/m3)$^{-1}$**	**(mg/kg-day)$^{-1}$**	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	NA	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.00E+06
Acenaphthylene	0.515	6.0E-02	NA	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05	of Concern	
Phenanthrene	14.9	3.0E-01	NA	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	NA	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	NA	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	NA	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	NA	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	NA	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	NA	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	NA	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	7.3E+00	1.1E-03	7.30E+00	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	7.3E-02	1.1E-04	7.30E-02	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	7.3E-03	1.1E-05	7.30E-03	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	7.3E-01	1.1E-04	7.30E-01	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	NA	7.00E-02	2.9E-02	NA	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	NA	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.0E+00	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	5.0E+00	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	4.46E-06	6.37E-08
Benzo(g,h,i)perylene	0.00E+00	0.00E+00
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	4.46E-06	6.37E-08
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Aroclor 1260	6.25E-06	8.92E-08
~Acenaphthene	5.80E-06	8.29E-08
~Anthracene	5.80E-06	8.29E-08
~Benz[a]anthracene	5.80E-06	8.29E-08
~Benzo[a]pyrene	5.80E-06	8.29E-08
~Benzo[b]fluoranthene	5.80E-06	8.29E-08
~Benzo[k]fluoranthene	5.80E-06	8.29E-08
~Chrysene	5.80E-06	8.29E-08
~Fluoranthene	5.80E-06	8.29E-08
~Fluorene	5.80E-06	8.29E-08
~Indeno[1,2,3-cd]pyrene	5.80E-06	8.29E-08
~Methylnaphthalene, 1-	5.80E-06	8.29E-08
~Methylnaphthalene, 2-	5.80E-06	8.29E-08
~Naphthalene	5.80E-06	8.29E-08
~Pyrene	5.80E-06	8.29E-08
Propyl benzene	4.46E-06	6.37E-08
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Cor
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
sec-Butylbenzene	2.26E-07	3.23E-09
Acenaphthylene	1.72E-06	2.46E-08
Phenanthrene	2.26E-07	3.23E-09
Perylene	2.26E-07	3.23E-09
Benzo(g,h,i)perylene	2.26E-07	3.23E-09
Aluminum	2.26E-07	3.23E-09
Antimony	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Beryllium	2.26E-07	3.23E-09
Butylbenzene, n-	2.60E-05	3.71E-07
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Dioxin TEQ	2.26E-07	3.23E-09
Ethylbenzene	3.73E-05	5.33E-07
~Dibenzofuran	1.30E-06	1.85E-08
Iron	2.26E-07	3.23E-09
MCPP	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Aroclor 1260	2.26E-07	3.23E-09
~Acenaphthene	1.72E-06	2.46E-08
~Anthracene	6.27E-07	8.96E-09
~Benz[a]anthracene	2.26E-07	3.23E-09
~Benzo[a]pyrene	2.26E-07	3.23E-09
~Benzo[b]fluoranthene	2.26E-07	3.23E-09
~Benzo[k]fluoranthene	2.26E-07	3.23E-09
~Chrysene	2.26E-07	3.23E-09
~Fluoranthene	2.26E-07	3.23E-09
~Fluorene	9.72E-07	1.39E-08
~Indeno[1,2,3-cd]pyrene	2.26E-07	3.23E-09
~Methylnaphthalene, 1-	3.81E-06	5.44E-08
~Methylnaphthalene, 2-	3.85E-06	5.50E-08
~Naphthalene	4.76E-06	6.79E-08
~Pyrene	2.26E-07	3.23E-09
Propyl benzene	3.02E-05	4.32E-07
Thallium	2.26E-07	3.23E-09
Toluene	4.93E-05	7.04E-07
Vanadium	2.26E-07	3.23E-09
Xylene, m-	3.86E-05	5.51E-07
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
USEPA Toxicity

	Risk				Hazard			
COPC	ing	derm	inhal	Summ	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	3.42E-06	0.00E+00	NA	3.42E-06
Acenaphthylene	NA	NA	NA	0.00E+00	2.77E-05	0.00E+00	NA	2.77E-05
Phenanthrene	NA	NA	NA	0.00E+00	1.60E-04	0.00E+00	NA	1.60E-04
Perylene	NA	NA	NA	0.00E+00	1.40E-06	1.93E-06	NA	3.33E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.61E-07	0.00E+00	NA	1.61E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic, Inorganic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.63E-09	1.63E-09	3.39E-04	0.00E+00	2.37E-03	2.71E-03
Butylbenzene, n-	NA	NA	NA	0.00E+00	5.30E-06	0.00E+00	NA	5.30E-06
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.98E-06	8.20E-07	4.05E-08	2.84E-06	1.52E+00	6.31E-01	1.86E-03	2.16E+00
Ethylbenzene	1.03E-10	0.00E+00	2.70E-10	3.73E-10	6.55E-06	0.00E+00	7.57E-06	1.41E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	9.69E-06	0.00E+00	NA	9.69E-06
Iron	NA	NA	NA	0.00E+00	6.50E-02	0.00E+00	NA	6.50E-02
MCPP	NA	NA	NA	0.00E+00	1.36E-04	1.87E-04	NA	3.23E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	7.17E-06	9.91E-06	7.53E-07	1.78E-05
~Aroclor 1260	1.61E-08	3.11E-08	3.20E-10	4.74E-08	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	1.32E-05	2.37E-05	NA	3.69E-05
~Anthracene	NA	NA	NA	0.00E+00	9.26E-07	1.66E-06	NA	2.59E-06
~Benz[a]anthracene	1.08E-09	1.94E-09	1.14E-11	3.02E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	5.39E-09	9.68E-09	5.68E-11	1.51E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.08E-09	1.94E-09	1.14E-11	3.02E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	7.74E-11	1.39E-10	8.17E-12	2.25E-10	NA	NA	NA	0.00E+00
~Chrysene	5.05E-11	9.07E-11	5.33E-12	1.47E-10	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	1.94E-05	3.48E-05	NA	5.42E-05
~Fluorene	NA	NA	NA	0.00E+00	1.95E-04	3.49E-04	NA	5.44E-04
~Indeno[1,2,3-cd]pyrene	3.03E-10	5.44E-10	3.20E-12	8.51E-10	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.47E-08	2.64E-08	NA	4.11E-08	5.07E-04	9.11E-04	NA	1.42E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.74E-03	1.39E-02	NA	2.16E-02
~Naphthalene	NA	NA	4.13E-09	4.13E-09	2.89E-04	5.19E-04	2.84E-03	3.65E-03
~Pyrene	NA	NA	NA	0.00E+00	5.27E-05	9.47E-05	NA	1.47E-04
Propyl benzene	NA	NA	NA	0.00E+00	3.55E-06	4.91E-06	3.33E-06	1.18E-05
Thallium	NA	NA	NA	0.00E+00	2.07E-01	0.00E+00	NA	2.07E-01
Toluene	NA	NA	NA	0.00E+00	3.59E-06	0.00E+00	8.77E-07	4.47E-06
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	7.10E-06	0.00E+00	1.70E-04	1.77E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.02E-06	8.92E-07	4.69E-08	2.96E-06	1.80E+00	6.47E-01	7.26E-03	2.46E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor				VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
sec-Butylbenzene	0.053	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	sec-Butylbenzene	8.8E+03	For all Chemicals	1.00E+06
Acenaphthylene	0.515	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	Acenaphthylene	1.5E+05		
Phenanthrene	14.9	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	Phenanthrene	5.6E+05		
Perylene	0.013	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Perylene	2.6E+06		
Benzo(g,h,i)perylene	0.0015	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	Benzo(g,h,i)perylene	2.6E+06		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum			
Antimony		4.0E-04	NA	6.00E-05	NA	NA	NA	Antimony			
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic			
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium			
Beryllium	0.21	2.0E-03	2.0E-05	1.40E-05	NA	2.4E-03	NA	Beryllium			
Butylbenzene, n-	0.082	5.0E-02	1.4E-01	5.00E-02	NA	NA	NA	Butylbenzene, n-	8.8E+03		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium			
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt			
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper			
Dioxin TEQ	0.00033	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ			
Ethylbenzene	0.203	1.0E-01	1.0E+00	1.00E-01	1.1E-02	2.5E-06	1.10E-02	Ethylbenzene	6.1E+03		
~Dibenzofuran	0.003	1.0E-03	1.4E-02	1.00E-03	NA	NA	NA	~Dibenzofuran	2.1E+05		
Iron	14098	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron			
MCPP	0.042	1.0E-03	3.5E-03	1.00E-03	NA	NA	NA	MCPP			
Manganese		2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese			
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel			
Phenol	0.666	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol			
~Aroclor 1260	0.174	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260			
~Acenaphthene	0.245	6.0E-02	2.1E-01	6.00E-02	NA	NA	NA	~Acenaphthene	1.5E+05		
~Anthracene	0.086	3.0E-01	1.1E+00	3.00E-01	NA	NA	NA	~Anthracene	5.6E+05		
~Benz[a]anthracene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benz[a]anthracene			
~Benzo[a]pyrene	0.016	NA	NA	NA	1.2E+01	1.1E-03	1.20E+01	~Benzo[a]pyrene			
~Benzo[b]fluoranthene	0.032	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[b]fluoranthene			
~Benzo[k]fluoranthene	0.023	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Benzo[k]fluoranthene			
~Chrysene	0.15	NA	NA	NA	1.2E-01	1.1E-05	1.20E-01	~Chrysene			
~Fluoranthene	0.24	4.0E-02	NA	4.00E-02	NA	NA	NA	~Fluoranthene			
~Fluorene	2.41	4.0E-02	1.4E-01	4.00E-02	NA	NA	NA	~Fluorene	3.0E+05		
~Indeno[1,2,3-cd]pyrene	0.009	NA	NA	NA	1.2E+00	1.1E-04	1.20E+00	~Indeno[1,2,3-cd]pyrene			
~Methylnaphthalene, 1-	11	7.0E-02	2.5E-01	7.00E-02	2.9E-02	8.3E-06	2.90E-02	~Methylnaphthalene, 1-	6.3E+04		
~Methylnaphthalene, 2-	9.59	4.0E-03	NA	4.00E-03	NA	NA	NA	~Methylnaphthalene, 2-	6.2E+04		
~Naphthalene	1.79	2.0E-02	3.0E-03	2.00E-02	NA	3.4E-05	NA	~Naphthalene	5.0E+04		
~Pyrene	0.49	3.0E-02	1.1E-01	3.00E-02	NA	NA	NA	~Pyrene	2.6E+06		
Propyl benzene	0.11	1.0E-01	1.4E-01	1.00E-01	NA	NA	NA	Propyl benzene	7.5E+03		
Thallium	0.64	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium			
Toluene	0.089	8.0E-02	3.0E-01	8.00E-02	NA	NA	NA	Toluene	4.6E+03		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium			
Xylene, m-	0.44	2.0E-01	1.0E-01	2.00E-01	NA	NA	NA	Xylene, m-	5.9E+03		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc			

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Cor
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamina
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

	IFderm	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
sec-Butylbenzene	0.00E+00	0.00E+00
Acenaphthylene	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	0.00E+00
Perylene	5.80E-06	8.29E-08
Benzo(g,h,i)perylene	5.80E-06	8.29E-08
Aluminum	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Beryllium	0.00E+00	0.00E+00
Butylbenzene, n-	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Ethylbenzene	0.00E+00	0.00E+00
~Dibenzofuran	0.00E+00	0.00E+00
Iron	0.00E+00	0.00E+00
MCPP	4.46E-06	6.37E-08
Manganese	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Aroclor 1260	6.25E-06	8.92E-08
~Acenaphthene	5.80E-06	8.29E-08
~Anthracene	5.80E-06	8.29E-08
~Benz[a]anthracene	5.80E-06	8.29E-08
~Benzo[a]pyrene	5.80E-06	8.29E-08
~Benzo[b]fluoranthene	5.80E-06	8.29E-08
~Benzo[k]fluoranthene	5.80E-06	8.29E-08
~Chrysene	5.80E-06	8.29E-08
~Fluoranthene	5.80E-06	8.29E-08
~Fluorene	5.80E-06	8.29E-08
~Indeno[1,2,3-cd]pyrene	5.80E-06	8.29E-08
~Methylnaphthalene, 1-	5.80E-06	8.29E-08
~Methylnaphthalene, 2-	5.80E-06	8.29E-08
~Naphthalene	5.80E-06	8.29E-08
~Pyrene	5.80E-06	8.29E-08
Propyl benzene	4.46E-06	6.37E-08
Thallium	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Xylene, m-	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Con
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
sec-Butylbenzene	2.26E-07	3.23E-09
Acenaphthylene	1.72E-06	2.46E-08
Phenanthrene	2.26E-07	3.23E-09
Perylene	2.26E-07	3.23E-09
Benzo(g,h,i)perylene	2.26E-07	3.23E-09
Aluminum	2.26E-07	3.23E-09
Antimony	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Beryllium	2.26E-07	3.23E-09
Butylbenzene, n-	2.60E-05	3.71E-07
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Dioxin TEQ	2.26E-07	3.23E-09
Ethylbenzene	3.73E-05	5.33E-07
~Dibenzofuran	1.30E-06	1.85E-08
Iron	2.26E-07	3.23E-09
MCPP	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Aroclor 1260	2.26E-07	3.23E-09
~Acenaphthene	1.72E-06	2.46E-08
~Anthracene	6.27E-07	8.96E-09
~Benz[a]anthracene	2.26E-07	3.23E-09
~Benzo[a]pyrene	2.26E-07	3.23E-09
~Benzo[b]fluoranthene	2.26E-07	3.23E-09
~Benzo[k]fluoranthene	2.26E-07	3.23E-09
~Chrysene	2.26E-07	3.23E-09
~Fluoranthene	2.26E-07	3.23E-09
~Fluorene	9.72E-07	1.39E-08
~Indeno[1,2,3-cd]pyrene	2.26E-07	3.23E-09
~Methylnaphthalene, 1-	3.81E-06	5.44E-08
~Methylnaphthalene, 2-	3.85E-06	5.50E-08
~Naphthalene	4.76E-06	6.79E-08
~Pyrene	2.26E-07	3.23E-09
Propyl benzene	3.02E-05	4.32E-07
Thallium	2.26E-07	3.23E-09
Toluene	4.93E-05	7.04E-07
Vanadium	2.26E-07	3.23E-09
Xylene, m-	3.86E-05	5.51E-07
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 2; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

	Risk				Hazard			
Chemical	ing	derm	inhal	Total	ing	derm	inhal	Total
sec-Butylbenzene	NA	NA	NA	0.00E+00	3.42E-06	0.00E+00	8.56E-08	3.51E-06
Acenaphthylene	NA	NA	NA	0.00E+00	2.77E-05	0.00E+00	4.23E-06	3.19E-05
Phenanthrene	NA	NA	NA	0.00E+00	1.60E-04	0.00E+00	3.06E-06	1.63E-04
Perylene	NA	NA	NA	0.00E+00	1.40E-06	2.51E-06	2.67E-08	3.94E-06
Benzo(g,h,i)perylene	NA	NA	NA	0.00E+00	1.61E-07	2.90E-07	3.08E-09	4.55E-07
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	NA	NA	1.63E-09	1.63E-09	3.39E-04	0.00E+00	2.37E-03	2.71E-03
Butylbenzene, n-	NA	NA	NA	0.00E+00	5.30E-06	0.00E+00	1.52E-05	2.05E-05
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.98E-06	8.20E-07	4.05E-08	2.84E-06	1.52E+00	6.31E-01	1.86E-03	2.16E+00
Ethylbenzene	1.03E-10	0.00E+00	2.70E-10	3.73E-10	6.55E-06	0.00E+00	7.57E-06	1.41E-05
~Dibenzofuran	NA	NA	NA	0.00E+00	9.69E-06	0.00E+00	2.78E-07	9.96E-06
Iron	NA	NA	NA	0.00E+00	6.50E-02	0.00E+00	NA	6.50E-02
MCPP	NA	NA	NA	0.00E+00	1.36E-04	1.87E-04	2.71E-06	3.26E-04
Manganese	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	7.17E-06	9.91E-06	7.53E-07	1.78E-05
~Aroclor 1260	1.61E-08	3.11E-08	3.20E-10	4.74E-08	NA	NA	NA	0.00E+00
~Acenaphthene	NA	NA	NA	0.00E+00	1.32E-05	2.37E-05	2.01E-06	3.89E-05
~Anthracene	NA	NA	NA	0.00E+00	9.26E-07	1.66E-06	4.91E-08	2.64E-06
~Benz[a]anthracene	1.77E-09	3.18E-09	1.14E-11	4.96E-09	NA	NA	NA	0.00E+00
~Benzo[a]pyrene	8.86E-09	1.59E-08	5.68E-11	2.48E-08	NA	NA	NA	0.00E+00
~Benzo[b]fluoranthene	1.77E-09	3.18E-09	1.14E-11	4.96E-09	NA	NA	NA	0.00E+00
~Benzo[k]fluoranthene	1.27E-09	2.29E-09	8.17E-12	3.57E-09	NA	NA	NA	0.00E+00
~Chrysene	8.30E-10	1.49E-09	5.33E-12	2.33E-09	NA	NA	NA	0.00E+00
~Fluoranthene	NA	NA	NA	0.00E+00	1.94E-05	3.48E-05	NA	5.42E-05
~Fluorene	NA	NA	NA	0.00E+00	1.95E-04	3.49E-04	1.67E-05	5.61E-04
~Indeno[1,2,3-cd]pyrene	4.98E-10	8.95E-10	3.20E-12	1.40E-09	NA	NA	NA	0.00E+00
~Methylnaphthalene, 1-	1.47E-08	2.64E-08	4.97E-09	4.61E-08	5.07E-04	9.11E-04	1.68E-04	1.59E-03
~Methylnaphthalene, 2-	NA	NA	NA	0.00E+00	7.74E-03	1.39E-02	NA	2.16E-02
~Naphthalene	NA	NA	4.13E-09	4.13E-09	2.89E-04	5.19E-04	2.84E-03	3.65E-03
~Pyrene	NA	NA	NA	0.00E+00	5.27E-05	9.47E-05	1.01E-06	1.48E-04
Propyl benzene	NA	NA	NA	0.00E+00	3.55E-06	4.91E-06	2.38E-05	3.22E-05
Thallium	NA	NA	NA	0.00E+00	2.07E-01	0.00E+00	NA	2.07E-01
Toluene	NA	NA	NA	0.00E+00	3.59E-06	0.00E+00	1.46E-05	1.82E-05
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Xylene, m-	NA	NA	NA	0.00E+00	7.10E-06	0.00E+00	1.70E-04	1.77E-04
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.02E-06	9.05E-07	5.19E-08	2.98E-06	1.80E+00	6.47E-01	7.51E-03	2.46E+00

Subarea 2 - Construction worker inhalation in trench - USEPA

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	ND	1.6E-05	2.0E-04	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethane	ND	2.6E-05	7.0E-03	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	6.2E-05	0.0E+00	6.0E-02	250	1	0.33	365	25550	2.4E-04	NA
1,3,5-Trimethylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
2-Butanone	ND	0.0E+00	5.0E+00	250	1	0.33	365	25550	NA	NA
2-Methylnaphthalene	3.3E-03	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acenaphthene	1.1E-04	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acetone	ND	0.0E+00	3.1E+01	250	1	0.33	365	25550	NA	NA
Benzene	6.9E-04	7.8E-06	3.0E-02	250	1	0.33	365	25550	5.3E-03	1.8E-08
Chloroethane	6.1E-05	0.0E+00	1.0E+01	250	1	0.33	365	25550	1.4E-06	NA
Carbon disulfide	5.3E-04	0.0E+00	7.0E-01	250	1	0.33	365	25550	1.7E-04	NA
Chloromethane	6.9E-05	0.0E+00	9.0E-02	250	1	0.33	365	25550	1.8E-04	NA
cis-1,2-Dichloroethene	5.6E-05	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Ethylbenzene	3.6E-05	2.5E-06	1.0E+00	250	1	0.33	365	25550	8.2E-06	2.9E-10
Fluorene	3.1E-04	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Hexachloroethane	ND	1.1E-05	3.0E-02	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	ND	0.0E+00	4.0E-01	250	1	0.33	365	25550	NA	NA
MTBE	ND	2.6E-07	3.0E+00	250	1	0.33	365	25550	NA	NA
Naphthalene	3.3E-03	3.4E-05	3.0E-03	250	1	0.33	365	25550	2.5E-01	3.7E-07
n-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
n-Propylbenzene	ND	0.0E+00	1.0E+00	250	1	0.33	365	25550	NA	NA
Pyrene	2.3E-06	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
sec-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
tert-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Tetrachloroethene	ND	2.6E-07	4.0E-02	250	1	0.33	365	25550	NA	NA
Toluene	1.3E-04	0.0E+00	5.0E+00	250	1	0.33	365	25550	5.8E-06	NA
Trichloroethene (TCE)	1.1E-04	4.1E-06	2.0E-03	250	1	0.33	365	25550	1.2E-02	1.4E-09
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	1.8E-04	0.0E+00	1.0E-01	250	1	0.33	365	25550	4.1E-04	NA
Chrysene	1.6E-06	1.1E-05	0.0E+00	250	1	0.33	365	25550	NA	5.7E-11
Total									2.7E-01	3.9E-07

Subarea 2 - Construction worker inhalation in trench - Cal EPA

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	ND	1.6E-05	1.4E-02	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethane	ND	2.1E-05	4.0E-01	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	6.2E-05	0.0E+00	6.0E-02	250	1	0.33	365	25550	2.4E-04	NA
1,3,5-Trimethylbenzene	ND	0.0E+00	6.0E-03	250	1	0.33	365	25550	NA	NA
2-Butanone	ND	0.0E+00	5.0E+00	250	1	0.33	365	25550	NA	NA
2-Methylnaphthalene	3.3E-03	0.0E+00	1.4E-02	250	1	0.33	365	25550	5.4E-02	NA
Acenaphthene	1.1E-04	0.0E+00	2.1E-01	250	1	0.33	365	25550	1.2E-04	NA
Acetone	ND	0.0E+00	3.1E+01	250	1	0.33	365	25550	NA	NA
Benzene	6.9E-04	2.9E-05	3.0E-02	250	1	0.33	365	25550	5.3E-03	6.5E-08
Chloroethane	6.1E-05	8.3E-07	1.0E+01	250	1	0.33	365	25550	1.4E-06	1.7E-10
Carbon disulfide	5.3E-04	0.0E+00	7.0E-01	250	1	0.33	365	25550	1.7E-04	NA
Chloromethane	6.9E-05	1.8E-06	9.0E-02	250	1	0.33	365	25550	1.8E-04	4.1E-10
cis-1,2-Dichloroethene	5.6E-05	0.0E+00	3.5E-02	250	1	0.33	365	25550	3.6E-04	NA
Ethylbenzene	3.6E-05	2.5E-06	1.0E+00	250	1	0.33	365	25550	8.2E-06	2.9E-10
Fluorene	3.1E-04	0.0E+00	1.4E-01	250	1	0.33	365	25550	5.1E-04	NA
Hexachloroethane	ND	1.1E-05	3.5E-03	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	ND	0.0E+00	4.0E-01	250	1	0.33	365	25550	NA	NA
MTBE	ND	2.6E-07	3.0E+00	250	1	0.33	365	25550	NA	NA
Naphthalene	3.3E-03	3.4E-05	3.0E-03	250	1	0.33	365	25550	2.5E-01	3.7E-07
n-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
n-Propylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
Pyrene	2.3E-06	0.0E+00	1.1E-01	250	1	0.33	365	25550	4.9E-06	NA
sec-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
tert-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
Tetrachloroethene	ND	5.9E-06	3.5E-02	250	1	0.33	365	25550	NA	NA
Toluene	1.3E-04	0.0E+00	3.0E-01	250	1	0.33	365	25550	9.7E-05	NA
Trichloroethene (TCE)	1.1E-04	4.1E-06	2.0E-03	250	1	0.33	365	25550	1.2E-02	1.4E-09
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	1.8E-04	0.0E+00	1.0E-01	250	1	0.33	365	25550	4.1E-04	NA
Chrysene	1.6E-06	1.1E-05	0.0E+00	250	1	0.33	365	25550	NA	5.7E-11

Total	3.3E-01	4.4E-07

DERMAL CONTACT WITH GROUND WATER
Subarea 2 Construction worker in trench - US EPA

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $DA_{event} = 2\,FA\,x\,K_p\,x\,C_w\,x\,CF\sqrt{\frac{6\,\tau_{event}\ x\ t_{event}}{\pi}}$

If ET > t*, then: $DA_{event} = FA\ x\ K_p\ x\ C_w\ x\ CF\ x\left[\frac{t_{event}}{1+B} + 2\,\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	USEPA Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.80E-03	ND
Benzene	78	5.10E-02	0.69	8	1.50E-02	0.01	0.001	1	2.87E-01	1.23E-06	2375	1	250	1	70	25550	4.09E-07	5.50E-02	2.25E-08
Toluene	92	1.14E-01	0.83	8	3.10E-02	0.002	0.001	1	3.44E-01	4.93E-07	2375	1	250	1	70	25550	1.64E-07	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	0.003	0.001	1	4.34E-01	1.21E-06	2375	1	250	1	70	25550	4.03E-07	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	0.0006	0.001	1	4.34E-01	2.27E-07	2375	1	250	1	70	25550	7.53E-08	1.10E-02	8.28E-10
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.70E-02	ND
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	0.071	0.001	1	6.55E-01	4.85E-05	2375	1	250	1	70	25550	1.61E-05	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.003	0.001	1	7.65E-01	2.01E-06	2375	1	250	1	70	25550	6.66E-07	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.10E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.10E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	0.0008	0.001	1	2.41E-01	4.07E-08	2375	1	250	1	70	25550	1.35E-08	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	0.012	0.001	1	8.93E-01	1.03E-05	2375	1	250	1	70	25550	3.42E-06	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.00E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	ND	0.001	1	2.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	0.0075	0.001	1	2.80E-01	1.04E-06	2375	1	250	1	70	25550	3.45E-07	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	0.0008	0.001	1	2.01E-01	2.20E-08	2375	1	250	1	70	25550	7.30E-09	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0009	0.001	1	3.66E-01	8.36E-08	2375	1	250	1	70	25550	2.77E-08	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.0003	0.001	1	1.42E+00	5.38E-07	2375	1	250	1	70	25550	1.79E-07	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.068	0.001	1	5.47E-01	2.54E-05	2375	1	250	1	70	25550	8.44E-06	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E-03	ND
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	0.001	0.001	1	3.66E-01	6.57E-08	2375	1	250	1	70	25550	2.18E-08	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	0.002	0.001	1	5.69E-01	2.11E-07	2375	1	250	1	70	25550	7.01E-08	4.60E-02	3.22E-09
Chrysene	228	2.73E+00	4.77	8	4.70E-01	0.00006	0.001	1	1.99E+00	3.14E-07	2375	1	250	1	70	25550	1.04E-07	7.30E-03	7.62E-10
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.90E-03	ND
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.00005	0.001	1	1.42E+00	9.76E-08	2375	1	250	1	70	25550	3.24E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	0.013	0.001	1	1.04E+00	1.45E-05	2375	1	250	1	70	25550	4.82E-06	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.29	0.001	1	2.87E-01	2.32E-06	2375	1	250	1	70	25550	7.70E-07	1.50E+00	1.16E-06
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	0.00084	0.001	1	1.18E-01	6.72E-09	2375	1	250	1	70	25550	2.23E-09	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	29.1	0.001	1	2.16E-01	2.33E-04	2375	1	250	1	70	25550	7.73E-05	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	6.39	0.001	1	2.13E-01	5.11E-05	2375	1	250	1	70	25550	1.70E-05	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.40E-02	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	0.0002	0.001	1	7.45E-01	1.40E-07	2375	1	250	1	70	25550	4.64E-08	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	0.002	0.001	1	6.22E-01	6.47E-08	2375	1	250	1	70	25550	2.15E-08	9.50E-04	2.04E-11
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	0.004	0.001	1	9.16E-01	3.12E-06	2375	1	250	1	70	25550	1.04E-06	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.90E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	0.002	0.001	1	1.06E+00	3.48E-08	2375	1	250	1	70	25550	1.16E-08	2.20E-03	2.54E-11
ND - not detected/not determined																		total risk	1.18E-06

BB - below background

DERMAL CONTACT WITH GROUND WATER
Subarea 2 Construction worker in trench - US EPA

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	0.01	0.001	1	2.87E-01	1.23E-06	2375	1	250	1	70	365	2.86E-05	4.00E-03	7.16E-03
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	0.002	0.001	1	3.44E-01	4.93E-07	2375	1	250	1	70	365	1.14E-05	8.00E-02	1.43E-04
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	0.003	0.001	1	4.34E-01	1.21E-06	2375	1	250	1	70	365	2.82E-05	2.00E-01	1.41E-04
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	0.0006	0.001	1	4.34E-01	2.27E-07	2375	1	250	1	70	365	5.27E-06	1.00E-01	5.27E-05
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	0.071	0.001	1	6.55E-01	4.85E-05	2375	1	250	1	70	365	1.13E-03	4.00E-03	2.82E-01
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.003	0.001	1	7.65E-01	2.01E-06	2375	1	250	1	70	365	4.66E-05	6.00E-02	7.77E-04
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	0.0008	0.001	1	2.41E-01	4.07E-08	2375	1	250	1	70	365	9.46E-07	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	0.012	0.001	1	8.93E-01	1.03E-05	2375	1	250	1	70	365	2.40E-04	4.00E-02	5.99E-03
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	ND	0.001	1	2.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	9.00E-01	ND
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	0.0075	0.001	1	2.80E-01	1.04E-06	2375	1	250	1	70	365	2.42E-05	1.00E-01	2.42E-04
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	0.0008	0.001	1	2.01E-01	2.20E-08	2375	1	250	1	70	365	5.11E-07	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0009	0.001	1	3.66E-01	8.36E-08	2375	1	250	1	70	365	1.94E-06	2.00E-03	9.71E-04
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.0003	0.001	1	1.42E+00	5.38E-07	2375	1	250	1	70	365	1.25E-05	3.00E-02	4.17E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.068	0.001	1	5.47E-01	2.54E-05	2375	1	250	1	70	365	5.91E-04	2.00E-02	2.95E-02
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	0.001	0.001	1	3.66E-01	6.57E-08	2375	1	250	1	70	365	1.53E-06	2.00E-02	7.63E-05
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	0.002	0.001	1	5.69E-01	2.11E-07	2375	1	250	1	70	365	4.91E-06	5.00E-04	9.81E-03
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	0.00006	0.001	1	1.99E+00	3.14E-07	2375	1	250	1	70	365	7.31E-06	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.00005	0.001	1	1.42E+00	9.76E-08	2375	1	250	1	70	365	2.27E-06	4.00E-02	5.67E-05
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	0.013	0.001	1	1.04E+00	1.45E-05	2375	1	250	1	70	365	3.37E-04	3.00E-01	1.12E-03
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.29	0.001	1	2.87E-01	2.32E-06	2375	1	250	1	70	365	5.39E-05	3.00E-04	1.80E-01
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	0.00084	0.001	1	1.18E-01	6.72E-09	2375	1	250	1	70	365	1.56E-07	1.40E-05	1.12E-02
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	29.1	0.001	1	2.16E-01	2.33E-04	2375	1	250	1	70	365	5.41E-03	7.00E-01	7.73E-03
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	6.39	0.001	1	2.13E-01	5.11E-05	2375	1	250	1	70	365	1.19E-03	9.60E-04	1.24E+00
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	0.0002	0.001	1	7.45E-01	1.40E-07	2375	1	250	1	70	365	3.24E-06	6.00E-02	5.41E-05
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	0.002	0.001	1	6.22E-01	6.47E-08	2375	1	250	1	70	365	1.50E-06	2.00E-01	7.52E-06
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	0.004	0.001	1	9.16E-01	3.12E-06	2375	1	250	1	70	365	7.26E-05	1.00E-03	7.26E-02
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	0.002	0.001	1	1.06E+00	3.48E-08	2375	1	250	1	70	365	8.09E-07	NA	ND
ND - not detected/not determined																		HI	1.85E+00

BB - below background

DERMAL CONTACT WITH GROUND WATER
Subarea 2 Construction worker in trench - Cal EPA

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $DA_{event} = 2\,FA\,x\,K_p\,x\,C_w\,x\,CF\sqrt{\frac{6\,\tau_{event}\ x\ t_{event}}{\pi}}$

If ET > t*, then: $DA_{event} = FA\ x\ K_p\ x\ C_w\ x\ CF\ x\left[\frac{t_{event}}{1+B} + 2\,\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	CalEPA Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.80E-03	ND
Benzene	78	5.10E-02	0.69	8	1.50E-02	0.01	0.001	1	2.87E-01	1.23E-06	2375	1	250	1	70	25550	4.09E-07	1.00E-01	4.09E-08
Toluene	92	1.14E-01	0.83	8	3.10E-02	0.002	0.001	1	3.44E-01	4.93E-07	2375	1	250	1	70	25550	1.64E-07	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	0.003	0.001	1	4.34E-01	1.21E-06	2375	1	250	1	70	25550	4.03E-07	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	0.0006	0.001	1	4.34E-01	2.27E-07	2375	1	250	1	70	25550	7.53E-08	1.10E-02	8.28E-10
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	7.20E-02	ND
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	0.071	0.001	1	6.55E-01	4.85E-05	2375	1	250	1	70	25550	1.61E-05	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.003	0.001	1	7.65E-01	2.01E-06	2375	1	250	1	70	25550	6.66E-07	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.70E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.10E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	0.0008	0.001	1	2.41E-01	4.07E-08	2375	1	250	1	70	25550	1.35E-08	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	0.012	0.001	1	8.93E-01	1.03E-05	2375	1	250	1	70	25550	3.42E-06	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.90E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	ND	0.001	1	2.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	0.0075	0.001	1	2.80E-01	1.04E-06	2375	1	250	1	70	25550	3.45E-07	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	0.0008	0.001	1	2.01E-01	2.20E-08	2375	1	250	1	70	25550	7.30E-09	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0009	0.001	1	3.66E-01	8.36E-08	2375	1	250	1	70	25550	2.77E-08	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.0003	0.001	1	1.42E+00	5.38E-07	2375	1	250	1	70	25550	1.79E-07	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.068	0.001	1	5.47E-01	2.54E-05	2375	1	250	1	70	25550	8.44E-06	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.40E-01	ND
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	0.001	0.001	1	3.66E-01	6.57E-08	2375	1	250	1	70	25550	2.18E-08	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	0.002	0.001	1	5.69E-01	2.11E-07	2375	1	250	1	70	25550	7.01E-08	5.90E-03	4.13E-10
Chrysene	228	2.73E+00	4.77	8	4.70E-01	0.00006	0.001	1	1.99E+00	3.14E-07	2375	1	250	1	70	25550	1.04E-07	1.20E-01	1.25E-08
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.90E-03	ND
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.00005	0.001	1	1.42E+00	9.76E-08	2375	1	250	1	70	25550	3.24E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	0.013	0.001	1	1.04E+00	1.45E-05	2375	1	250	1	70	25550	4.82E-06	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.29	0.001	1	2.87E-01	2.32E-06	2375	1	250	1	70	25550	7.70E-07	1.50E+00	1.16E-06
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	0.00084	0.001	1	1.18E-01	6.72E-09	2375	1	250	1	70	25550	2.23E-09	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	29.1	0.001	1	2.16E-01	2.33E-04	2375	1	250	1	70	25550	7.73E-05	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	6.39	0.001	1	2.13E-01	5.11E-05	2375	1	250	1	70	25550	1.70E-05	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.00E-03	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	0.0002	0.001	1	7.45E-01	1.40E-07	2375	1	250	1	70	25550	4.64E-08	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	0.002	0.001	1	6.22E-01	6.47E-08	2375	1	250	1	70	25550	2.15E-08	9.50E-04	2.04E-11
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	0.004	0.001	1	9.16E-01	3.12E-06	2375	1	250	1	70	25550	1.04E-06	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.00E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	0.002	0.001	1	1.06E+00	3.48E-08	2375	1	250	1	70	25550	1.16E-08	2.20E-03	2.54E-11
ND - not detected/not determined																		total risk	1.21E-06

BB - below background

DERMAL CONTACT WITH GROUND WATER
Subarea 2 Construction worker in trench - Cal EPA

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	0.01	0.001	1	2.87E-01	1.23E-06	2375	1	250	1	70	365	2.86E-05	4.00E-03	7.16E-03
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	0.002	0.001	1	3.44E-01	4.93E-07	2375	1	250	1	70	365	1.14E-05	8.00E-02	1.43E-04
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	0.003	0.001	1	4.34E-01	1.21E-06	2375	1	250	1	70	365	2.82E-05	2.00E-01	1.41E-04
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	0.0006	0.001	1	4.34E-01	2.27E-07	2375	1	250	1	70	365	5.27E-06	1.00E-01	5.27E-05
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	0.071	0.001	1	6.55E-01	4.85E-05	2375	1	250	1	70	365	1.13E-03	4.00E-03	2.82E-01
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.003	0.001	1	7.65E-01	2.01E-06	2375	1	250	1	70	365	4.66E-05	6.00E-02	7.77E-04
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	ND	0.001	1	4.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	0.0008	0.001	1	2.41E-01	4.07E-08	2375	1	250	1	70	365	9.46E-07	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	0.012	0.001	1	8.93E-01	1.03E-05	2375	1	250	1	70	365	2.40E-04	4.00E-02	5.99E-03
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	ND	0.001	1	2.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	9.00E-01	ND
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	0.0075	0.001	1	2.80E-01	1.04E-06	2375	1	250	1	70	365	2.42E-05	1.00E-01	2.42E-04
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	0.0008	0.001	1	2.01E-01	2.20E-08	2375	1	250	1	70	365	5.11E-07	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0009	0.001	1	3.66E-01	8.36E-08	2375	1	250	1	70	365	1.94E-06	2.00E-03	9.71E-04
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.0003	0.001	1	1.42E+00	5.38E-07	2375	1	250	1	70	365	1.25E-05	3.00E-02	4.17E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.068	0.001	1	5.47E-01	2.54E-05	2375	1	250	1	70	365	5.91E-04	2.00E-02	2.95E-02
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	0.001	0.001	1	3.66E-01	6.57E-08	2375	1	250	1	70	365	1.53E-06	2.00E-02	7.63E-05
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	0.002	0.001	1	5.69E-01	2.11E-07	2375	1	250	1	70	365	4.91E-06	5.00E-04	9.81E-03
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	0.00006	0.001	1	1.99E+00	3.14E-07	2375	1	250	1	70	365	7.31E-06	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.00005	0.001	1	1.42E+00	9.76E-08	2375	1	250	1	70	365	2.27E-06	4.00E-02	5.67E-05
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	0.013	0.001	1	1.04E+00	1.45E-05	2375	1	250	1	70	365	3.37E-04	3.00E-01	1.12E-03
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.29	0.001	1	2.87E-01	2.32E-06	2375	1	250	1	70	365	5.39E-05	3.00E-04	1.80E-01
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	0.00084	0.001	1	1.18E-01	6.72E-09	2375	1	250	1	70	365	1.56E-07	1.40E-05	1.12E-02
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	29.1	0.001	1	2.16E-01	2.33E-04	2375	1	250	1	70	365	5.41E-03	7.00E-01	7.73E-03
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	6.39	0.001	1	2.13E-01	5.11E-05	2375	1	250	1	70	365	1.19E-03	9.60E-04	1.24E+00
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	BB	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	BB	0.001	1	2.03E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	BB	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	0.0002	0.001	1	7.45E-01	1.40E-07	2375	1	250	1	70	365	3.24E-06	6.00E-02	5.41E-05
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	0.002	0.001	1	6.22E-01	6.47E-08	2375	1	250	1	70	365	1.50E-06	2.00E-01	7.52E-06
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	0.004	0.001	1	9.16E-01	3.12E-06	2375	1	250	1	70	365	7.26E-05	1.00E-03	7.26E-02
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	0.002	0.001	1	1.06E+00	3.48E-08	2375	1	250	1	70	365	8.09E-07	NA	ND
ND - not detected/not determined																		HI	1.85E+00

BB - below background

Subarea 3: Cancer Risk and Noncancer Health Hazard Calculations

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Cadmium	5.47E-09	1.87E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due
Area 3; Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Cadmium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Silver	7.05E-10	2.42E-10
Thallium	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxin TEQ	5.95E-06	7.13E-07	8.96E-10	6.67E-06	1.91E-01	2.28E-02	1.72E-06	2.14E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	2.17E-07	1.21E-07	3.18E-11	3.38E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	6.17E-06	8.34E-07	9.27E-10	7.00E-06	1.91E-01	2.28E-02	1.72E-06	2.14E-01

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soi
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Cadmium	5.47E-09	1.87E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Cadmium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Silver	7.05E-10	2.42E-10
Thallium	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	1.31E-10	1.31E-10	4.11E-04	6.56E-05	1.06E-05	4.87E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.56E-06	3.07E-07	3.86E-10	2.87E-06	8.22E-02	9.84E-03	7.40E-07	9.20E-02
Iron	NA	NA	NA	0.00E+00	2.92E-02	0.00E+00	NA	2.92E-02
Manganese	NA	NA	NA	0.00E+00	6.11E-02	0.00E+00	1.51E-02	7.62E-02
Molybdenum	NA	NA	NA	0.00E+00	2.60E-03	0.00E+00	NA	2.60E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.64E-06	6.56E-07	1.27E-09	2.30E-06
~Aroclor 1260	1.88E-07	1.05E-07	2.76E-11	2.93E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	4.11E-04	0.00E+00	NA	4.11E-04
Thallium	NA	NA	NA	0.00E+00	1.26E-01	0.00E+00	NA	1.26E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.75E-06	4.12E-07	5.44E-10	3.16E-06	3.02E-01	9.90E-03	1.51E-02	3.27E-01

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Cadmium	5.47E-09	1.87E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due
Area 3; Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Cadmium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Silver	7.05E-10	2.42E-10
Thallium	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxing TEQ	5.95E-06	7.13E-07	8.96E-10	6.67E-06	1.91E-01	2.28E-02	1.72E-06	2.14E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	2.17E-07	1.21E-07	3.18E-11	3.38E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	6.17E-06	8.34E-07	9.27E-10	7.00E-06	1.91E-01	2.28E-02	1.72E-06	2.14E-01

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.37E-06	4.70E-07

Adult Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.64E-07	5.62E-08
Barium	0.00E+00	0.00E+00
Cadmium	5.47E-09	1.87E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.64E-07	5.62E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	5.47E-07	1.87E-07
~Aroclor 1260	7.65E-07	2.62E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Residential Exposure Scenario - Calculation of Risk Due
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	2.42E-10
Arsenic	7.05E-10	2.42E-10
Barium	7.05E-10	2.42E-10
Cadmium	7.05E-10	2.42E-10
Chromium	7.05E-10	2.42E-10
Cobalt	7.05E-10	2.42E-10
Copper	7.05E-10	2.42E-10
Dioxin TEQ	7.05E-10	2.42E-10
Iron	7.05E-10	2.42E-10
Manganese	7.05E-10	2.42E-10
Molybdenum	7.05E-10	2.42E-10
Nickel	7.05E-10	2.42E-10
Phenol	7.05E-10	2.42E-10
~Aroclor 1260	7.05E-10	2.42E-10
Silver	7.05E-10	2.42E-10
Thallium	7.05E-10	2.42E-10
Vanadium	7.05E-10	2.42E-10
Zinc	7.05E-10	2.42E-10

Adult Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	3.05E-10	3.05E-10	4.11E-04	6.56E-05	1.06E-05	4.87E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.56E-06	3.07E-07	3.86E-10	2.87E-06	8.22E-02	9.84E-03	7.40E-07	9.20E-02
Iron	NA	NA	NA	0.00E+00	2.92E-02	0.00E+00	NA	2.92E-02
Manganese	NA	NA	NA	0.00E+00	6.11E-02	0.00E+00	8.38E-03	6.95E-02
Molybdenum	NA	NA	NA	0.00E+00	2.60E-03	0.00E+00	NA	2.60E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.64E-06	6.56E-07	1.27E-09	2.30E-06
~Aroclor 1260	1.88E-07	1.05E-07	2.76E-11	2.93E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	4.11E-04	0.00E+00	NA	4.11E-04
Thallium	NA	NA	NA	0.00E+00	1.26E-01	0.00E+00	NA	1.26E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.75E-06	4.12E-07	7.18E-10	3.16E-06	3.02E-01	9.90E-03	8.39E-03	3.20E-01

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.71E-08	3.18E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due
Area 3; Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Cadmium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Silver	7.05E-10	6.04E-11
Thallium	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxin TEQ	1.39E-05	1.21E-06	2.24E-10	1.51E-05	1.78E+00	1.55E-01	1.72E-06	1.94E+00
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	5.06E-07	2.06E-07	7.96E-12	7.12E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	1.44E-05	1.41E-06	2.32E-10	1.58E-05	1.78E+00	1.55E-01	1.72E-06	1.94E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	of Concern
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Residential Exposure Scenario - Calculation of Risk Due to Soi
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.71E-08	3.18E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Cadmium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Silver	7.05E-10	6.04E-11
Thallium	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	3.26E-11	3.26E-11	3.84E-03	4.45E-04	1.06E-05	4.29E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	5.98E-06	5.21E-07	9.65E-11	6.50E-06	7.67E-01	6.67E-02	7.40E-07	8.34E-01
Iron	NA	NA	NA	0.00E+00	2.72E-01	0.00E+00	NA	2.72E-01
Manganese	NA	NA	NA	0.00E+00	5.70E-01	0.00E+00	1.51E-02	5.85E-01
Molybdenum	NA	NA	NA	0.00E+00	2.43E-02	0.00E+00	NA	2.43E-02
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.53E-05	4.45E-06	1.27E-09	1.98E-05
~Aroclor 1260	4.38E-07	1.78E-07	6.89E-12	6.16E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	3.84E-03	0.00E+00	NA	3.84E-03
Thallium	NA	NA	NA	0.00E+00	1.18E+00	0.00E+00	NA	1.18E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	6.42E-06	6.99E-07	1.36E-10	7.12E-06	2.82E+00	6.72E-02	1.51E-02	2.90E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.71E-08	3.18E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due
Area 3; Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Cadmium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Silver	7.05E-10	6.04E-11
Thallium	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxing TEQ	1.39E-05	1.21E-06	2.24E-10	1.51E-05	1.78E+00	1.55E-01	1.72E-06	1.94E+00
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	5.06E-07	2.06E-07	7.96E-12	7.12E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	1.44E-05	1.41E-06	2.32E-10	1.58E-05	1.78E+00	1.55E-01	1.72E-06	1.94E+00

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Child Residential Exposure Scenario - Calculation of Risk Due to Soil
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	1.28E-05	1.10E-06

Child Residential Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.11E-06	9.53E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.71E-08	3.18E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.11E-06	9.53E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.71E-06	3.18E-07
~Aroclor 1260	5.19E-06	4.45E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Residential Exposure Scenario - Calculation of Risk Due
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	7.05E-10	6.04E-11
Arsenic	7.05E-10	6.04E-11
Barium	7.05E-10	6.04E-11
Cadmium	7.05E-10	6.04E-11
Chromium	7.05E-10	6.04E-11
Cobalt	7.05E-10	6.04E-11
Copper	7.05E-10	6.04E-11
Dioxin TEQ	7.05E-10	6.04E-11
Iron	7.05E-10	6.04E-11
Manganese	7.05E-10	6.04E-11
Molybdenum	7.05E-10	6.04E-11
Nickel	7.05E-10	6.04E-11
Phenol	7.05E-10	6.04E-11
~Aroclor 1260	7.05E-10	6.04E-11
Silver	7.05E-10	6.04E-11
Thallium	7.05E-10	6.04E-11
Vanadium	7.05E-10	6.04E-11
Zinc	7.05E-10	6.04E-11

Child Residential Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	7.61E-11	7.61E-11	3.84E-03	4.45E-04	1.06E-05	4.29E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	5.98E-06	5.21E-07	9.65E-11	6.50E-06	7.67E-01	6.67E-02	7.40E-07	8.34E-01
Iron	NA	NA	NA	0.00E+00	2.72E-01	0.00E+00	NA	2.72E-01
Manganese	NA	NA	NA	0.00E+00	5.70E-01	0.00E+00	8.38E-03	5.78E-01
Molybdenum	NA	NA	NA	0.00E+00	2.43E-02	0.00E+00	NA	2.43E-02
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.53E-05	4.45E-06	1.27E-09	1.98E-05
~Aroclor 1260	4.38E-07	1.78E-07	6.89E-12	6.16E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	3.84E-03	0.00E+00	NA	3.84E-03
Thallium	NA	NA	NA	0.00E+00	1.18E+00	0.00E+00	NA	1.18E+00
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	6.42E-06	6.99E-07	1.79E-10	7.12E-06	2.82E+00	6.72E-02	8.39E-03	2.89E+00

Subarea 3 Inhalation of ambient air for the Resident adult and child - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	350	30	1.00	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	350	30	1.00	10950	25550	1.3E-07	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	350	30	1.00	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	350	30	1.00	10950	25550	2.7E-10	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	7.8E-06	3.0E-02	350	30	1.00	10950	25550	NA	NA
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	0.0E+00	1.0E+01	350	30	1.00	10950	25550	NA	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	2.3E-05	9.8E-02	350	30	1.00	10950	25550	1.1E-07	1.05E-10
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	0.0E+00	9.0E-02	350	30	1.00	10950	25550	NA	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	350	30	1.00	10950	25550	NA	NA
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	350	30	1.00	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	350	30	1.00	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	350	30	1.00	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	350	30	1.00	10950	25550	4.4E-07	1.91E-11
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	0.0E+00	350	30	1.00	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	350	30	1.00	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	350	30	1.00	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	NA	0.0E+00	5.0E+00	350	30	1.00	10950	25550	NA	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	350	30	1.00	10950	25550	NA	NA
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	350	30	1.00	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	350	30	1.00	10950	25550	NA	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	350	30	1.00	10950	25550	NA	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	350	30	1.00	10950	25550	NA	NA

Total	6.72E-07	1.24E-10

(1) based on properties for trans-1,2-DCE.

Subarea 3 Inhalation of ambient air for the Resident adult and child - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 24 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	350	30	1.00	10950	25550	ND	ND
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	350	30	1.00	10950	25550	ND	ND
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	350	30	1.00	10950	25550	1.3E-07	ND
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	350	30	1.00	10950	25550	ND	ND
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	350	30	1.00	10950	25550	ND	ND
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	1.4E-02	350	30	1.00	10950	25550	ND	ND
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	2.1E-01	350	30	1.00	10950	25550	3.8E-10	ND
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	350	30	1.00	10950	25550	2.7E-10	ND
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	2.9E-05	3.0E-02	350	30	1.00	10950	25550	ND	ND
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	8.3E-07	1.0E+01	350	30	1.00	10950	25550	ND	ND
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	5.3E-06	3.0E-01	350	30	1.00	10950	25550	3.6E-08	2.43E-11
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	1.8E-06	9.0E-02	350	30	1.00	10950	25550	ND	ND
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	3.5E-02	350	30	1.00	10950	25550	1.1E-07	ND
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	350	30	1.00	10950	25550	ND	ND
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	ND	ND
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	350	30	1.00	10950	25550	ND	ND
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	350	30	1.00	10950	25550	ND	ND
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	350	30	1.00	10950	25550	ND	ND
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	350	30	1.00	10950	25550	4.4E-07	1.91E-11
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	ND	ND
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	ND	ND
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	1.1E-01	350	30	1.00	10950	25550	2.4E-10	ND
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	ND	ND
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	350	30	1.00	10950	25550	ND	ND
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	350	30	1.00	10950	25550	ND	ND
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	#VALUE!	0.0E+00	3.0E-01	350	30	1.00	10950	25550	ND	ND
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	350	30	1.00	10950	25550	ND	ND
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	350	30	1.00	10950	25550	ND	ND
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	350	30	1.00	10950	25550	ND	ND
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	350	30	1.00	10950	25550	ND	ND
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	350	30	1.00	10950	25550	ND	ND

Total	7.05E-07	4.33E-11

(1) based on properties for trans-1,2-DCE.

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Occupational Worker Exposure Scenario - Calculation of Risk Due to
Area 3; Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Cadmium	1.12E-08	3.98E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Cadmium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Silver	1.66E-10	5.94E-11
Thallium	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxin TEQ	4.43E-06	1.51E-06	2.20E-10	5.94E-06	1.36E-01	4.66E-02	4.05E-07	1.83E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	1.61E-07	2.58E-07	7.82E-12	4.19E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	4.59E-06	1.77E-06	2.28E-10	6.36E-06	1.36E-01	4.66E-02	4.05E-07	1.83E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Occupational Worker Exposure Scenario - Calculation of Risk Due t
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Ris
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Cadmium	1.12E-08	3.98E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Cadmium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Silver	1.66E-10	5.94E-11
Thallium	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	3.21E-11	3.21E-11	2.94E-04	1.34E-04	2.49E-06	4.30E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.91E-06	6.53E-07	9.47E-11	2.56E-06	5.87E-02	2.01E-02	1.75E-07	7.88E-02
Iron	NA	NA	NA	0.00E+00	2.08E-02	0.00E+00	NA	2.08E-02
Manganese	NA	NA	NA	0.00E+00	4.36E-02	0.00E+00	3.56E-03	4.72E-02
Molybdenum	NA	NA	NA	0.00E+00	1.86E-03	0.00E+00	NA	1.86E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.17E-06	1.34E-06	2.99E-10	2.51E-06
~Aroclor 1260	1.40E-07	2.23E-07	6.77E-12	3.63E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.94E-04	0.00E+00	NA	2.94E-04
Thallium	NA	NA	NA	0.00E+00	9.00E-02	0.00E+00	NA	9.00E-02
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.05E-06	8.76E-07	1.34E-10	2.92E-06	2.16E-01	2.02E-02	3.56E-03	2.39E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	ND	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel	ND	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Occupational Worker Exposure Scenario - Calculation of Risk Due to
Area 3; Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Cadmium	1.12E-08	3.98E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Cadmium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Silver	1.66E-10	5.94E-11
Thallium	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxing TEQ	4.43E-06	1.51E-06	2.20E-10	5.94E-06	1.36E-01	4.66E-02	4.05E-07	1.83E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	1.61E-07	2.58E-07	7.82E-12	4.19E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	4.59E-06	1.77E-06	2.28E-10	6.36E-06	1.36E-01	4.66E-02	4.05E-07	1.83E-01

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Occupational Worker Exposure Scenario - Calculation of Risk Due to
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.49E-07

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	3.35E-07	1.20E-07
Barium	0.00E+00	0.00E+00
Cadmium	1.12E-08	3.98E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	3.35E-07	1.20E-07
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	1.12E-06	3.98E-07
~Aroclor 1260	1.56E-06	5.58E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Occupational Worker Exposure Scenario - Calculation of Risk
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	1.66E-10	5.94E-11
Arsenic	1.66E-10	5.94E-11
Barium	1.66E-10	5.94E-11
Cadmium	1.66E-10	5.94E-11
Chromium	1.66E-10	5.94E-11
Cobalt	1.66E-10	5.94E-11
Copper	1.66E-10	5.94E-11
Dioxin TEQ	1.66E-10	5.94E-11
Iron	1.66E-10	5.94E-11
Manganese	1.66E-10	5.94E-11
Molybdenum	1.66E-10	5.94E-11
Nickel	1.66E-10	5.94E-11
Phenol	1.66E-10	5.94E-11
~Aroclor 1260	1.66E-10	5.94E-11
Silver	1.66E-10	5.94E-11
Thallium	1.66E-10	5.94E-11
Vanadium	1.66E-10	5.94E-11
Zinc	1.66E-10	5.94E-11

Occupational Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	7.48E-11	7.48E-11	2.94E-04	1.34E-04	2.49E-06	4.30E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.91E-06	6.53E-07	9.47E-11	2.56E-06	5.87E-02	2.01E-02	1.75E-07	7.88E-02
Iron	NA	NA	NA	0.00E+00	2.08E-02	0.00E+00	NA	2.08E-02
Manganese	NA	NA	NA	0.00E+00	4.36E-02	0.00E+00	1.98E-03	4.56E-02
Molybdenum	NA	NA	NA	0.00E+00	1.86E-03	0.00E+00	NA	1.86E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.17E-06	1.34E-06	2.99E-10	2.51E-06
~Aroclor 1260	1.40E-07	2.23E-07	6.77E-12	3.63E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.94E-04	0.00E+00	NA	2.94E-04
Thallium	NA	NA	NA	0.00E+00	9.00E-02	0.00E+00	NA	9.00E-02
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.05E-06	8.76E-07	1.76E-10	2.92E-06	2.16E-01	2.02E-02	1.98E-03	2.38E-01

Subarea 3 Inhalation of ambient air for Occupational Worker - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	250	25	0.33	9125	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	250	25	0.33	9125	25550	3.0E-08	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	25	0.33	9125	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	250	25	0.33	9125	25550	6.3E-11	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	7.8E-06	3.0E-02	250	25	0.33	9125	25550	NA	NA
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	0.0E+00	1.0E+01	250	25	0.33	9125	25550	NA	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	2.3E-05	9.8E-02	250	25	0.33	9125	25550	2.6E-08	2.09E-11
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	0.0E+00	9.0E-02	250	25	0.33	9125	25550	NA	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	250	25	0.33	9125	25550	NA	NA
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	250	25	0.33	9125	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	25	0.33	9125	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	25	0.33	9125	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	250	25	0.33	9125	25550	1.0E-07	3.78E-12
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	0.0E+00	250	25	0.33	9125	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	250	25	0.33	9125	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	250	25	0.33	9125	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	NA	0.0E+00	5.0E+00	250	25	0.33	9125	25550	NA	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	250	25	0.33	9125	25550	NA	NA
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	25	0.33	9125	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	250	25	0.33	9125	25550	NA	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	250	25	0.33	9125	25550	NA	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	250	25	0.33	9125	25550	NA	NA

Total	1.60E-07	2.47E-11

Subarea 3 Inhalation of ambient air for Occupational Worker - Cal EPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

$$C_{air} = C_{gw} \cdot VF_{wamb}$$

where:

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	250	25	0.33	9125	25550	ND	ND
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	250	25	0.33	9125	25550	ND	ND
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	250	25	0.33	9125	25550	3.0E-08	ND
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	250	25	0.33	9125	25550	ND	ND
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	25	0.33	9125	25550	ND	ND
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	1.4E-02	250	25	0.33	9125	25550	ND	ND
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	2.1E-01	250	25	0.33	9125	25550	9.0E-11	ND
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	250	25	0.33	9125	25550	6.3E-11	ND
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	2.9E-05	3.0E-02	250	25	0.33	9125	25550	ND	ND
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	8.3E-07	1.0E+01	250	25	0.33	9125	25550	ND	ND
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	5.3E-06	3.0E-01	250	25	0.33	9125	25550	8.5E-09	4.82E-12
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	1.8E-06	9.0E-02	250	25	0.33	9125	25550	ND	ND
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	3.5E-02	250	25	0.33	9125	25550	2.5E-08	ND
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	250	25	0.33	9125	25550	ND	ND
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	ND	ND
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	250	25	0.33	9125	25550	ND	ND
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	25	0.33	9125	25550	ND	ND
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	25	0.33	9125	25550	ND	ND
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	250	25	0.33	9125	25550	1.0E-07	3.78E-12
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	ND	ND
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	ND	ND
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	1.1E-01	250	25	0.33	9125	25550	5.7E-11	ND
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	ND	ND
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	250	25	0.33	9125	25550	ND	ND
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	250	25	0.33	9125	25550	ND	ND
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	NA	0.0E+00	3.0E-01	250	25	0.33	9125	25550	ND	ND
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	250	25	0.33	9125	25550	ND	ND
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	25	0.33	9125	25550	ND	ND
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	250	25	0.33	9125	25550	ND	ND
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	250	25	0.33	9125	25550	ND	ND
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	250	25	0.33	9125	25550	ND	ND

Total	1.68E-07	8.60E-12

Soil Gas Vapor Intrusion

Subarea 3 Residential Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
Benzene	1.2	2.5E-08	6.8E-05
Bromodichloromethane	1.3	2.3E-08	2.0E-05
Carbon disulfide	3	NA	7.6E-06
Chloroform	33	1.3E-07	2.0E-04
Ethylbenzene	0.67	1.2E-09	1.1E-06
Methylethylketone (2-butanone)	7.8	NA	2.6E-06
Tetrachloroethylene	2.9	1.2E-08	1.3E-04
Toluene	3.2	NA	1.8E-05
Trichloroethylene	1	2.9E-09	8.2E-04
Trichlorofluoromethane	1.6	NA	3.9E-06
Total		2.0E-07	1.3E-03

Subarea 3 Residential USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
Benzene	1.2	6.8E-09	6.8E-05
Bromodichloromethane	1.3	2.3E-08	NA
Carbon disulfide	3	NA	7.6E-06
Chloroform	33	5.8E-07	6.0E-04
Ethylbenzene	0.67	1.2E-09	1.1E-06
Methylethylketone (2-butanone)	7.8	NA	2.6E-06
Tetrachloroethylene	2.9	1.2E-08	1.7E-05
Toluene	3.2	NA	1.1E-06
Trichloroethylene	1	1.4E-09	1.6E-04
Trichlorofluoromethane	1.6	NA	3.9E-06
Total		6.2E-07	8.6E-04

Subarea 3 Industrial Cal EPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
Benzene	1.2	1.5E-08	4.9E-05
Bromodichloromethane	1.3	1.3E-08	1.5E-05
Carbon disulfide	3	NA	5.4E-06
Chloroform	33	7.9E-08	1.4E-04
Ethylbenzene	0.67	6.9E-10	7.7E-07
Methylethylketone (2-butanone)	7.8	NA	1.8E-06
Tetrachloroethylene	2.9	7.0E-09	9.5E-05
Toluene	3.2	NA	1.3E-05
Trichloroethylene	1	1.7E-09	5.9E-04
Trichlorofluoromethane	1.6	NA	2.8E-06
Total		1.2E-07	9.1E-04

Subarea 3 Industrial USEPA

Chemical Name	Concentration (µg/m3)	Incremental Risk	Hazard Quotient
Benzene	1.2	4.1E-09	4.9E-05
Bromodichloromethane	1.3	1.3E-08	NA
Carbon disulfide	3	NA	5.4E-06
Chloroform	33	3.4E-07	4.3E-04
Ethylbenzene	0.67	6.9E-10	7.7E-07
Methylethylketone (2-butanone)	7.8	NA	1.8E-06
Tetrachloroethylene	2.9	7.0E-09	1.2E-05
Toluene	3.2	NA	7.7E-07
Trichloroethylene	1	8.4E-10	1.2E-04
Trichlorofluoromethane	1.6	NA	2.8E-06
Total		3.7E-07	6.2E-04

Groundwater Vapor Intrusion

Subarea 3 Residential Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
Acenaphthene	0.06	NA	3.3E-07
Acetone	5.4	NA	1.9E-07
Chloroform	0.71	2.4E-08	3.5E-05
cis-1,2-Dichloroethylene	0.3	NA	1.0E-04
Naphthalene	0.6	1.8E-08	4.1E-04
Pyrene	0.09	NA	1.8E-07
1,2-Dichloroethylene, total	0.3	NA	1.3E-04
Total		4.2E-08	6.7E-04

Subarea 3 Residential USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
Acenaphthene	0.06	NA	NA
Acetone	5.4	NA	1.9E-07
Chloroform	0.71	1.0E-07	1.1E-04
cis-1,2-Dichloroethylene	0.3	NA	NA
Naphthalene	0.6	1.8E-08	4.1E-04
Pyrene	0.09	NA	NA
trans-1,2-Dichloroethylene	0.3	NA	1.3E-04
Total		1.2E-07	6.4E-04

Subarea 3 Occupational Cal EPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
Acenaphthene	0.06	NA	2.4E-07
Acetone	5.4	NA	1.3E-07
Chloroform	0.71	1.4E-08	2.5E-05
cis-1,2-Dichloroethylene	0.3	NA	7.4E-05
Naphthalene	0.6	1.1E-08	2.9E-04
Pyrene	0.09	NA	1.3E-07
trans-1,2-Dichloroethylene	0.3	NA	8.9E-05
Total		2.5E-08	4.8E-04

Subarea 3 Occupational USEPA

Chemical Name	Concentration (µg/L)	Incremental Risk	Hazard Quotient
Acenaphthene	0.06	NA	NA
Acetone	5.4	NA	1.3E-07
Chloroform	0.71	6.1E-08	7.6E-05
cis-1,2-Dichloroethylene	0.3	NA	NA
Naphthalene	0.6	1.1E-08	2.9E-04
Pyrene	0.09	NA	NA
trans-1,2-Dichloroethylene	0.3	NA	8.9E-05
Total		7.2E-08	4.6E-04

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA		
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA		
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA		
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	ND	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel	ND	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Adult Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk D
Area 3; Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.90E-09	1.34E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Cadmium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Silver	5.04E-11	1.73E-11
Thallium	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxin TEQ	4.25E-06	5.09E-07	6.40E-11	4.76E-06	1.36E-01	1.63E-02	1.23E-07	1.53E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	1.55E-07	8.66E-08	2.27E-12	2.42E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	4.41E-06	5.96E-07	6.62E-11	5.00E-06	1.36E-01	1.63E-02	1.23E-07	1.53E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Adult Recreational Exposure Scenario - Calculation of Risk Due to S
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.90E-09	1.34E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Cadmium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Silver	5.04E-11	1.73E-11
Thallium	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	9.32E-12	9.32E-12	2.94E-04	4.68E-05	7.55E-07	3.41E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.83E-06	2.19E-07	2.76E-11	2.05E-06	5.87E-02	7.03E-03	5.29E-08	6.57E-02
Iron	NA	NA	NA	0.00E+00	2.08E-02	0.00E+00	NA	2.08E-02
Manganese	NA	NA	NA	0.00E+00	4.36E-02	0.00E+00	1.08E-03	4.47E-02
Molybdenum	NA	NA	NA	0.00E+00	1.86E-03	0.00E+00	NA	1.86E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.17E-06	4.68E-07	9.07E-11	1.64E-06
~Aroclor 1260	1.34E-07	7.50E-08	1.97E-12	2.09E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.94E-04	0.00E+00	NA	2.94E-04
Thallium	NA	NA	NA	0.00E+00	9.00E-02	0.00E+00	NA	9.00E-02
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.97E-06	2.94E-07	3.89E-11	2.26E-06	2.16E-01	7.07E-03	1.08E-03	2.24E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		For all Chemicals of Concern	1.36E+09
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA		
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	ND	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel	ND	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Adult Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk D
Area 3; Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.90E-09	1.34E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Cadmium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Silver	5.04E-11	1.73E-11
Thallium	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxing TEQ	4.25E-06	5.09E-07	6.40E-11	4.76E-06	1.36E-01	1.63E-02	1.23E-07	1.53E-01
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	1.55E-07	8.66E-08	2.27E-12	2.42E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	4.41E-06	5.96E-07	6.62E-11	5.00E-06	1.36E-01	1.63E-02	1.23E-07	1.53E-01

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Adult Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.78E-07	3.35E-07

Adult Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.17E-07	4.02E-08
Barium	0.00E+00	0.00E+00
Cadmium	3.90E-09	1.34E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.17E-07	4.02E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	3.90E-07	1.34E-07
~Aroclor 1260	5.47E-07	1.87E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Adult Recreational Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	1.73E-11
Arsenic	5.04E-11	1.73E-11
Barium	5.04E-11	1.73E-11
Cadmium	5.04E-11	1.73E-11
Chromium	5.04E-11	1.73E-11
Cobalt	5.04E-11	1.73E-11
Copper	5.04E-11	1.73E-11
Dioxin TEQ	5.04E-11	1.73E-11
Iron	5.04E-11	1.73E-11
Manganese	5.04E-11	1.73E-11
Molybdenum	5.04E-11	1.73E-11
Nickel	5.04E-11	1.73E-11
Phenol	5.04E-11	1.73E-11
~Aroclor 1260	5.04E-11	1.73E-11
Silver	5.04E-11	1.73E-11
Thallium	5.04E-11	1.73E-11
Vanadium	5.04E-11	1.73E-11
Zinc	5.04E-11	1.73E-11

Adult Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	2.18E-11	2.18E-11	2.94E-04	4.68E-05	7.55E-07	3.41E-04
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	1.83E-06	2.19E-07	2.76E-11	2.05E-06	5.87E-02	7.03E-03	5.29E-08	6.57E-02
Iron	NA	NA	NA	0.00E+00	2.08E-02	0.00E+00	NA	2.08E-02
Manganese	NA	NA	NA	0.00E+00	4.36E-02	0.00E+00	5.99E-04	4.42E-02
Molybdenum	NA	NA	NA	0.00E+00	1.86E-03	0.00E+00	NA	1.86E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.17E-06	4.68E-07	9.07E-11	1.64E-06
~Aroclor 1260	1.34E-07	7.50E-08	1.97E-12	2.09E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.94E-04	0.00E+00	NA	2.94E-04
Thallium	NA	NA	NA	0.00E+00	9.00E-02	0.00E+00	NA	9.00E-02
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	1.97E-06	2.94E-07	5.13E-11	2.26E-06	2.16E-01	7.07E-03	6.00E-04	2.23E-01

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; Surface Soil
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk D
Area 3; Surface Soil
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Cadmium	2.65E-08	2.27E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Cadmium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Silver	5.04E-11	4.32E-12
Thallium	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxin TEQ	9.92E-06	8.63E-07	1.60E-11	1.08E-05	1.27E+00	1.11E-01	1.23E-07	1.38E+00
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	3.62E-07	1.47E-07	5.68E-13	5.08E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	1.03E-05	1.01E-06	1.66E-11	1.13E-05	1.27E+00	1.11E-01	1.23E-07	1.38E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Recreational Exposure Scenario - Calculation of Risk Due to S
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Cadmium	2.65E-08	2.27E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Cadmium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Silver	5.04E-11	4.32E-12
Thallium	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	2.33E-12	2.33E-12	2.74E-03	3.18E-04	7.55E-07	3.06E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.27E-06	3.72E-07	6.89E-12	4.65E-06	5.48E-01	4.77E-02	5.29E-08	5.96E-01
Iron	NA	NA	NA	0.00E+00	1.94E-01	0.00E+00	NA	1.94E-01
Manganese	NA	NA	NA	0.00E+00	4.07E-01	0.00E+00	1.08E-03	4.08E-01
Molybdenum	NA	NA	NA	0.00E+00	1.74E-02	0.00E+00	NA	1.74E-02
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.10E-05	3.18E-06	9.07E-11	1.41E-05
~Aroclor 1260	3.13E-07	1.27E-07	4.92E-13	4.40E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.74E-03	0.00E+00	NA	2.74E-03
Thallium	NA	NA	NA	0.00E+00	8.40E-01	0.00E+00	NA	8.40E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.59E-06	4.99E-07	9.71E-12	5.09E-06	2.01E+00	4.80E-02	1.08E-03	2.06E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**		
Aluminum	ND	1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.36E+09
Arsenic	ND	3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA	
Barium	ND	2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	ND	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA	
Chromium	ND	3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA	
Cobalt	ND	3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper	ND	4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.0000975	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	ND	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	ND	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel	ND	2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	ND	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.231	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	ND	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	ND	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium	ND	5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc	ND	3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Child Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; Surface Soil
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk D
Area 3; Surface Soil
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Cadmium	2.65E-08	2.27E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Du
Area 3; Surface Soil
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Cadmium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Silver	5.04E-11	4.32E-12
Thallium	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; Surface Soil
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Arsenic	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Barium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cadmium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Chromium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Cobalt	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Copper	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Dioxing TEQ	9.92E-06	8.63E-07	1.60E-11	1.08E-05	1.27E+00	1.11E-01	1.23E-07	1.38E+00
Iron	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Manganese	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Molybdenum	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Nickel	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Phenol	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
~Aroclor 1260	3.62E-07	1.47E-07	5.68E-13	5.08E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Thallium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Vanadium	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	NA	NA	NA	0.00E+00
Total	1.03E-05	1.01E-06	1.66E-11	1.13E-05	1.27E+00	1.11E-01	1.23E-07	1.38E+00

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.36E+09
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Child Recreational Exposure Scenario - Calculation of Risk Due to Sc
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	9.13E-06	7.83E-07

Child Recreational Exposure Scenario - Calculation of Risk D
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	7.95E-07	6.81E-08
Barium	0.00E+00	0.00E+00
Cadmium	2.65E-08	2.27E-09
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	7.95E-07	6.81E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	2.65E-06	2.27E-07
~Aroclor 1260	3.71E-06	3.18E-07
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Child Recreational Exposure Scenario - Calculation of Risk Du
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	5.04E-11	4.32E-12
Arsenic	5.04E-11	4.32E-12
Barium	5.04E-11	4.32E-12
Cadmium	5.04E-11	4.32E-12
Chromium	5.04E-11	4.32E-12
Cobalt	5.04E-11	4.32E-12
Copper	5.04E-11	4.32E-12
Dioxin TEQ	5.04E-11	4.32E-12
Iron	5.04E-11	4.32E-12
Manganese	5.04E-11	4.32E-12
Molybdenum	5.04E-11	4.32E-12
Nickel	5.04E-11	4.32E-12
Phenol	5.04E-11	4.32E-12
~Aroclor 1260	5.04E-11	4.32E-12
Silver	5.04E-11	4.32E-12
Thallium	5.04E-11	4.32E-12
Vanadium	5.04E-11	4.32E-12
Zinc	5.04E-11	4.32E-12

Child Recreational Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	5.44E-12	5.44E-12	2.74E-03	3.18E-04	7.55E-07	3.06E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	4.27E-06	3.72E-07	6.89E-12	4.65E-06	5.48E-01	4.77E-02	5.29E-08	5.96E-01
Iron	NA	NA	NA	0.00E+00	1.94E-01	0.00E+00	NA	1.94E-01
Manganese	NA	NA	NA	0.00E+00	4.07E-01	0.00E+00	5.99E-04	4.08E-01
Molybdenum	NA	NA	NA	0.00E+00	1.74E-02	0.00E+00	NA	1.74E-02
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	1.10E-05	3.18E-06	9.07E-11	1.41E-05
~Aroclor 1260	3.13E-07	1.27E-07	4.92E-13	4.40E-07	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	2.74E-03	0.00E+00	NA	2.74E-03
Thallium	NA	NA	NA	0.00E+00	8.40E-01	0.00E+00	NA	8.40E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	4.59E-06	4.99E-07	1.28E-11	5.09E-06	2.01E+00	4.80E-02	6.00E-04	2.06E+00

Subarea 3 Inhalation of ambient air for the Recreational User - CalEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	1.4E-02	250	30	0.10	10950	25550	ND	ND
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.1E-05	4.0E-01	250	30	0.10	10950	25550	ND	ND
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	250	30	0.10	10950	25550	9.4E-09	ND
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	6.0E-03	250	30	0.10	10950	25550	ND	ND
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	30	0.10	10950	25550	ND	ND
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	1.4E-02	250	30	0.10	10950	25550	ND	ND
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	2.1E-01	250	30	0.10	10950	25550	2.8E-11	ND
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	250	30	0.10	10950	25550	2.0E-11	ND
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	2.9E-05	3.0E-02	250	30	0.10	10950	25550	ND	ND
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	8.3E-07	1.0E+01	250	30	0.10	10950	25550	ND	ND
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	5.3E-06	3.0E-01	250	30	0.10	10950	25550	2.7E-09	1.81E-12
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	1.8E-06	9.0E-02	250	30	0.10	10950	25550	ND	ND
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	3.5E-02	250	30	0.10	10950	25550	7.9E-09	ND
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	250	30	0.10	10950	25550	ND	ND
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	ND	ND
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.5E-03	250	30	0.10	10950	25550	ND	ND
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	30	0.10	10950	25550	ND	ND
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	30	0.10	10950	25550	ND	ND
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	250	30	0.10	10950	25550	3.2E-08	1.42E-12
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	ND	ND
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	ND	ND
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	1.1E-01	250	30	0.10	10950	25550	1.8E-11	ND
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	ND	ND
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.4E-01	250	30	0.10	10950	25550	ND	ND
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	5.9E-06	3.5E-02	250	30	0.10	10950	25550	ND	ND
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	NA	0.0E+00	3.0E-01	250	30	0.10	10950	25550	ND	ND
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	250	30	0.10	10950	25550	ND	ND
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	30	0.10	10950	25550	ND	ND
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	250	30	0.10	10950	25550	ND	ND
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	250	30	0.10	10950	25550	ND	ND
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	250	30	0.10	10950	25550	ND	ND

Total	5.25E-08	3.22E-12

Subarea 3 Inhalation of ambient air for the Recreational User - USEPA

The EPCs for chemicals in ambient outdoor air resulting from diffusion from groundwater were estimated by multiplying the chemical's maximum concentration in groundwater by a groundwater-to-outdoor air volatilization factor (VF_{wamb}) as follows:

where: $C_{air} = C_{gw} \cdot VF_{wamb}$

C_{gw} = concentration of the chemical dissolved in groundwater (mg/L)

VF_{wamb} = groundwater-to-outdoor air volatilization factor (mg/m^3 air per mg/L water)

and

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{gw}}{W \cdot D_T^{eff}} \right]} \bullet 10^3 \ \frac{L}{m^3}$$

where:

H = chemical-specific Henry's law constant (dimensionless)

U_{air} = wind speed above ground surface in ambient mixing zone (cm/s)

δ_{air} = ambient air mixing zone height (cm)

L_{gw} = depth to groundwater (cm)

W = width of source area parallel to wind direction (cm)

D_T^{eff} = effective diffusivity above the water table (cm^2/s)

parameter was obtained from the J&E vapor intrusion models for groundwater (version 3.0; last modified on February 4, 2009).

Maximum concentrations of COPCs in groundwater were used as the concentration in groundwater (Cgw).

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Hi	H	Uair	δair	Lgw	W	D_T^{eff}	Cgw	VFwamb	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	atm-m3/ mol-K	unitless	cm/s	cm	cm	cm	cm2/s	mg/L	mg/m3 air per mg/L water	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 2.5 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	9.11E-04	0.03734	225	200	274	1500	8.94E-04	ND	4.06E-06	NA	1.6E-05	2.0E-04	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethane	9.77E-04	0.04004	225	200	274	1500	1.10E-03	ND	5.36E-06	NA	2.6E-05	7.0E-03	250	30	0.10	10950	25550	NA	NA
1,2-Dichloroethene, total (1)	9.36E-03	0.38361	225	200	274	1500	5.65E-04	0.0003	2.64E-05	7.91E-09	0.0E+00	6.0E-02	250	30	0.10	10950	25550	9.4E-09	NA
1,3,5-Trimethylbenzene	5.87E-03	0.24058	225	200	274	1500	4.96E-04	ND	1.45E-05	NA	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
2-Butanone	5.58E-05	0.00229	225	200	274	1500	5.08E-03	ND	1.41E-06	NA	0.0E+00	5.0E+00	250	30	0.10	10950	25550	NA	NA
2-Methylnaphthalene	5.17E-04	0.02118	225	200	274	1500	8.84E-04	ND	2.28E-06	NA	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acenaphthene	1.55E-04	0.00634	225	200	274	1500	1.78E-03	0.00006	1.37E-06	8.24E-11	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Acetone	3.87E-05	0.00159	225	200	274	1500	8.24E-03	0.0054	1.59E-06	8.59E-09	0.0E+00	3.1E+01	250	30	0.10	10950	25550	2.0E-11	NA
Benzene	5.54E-03	0.22698	225	200	274	1500	7.10E-04	ND	1.96E-05	NA	7.8E-06	3.0E-02	250	30	0.10	10950	25550	NA	NA
Chloroethane	8.80E-03	0.36071	225	200	274	1500	2.05E-03	ND	9.00E-05	NA	0.0E+00	1.0E+01	250	30	0.10	10950	25550	NA	NA
Chloroform	3.66E-03	0.15009	225	200	274	1500	8.60E-04	0.00071	1.57E-05	1.11E-08	2.3E-05	9.8E-02	250	30	0.10	10950	25550	8.1E-09	7.84E-12
Chloromethane	8.80E-03	0.36071	225	200	274	1500	9.57E-04	ND	4.20E-05	NA	0.0E+00	9.0E-02	250	30	0.10	10950	25550	NA	NA
cis-1,2-Dichloroethene	4.07E-03	0.16686	225	200	274	1500	6.36E-04	0.0003	1.29E-05	3.87E-09	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Ethylbenzene	7.86E-03	0.32227	225	200	274	1500	5.89E-04	ND	2.31E-05	NA	2.5E-06	1.0E+00	250	30	0.10	10950	25550	NA	NA
Fluorene	6.34E-05	0.00260	225	200	274	1500	3.15E-03	ND	9.97E-07	NA	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
Hexachloroethane	3.88E-03	0.15909	225	200	274	1500	7.22E-05	ND	1.40E-06	NA	1.1E-05	3.0E-02	250	30	0.10	10950	25550	NA	NA
Isopropylbenzene	1.16E+00	47.44040	225	200	274	1500	4.82E-04	ND	2.78E-03	NA	0.0E+00	4.0E-01	250	30	0.10	10950	25550	NA	NA
MTBE	6.23E-04	0.02556	225	200	274	1500	1.30E-03	ND	4.04E-06	NA	2.6E-07	3.0E+00	250	30	0.10	10950	25550	NA	NA
Naphthalene	4.82E-04	0.01975	225	200	274	1500	9.46E-04	0.0006	2.27E-06	1.36E-09	3.4E-05	3.0E-03	250	30	0.10	10950	25550	3.2E-08	1.42E-12
n-Butylbenzene	1.31E-02	0.53813	225	200	274	1500	4.43E-04	ND	2.90E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
n-Propylbenzene	1.07E-02	0.43691	225	200	274	1500	4.70E-04	ND	2.50E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
Pyrene	1.10E-05	0.00045	225	200	274	1500	5.36E-03	0.00009	2.93E-07	2.64E-11	0.0E+00	0.0E+00	250	30	0.10	10950	25550	NA	NA
sec-Butylbenzene	1.39E-02	0.56802	225	200	274	1500	4.56E-04	ND	3.15E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
tert-Butylbenzene	1.19E-02	0.48689	225	200	274	1500	4.41E-04	ND	2.61E-05	NA	0.0E+00	1.0E+00	250	30	0.10	10950	25550	NA	NA
Tetrachloroethene	1.84E-02	0.75250	225	200	274	1500	5.48E-04	ND	5.02E-05	NA	2.6E-07	4.0E-02	250	30	0.10	10950	25550	NA	NA
Toluene	6.62E-03	0.27156	225	200	274	1500	6.88E-04	ND	2.27E-05	NA	0.0E+00	5.0E+00	250	30	0.10	10950	25550	NA	NA
Trichloroethene (TCE)	1.03E-02	0.42124	225	200	274	1500	6.15E-04	ND	3.15E-05	NA	4.1E-06	2.0E-03	250	30	0.10	10950	25550	NA	NA
Vinyl acetate	5.10E-04	0.02090	225	200	274	1500	1.21E-03	ND	3.08E-06	NA	0.0E+00	2.0E-01	250	30	0.10	10950	25550	NA	NA
Xylenes, total	5.18E-03	0.21225	225	200	274	1500	7.09E-04	ND	1.83E-05	NA	0.0E+00	1.0E-01	250	30	0.10	10950	25550	NA	NA
Carbon disulfide	3.02E-02	1.23820	225	200	274	1500	7.09E-04	ND	1.07E-04	NA	0.0E+00	7.0E-01	250	30	0.10	10950	25550	NA	NA
Chrysene	9.44E-05	0.00387	225	200	274	1500	7.09E-04	ND	3.34E-07	NA	1.1E-05	0.0E+00	250	30	0.10	10950	25550	NA	NA

Total	5.00E-08	9.26E-12

(1) based on properties for trans-1,2-DCE.

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

		Reference Dose			Slope Factor			VF		PEF
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg	(m^3/kg)
Chemical	**(mg/kg)**	**(mg/kg-day)**	**(mg/m3)**	**(mg/kg-day)**	**$(mg/kg\text{-}day)^{-1}$**	**$(ug/m3)^{-1}$**	**$(mg/kg\text{-}day)^{-1}$**	**Volatile Organic Compounds**		
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern 1.00E+06
Arsenic		3.0E-04	1.5E-05	3.00E-04	1.5E+00	4.3E-03	1.50E+00	Arsenic	NA	
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA	
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	1.8E-03	NA	Cadmium	NA	
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	8.4E-02	2.00E+01	Chromium	NA	
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA	
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA	
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA	
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA	
Manganese	1070	2.4E-02	5.0E-05	9.60E-04	NA	NA	NA	Manganese	NA	
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA	
Nickel		2.0E-02	9.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA	
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA	
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA	
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA	
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA	
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA	
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA	

Construction Worker Exposure Scenario - Calculation of Risk Due to
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risl
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Cadmium	4.46E-08	6.37E-10
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Aroclor 1260	6.25E-06	8.92E-08
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Cadmium	2.26E-07	3.23E-09
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Dioxin TEQ	2.26E-07	3.23E-09
Iron	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Molybdenum	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Aroclor 1260	2.26E-07	3.23E-09
Silver	2.26E-07	3.23E-09
Thallium	2.26E-07	3.23E-09
Vanadium	2.26E-07	3.23E-09
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
USEPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	1.74E-09	1.74E-09	9.69E-04	5.35E-04	3.39E-03	4.89E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.52E-07	1.04E-07	5.15E-09	3.61E-07	1.94E-01	8.03E-02	2.37E-04	2.74E-01
Iron	NA	NA	NA	0.00E+00	6.87E-02	0.00E+00	NA	6.87E-02
Manganese	NA	NA	NA	0.00E+00	1.44E-01	0.00E+00	4.84E+00	4.98E+00
Molybdenum	NA	NA	NA	0.00E+00	6.14E-03	0.00E+00	NA	6.14E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	3.87E-06	5.35E-06	4.07E-07	9.64E-06
~Aroclor 1260	1.85E-08	3.57E-08	3.68E-10	5.45E-08	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	9.69E-04	0.00E+00	NA	9.69E-04
Thallium	NA	NA	NA	0.00E+00	2.97E-01	0.00E+00	NA	2.97E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.70E-07	1.40E-07	7.27E-09	4.18E-07	7.12E-01	8.09E-02	4.84E+00	5.63E+00

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

		Reference Dose			Slope Factor			VF		PEF	
	EPC	Oral RfD	Reference Concentration	Dermal	Oral SF	Unit Risk Factor	Dermal		m^3/kg		(m^3/kg)
Chemical	(mg/kg)	(mg/kg-day)	(mg/m3)	(mg/kg-day)	$(mg/kg\text{-}day)^{-1}$	$(ug/m3)^{-1}$	$(mg/kg\text{-}day)^{-1}$	**Volatile Organic Compounds**			
Aluminum		1.0E+00	5.0E-03	1.00E+00	NA	NA	NA	Aluminum	NA	For all Chemicals of Concern	1.00E+06
Arsenic		3.0E-04	1.5E-05	3.00E-04	9.5E+00	3.3E-03	9.50E+00	Arsenic	NA		
Barium		2.0E-01	5.0E-04	1.40E-02	NA	NA	NA	Barium	NA		
Cadmium	0.3	1.0E-03	2.0E-05	2.50E-05	NA	4.2E-03	NA	Cadmium	NA		
Chromium		3.0E-03	1.0E-04	7.50E-05	5.0E-01	1.5E-01	2.00E+01	Chromium	NA		
Cobalt		3.0E-04	6.0E-06	3.00E-04	NA	9.0E-03	NA	Cobalt	NA		
Copper		4.0E-02	NA	4.00E-02	NA	NA	NA	Copper	NA		
Dioxin TEQ	0.000042	7.0E-10	4.0E-08	7.00E-10	1.3E+05	3.8E+01	1.30E+05	Dioxin TEQ	NA		
Iron	14900	7.0E-01	NA	7.00E-01	NA	NA	NA	Iron	NA		
Manganese	1070	2.4E-02	9.0E-05	9.60E-04	NA	NA	NA	Manganese	NA		
Molybdenum	9.5	5.0E-03	NA	5.00E-03	NA	NA	NA	Molybdenum	NA		
Nickel		2.0E-02	5.0E-05	8.00E-04	NA	2.6E-04	NA	Nickel	NA		
Phenol	0.36	3.0E-01	2.0E-01	3.00E-01	NA	NA	NA	Phenol	NA		
~Aroclor 1260	0.2	NA	NA	NA	2.0E+00	5.7E-04	2.00E+00	~Aroclor 1260	NA		
Silver	1.5	5.0E-03	NA	2.00E-04	NA	NA	NA	Silver	NA		
Thallium	0.92	1.0E-05	NA	1.00E-05	NA	NA	NA	Thallium	NA		
Vanadium		5.0E-03	NA	5.00E-03	NA	NA	NA	Vanadium	NA		
Zinc		3.0E-01	NA	3.00E-01	NA	NA	NA	Zinc	NA		

Construction Worker Exposure Scenario - Calculation of Risk Due to
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

A. INGESTION PATHWAY

	IForal	
	Noncarcinogens (kg/kg-day)	**Carcinogens (kg/kg-day)**
For all chemicals	3.23E-06	4.61E-08

Construction Worker Exposure Scenario - Calculation of Risl
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

B. DERMAL PATHWAY

Chemical	IFderm	
	Noncarcinogens (kg/kg-day)	Carcinogens (kg/kg-day)
Aluminum	0.00E+00	0.00E+00
Arsenic	1.34E-06	1.91E-08
Barium	0.00E+00	0.00E+00
Cadmium	4.46E-08	6.37E-10
Chromium	0.00E+00	0.00E+00
Cobalt	0.00E+00	0.00E+00
Copper	0.00E+00	0.00E+00
Dioxin TEQ	1.34E-06	1.91E-08
Iron	0.00E+00	0.00E+00
Manganese	0.00E+00	0.00E+00
Molybdenum	0.00E+00	0.00E+00
Nickel	0.00E+00	0.00E+00
Phenol	4.46E-06	6.37E-08
~Aroclor 1260	6.25E-06	8.92E-08
Silver	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00
Vanadium	0.00E+00	0.00E+00
Zinc	0.00E+00	0.00E+00

Construction Worker Exposure Scenario - Calculation of Risk
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

C. INHALATION PATHWAY

Chemical	IFinh	
	Noncarcinogens (kg/m3)	Carcinogens (kg/m3)
Aluminum	2.26E-07	3.23E-09
Arsenic	2.26E-07	3.23E-09
Barium	2.26E-07	3.23E-09
Cadmium	2.26E-07	3.23E-09
Chromium	2.26E-07	3.23E-09
Cobalt	2.26E-07	3.23E-09
Copper	2.26E-07	3.23E-09
Dioxin TEQ	2.26E-07	3.23E-09
Iron	2.26E-07	3.23E-09
Manganese	2.26E-07	3.23E-09
Molybdenum	2.26E-07	3.23E-09
Nickel	2.26E-07	3.23E-09
Phenol	2.26E-07	3.23E-09
~Aroclor 1260	2.26E-07	3.23E-09
Silver	2.26E-07	3.23E-09
Thallium	2.26E-07	3.23E-09
Vanadium	2.26E-07	3.23E-09
Zinc	2.26E-07	3.23E-09

Construction Worker Exposure Scenario - Calculation of Risk Due to Soil Contamination
Area 3; All Soil (0-8 ft bgs)
Cal/EPA Toxicity

SOIL PATHWAY (Ingestion, dermal contact and inhalation of volatiles and particulates)

	Risk				Hazard			
	ing	derm	inhal	Total	ing	derm	inhal	Total
Aluminum	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NA	NA	4.07E-09	4.07E-09	9.69E-04	5.35E-04	3.39E-03	4.89E-03
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Dioxin TEQ	2.52E-07	1.04E-07	5.15E-09	3.61E-07	1.94E-01	8.03E-02	2.37E-04	2.74E-01
Iron	NA	NA	NA	0.00E+00	6.87E-02	0.00E+00	NA	6.87E-02
Manganese	NA	NA	NA	0.00E+00	1.44E-01	0.00E+00	2.69E+00	2.83E+00
Molybdenum	NA	NA	NA	0.00E+00	6.14E-03	0.00E+00	NA	6.14E-03
Nickel	NA	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	NA	NA	NA	0.00E+00	3.87E-06	5.35E-06	4.07E-07	9.64E-06
~Aroclor 1260	1.85E-08	3.57E-08	3.68E-10	5.45E-08	NA	NA	NA	0.00E+00
Silver	NA	NA	NA	0.00E+00	9.69E-04	0.00E+00	NA	9.69E-04
Thallium	NA	NA	NA	0.00E+00	2.97E-01	0.00E+00	NA	2.97E-01
Vanadium	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Zinc	NA	NA	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
Total	2.70E-07	1.40E-07	9.59E-09	4.20E-07	7.12E-01	8.09E-02	2.69E+00	3.48E+00

Subarea 3 - Construction Worker Inhalation in Trench - USEPA

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	USEPA URF	USEPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	ND	1.6E-05	2.0E-04	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethane	ND	2.6E-05	7.0E-03	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	1.9E-05	0.0E+00	6.0E-02	250	1	0.33	365	25550	7.1E-05	NA
1,3,5-Trimethylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
2-Butanone	ND	0.0E+00	5.0E+00	250	1	0.33	365	25550	NA	NA
2-Methylnaphthalene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acenaphthene	2.2E-06	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Acetone	1.6E-04	0.0E+00	3.1E+01	250	1	0.33	365	25550	1.2E-06	NA
Benzene	ND	7.8E-06	3.0E-02	250	1	0.33	365	25550	NA	NA
Chloroethane	ND	0.0E+00	1.0E+01	250	1	0.33	365	25550	NA	NA
Chloroform	4.0E-05	2.3E-05	9.8E-02	250	1	0.33	365	25550	9.2E-05	3.0E-09
Chloromethane	ND	0.0E+00	9.0E-02	250	1	0.33	365	25550	NA	NA
cis-1,2-Dichloroethene	1.9E-05	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Ethylbenzene	ND	2.5E-06	1.0E+00	250	1	0.33	365	25550	NA	NA
Fluorene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Hexachloroethane	ND	1.1E-05	3.0E-02	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	ND	0.0E+00	4.0E-01	250	1	0.33	365	25550	NA	NA
MTBE	ND	2.6E-07	3.0E+00	250	1	0.33	365	25550	NA	NA
Naphthalene	2.9E-05	3.4E-05	3.0E-03	250	1	0.33	365	25550	2.2E-03	3.3E-09
n-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
n-Propylbenzene	ND	0.0E+00	1.0E+00	250	1	0.33	365	25550	NA	NA
Pyrene	6.8E-07	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
sec-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
tert-Butylbenzene	ND	0.0E+00	0.0E+00	250	1	0.33	365	25550	NA	NA
Tetrachloroethene	ND	2.6E-07	4.0E-02	250	1	0.33	365	25550	NA	NA
Toluene	ND	0.0E+00	5.0E+00	250	1	0.33	365	25550	NA	NA
Trichloroethene (TCE)	ND	4.1E-06	2.0E-03	250	1	0.33	365	25550	NA	NA
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	ND	0.0E+00	1.0E-01	250	1	0.33	365	25550	NA	NA

Total	2.4E-03	6.2E-09

Subarea 3 - Construction Worker Inhalation in Trench - CalEPA

Cancer Risk = Cair *URF*ET*EF*ED/(AT_{CANCER})

Hazard Quotient = Cair *EF*ET*ED/(RFC*$AT_{NONCANCER}$)

COPC	Cair	CAL EPA URF	CAL EPA RfC	EF	ED	ET	$AT_{noncancer}$	AT_{cancer}	Hazard	Risk
COPC	mg/m3	per ug/m3	mg/m3	day/yr	yr	(assumes 8 hr/day per 24 hours/day)	day/yr	day/yr	Inhalation HQ	Inhalation Risk
1,1,2-Trichloroethane	ND	1.6E-05	1.4E-02	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethane	ND	2.1E-05	4.0E-01	250	1	0.33	365	25550	NA	NA
1,2-Dichloroethene, total	1.9E-05	0.0E+00	6.0E-02	250	1	0.33	365	25550	7.1E-05	NA
1,3,5-Trimethylbenzene	ND	0.0E+00	6.0E-03	250	1	0.33	365	25550	NA	NA
2-Butanone	ND	0.0E+00	5.0E+00	250	1	0.33	365	25550	NA	NA
2-Methylnaphthalene	ND	0.0E+00	1.4E-02	250	1	0.33	365	25550	NA	NA
Acenaphthene	2.2E-06	0.0E+00	2.1E-01	250	1	0.33	365	25550	2.4E-06	NA
Acetone	1.6E-04	0.0E+00	3.1E+01	250	1	0.33	365	25550	1.2E-06	NA
Benzene	ND	2.9E-05	3.0E-02	250	1	0.33	365	25550	NA	NA
Chloroethane	ND	8.3E-07	1.0E+01	250	1	0.33	365	25550	NA	NA
Chloroform	4.0E-05	5.3E-06	3.0E-01	250	1	0.33	365	25550	3.0E-05	6.8E-10
Chloromethane	ND	1.8E-06	9.0E-02	250	1	0.33	365	25550	NA	NA
cis-1,2-Dichloroethene	1.9E-05	0.0E+00	3.5E-02	250	1	0.33	365	25550	1.2E-04	NA
Ethylbenzene	ND	2.5E-06	1.0E+00	250	1	0.33	365	25550	NA	NA
Fluorene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
Hexachloroethane	ND	1.1E-05	3.5E-03	250	1	0.33	365	25550	NA	NA
Isopropylbenzene	ND	0.0E+00	4.0E-01	250	1	0.33	365	25550	NA	NA
MTBE	ND	2.6E-07	3.0E+00	250	1	0.33	365	25550	NA	NA
Naphthalene	2.9E-05	3.4E-05	3.0E-03	250	1	0.33	365	25550	2.2E-03	3.3E-09
n-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
n-Propylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
Pyrene	6.8E-07	0.0E+00	1.1E-01	250	1	0.33	365	25550	1.5E-06	NA
sec-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
tert-Butylbenzene	ND	0.0E+00	1.4E-01	250	1	0.33	365	25550	NA	NA
Tetrachloroethene	ND	5.9E-06	3.5E-02	250	1	0.33	365	25550	NA	NA
Toluene	ND	0.0E+00	3.0E-01	250	1	0.33	365	25550	NA	NA
Trichloroethene (TCE)	ND	4.1E-06	2.0E-03	250	1	0.33	365	25550	NA	NA
Vinyl acetate	ND	0.0E+00	2.0E-01	250	1	0.33	365	25550	NA	NA
Xylenes, total	ND	0.0E+00	1.0E-01	250	1	0.33	365	25550	NA	NA

Total	2.5E-03	3.9E-09

DERMAL CONTACT WITH GROUND WATER
Subarea 3 - Construction worker - US EPA

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $DA_{event} = 2\,FA \times K_p \times C_w \times CF \sqrt{\frac{6\,\tau_{event} \times t_{event}}{\pi}}$

If ET > t*, then: $DA_{event} = FA \times K_p \times C_w \times CF \times \left[\frac{t_{event}}{1+B} + 2\,\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.80E-03	ND
Benzene	78	5.10E-02	0.69	8	1.50E-02	ND	0.001	1	2.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.50E-02	ND
Toluene	92	1.14E-01	0.83	8	3.10E-02	ND	0.001	1	3.44E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.10E-02	ND
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.70E-02	ND
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	ND	0.001	1	6.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.00006	0.001	1	7.65E-01	4.01E-08	2375	1	250	1	70	25550	1.33E-08	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.10E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	0.00071	0.001	1	4.87E-01	4.24E-08	2375	1	250	1	70	25550	1.41E-08	3.10E-02	4.36E-10
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	ND	0.001	1	2.41E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.00E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	0.0054	0.001	1	2.22E-01	2.33E-08	2375	1	250	1	70	25550	7.74E-09	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	ND	0.001	1	2.01E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0003	0.001	1	3.66E-01	2.79E-08	2375	1	250	1	70	25550	9.25E-09	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.00009	0.001	1	1.42E+00	1.61E-07	2375	1	250	1	70	25550	5.36E-08	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.0006	0.001	1	5.47E-01	2.24E-07	2375	1	250	1	70	25550	7.45E-08	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E-03	ND
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	0.0003	0.001	1	3.66E-01	1.97E-08	2375	1	250	1	70	25550	6.54E-09	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	ND	0.001	1	5.69E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.60E-02	ND
Chrysene	228	2.73E+00	4.77	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	7.30E-03	ND
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.90E-03	ND
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	25550	6.48E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.0249	0.001	1	2.87E-01	1.99E-07	2375	1	250	1	70	25550	6.61E-08	1.50E+00	9.92E-08
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	BB	0.001	1	1.18E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	BB	0.001	1	2.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	BB	0.001	1	2.13E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	ND	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	0.0166	0.001	1	2.03E-01	1.33E-07	2375	1	250	1	70	25550	4.41E-08	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	ND	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.40E-02	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.50E-04	ND
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.90E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.20E-03	ND
ND - not detected/not determined																		total risk	9.96E-08

BB - below background

DERMAL CONTACT WITH GROUND WATER
Subarea 3 - Construction worker - US EPA

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	ND	0.001	1	2.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	ND	0.001	1	3.44E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-02	ND
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	ND	0.001	1	6.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.00006	0.001	1	7.65E-01	4.01E-08	2375	1	250	1	70	365	9.32E-07	6.00E-02	1.55E-05
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	0.00071	0.001	1	4.87E-01	4.24E-08	2375	1	250	1	70	365	9.85E-07	1.00E-02	9.85E-05
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	ND	0.001	1	2.41E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	0.0054	0.001	1	2.22E-01	2.33E-08	2375	1	250	1	70	365	5.42E-07	9.00E-01	6.02E-07
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	ND	0.001	1	2.01E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0003	0.001	1	3.66E-01	2.79E-08	2375	1	250	1	70	365	6.47E-07	2.00E-03	3.24E-04
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.00009	0.001	1	1.42E+00	1.61E-07	2375	1	250	1	70	365	3.75E-06	3.00E-02	1.25E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.0006	0.001	1	5.47E-01	2.24E-07	2375	1	250	1	70	365	5.21E-06	2.00E-02	2.61E-04
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	0.0003	0.001	1	3.66E-01	1.97E-08	2375	1	250	1	70	365	4.58E-07	2.00E-02	2.29E-05
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	ND	0.001	1	5.69E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-04	ND
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	365	4.54E-06	4.00E-02	1.13E-04
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.0249	0.001	1	2.87E-01	1.99E-07	2375	1	250	1	70	365	4.63E-06	3.00E-04	1.54E-02
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	BB	0.001	1	1.18E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-05	ND
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	BB	0.001	1	2.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-01	ND
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	BB	0.001	1	2.13E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	9.60E-04	ND
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	ND	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	0.0166	0.001	1	2.03E-01	1.33E-07	2375	1	250	1	70	365	3.09E-06	5.00E-03	6.17E-04
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	ND	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-02	ND
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-03	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
ND - not detected/not determined																		HI	1.70E-02

BB - below background

DERMAL CONTACT WITH GROUND WATER
Subarea 3 - Construction worker - Cal EPA

The calculation of DA_{event} is as follows for organics:

If ET < t*, then: $DA_{event} = 2\,FA\,x\,K_p\,x\,C_w\,x\,CF\sqrt{\frac{6\,\tau_{event}\ x\ t_{event}}{\pi}}$

If ET > t*, then: $DA_{event} = FA\ x\ K_p\ x\ C_w\ x\ CF\ x\left[\frac{t_{event}}{1+B} + 2\,\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal CSF (mg/kg-day)-1	Carcinogenic RISK
Methyl tert-Butyl Ether	88	1.21E-02	0.78	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.80E-03	ND
Benzene	78	5.10E-02	0.69	8	1.50E-02	ND	0.001	1	2.87E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.00E-01	ND
Toluene	92	1.14E-01	0.83	8	3.10E-02	ND	0.001	1	3.44E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Xylenes	110	2.14E-01	1.04	8	5.30E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Ethylbenzene	110	1.98E-01	1.04	8	4.90E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.10E-02	ND
1,1,2-Trichloroethane	133	2.84E-02	1.40	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	7.20E-02	ND
2-Methylnaphthalene	142	4.20E-01	1.57	8	9.17E-02	ND	0.001	1	6.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Acenaphthene	154	4.10E-01	1.84	8	8.60E-02	0.00006	0.001	1	7.65E-01	4.01E-08	2375	1	250	1	70	25550	1.33E-08	NA	ND
1,2-Dichloroethane (EDC)	99	1.61E-02	0.90	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	4.70E-02	ND
Chloroform	119	2.85E-02	1.17	8	6.80E-03	0.00071	0.001	1	4.87E-01	4.24E-08	2375	1	250	1	70	25550	1.41E-08	3.10E-02	4.36E-10
1,3,5-Trimethylbenzene	120	2.62E-01	1.18	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloroethane	65	1.88E-02	0.58	8	6.10E-03	ND	0.001	1	2.41E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Fluorene	166	5.45E-01	2.14	8	1.10E-01	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Butanone (MEK)	72	3.14E-03	0.64	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Hexachloroethane	237	2.95E-01	5.35	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.90E-02	ND
Acetone	58	1.50E-03	0.53	8	5.12E-04	0.0054	0.001	1	2.22E-01	2.33E-08	2375	1	250	1	70	25550	7.74E-09	NA	ND
Carbon Disulfide	76	5.70E-02	0.67	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chloromethane	51	9.02E-03	0.48	8	3.30E-03	ND	0.001	1	2.01E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
cis-1,2-Dichloroethene	97	4.16E-02	0.88	8	1.10E-02	0.0003	0.001	1	3.66E-01	2.79E-08	2375	1	250	1	70	25550	9.25E-09	NA	ND
Pyrene	202	1.10E+00	3.41	8	2.01E-01	0.00009	0.001	1	1.42E+00	1.61E-07	2375	1	250	1	70	25550	5.36E-08	NA	ND
Isopropylbenzene	120	3.78E-01	1.18	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Naphthalene	128	2.05E-01	1.31	8	4.70E-02	0.0006	0.001	1	5.47E-01	2.24E-07	2375	1	250	1	70	25550	7.45E-08	NA	ND
n-Butylbenzene	134	1.00E+00	1.42	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tetrachloroethene	166	1.64E-01	2.14	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.40E-01	ND
Vinyl acetate	86	5.60E-03	0.76	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
n-Propylbenzene	120	3.96E-01	1.18	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
sec-Butylbenzene	134	1.34E+00	1.42	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
tert-Butylbenzene	134	6.63E-01	1.42	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
1,2-Dichloroethene, total	97	2.92E-02	0.88	8	7.70E-03	0.0003	0.001	1	3.66E-01	1.97E-08	2375	1	250	1	70	25550	6.54E-09	NA	ND
Trichloroethene (TCE)	131	5.28E-02	1.36	8	1.20E-02	ND	0.001	1	5.69E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	5.90E-03	ND
Chrysene	228	2.73E+00	4.77	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.20E-01	ND
2,4-Dimethylphenol	122	6.37E-03	1.22	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
2-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Isopropyltoluene	134	6.54E-01	1.42	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
4-Methylphenol	108	3.08E-02	1.01	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Anthracene	178	7.29E-01	2.50	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Butylbenzylphthalate	312	2.62E-01	14.08	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	1.90E-03	ND
Fluoranthene	202	1.20E+00	3.41	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	25550	6.48E-08	NA	ND
Phenanthrene	178	7.18E-01	2.50	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Phenol	94	1.60E-02	0.85	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Aluminum	30	2.11E-03	0.37	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Antimony	125	4.30E-03	1.26	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Arsenic	78	3.40E-03	0.69	8	1.00E-03	0.0249	0.001	1	2.87E-01	1.99E-07	2375	1	250	1	70	25550	6.61E-08	1.50E+00	9.92E-08
Barium	137	4.50E-03	1.47	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Beryllium	9	1.15E-03	0.28	8	1.00E-03	BB	0.001	1	1.18E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Cadmium	112	4.07E-03	1.07	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Chromium, Total	52	5.55E-03	0.49	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.00E+01	ND
Cobalt	59	1.18E-03	0.54	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Copper	64	3.07E-03	0.57	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Iron	56	2.87E-03	0.52	8	1.00E-03	BB	0.001	1	2.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Manganese	55	2.85E-03	0.51	8	1.00E-03	BB	0.001	1	2.13E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Mercury	201	5.45E-03	3.35	8	1.00E-03	ND	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Molybdenum	96	3.77E-03	0.87	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Nickel	59	5.89E-04	0.54	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Selenium	81	3.46E-03	0.72	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Silver	108	2.40E-03	1.01	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Thallium	204	5.50E-03	3.52	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Vanadium	51	2.75E-03	0.49	8	1.00E-03	0.0166	0.001	1	2.03E-01	1.33E-07	2375	1	250	1	70	25550	4.41E-08	NA	ND
Zinc	67	1.89E-03	0.60	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Tin	119	4.19E-03	1.16	8	1.00E-03	ND	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	38.99	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	3.00E-03	ND
Acenaphthylene	152	4.32E-01	1.79	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
Isophorone	138	1.60E-02	1.49	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.50E-04	ND
Dibenzofuran	168	4.86E-01	2.20	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	25550	#VALUE!	NA	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	9.00E-03	ND
Phenacetin	179	8.90E-03	2.53	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	25550	#VALUE!	2.20E-03	ND
ND - not detected/not determined																		total risk	9.96E-08
BB - below background																			

DERMAL CONTACT WITH GROUND WATER
Subarea 3 - Construction worker - Cal EPA

ANALYTE	MW g/mol	B (unitless)	t* (hr)	t event (hr)	Kp (cm/hr)	GW conc (mg/L)	Factor (L/cm3)	FA (unitless)	tau (hr)	DA event (mg/cm2-event)	SA (cm2)	EV (events/day)	EF (days/yr)	ED (yr)	BW (kg)	AT (days)	INTAKE (mg/kg-day)	Dermal RfD (mg/kg-day)-1	Noncarcinogenic HAZARD
Methyl tert-Butyl Ether	88	1.21E-02	7.84E-01	8	3.35E-03	ND	0.001	1	3.27E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Benzene	78	5.10E-02	6.89E-01	8	1.50E-02	ND	0.001	1	2.87E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
Toluene	92	1.14E-01	8.25E-01	8	3.10E-02	ND	0.001	1	3.44E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-02	ND
Xylenes	110	2.14E-01	1.04E+00	8	5.30E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Ethylbenzene	110	1.98E-01	1.04E+00	8	4.90E-02	ND	0.001	1	4.34E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
1,1,2-Trichloroethane	133	2.84E-02	1.40E+00	8	6.40E-03	ND	0.001	1	5.83E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
2-Methylnaphthalene	142	4.20E-01	1.57E+00	8	9.17E-02	ND	0.001	1	6.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-03	ND
Acenaphthene	154	4.10E-01	1.84E+00	8	8.60E-02	0.00006	0.001	1	7.65E-01	4.01E-08	2375	1	250	1	70	365	9.32E-07	6.00E-02	1.55E-05
1,2-Dichloroethane (EDC)	99	1.61E-02	9.03E-01	8	4.20E-03	ND	0.001	1	3.76E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Chloroform	119	2.85E-02	1.17E+00	8	6.80E-03	0.00071	0.001	1	4.87E-01	4.24E-08	2375	1	250	1	70	365	9.85E-07	1.00E-02	9.85E-05
1,3,5-Trimethylbenzene	120	2.62E-01	1.18E+00	8	6.21E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-02	ND
Chloroethane	64.5	1.88E-02	5.79E-01	8	6.10E-03	ND	0.001	1	2.41E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Fluorene	166	5.45E-01	2.14E+00	8	1.10E-01	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
2-Butanone (MEK)	72.1	3.14E-03	6.38E-01	8	9.60E-04	ND	0.001	1	2.66E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
Hexachloroethane	237	2.95E-01	5.35E+00	8	4.98E-02	ND	0.001	1	2.23E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-04	ND
Acetone	58.1	1.50E-03	5.33E-01	8	5.12E-04	0.0054	0.001	1	2.22E-01	2.33E-08	2375	1	250	1	70	365	5.42E-07	9.00E-01	6.02E-07
Carbon Disulfide	76.1	5.70E-02	6.72E-01	8	1.70E-02	ND	0.001	1	2.80E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Chloromethane	50.5	9.02E-03	4.83E-01	8	3.30E-03	ND	0.001	1	2.01E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
cis-1,2-Dichloroethene	96.9	4.16E-02	8.79E-01	8	1.10E-02	0.0003	0.001	1	3.66E-01	2.79E-08	2375	1	250	1	70	365	6.47E-07	2.00E-03	3.24E-04
Pyrene	202	1.10E+00	3.41E+00	8	2.01E-01	0.00009	0.001	1	1.42E+00	1.61E-07	2375	1	250	1	70	365	3.75E-06	3.00E-02	1.25E-04
Isopropylbenzene	120	3.78E-01	1.18E+00	8	8.97E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Naphthalene	128	2.05E-01	1.31E+00	8	4.70E-02	0.0006	0.001	1	5.47E-01	2.24E-07	2375	1	250	1	70	365	5.21E-06	2.00E-02	2.61E-04
n-Butylbenzene	134	1.00E+00	1.42E+00	8	2.25E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
Tetrachloroethene	166	1.64E-01	2.14E+00	8	3.30E-02	ND	0.001	1	8.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-03	ND
Vinyl acetate	86.1	5.60E-03	7.65E-01	8	1.57E-03	ND	0.001	1	3.19E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
n-Propylbenzene	120	3.96E-01	1.18E+00	8	9.39E-02	ND	0.001	1	4.93E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
sec-Butylbenzene	134	1.34E+00	1.42E+00	8	3.01E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
tert-Butylbenzene	134	6.63E-01	1.42E+00	8	1.49E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
1,2-Dichloroethene, total	96.9	2.92E-02	8.79E-01	8	7.70E-03	0.0003	0.001	1	3.66E-01	1.97E-08	2375	1	250	1	70	365	4.58E-07	2.00E-02	2.29E-05
Trichloroethene (TCE)	131	5.28E-02	1.36E+00	8	1.20E-02	ND	0.001	1	5.69E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-04	ND
Chrysene	228	2.73E+00	4.77E+00	8	4.70E-01	ND	0.001	1	1.99E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
2,4-Dimethylphenol	122	6.37E-03	1.22E+00	8	1.50E-03	ND	0.001	1	5.06E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
2-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-02	ND
4-Isopropyltoluene	134	6.54E-01	1.42E+00	8	1.47E-01	ND	0.001	1	5.91E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
4-Methylphenol	108	3.08E-02	1.01E+00	8	7.70E-03	ND	0.001	1	4.23E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-01	ND
Anthracene	178	7.29E-01	2.50E+00	8	1.42E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Butylbenzylphthalate	312	2.62E-01	1.41E+01	8	3.85E-02	ND	0.001	1	5.87E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Fluoranthene	202	1.20E+00	3.41E+00	8	2.20E-01	0.0001	0.001	1	1.42E+00	1.95E-07	2375	1	250	1	70	365	4.54E-06	4.00E-02	1.13E-04
Phenanthrene	178	7.18E-01	2.50E+00	8	1.40E-01	ND	0.001	1	1.04E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Phenol	94	1.60E-02	8.47E-01	8	4.30E-03	ND	0.001	1	3.53E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Aluminum	30	2.11E-03	3.71E-01	8	1.00E-03	BB	0.001	1	1.55E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E+00	ND
Antimony	124.78	4.30E-03	1.26E+00	8	1.00E-03	BB	0.001	1	5.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-05	ND
Arsenic	77.95	3.40E-03	6.89E-01	8	1.00E-03	0.0249	0.001	1	2.87E-01	1.99E-07	2375	1	250	1	70	365	4.63E-06	3.00E-04	1.54E-02
Barium	137	4.50E-03	1.47E+00	8	1.00E-03	BB	0.001	1	6.14E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-02	ND
Beryllium	9	1.15E-03	2.83E-01	8	1.00E-03	BB	0.001	1	1.18E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.40E-05	ND
Cadmium	112	4.07E-03	1.07E+00	8	1.00E-03	BB	0.001	1	4.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.50E-05	ND
Chromium, Total	52	5.55E-03	4.93E-01	8	2.00E-03	BB	0.001	1	2.05E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.50E-05	ND
Cobalt	59	1.18E-03	5.39E-01	8	4.00E-04	BB	0.001	1	2.25E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-04	ND
Copper	63.55	3.07E-03	5.72E-01	8	1.00E-03	BB	0.001	1	2.38E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	4.00E-02	ND
Iron	55.85	2.87E-03	5.18E-01	8	1.00E-03	BB	0.001	1	2.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	7.00E-01	ND
Manganese	54.94	2.85E-03	5.12E-01	8	1.00E-03	BB	0.001	1	2.13E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	9.60E-04	ND
Mercury	200.59	5.45E-03	3.35E+00	8	1.00E-03	ND	0.001	1	1.39E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.10E-05	ND
Molybdenum	95.94	3.77E-03	8.68E-01	8	1.00E-03	BB	0.001	1	3.62E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Nickel	58.69	5.89E-04	5.37E-01	8	2.00E-04	BB	0.001	1	2.24E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	8.00E-04	ND
Selenium	80.98	3.46E-03	7.16E-01	8	1.00E-03	BB	0.001	1	2.98E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	5.00E-03	ND
Silver	107.87	2.40E-03	1.01E+00	8	6.00E-04	BB	0.001	1	4.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-04	ND
Thallium	204.38	5.50E-03	3.52E+00	8	1.00E-03	BB	0.001	1	1.46E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-05	ND
Vanadium	50.94	2.75E-03	4.86E-01	8	1.00E-03	0.0166	0.001	1	2.03E-01	1.33E-07	2375	1	250	1	70	365	3.09E-06	5.00E-03	6.17E-04
Zinc	67.41	1.89E-03	6.01E-01	8	6.00E-04	BB	0.001	1	2.50E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	3.00E-01	ND
Tin	118.69	4.19E-03	1.16E+00	8	1.00E-03	ND	0.001	1	4.85E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-01	ND
bis(2-ethylhexyl)phthalate	391	1.90E-01	3.90E+01	8	2.50E-02	ND	0.001	1	1.62E+01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-02	ND
Acenaphthylene	152	4.32E-01	1.79E+00	8	9.11E-02	ND	0.001	1	7.45E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	6.00E-02	ND
Isophorone	138	1.60E-02	1.49E+00	8	3.54E-03	ND	0.001	1	6.22E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	2.00E-01	ND
Dibenzofuran	168	4.86E-01	2.20E+00	8	9.75E-02	ND	0.001	1	9.16E-01	#VALUE!	2375	1	250	1	70	365	#VALUE!	1.00E-03	ND
N-nitrosodiphenylamine	198	1.41E-01	3.24E+00	8	2.60E-02	ND	0.001	1	1.35E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
Phenacetin	179	8.90E-03	2.53E+00	8	1.73E-03	ND	0.001	1	1.06E+00	#VALUE!	2375	1	250	1	70	365	#VALUE!	NA	ND
ND - not detected/not determined																		HI	1.70E-02
BB - below background																			

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
15	assumptions and uncertainties	Section 2.5.1	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 7.0.

Section 7.0: UNCERTAINTIES ASSOCIATED WITH RISK ESTIMATES

Risk managers take uncertainty into consideration when making decisions based on cancer risks, especially when within the risk management range (10^{-6} to 10^{-4}) and HIs above 1. Understanding uncertainty associated with risk estimates is important before making risk management decisions. Therefore, qualitative evaluations are provided here to address the variability and uncertainty associated with the exposure and risk estimates presented in this HHRA. Although this risk assessment is consistent with EPA guidance, guidelines, and policies that are designed to reduce potential uncertainty and ensure consistency, the risk results are best estimates based on the most current information and risk assessment techniques. The results are not 100 percent certain because of variability and uncertainty associated with the inputs to the risk calculations. Therefore, it is important to understand the adequacy of the data and any uncertainty associated with exposure or toxicity before making risk management decisions.

Two primary sources of uncertainty associated with risk estimates are:

- Parameter uncertainty (i.e., uncertainty in model input parameter exposure variables)
- Model uncertainty (i.e., methods/models used to calculate EPCs and risk)

This section summarizes the various uncertainties and the likely impact of these uncertainties on the calculated risks.

7.1 Parameter Uncertainty

Parameter uncertainty is the most likely source of uncertainty impacting the calculated cancer risks and noncancer health hazards. Parameters involved in the risk assessment are categorized according to the step in which they occur (i.e., hazard identification, exposure assessment, dose-response [toxicity] assessment, and risk characterization). Because of the conservative parameters specified in this HHRA, risk results are more likely to be overestimated rather than underestimated.

7.1.1 Hazard Identification

One of the major uncertainties associated with the hazard identification process is the identification of COPCs, which ultimately relies on the adequacy of the data. The validity of any risk assessment is dependent on the adequacy of the site characterization. The data must be considered adequate to support the risk assessment and make risk management decisions. Sample collection was generally biased to areas known or suspected to have chemical impacts. However, insufficiencies in the historical data set (as listed below) may under- or overestimate risks/hazards.

- The soil data evaluated in the HHRA consisted of soil samples collected between 1992 and 2010. It was assumed that concentrations have remained the same since sample collection and would continue to remain the same for the duration of exposure. Considering the physical and chemical properties of certain types of COPCs (i.e., VOCs, SVOCs) wherein biodegradation would be an important factor causing chemical concentrations to decrease (especially since the source of contamination has been removed), and assuming concentrations have remained steady and will continue to remain unchanged is overestimating the actual EPC over the exposure duration. Therefore, the risk/hazard would be overestimated.
- Dioxin data for Subarea 2 are from both discrete and composite samples (i.e., samples that combine soil samples across different locations), which were compiled into one data set for development of the EPC. Use of composites, rather than grab samples, may dilute or misrepresent concentrations at specific points (i.e., “hot spots”); however, because these

data were used to estimate average concentrations across the subarea (i.e., 95% UCL for the EPC), the use of composites on the estimate of risk for the purposes of the HHRA should not have impacted the risk estimates any more than the use of grab samples. Figure 7-1 shows box plots of the grab samples, composite samples, and a combined subsoil set. Also shown is the 95% UCL derived for each data set. As expected, the composite UCL is lower than the grab UCL, but the composite samples were collected to confirm an excavation so it is not unreasonable for the composite sample from an excavation to be less than the grab sample outside the limits of the excavation. The HHRA used the subsoil combined UCL of 330 nanograms per kilogram (ng/kg), which is a better representation of the arithmetic average dioxin concentration remaining in Subarea 2. Therefore, use of composite samples has not impacted the risk/hazard estimates any more than the use of grab samples.

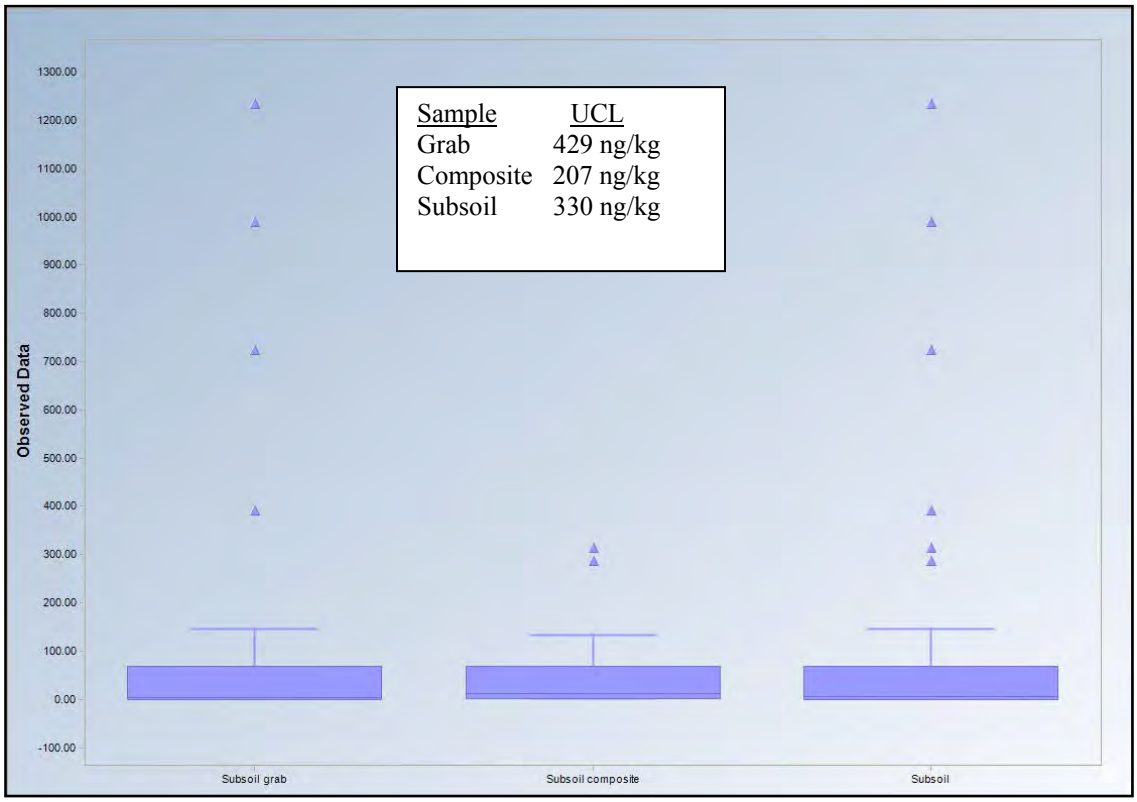

Figure 7-1. Comparison of Dioxin Concentrations by Sample Type

For purposes of this HHRA, surface samples for all COPCs, except dioxins, were represented by soil samples collected from 0 to 2 feet bgs, rather than 0 to 0.5 feet bgs. Although the 0 to 2 feet bgs depth interval is deeper than what DTSC prefers to consider surface soil for risk assessment purposes (0 to 0.5 feet bgs), a significant portion of IR Site 6 is paved with concrete. Concrete typically extends from 0 to 0.5 feet bgs, with 6 inches to 1 foot of aggregate base below the concrete, which precludes soil sampling within the 0 to 0.5 feet bgs depth interval in many portions of IR Site 6. As part of this uncertainty analysis to evaluate the potential differences in the EPCs and the associated risk estimates, EPCs were calculated for depth intervals constituting a 0 to 0.5 feet bgs and below 0.5 feet bgs once the concrete and aggregate base had been accounted for in the depth of the

sample. Only the dioxin TEQ data from Subareas 1 and 2 were sufficient to conduct this evaluation. For Subarea 1, there were 20 samples collected between 0 to 2 feet bgs, while only seven samples collected from the 0 to 0.0.5 feet bgs interval. For Subarea 2, there were 39 samples collected between 0 to 2 feet bgs, while only 17 samples collected from the 0 to 0.0.5 feet bgs interval. Summary statistics for the depth intervals from Subareas 1 and 2 are provided in Table 7-1. As shown on Table 7-1, the use of samples from the 0 to 2 feet bgs interval may underestimate exposure to a receptor by diluting the EPC if soil disturbance (i.e., future redevelopment that did not entail regrading of the area) is not expected to occur, or conversely it may overestimate exposure by assuming receptors would come into contact with contaminants beneath 6 inches. Therefore, the risk/hazard results could be over- or underestimated for this HHRA.

Table 7-1. Summary Statistics for Dioxin TEQ from Different Depth Intervals

Subarea	Depth Interval (ft. bgs)	Number of Samples	UCL (ng/kg)	Min (ng/kg)	Max (ng/kg)
1	0 – 2	20	192(2)	0.053	415
	0 – 0.5	7	545	0.181	284(1)
2	0 – 2	39	395(2)	0.137	1236
	0 – 0.5	17	501(1)	0.172	502

(1) Indicates this value was the EPC used in the risk assessment.
(2) Indicates the value that would have been used in the risk assessment had the surface soil samples for dioxin TEQ not been adjusted for the presence of concrete and aggregate base.

- The number of samples collected across Subarea 3 (less than 10 samples) was much less than the other two areas because the focus of sampling was on identified source areas in Subareas 1 and 2. The majority of these samples were collected at 5.5 feet bgs. Lack of samples from certain shallow depths within Subarea 3 most likely underestimates the risk/hazard; however, historical activities resulting in potential source area did not occur in Subarea 3.
- Groundwater data consisted of samples collected between 1995 through 2010. It was assumed that concentrations have remained the same since sample collection and would continue to remain the same for the duration of exposure. Considering the physical and chemical properties of certain types of COPCs (i.e., VOCs, SVOCs) wherein biodegradation would be an important factor causing chemical concentrations to decrease (especially since the source of contamination has been removed), assuming concentrations have remained steady and will continue to remain unchanged is overestimating the actual EPC over the exposure duration. Therefore, the risk/hazard would be overestimated.
- Similarly, reliance on analytical data from one-time hydropunch sampling or wells not sampled for several years assumes that concentrations in a particular area have not changed. This assumption could lead to an over- or underestimate of risk if concentrations have increased or decreased, respectively, over the years.
- Use of max soil gas data from 2004 and groundwater data from 1995 in Subarea 1 overestimates the risk and health hazard from vapor intrusion to indoor air. Figure 7-2

depicts the former UST area (i.e., UST 240A and 240B) where elevated petroleum hydrocarbon constituents have been detected in groundwater and soil gas. Notice that the former UST area occupies a very small portion of Subarea 1. The results of the risk assessment for Subarea 1, based on maximum historical concentrations, indicated that petroleum constituents (e.g., benzene, ethylbenzene, toluene, and xylenes) were primary contributors to excess cancer risks and noncancer health hazards for both groundwater and soil gas. In order to show that historical concentrations in groundwater and soil gas overestimate risk/hazard in this former UST area, concentrations of benzene in groundwater and soil gas from locations within and near this area have been plotted over time and are depicted on Figure 7-3. In accordance with how analytical data were compiled and EPC selected (as described in Section 3.1.2), the EPC for groundwater was the concentration detected in MW11 in 1995. The last sampling result from MW11 shows that benzene concentrations started to decrease. Decreasing concentrations of benzene is further supported by looking at the declining benzene concentrations in MW01, which is located upgradient of MW11 (see Figure 7-2). In fact, the benzene concentration in MW01 in October 2010, which is the last sampling event conducted, was 360 µg/ml. Similarly for benzene soil gas concentrations, as shown on Figure 7-3, the EPC for soil gas was based on the sample collected at location SV-04B (Figure 7-2) in 2004. Additional soil gas samples collected near the former UST area in 2010 (SG01, SG02 and SG05 shown on Figure 7-2) indicated concentrations of benzene had decreased to around 1 µg/m3 (Figure 7-3) in that area.

7.1.2 Exposure Assessment.

Exposure parameter uncertainty is a common source of uncertainty impacting the calculated cancer risks and noncancer health hazards. Several parameters associated with the exposure assessment have uncertainties associated with them that impart uncertainty to the calculated cancer risks and the noncancer health hazards. These include EPCs, potential receptors, and exposure assumptions evaluated. Each of these is discussed below.

- Outdoor air concentrations were estimated from calculated PEFs and VFs based on standard default data. Risks were more likely to be overestimated because of conservative assumptions in the cross-media mass transfer equations, which include no biodegradation or other loss mechanism.
- ED and EF for inhalation of VOCs (indoor and outdoor) are problematic because they require a receptor to spend 24 hours per day and 350 days per year indoor and outdoor. In this risk assessment, it was assumed that residents would spend 24 hours indoors and 24 hours outdoors while breathing contaminated air. Thus, each exposure assumption is designed to overestimate the potential risk to COPCs indoors and outdoors.
- Based on EPA risk assessment guidance (EPA, 1989), the UCL of the arithmetic mean is used as the EPC because it is a health-protective estimate of the average site-wide concentration that a receptor would be exposed to. The UCL is a statistic and thus by nature is uncertain; however, to minimize the uncertainty in the EPCs, UCLs were calculated using several statistical methods, and the most appropriate value was selected based on factors such as distribution of the raw data (e.g., normal, lognormal). The UCL is used to represent the reasonable maximum exposure (RME) encountered at the site; therefore, risks may be overestimated for some receptors that may experience less exposure than the RME.

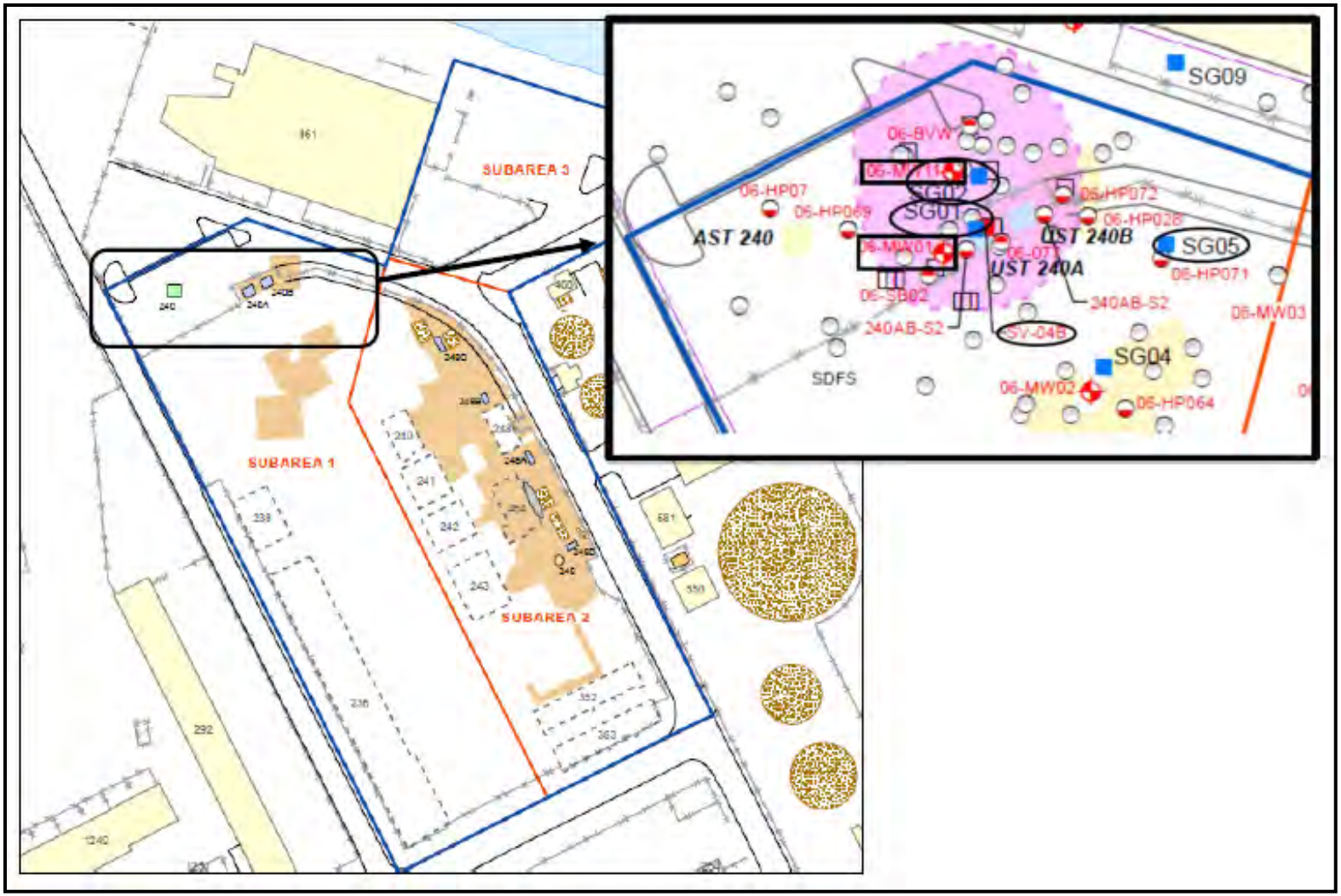

Figure 7-2. Area of Elevated Petroleum Hydrocarbons in Former USTs 240A and 240B Area

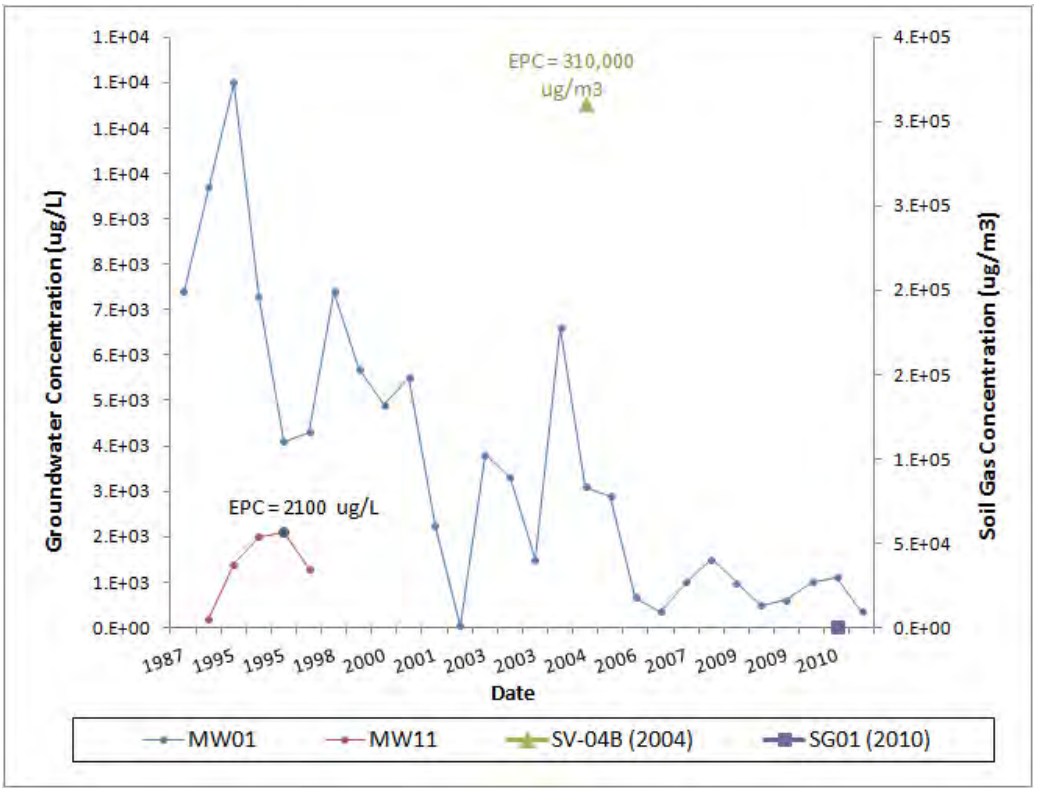

Figure 7-3. Benzene Concentrations in Groundwater and Soil Gas Collected from Former UST 240A and 240B Area

- Based on EPA risk assessment guidance (EPA, 1989), the UCL of the arithmetic mean is used as the EPC because it is a health-protective estimate of the average site-wide concentration that a receptor would be exposed to. The UCL is a statistic and thus by nature is uncertain; however, to minimize the uncertainty in the EPCs, UCLs were calculated using several statistical methods, and the most appropriate value was selected based on factors such as distribution of the raw data (e.g., normal, lognormal). The UCL is used to represent the reasonable maximum exposure (RME) encountered at the site; therefore, risks may be overestimated for some receptors that may experience less exposure than the RME.
- Use of maximum concentrations for data sets with an insufficient number of samples to calculate a UCL may result in an overestimate of risk; however, an insufficient number of samples may indicate insufficient characterization and that contaminated areas have been overlooked, in which case the risk/hazard is underestimated.
- There is uncertainty in the activities and habits of the recreational user evaluated in the risk assessment especially with regard to EF and ED. The EF and ED of 250 days per year for 30 years suggests that a person visits the same park about 21 days each month for 12 months for 30 years. Assuming people do not just visit one park, but may spend their time at different places, and assuming recreational habits change over time (e.g., go to the park, go to a gym, go swimming, etc.), it seems that the exposure parameters in this HHRA would most likely overestimate risk/hazard for the recreational receptor.

- Uncertainty exists in the activity patterns of the construction/excavation worker trenching scenario. Exposure during trenching assumes that a worker will be in a trench, with his or her feet covered with groundwater and breathing groundwater vapors for an 8-hour period for 250 days per year. The construction/excavation worker also assumes that direct exposure to soil for 8 hours per day, 250 days per year is occurring at the same time the worker is in the trench. In addition, this scenario does not account for workers dewatering excavations, nor does it account for the use of heavy machinery to trench at any time throughout the day or yearlong construction period. Thus, the exposure parameters used in this HHRA are more likely to overestimate risk/hazard for these receptors.

7.1.3 Toxicity Assessment

As discussed below, the primary aspects of the toxicity assessment that impart uncertainty to the calculated risks include uncertainty in the toxicity data for constituents detected at the site.

- The toxicity assessments included human epidemiological studies in addition to animal studies. Following careful review of the data, the most appropriate studies were used to develop toxicity values. Because toxicity values are typically the most conservative values available, risks are more likely to be overestimated than underestimated. Several Cal/EPA-recommended toxicity values, especially those for the indoor air risk drivers (benzene and vinyl chloride), are more conservative than EPA toxicity values, leading to higher risks.
- The cancer toxicity for dioxins is being evaluated through the EPA reassessment. The noncancer assessment, or a margin of exposure, was calculated using the ATSDR MRL. The potential exists that the dioxin risks may be either overestimated or underestimated, depending on the results of the reassessment.
- Toxicity values are lacking for some of the noncancer petroleum hydrocarbon constituents. Because toxicity values were not available for certain COPCs, health hazards are likely to be underestimated.
- Surrogate toxicity values were used in some cases for structurally similar COPCs lacking noncancer toxicity values (Table 7-2). These COPCs (except for Aroclor 1260) were detected in less than 50% of the samples and were not identified as primary contributors to health hazards. As such, health hazards are either under- or overestimated.

7.1.4 Risk Characterization

Finally, uncertainty in the calculated risks can arise from uncertainty in the way in which risks were calculated or aggregated, as discussed below.

- The assessment did evaluate the potential cancer risks based on background concentrations. The contributions from background concentrations are discussed in the risk assessment. If background constituents are included in the risk assessment, the calculated risks overestimate the risk attributed to chemical releases from the site.
- Future redevelopment of IR Site 6 may affect assumptions relating to exposure pathways and input parameters. Thus, if future redevelopment causes conditions that are significantly different than the conditions assumed under the exposure scenarios evaluated in this HHRA, then the estimates of risk/hazard could be over- or underestimated.

Table 7-2. Summary of Surrogate Toxicity Values for COPC

COPC	Subarea 1 FOD/Max	Subarea 2 FOD/Max	Subarea 3 FOD/Max	Surrogate for Toxicity
Soil (µg/kg)				
Acenaphthylene	24%/81	7%/1,200	ND	Acenaphthene
Benzo(g,h,i)perylene	47%/7.6	12%/1.5	ND	Pyrene
sec-Butylbenzene	33%/20,000	6%/53	ND	n-Butylbenzene
tert-Butylbenzene	30%/5,800	ND	ND	n-Butylbenzene
p-Isopropyltoluene	45%/5,700	ND	ND	Cumene
Phenanthrene	34%/680	43%/28,000	ND	Anthracene
Aroclor 1260	ND	66%/280	90%/390	Aroclor 1254
Groundwater (µg/L)				
Acenaphthylene	ND	1%/0.2	ND	Acenaphthene
sec-Butylbenzene	6%/2.1	ND	ND	n-Butylbenzene
tert-Butylbenzene	6%/1.7	ND	ND	n-Butylbenzene
p-Isopropyltoluene	25%/9.3	ND	ND	Cumene
Phenanthrene	ND	4%/13	ND	Anthracene

FOD – frequency of detection
Max – maximum concentration detected
ND – not detected in subarea

7.2 Model Uncertainty

For the assessment of risk, accepted exposure and risk models have been used in this HHRA; therefore, it is assumed that the formulations of the models used to predict exposure and risk are valid at this time. However, large uncertainties can often arise in risk estimates that are based on models that simulate the fate and transport of contaminants. The uncertainties associated with indoor and outdoor air modeling are based on the basic principles of chemical fate and transport, chemical partitioning between media, and the physical and chemical properties of the chemicals themselves:

- The air models assume a handful of environmental conditions that may or may not exist at IR Site 6. Environmental conditions at any site are much too variable to assume that all of the environmental conditions of any model would be applicable. For IR Site 6, the analytical data collected for soil, groundwater, and soil gas indicate that chemicals are not homogeneously distributed and an infinite source of contamination does not exist (i.e., the sources have been removed and soil excavation and groundwater pilot tests have been conducted). As such, VOC mass in the subsurface would decrease over time and ultimately be depleted. Given that certain site-specific conditions conflict with model assumptions, both the modeled indoor air and outdoor air concentrations assessed in this HHRA were most likely overestimated and therefore cause an overestimate of risk.
- For the indoor air modeling, future redevelopment of the area may affect assumptions relating to preferential pathways, air mixing in a building, and other building-related input parameters. Because future building designs and specifications are unknown at this time, the estimation of indoor air concentrations was conservatively biased, which adds to an overestimate of risk. Alternatively, if future redevelopment causes conditions that are similar to or more variable than model conditions, then the estimates of indoor air concentrations could be over- or underestimated, and risks over- or underestimated

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
16	Terrestrial habitat on TI	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 2.2.1.

2.2.1 Treasure Island

In the 1993 Phase I, the problem formulation was developed based on existing data, biotic surveys, and fate and transport analysis (PRC 1993). The terrestrial habitat on TI was characterized as manmade, poor quality, with large areas of pavement, gravel, or buildings restricting use of the sites by ecological receptors. The habitat on TI was characterized during a site tour on June 3, 1994, attended by the Navy and the regulatory agencies. Because higher-quality habitat existed nearby at YBI, the Navy and the regulatory agencies concluded (1) wildlife use of TI was infrequent, (2) the risk to terrestrial receptors was minimal, and (3) further assessment of the TI onshore sites was not necessary (EPA 1994). Based on that decision, risk to terrestrial receptors was not further evaluated for TI sites.

During a BCT meeting in September 2005, the regulatory agencies stated conclusions based on the Phase I report (PRC 1993) and 1994 site tour applied only to transient ecological species (Tetra Tech 2005). The regulatory agencies further stated that the documentation of ecological risk in the current site-specific RI reports is inadequate because it is based on previous investigations that were never documented in a final report. The regulatory agencies requested risk to resident species, including plants, invertebrates, birds, and mammals be documented in a SLERA. Based on these discussions, the Navy agreed to evaluate risk to terrestrial receptors from contaminated soil at IR Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.2.2 Yerba Buena Island

In Phase II, a SLERA was conducted for Sites 8, 11, 28, and 29 as part of the Draft Final Onshore Operable Unit RI Report (Tetra Tech 1997). The SLERA evaluated three representative species, the deer mouse (*Peromyscus maniculatus*), American kestrel (*Falco sparverius*), and American peregrine falcon (*Falco peregrinus anatum*). The deer mouse and American kestrel were selected to represent small mammals and raptors; the Peregrine falcon was selected because it is a state endangered species and two pairs were known to nest on the San Francisco-Oakland Bay Bridge. Potential risks posed by ingestion of chemicals in prey and soil were assessed using an exposure and effects model (food chain model [FCM]).

The results of the SLERA indicated potential risk to the peregrine falcon under conservative exposure and effects conditions at Sites 8, 11, 28, and 29. The regulatory agencies recommended a validation study using chemical concentrations in bird tissue collected at the site to further evaluate potential risk to the peregrine falcon. The SLERA also indicated possible risk to small mammals from the concentrations of chemicals at the site; however, based on the small total area of the sites compared to the total area of YBI and the historical and continuing disturbance of the sites, the Navy and regulatory agencies agreed that further evaluation of small mammals was not necessary (as stated in the comments [dated January 23, 1998] received by the DTSC on the Draft Final RI Report [PRC 1997]).

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
17	1996 special-status plant survey	Section 2.5.2	Final Special-Status Plan Survey and Habitat Assessment for Naval Station Treasure Island, Yerba Buena Island, California. Tetra Tech, Inc. and Michael Wood. November 1996. Summary.

SUMMARY

Yerba Buena Island is a natural geologic feature situated in San Francisco Bay between the cities of San Francisco and Oakland. Treasure Island is a man-made island composed of artificial fill immediately north of Yerba Buena Island. This report covers Yerba Buena Island only as man-made, highly urbanized Treasure Island is very unlikely to support sensitive plant species. Yerba Burena Island is located within San Francisco County limits. The island has been under continuous control of the United States military since 1867 and has been off-limits to the general public. Yerba Buena Island has been used as an artillery base, Army quartermast depot, torpedo station, naval training station and naval receiving ship. Currently, the island supports officer's family housing, a U.S. Coast Guard base and navigation center.

The U.S. Navy currently controls approximately three-quarters of the area of Yerba Buena Island; the remainder of the island is controlled by the U.S. Coast Guard. The Defense Base Realignment and Closure Act (BRAC) of 1990 established procedures for closure and realignment of military bases. In 1993, the BRAC Commission recommended closure of Naval Station Treasure Island (NSTI) (which includes Yerba Buena Island and Treasure Island), which was subsequently approved by Congress and the President. NSTI is scheduled to close in September 1997. The U.S. Coast Guard will continue to operate at Yerba Buena Island after the Naval Station closes.

No state- or federally-listed endangered, threatened or rare plant species were found during these surveys. However, numerous plant species which are uncommon in the city of San Francisco were found. Remnant plant populations of dune gilia, Dutchman's pipevine, large-flowered sand-spurrey, yellow bush lupine, stinging phacelia, fiesta flower, common montia, and oso berry are present.

Yerba Buena Island has a long history of human disturbance since early colonization. Use of the island for goat grazing, removal of the native oak trees for fuel and building, and the spread of invasive exotic plants have resulted in the loss of much of the natural vegetation. However, several excellent examples of some of the San Francisco Peninsula's original vegetation still remain. Of special interest are stands of Northern (Franciscan) Coastal Scrub and Coast Live Oak Woodland. These vegetation types are similar to remaining stands still found in the City of San Francisco and are probably more closely related to the prehistoric flora of San Francisco than any other land mass bordering the Bay, with the possible exception of Angel Island. Some portions of these native plant communities are remarkably intact and may represent a very valuable genetic resource. Several plant species found on Yerba Buena Island occur in only very

limited numbers in San Francisco, making them a potential source of plant material for restoration efforts on the mainland.

This work represents perhaps the first detailed assessment of the flora of Yerba Buena Island. No recent or historical survey of the plants of Yerba Buena Island has ever been published.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
18	2007 SLERA	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Sections 2.4 through 3.2.

2.4 IDENTIFICATION OF CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

All detected inorganic and organic chemicals in soil, except for essential nutrients such as calcium, iron, magnesium, potassium, and sodium, were selected for evaluation as preliminary COPECs for IR Sites 6, 12, 21, 24, 30, 31, 32, and 33. Analytical data collected between 1992 and 2005 for soil samples (0 to 4 feet below ground surface [bgs]), within the boundaries of each site were used for a preliminary identification of COPECs. The depth interval to be evaluated was selected based on discussions between the Navy and the regulatory agencies during the September 2005 BCT meeting (Tetra Tech 2005). The frequency of detection, minimum and maximum concentrations, and location of the maximum concentration in soil (0 to 4 feet bgs) are presented in Tables 4 through 11.

2.5 CONCEPTUAL SITE MODEL

The CSM is a framework for relating ecological receptors to contaminated media. The CSM identifies exposure pathways to be evaluated in the SLERA and provides other key information such as chemical sources, release and transport mechanisms, and the relative importance of exposure pathways to specific receptor groups. The CSM includes the following components:

- Stressors
- Fate and transport of chemicals
- Exposure pathways and routes
- Assessment and measurement endpoints

The following sections briefly describe the components of the CSMs for IR Sites 6, 12, 21, 24, 30, 31, 32 and 33, which are illustrated on Figures 12 and 13.

2.5.1 Stressors

Stressors can be defined as any factor that causes adverse ecological effects at a site. Chemical stressors in soil at each site were identified as COPECs for evaluation in this SLERA using data collected during previous investigations. All detected chemicals at each site were considered COPECs for the SLERA. COPECs considered included metals, pesticides, PCBs, semivolatile organic compounds (SVOC), and dioxins. Volatile organic compounds (VOC) were also evaluated for inhalation for burrowing mammals. The COPECs for each site are presented in each of the benchmark comparison tables and dose model tables in Appendices D, E, G, and I. Other stressors, such as pest, invasive, and introduced species, were not considered in the SLERA.

2.5.2 Fate and Transport of Chemicals

Although exposure is a simple concept, accurately describing the fate and transport of chemicals from their source to a site of toxic action in living organisms can be complicated. In general, a chemical must leave the environmental matrix, move across several biological membranes, and concentrate in a tissue to the extent that its toxic action is exerted for an adverse exposure to occur. A chemical that can move from the environmental matrix to the tissue of a receptor is said to be bioavailable. Toxic effects observed during laboratory testing of field samples can be caused by a number of factors, including exposure to bioavailable chemicals. Interactions with soil, sediment, and aqueous matrices are considered in interpreting adverse effects associated with exposure to chemicals. A general CSM for fate and transport is presented in Figure 12.

The fate and transport of chemicals associated with each IR site determine the extent to which chemical stressors in soil may affect various ecological receptors at the site. Chemicals concentrations in soil at various depths may affect surface dwelling and burrowing receptors such as plants, invertebrates, birds, and mammals. Chemicals in soil at Site 6 are only available to receptors in the limited area of ruderal vegetation near the fence line. Sites 12, 24, and 33 are covered in part by pavement and buildings, but do have some open areas of ruderal and landscaped vegetation. Sites 30 and 31 are mostly paved, with marginal areas of landscaping where chemicals in soil may be available to receptors. Chemicals in soil at Sites 21 and 32 are not available to receptors because the sites are completely paved.

VOCs and SVOCs may volatilize from soil and become concentrated in the air of burrows where burrowing mammals may be exposed via inhalation. However, Sites 21 and 32 are completely paved and no burrowing animals were observed at the remaining sites.

2.5.3 Exposure Pathways and Routes

A chemical must be able to travel from a source to a representative receptor and must be taken up through one or more routes for an exposure pathway to be considered complete. Potential exposure pathways that result in receptor contact include exposure to soils, surface water, groundwater, air, and food items.

Exposure routes are the point of entry of a chemical into a receptor. For plants, they include root uptake and leaf sorption. Exposure routes for animals include inhalation, dermal contact, and ingestion of contaminated soil and food (see Figure 13). Plants exposed to chemicals in soil may accumulate concentrations in the tissues that cause adverse effects on growth, reproduction, or survival. Independent of direct effects on the plant, chemicals in plant tissues may be transferred to herbivores, omnivores, and detritivores, which in turn may be consumed by omnivores and carnivores. This food-chain transfer, and potential bioaccumulation, may result in unacceptably high doses of chemicals to higher-trophic-level predators, even when concentrations in soil are safe for lower-trophic-level receptors, such as plants and invertebrates.

Potential exposure pathways are diagrammed in a CSM for Sites 6, 12, 21, 24, 30, 31, 32, and 33 and YBI on Figure 13. Soil is the predominant medium at these sites that enables a chemical to travel from the source to a terrestrial receptor. The surface water exposure pathway was not evaluated at these sites because no perennial surface water bodies are found on TI.

An exposure pathway evaluation was conducted for current land use considering reasonably foreseeable future land use (CCSF 1996) for Sites 6, 12, 21, 24, 30, 31, 32, and 33 (see Figure 13) and the observations made during the 2006 site visit. In light of the intensively developed nature of the sites, exposure to plants and invertebrates is limited to species that can adapt to artificial and disturbance regimes. Exposure of birds and mammals is primarily to opportunistic species adapted to urban, landscaped habitats (urban pests). Exposure pathways are expected to remain unchanged because the land use of TI is not expected to change in the future and urban redevelopment is planned for each of the sites once TI has been transferred (CCSF 1996).

2.5.4 Assessment and Measurement Endpoints

The following sections identify the selected assessment endpoints, the surrogate ecological receptors for the assessment endpoints, and the measurement endpoints for the SLERA for Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.5.4.1 Assessment Endpoints

The assessment endpoints represent those aspects of the ecosystem that need to be protected. EPA defines assessment endpoints as "explicit expressions of the actual environmental values (for example, ecological resources) that are to be protected" (EPA 1997). Assessment endpoints are environmental characteristics that, if significantly impaired, would indicate a need for action by risk managers. Various definitions of valuable ecological resources include those without which ecosystem function would be significantly impaired; those that provide critical resources; and those perceived by humans as valuable, such as endangered species and other issues addressed by legislation. Useful assessment endpoints define both the valuable ecological entities at the site and a characteristic of the entity to protect, such as reproductive success or production per unit area.

Because of the poor-quality habitat (described in Section 2.3), receptor use of TI is limited to opportunistic species that are adapted to urban environments. No important ecosystems or species of ecological relevance were identified at sites on TI. Ecologically relevant endpoints help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998).

Loss of one or more of the species present on TI would not result in any disruption or change to the current ecosystem. Additionally, higher trophic level receptors such as raptors are expected to preferentially select the habitat on YBI, which has a more suitable physical structure and food availability, while avoiding areas of lower-quality habitat on TI. However, the Navy agreed to the regulatory agencies' request to evaluate these sites on TI in a complete SLERA (Steps 1 and 2). Therefore, assessment endpoints were selected based solely on trophic levels present on TI and

include urban species adapted to industrial and landscaped habitat. Table 12 lists the assessment endpoints identified for IR Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.5.4.2 Ecological Receptors as Surrogates for the Assessment Endpoints

According to Navy guidance (Navy 1999), representative ecological receptors endpoints are selected based on the following characteristics:

- Represent ecosystem components that are ecologically relevant at the site. Examples of ecologically relevant attributes include:
  - Serve as critical food source for a population
  - Provide unique nesting habitat for a species
  - Serve as the primary seed dispersal mechanism
  - Maintain biodiversity
  - Maintain a critically important ecological function, such as wetlands enhancing water quality

  A reduction or loss of one of these attributes because of exposure to contaminants could result in a high degree of ecosystem disruption.

- Represent the major trophic levels present at the site; and

- Serve as a surrogate for species identified as "important" species at the site. "Important" means species valued by regulators or stakeholders for reasons other than ecological importance. For example, regulatory agencies may be concerned about a recreational fishery, which by itself may or may not represent an important ecosystem component level (Navy 2004a).

Again, receptor use of TI is limited to species adapted to urban environments because of the poor quality habitat, as described in Section 2.3. However, Step 2 of the SLERA requires that representative receptors be identified. Representative receptors were selected based solely on trophic levels present on TI and include urban species adapted to industrial and landscaped habitat. Table 12 lists the representative ecological receptors identified for IR Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.5.4.3 Measurement Endpoints

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 (such as mortality, reproduction, or growth)" (EPA 1997). Measurement endpoints more closely reflect technical considerations in the risk assessment process; that is, measurement endpoints are focused on both direct measures of ecological effects such as toxicity tests and indirect measures such as food-chain modeling that allow for an evaluation of risk to representative receptors. Measurement endpoints can include measures of exposure or effect and are frequently numerical expressions of observations. Each measurement endpoint correlates directly with one of the

defined assessment endpoints and was based on mechanisms of toxicity in the available literature. Table 12 lists the measurement endpoints associated with IR Sites 6, 12, 21, 24, 30, 31, 32, and 33.

2.6 OUTCOME OF EXPOSURE PATHWAY EVALUATION (STEP 1)

In a SLERA, it is necessary to identify (1) what specifically is to be protected; and (2) which ecological resources and processes must be sustained and for what reason. Definitions of valuable ecological resources include those without which ecosystem function would be significantly impaired; those that provide critical resources; and those perceived by humans as valuable, such as endangered species (EPA 1997, 1998; Navy 1999, 2004a). TI is not a natural ecosystem; rather it is a manmade island built from dredge material from the Bay. TI has never supported a natural ecosystem or provided habitat for valuable ecological receptors. Because of the artificial and disturbed nature of the sites, exposure to plants and invertebrates is limited to opportunistic species that can adapt to high disturbance regimes. Future exposure will also be limited to species adapted to urban, landscaped habitats because urban redevelopment is planned for each of the sites once TI has been transferred (CCSF 1996). Although the exposure pathway evaluation links site contaminants in soil to ecological receptors, it does not link ecologically valuable endpoints to contamination.

Habitat surveys conducted at Sites 6, 12, 21, 24, 30, 31, 32, and 33 did not identify any ecological resources or processes without which ecosystem function would be significantly impaired. Based on the overall poor quality of the habitat on TI, the Navy does not recommend further evaluation of ecological risk in a Tier II assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33. For these sites, this SLERA fulfills the CERCLA requirement for conducting an ERA to assess threats to the environment.

3.0 TIER 1 SLERA STEP 2: EXPOSURE ESTIMATION AND RISK CALCULATION

Typically, a SLERA would proceed to Step 2 only if quality habitat to support ecologically relevant ecosystems or receptors were identified in Step 1; however, the Navy has agreed to the regulatory agencies' request to conduct a complete SLERA (Steps 1 and 2) for these sites on TI. This section describes the screening-level exposure estimate and risk calculation for Sites 6, 12, 21, 24, 30, 31, 32, and 33.

3.1 METHODOLOGY FOR EVALUATING EFFECTS

The following sections describe the methodology for evaluating risk to plants, invertebrates, birds, and mammals from exposure to contaminants in soil at Sites 6, 12, 21, 24, 30, 31, 32, and 33.

3.1.1 Methodology for Evaluating Effects to Plants

The evaluation of risk to plants focused on maintenance of sufficient rates of survival, growth, and reproduction to maintain populations of plants and those receptors that depend on the plants. Plants are exposed to chemicals via direct contact with contaminated soil. Root uptake is the

dominant route for entry of metals into terrestrial plants (Hughes 1981). Bioavailability of metals for root uptake varies with the oxidation state and organic composition of the soil. One hundred percent bioavailability was assumed for the SLERA.

Exposure estimates for plants were assumed to be the maximum concentration of each COPEC detected in samples collected from 0 to 4 feet bgs at each site. In accordance with guidance, the SLERA accounts for the root depths by conservatively assuming that chemicals present in the top 4 feet of soil are bioavailable to the plants (DTSC 1998).

Exposure estimates for COPECs were compared with ecological soil screening levels (Eco-SSL) (EPA 2005a) or, if Eco-SSLs were not available, with Oak Ridge National Laboratory (ORNL) toxicity-based benchmarks (Efroymson and others 1997a) by the Screening Ecological Risk Assessment System (SERAS) software program developed by Signal Corporation (2004) to identify chemicals that pose a potentially unacceptable risk for plants. The SERAS program is a software tool designed to assist in a risk assessment. The program compares analytical data for soil, sediment, or water with ecological screening benchmarks and calculates hazard quotients (HQ). Numerous EPA, state, and regional sources of benchmark data for soil, sediment, and surface water are currently available in the program. After a screen is run with SERAS, the program produces tables in Microsoft Excel that include a summary of all chemical data within a data set; a list of chemicals that have benchmarks sorted by HQ; and a list of chemicals analyzed that do not have benchmarks. Plant benchmarks used in this SLERA (see Table 13) are summarized in the following two paragraphs.

Eco-SSLs are risk-based concentrations of chemicals in soil that are protective of ecological receptors likely to come into contact with soil, either directly or via ingestion of biota that live in or on soil (EPA 2005a). Eco-SSLs were derived based on a literature review of available toxicity data on plants, invertebrates in soil, birds, and mammals. Eco-SSLs are intended for screening chemical concentrations in soil. Eco-SSLs for plants apply to soils where the pH is between 4.0 and 8.5, with an organic matter content less than or equal to 10 percent (EPA 2005a). Eco-SSLs are available for only a few metals (EPA 2005a).

ORNL plant benchmarks represent concentrations of chemicals corresponding to the lowest observed effects concentration for the 10th percentile of plant species tested (Suter 1993; Will and Suter 1995a, 1995b; Efroymson and others 1997a). Growth and yield are ecologically significant responses, both in terms of protection of plants and the ability of vegetation to support consumers. The methodology used to develop ORNL benchmarks has proven extremely conservative in practice (Efroymson and others 1997a). ORNL plant toxicity benchmarks are lower than most ecological preliminary remediation goals (Efroymson and others 1997c); however, the ORNL phytotoxicity values are the best screening alternative at this time for chemicals that lack Eco-SSLs.

For each site, chemicals that posed potential risk to plants were identified based on comparison of the maximum detected concentrations in soil with Eco-SSLs or ORNL plant toxicity benchmarks. The 95 UCL was also compared with the plant toxicity benchmarks at the request

of DTSC, but the potential risk from toxic effects was based on the maximum concentration; although the hazard quotients calculated using the 95 UCL are presented in the tables, they will not be discussed in the text. COPEC HQs for each site, which represent the ratio of the maximum site concentration in soil to the plant screening value, are presented in Appendix D.

3.1.2 Methodology for Evaluating Effects to Soil Invertebrates

The evaluation of risk to terrestrial invertebrates focused on maintaining sufficient rates of survival and growth to protect populations of invertebrates in soil. The CSM presented in Section 2.5 identifies a potentially complete exposure pathway from contaminated soils to invertebrates in soil via direct contact. Similar to plants, risks to invertebrates are evaluated by comparing the maximum concentration of chemicals in soil with toxicological benchmarks (EPA 2005a; Efroymson and others 1997b). Exposure estimates that exceed the invertebrate benchmarks indicate potential risk. Further details of the exposure analysis, effects characterization, and risk characterization are provided below.

Exposure of invertebrates was considered to occur via direct contact with contaminated soil. Ingestion of soil by terrestrial invertebrates is included in the direct contact pathway. Exposure point concentrations for invertebrates were assumed to be the maximum concentration of each COPEC detected from 0 to 4 feet bgs at each site.

Maximum concentrations of chemicals at each site were compared with all available Eco-SSLs for invertebrates in soil (EPA 2005a). Toxicological benchmarks developed by ORNL (Efroymson and others 1997b) were used when necessary to augment the Eco-SSLs. The comparisons used the SERAS software program, as described above for plants. Invertebrate benchmarks used in this SLERA (see Table 13) are summarized below.

As described above for plants, Eco-SSLs for invertebrates apply to soils where the pH is between 4.0 and 8.5, with an organic matter content less than or equal to 10 percent (EPA 2005b). Eco-SSLs for invertebrates in soil are available for a few metals only.

The ORNL toxicity benchmarks for earthworms were derived by rank-ordering the lowest observed effect concentrations and then selecting a number that approximated the 10th percentile (Efroymson and others 1997b). These benchmarks were developed for use as screening values, and not as regulatory criteria.

Chemicals that posed potential risk to invertebrates were identified based on comparison of the maximum detected concentrations in soil with Eco-SSL or ORNL invertebrate toxicity benchmarks. The 95 UCL was also compared with the invertebrate toxicity benchmarks at the request of DTSC, but the potential risk from toxic effects was based on the maximum concentration; although the hazard quotients calculated using the 95 UCL are presented in the tables, they will not be discussed in the text. COPEC HQs for each site, which represent the ratio of the maximum concentration in site soil to the invertebrate screening value, are presented in Appendix E.

3.1.3 Methodology for Evaluating Effects to Birds and Mammals

The evaluation of risk to birds and mammals was based on the selected assessment and measurement endpoints identified in Section 2.5.4. FCMs were used to assess exposure of bird and mammals to chemicals ingested in food or incidentally during other activities, especially for chemicals that bioaccumulate (Pascoe and others 1996). In addition to FCMs, inhalation models were used to assess exposure of the deer mouse to VOCs and SVOCs that volatilize from soil (EPA 1993). These models focus on receptors of concern that are expected to live in underground burrows where vapors could accumulate.

The following sections describe the models used to estimate ingested and inhaled doses of site COPECs for birds and mammals using site-specific soil and estimated concentrations in prey.

3.1.3.1 Quantitative Evaluation of Risk Using a Food-Chain Model

Food-chain models for birds and mammals assume that exposure to COPECs is primarily through ingestion of contaminated soil and prey. Exposure models estimate the mass of a COPEC internalized daily by a receptor per kilogram of body weight per day (the daily COPEC dose). Estimates of exposure are generally based on knowledge of the spatial and temporal distribution of both COPECs and receptors and on specific natural and life history characteristics that influence exposure to COPECs. The maximum and 95 UCL concentrations for soil samples collected from 0 to 4 feet bgs at each site were used in food-chain models to estimate doses. The parameters used in estimating total daily doses to birds and mammals are provided in Appendix F.

The total exposure from ingestion for each receptor of concern was calculated as the sum of the dietary exposure. The following generic equation was adapted for each representative receptor:

$$Total\ dose = \{[(FIR \times C_f) + (SIR \times C_S)] \times AUF\}/BW$$

where:

Total Dose	=	Estimated dose from ingestion (milligrams per kilogram body weight-day [mg/kg-day])
FIR	=	Food Ingestion rate (kilograms per day)
C_f	=	COPEC concentration in prey in dry weight (mg/kg)
SIR	=	Soil ingestion rate (kilograms per day)
C_s	=	COPEC concentration in soil in dry weight (mg/kg)
AUF	=	Area use factor (unitless)
BW	=	Adult body weight (kilogram)

As required in a SLERA, conservative assumptions were used in this FCM analysis in the absence of site- or species-specific data. Exposure was assessed in the context of the following linear food chains to evaluate potential ecological effects on birds and mammals:

Soil → Invertebrates → American robin

Soil → Invertebrates → Ornate shrew

Bioaccumulation Factors and Models

Bioaccumulation models were used to estimate the concentrations of COPECs in prey tissue based on the concentrations of COPECs in soil because site-specific prey data were not available for use in the dose calculation. Soil-to-biota bioaccumulation models for earthworms, plant, and small mammals were used, both as simple bioaccumulation factors (BAF) that were multiplied by the concentration in soil, and in regression models, which incorporate the concentration in soil to estimate the concentration in prey.

The Vandenberg regression equations were preferred for plant and invertebrate BAFs because they are region-specific, based on site-specific data for tissue and soil collected at a nearby U.S. Air Force base (U.S Air Force 2003). The regression model was applied only if the model was significant (the slope differed significantly [$p < 0.05$] from 0) and the coefficient of determination (R^2) was greater than or equal to 0.2. If these criteria were not met, then another regression model or BAF was selected to estimate bioaccumulation. Updated Eco-SSL BAFs and regressions were used second only to Vandenberg equations for plants and invertebrates and as the primary source for small mammal BAFs (EPA 2005b). Additional regression models and simple BAFs (Bechtel-Jacobs 1998; ORNL 2006; Sample and Arenal 1999; Sample and others 1998, Baes and others 1984) were chosen if no Eco-SSL was available. The original 2003 Eco-SSL BAFs were retained instead of using a default BAF for chemicals without any alternative invertebrate BAFs (EPA 2003). A default of 1 was used for chemicals without any available BAFs. Appendix H presents the BAFs used in this SLERA.

The following bioaccumulation models were considered for use in this SLERA and are listed below in order of preference.

- Plants
  - Vandenberg Regression (U.S. Air Force 2003)
  - Revised Eco-SSL Model (EPA 2005b)
  - Bechtel Regression (Bechtel-Jacobs 1998)
  - Median BAF (Bechtel-Jacobs 1998)
  - BAFs from ORNL Risk Assessment Information System database using the following equation from (McKone 1994, as cited in ORNL 2006): BAF= 38*Kow-0.58 (ORNL 2006)
  - Default BAF (equals 1)
- Invertebrates
  - Vandenberg Regression (U.S. Air Force 2003)
  - Revised Eco-SSL Model (EPA 2005b)

- Median BAF (Sample and others 1999)
- Median BAF (Sample and others 1998)
- EPA Eco-SSL 2003 Biotransfer factor calculated using the following equation (provided in EPA 2003):

  $$BAF = 10\ (\log K_{ow} - 0.6) / [foc \times 10(0.983\ \log K_{ow} + 0.00028)]$$

  Chemical of potential ecological concern specific $\log K_{ow}$s from ORNL Risk Assessment Information System: http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf. Fraction organic carbon (foc) will be set to 1 percent (0.01) per EPA (2003). Organic chemicals only.
- Default BAF (equals 1)

- Small Mammals
  - Revised Eco-SSL Model (EPA 2005b)
  - Sample Regression (Sample and others 1998)
  - Median BAF (Sample and others 1998)
  - Baes Biotransfer Factor (inorganic chemicals only [Baes and others 1984])
  - Default BAF (equals 1)

3.1.3.2 Quantitative Evaluation of Risk Using an Inhalation Model

The air exposure pathway is typically considered incomplete for inhalation of contaminated dust or vapors for most receptors. It is also typically assumed that this potential pathway is insignificant when compared with exposure through ingestion of contaminated soil or prey. However, a quantitative evaluation of the risk to burrowing mammals (deer mouse) from exposure to volatile COPECs in the burrows was conducted because of the potential exposure to VOCs and SVOCs detected in soil. Burrowing receptors are more likely than other receptors to be exposed to VOCs and SVOCs in soil because they dig and inhabit burrows underground. The maximum COPEC concentrations in soil samples collected from 0 to 4 feet bgs at each site were used to estimate inhalation doses for the deer mouse. The 95 UCL was also used to estimate doses at the request of DTSC, but the potential risk from toxic effects was based on the maximum concentration.

Site-specific estimates of the COPEC concentration in air within burrows were calculated by using guidance from EPA (2002) for estimating air concentration from soil, and DTSC (2004) for estimating air concentration from groundwater. The following generic equation was used in these calculations:

$$C_{COPEC\ in\ air}\ (mg/m^3) = [C_{soil}\ (mg/kg) / VF\ (m^3/kg)]$$

where:

VF = Volatilization factor from: http://www.epa.gov/Region9/waste/sfund/prg/files/04physchem.pdf

Once a dose was calculated, it was then compared with low toxicity reference values (TRV) to estimate the potential adverse biological effects on the receptor. The risk to each representative species was characterized based on this comparison. Doses that exceeded the TRV were considered a potential risk to receptors. Doses that did not exceed the TRV were not considered to pose risk to receptors. No conclusions can be drawn about chemicals when there are no benchmarks or TRVs.

Calculations for concentrations of VOCs and SVOCs in air to evaluate the potential for risk to burrowing mammals are presented in Appendix I.

3.1.3.3 Toxicological Effects on Birds and Mammals

Site-specific daily ingestion dose estimates were compared with TRVs to estimate the potential adverse biological effects on each receptor. The risk to representative receptors was characterized based on this comparison, which was conducted consistent with EPA's HQ methodology (EPA 1986), as follows:

$$HQ = \frac{Dose}{TRV} = \frac{(mg / kg - day)}{(mg / kg - day)}$$

where:

HQ = Hazard quotient (unitless)

Dose = COPEC-, receptor-, and site-specific daily dose estimate (mg/kg-day)

TRV = COPEC- and receptor-specific toxicity reference value (mg/kg-day)

Hazard quotients were calculated similarly for the inhalation model; however, TRVs for inhalation are provided in concentration units. Therefore, the COPEC concentration in air (mg/m^3) was divided by the COPEC- and receptor-specific TRV (in mg/m^3). The equation for calculating the HQs for the inhalation pathway is provided below:

$$HQ = \frac{AirConcentration}{TRV} = \frac{(mg / m^3)}{(mg / m^3)}$$

where:

HQ = Hazard quotient (unit less)

AirConcentration = COPEC- and site-specific daily dose estimate (mg/m^3)

TRV = COPEC- and receptor-specific toxicity reference value (mg/m^3)

It is Navy policy that resulting HQs not be compared or added; instead, they should be considered individually because of the differences in the degree of conservatism in TRVs selected for various COPECs and receptors (Navy 1999).

3.1.3.4 Toxicity Reference Values

TRVs used in the FCMs were chosen first from the Navy-Biological Technical Assistance Group (BTAG) technical memorandum (Navy 1998). The BTAG TRV-low for lead in mammals was updated in 2002 to consider behavioral and systemic effects (DTSC 2002). Each TRV represents a critical exposure level from a toxicological study and is supported by a data set of toxicological exposures and effects. A low TRV is a conservative value consistent with a chronic no-observed-adverse-effects level (NOAEL). A high TRV represents a mid-range effects level for a COPEC, where the endpoint of toxicity was ecologically relevant. TRVs used in this SLERA are provided on Table 5 and are summarized below.

If a BTAG TRV was not available, TRVs were based on toxicological benchmarks for wildlife developed by ORNL (Sample and others 1996). These benchmarks consider COPEC exposure only through oral ingestion of contaminated media. The ORNL benchmarks are used in a manner similar to the Navy-BTAG TRVs.

TRVs for the inhalation model are based on ecological risk assessments that have recently been finalized at Vandenberg and Edwards Air Force Bases (U.S. Air Force 2003, 2004) and modified reference concentrations (RfC) derived from the EPA Integrated Risk Information System (IRIS) database for human health risk assessment. RfCs represent "an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 2005c); therefore, modification was required for RfCs to be applicable to other mammals. In some cases, human RfCs were adjusted; in other cases, animal RfCs were derived *de novo* from toxicological information presented in IRIS, with animal studies preferred over human studies where available. Effect benchmarks (NOAELs and lowest observed adverse effects levels [LOAEL]) were adjusted based on the study exposure duration, to yield a continuous exposure equivalent. The IRIS procedure of using pharmacokinetic models or assumptions to develop human exposure concentrations was omitted. The following uncertainty factors were applied, where appropriate: subchronic to chronic exposure extrapolation; LOAEL to NOAEL; and database deficiencies. Uncertainty factors (UF) for intraspecies and interspecies (animal to human) extrapolation were not applied. The value of individual UFs is 10 (EPA's default value) or 3 (100.5) for less severe deficiencies. The derivation of the modified RfCs for individual chemicals is presented in Appendix J. The exposure concentrations in the literature studies were first converted to daily exposure concentrations. UFs were applied to convert the literature-based daily exposure concentrations to COPEC-specific, NOAEL-equivalent TRVs.

3.2 CHARACTERIZATION OF POTENTIAL RISK TO RECEPTORS

The evaluation of risk to ecological receptors focused on selected assessment endpoints identified in Section 2.5.4. Risks to plants, invertebrates, insectivorous birds, insectivorous mammals, and burrowing mammals was evaluated; American robins and ornate shrews were selected as receptor species representative of all insectivorous bird or mammal species that may use the site. Throughout, the HQ was calculated by dividing the chemical concentration in the soil (in mg/kg) by the benchmark. HQ calculations for plants are presented in Appendix D. HQ calculations for invertebrates are presented in Appendix E. HQ calculations for the FCM for birds and mammals are presented in Appendix G. HQ calculations for the inhalation model for burrowing mammals are presented in Appendix I. The uncertainties associated with the risk evaluation are presented in Section 3.3.

As specified in both Navy (1999) and EPA (1997) guidance for SLERAs, estimated doses should be calculated using the maximum site-specific concentrations in soil and the literature-derived BAF (to estimate concentrations in prey). These doses should then be compared with low TRVs to estimate the potential adverse biological effects on the receptor.

At the request of DTSC, the following HQ calculations usually conducted in Step 3a of the BERA were also included in this evaluation:

- 95 UCL dose/low TRV
- Maximum concentration dose/high TRV
- 95 UCL dose/high TRV
- Ambient dose/low TRV
- Ambient dose/high TRV
- Ambient sediment concentration/plant benchmark
- Ambient sediment concentration /invertebrate benchmark

Doses based on the high TRV were evaluated for COPECs only where the HQ based on the maximum concentration and the low TRV exceeded 1.

Tables in the text provide the following information:

- HQs based on maximum and UCL 95 soil concentrations and low TRV. These tables provide the most conservative estimate of risk per Navy and EPA guidance for conducting a SLERA.

- HQs based on high and low TRV corrected for the Bay ambient. These tables show the results of the refinement step normally conducted in Step 3a of the BERA.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
19	SLERA recommended	Section 2.5.2	Screening-Level Ecological Risk Assessment for Sites 6, 12, 21, 24, 30, 31, 32, and 33, Naval Station Treasure Island, San Francisco, California. SulTech. March 23, 2007. Section 5.0.

Results of the Step 2 exposure estimation indicate that using the maximum soil concentrations resulted in an HQ greater than 1 of some COPECs at Sites 6, 12, 21, 24, 30, 31, 32, and 33 and pose potentially unacceptable risks to plant, invertebrate, and vertebrate receptors based on the conservative assumptions of the SLERA.

4.0 SCIENTIFIC MANAGEMENT DECISION POINT

The scientific management decision point for a SLERA, which follows Step 2, focuses on identifying the need for further evaluation (EPA 1997, 2001). Two decision criteria determine the outcome of the Tier 1 SLERA as described in Section 1.2 (Navy 1999, 2004a): (1) existence of a complete exposure pathway from the chemical to the receptor, and (2) chemical concentrations or doses that exceed the screening criteria used for comparison. The following outcomes and conclusions may result from the Tier 1 SLERA for each site:

- No complete exposure pathway to ecologically relevant ecosystems or receptors (no exposure) and no concentrations or doses exceed screening criteria (no effects) – no further action
- No complete exposure pathway to ecologically relevant ecosystems or receptors (no exposure) and concentrations or doses exceed screening criteria (effects) – no further action
- Complete exposure pathway to ecologically relevant ecosystems or receptors (exposure) and no concentrations or doses exceed screening levels (no effects) – no further action
- Complete exposure pathway to ecologically relevant ecosystems or receptors (exposure) and concentrations or doses exceed screening criteria (effects) – Tier 2 BERA or remediation initiated

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are identified for Sites 6, 12, 21, 24, 30, 31, 32, and 33.

In a SLERA, it is necessary to identify (1) what specifically is to be protected and (2) which ecological resources and processes must be sustained and for what reason. Because of the artificial and disturbed nature of the sites, exposure to plants and invertebrates is limited to opportunistic species that can adapt to high disturbance regimes. Although the exposure pathway evaluation links site contaminants in soil to ecological receptors, it does not link ecologically valuable endpoints to contamination. The conclusion for each IR site evaluated in this SLERA is that there are no complete exposure pathways to ecologically relevant ecosystems or receptors (no exposure) and concentrations or doses exceed screening criteria (effects) – no further action.

TI is not a natural ecosystem; rather, it is a manmade island built from dredge material from the San Francisco Bay. TI has never supported a natural ecosystem or provided habitat for ecologically relevant receptors. Future exposure will also be limited to species adapted to urban, landscaped habitats because urban redevelopment is planned for each of the sites once TI has been transferred (CCSF 1996).

Habitat surveys conducted at Sites 6, 12, 21, 24, 30, 31, 32, and 33 did not identify any ecological resources or processes without which ecosystem function would be significantly impaired. Based on the overall poor quality of the habitat on TI, the Navy does not recommend further evaluation of ecological risk in a Tier II assessment for Sites 6, 12, 21, 24, 30, 31, 33, and 33. For these sites, this SLERA fulfills the CERCLA requirement for conducting an ERA to assess threats to the environment.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
20	sediments do not pose unacceptable risk	Section 2.5.2	Installation Restoration Site 13 Offshore Sediments Record of Decision, Naval Station Treasure Island, Treasure Island, San Francisco, California. Department of the Navy. April 7, 2005. Section 1.5.

and pore water samples were collected during a Phase II RI in 1996 to further characterize the sources, extent, and potential toxicity of chemical contamination in the offshore sediment at Site 13. The sample locations were non-randomly located along transects extending offshore from storm water outfalls or potential onshore sources. More than 100 offshore locations were sampled. As part of the Phase II RI, invertebrate bioassays and tissue residue analyses were also conducted.

The results of these two offshore investigations indicated metals, polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH), dichlorodiphenyltrichloroethane, and other organics were the chemicals most frequently detected in sediment samples. The majority of samples where these chemicals were detected were at low concentrations when compared with the sediment screening criteria. The sample locations where these chemicals were detected were generally randomly distributed throughout Site 13 and did not identify any offshore area contaminated by onshore sources.

Two additional investigations were conducted in 2001 and 2002 to assess specific areas identified by the regulatory agencies as requiring further assessment of the offshore sediments at TI. Specifically, the regulatory agencies requested the Navy further investigate the sediments adjacent to possible onshore source areas at IR Sites 11 and 12, which may have deposited burned materials in the form of solid waste or PCB-contaminated material. Offshore samples were collected and analyzed for metals, total petroleum hydrocarbons (TPH), and PCBs. Concentrations of metals, PCBs, and TPH in the offshore sediments were found not to be elevated. These assessments indicated that no additional investigation was required.

1.4 STATUTORY DETERMINATIONS

The no action decision was made for Site 13 because the sediments do not pose an unacceptable risk to human health or the environment. Because the no action decision was made, there are no CERCLA Section 121 statutory determinations for this ROD, and a 5-year review will not be required for Site 13.

1.5 DECLARATION STATEMENT

Based on the RI evaluation of analytical data, historical information, and site inspections, the Navy, with the concurrence of the Cal/EPA DTSC and Cal/EPA Water Board, has concluded no remedial action is necessary for Site 13, Offshore Sediments, at NAVSTA TI. Furthermore, hazardous substances are not present in Site 13 sediments at concentrations above unacceptable risk levels, therefore, the 5-year review requirement of CERCLA Section 121(c) is not applicable.

James B. Sullivan
BRAC Environmental Coordinator
Naval Station Treasure Island
U.S. Department of the Navy

April 7th 2005
Date

Anthony J. Landis, P.E.
Chief
Northern California Operations
Office of Military Facilities

3-17-05
Date

Bruce H. Wolfe
Executive Officer
California Regional Water Quality Control Board
San Francisco Bay Region

March 10, 2005
Date

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
21	potential impacts to aquatic wildlife	Section 2.5.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Cover through Section 4 of Appendix K.

Appendix K. Evaluation of Potential Groundwater Impacts to Aquatic Habitat

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Acronyms and Abbreviations

bgs	below ground surface
COPCs	chemicals of potential concern
DAFs	dilution attenuation factors
EPA	U.S. Environmental Protection Agency
IR Site 6	Installation Remediation Site 6
mg/L	milligrams per liter
NAVSTA TI	Naval Station Treasure Island
RI/FS	Remedial Investigation/Feasibility Study
TPH	total petroleum hydrocarbons
UST	underground storage tank
Water Board	San Francisco Bay Regional Water Quality Control Board
µg/L	micrograms per liter

Section 1. Introduction

The purpose of this report is to present the results of fate and transport modeling for petroleum constituents in groundwater at Installation Remediation Site 6 (IR Site 6), Naval Station Treasure Island (NAVSTA TI). The primary objective of the modeling is to evaluate potential groundwater impacts to aquatic habitat in support the Remedial Investigation/Feasibility Study (RI/FS). The modeling results were used to (1) confirm groundwater data collected during the 2010 data gaps investigation (i.e., that no petroleum contamination was found in the temporary well samples), and (2) evaluate whether groundwater containing petroleum constituents at concentrations above groundwater screening levels could potentially reach the San Francisco Bay in the future. The modeling was performed using BIOSCREEN, a screening model that simulates natural attenuation of dissolved hydrocarbons at petroleum release sites.

This appendix summarizes estimation of chemical concentrations at points of groundwater discharge to San Francisco Bay along the shoreline of IR Site 6 to identify any chemicals of potential concern (COPC) that should be addressed by the RI/FS. The estimation of chemical concentrations at points of groundwater discharge was based on the results of highly conservative analytical modeling of groundwater flow and solute transport performed for specified locations where groundwater samples have been collected at IR Site 6. This appendix discusses the modeling approach, input data, simulation results, and uncertainty analysis.

Section 2. Model Overview and Approach

To evaluate chemical fate and transport in groundwater and the potential for migration of chemicals to San Francisco Bay, a highly conservative screening-level analysis based on the BIOSCREEN solute transport model (U.S. Environmental Protection Agency [EPA], 1996; ASTM International, 1995 and 1998) was performed. BIOSCREEN is an analytical code based on the Domenico solute transport model (Domenico, 1987), with well documented applications to risk-based corrective action analyses (EPA, 1996; ASTM International, 1995 and 1998).

Model simulations using BIOSCREEN were based on identification of COPCs, uniform and constant (i.e., infinite) point sources of COPCs in groundwater, shortest travel distances to San Francisco Bay, and estimation of chemical attenuation between the source locations and points of groundwater discharge to the bay. As a conservative measure, model simulation of chemical transport was based on one-dimensional, uniform, and steady-steady groundwater flow, with chemical attenuation limited solely to the effects of mechanical dispersion; this was represented by model-estimated dilution attenuation factors (DAFs). Distance-specific DAFs were subsequently combined with chemical-specific source concentrations to estimate chemical concentrations at points of groundwater discharge to the bay; this relationship is summarized by the following equation:

$$\textit{Concentration at Point of Groundwater Discharge to Bay} = \frac{\textit{Source Concentration}}{\textit{DAF}}$$

Toxicity screening levels were compiled under the NAVSTA TI groundwater monitoring program to address the exposure of aquatic organisms living along the shoreline of NAVSTA TI that may be exposed to chemicals if contaminated groundwater discharges to San Francisco Bay. The comprehensive list of groundwater screening levels was compiled using toxicity criteria established by the San Francisco Bay Regional Water Quality Control Board (Water Board) in "San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)" (Water Board, 2010) and "A Compilation of Water Quality Goals" (Water Board, 2008), the EPA in the California Toxics Rule (EPA, 2000) and National Recommended Water Quality Criteria (EPA, 2002a and 2002b,); and other sources (Water Board, 1995, 1998, and 2000; Central Valley Regional Water Quality Control Board, 2001; Tetra Tech EM Inc. [TtEMI], 1999 and 2001). The following chemicals were detected in groundwater samples at IR Site 6 at concentrations exceeding both toxicity screening criteria and ambient concentrations for metals in groundwater: benzene, ethylbenzene, naphthalene, toluene, total petroleum hydrocarbons (TPH), and arsenic. These chemicals were identified as the COPCs to be evaluated in this appendix.

Section 3. Model Scenarios

Model-simulated scenarios were conceptualized based on the following rationale:

- COPCs correspond to chemicals exceeding groundwater screening levels at each groundwater sampling location. Three source concentration scenarios were simulated for each COPC:
  1. Maximum source concentration since June 2003
  2. Average source concentration since June 2003
  3. Average source concentration over the last four sampling events
- In the absence of known sources of COPCs in soil and/or regional groundwater plumes across IR Site 6, COPC sources were assumed to be point sources corresponding to the location of each detection exceeding groundwater screening levels (see Figures K-1 through K-6).
- As a highly conservative measure, point sources were assumed to be constant (i.e., infinite), contributing mass to downgradient areas indefinitely and without depletion of the source.
- Groundwater travel distances to San Francisco Bay were selected based on the closest distance from the groundwater sampling locations to the bay.

Section 4. Model Formulation and Input Data

BIOSCREEN makes use of data characterizing chemical sources in groundwater, flow and mixing parameters, retardation factors, and first-order decay parameters to represent transport and attenuation of chemicals. Within the groundwater flow regime, the model accounts for the effects of advection, dispersion, sorption, and biodegradation based on the following equation:

$$C(x)i/Csi = \exp\{x/2\alpha x[1-(1+4\lambda i\ \alpha x\ Ri/v)1/2]\}\ erf\ \{Sw/4(\alpha yx)1/2\}\ erf\ \{Sd/4(\alpha zx)1/2\}$$

where:

$C(x)_i$	=	Concentration of constituent at distance x downstream of source (milligrams per liter [mg/L])
C_{si}	=	Concentration of constituent i at source (mg/L)
x	=	distance downgradient of source (feet)
α_x	=	longitudinal groundwater dispersivity (feet)
α_y	=	transverse groundwater dispersivity (feet)
α_z	=	vertical groundwater dispersivity (feet)
λ_i	=	first-order degradation rate (day^{-1})
R_i	=	constituent retardation factor
v	=	groundwater seepage
		velocity = $v = Ki/\theta_e$ *(feet per day)*
K	=	hydraulic conductivity (feet per day)
i	=	hydraulic gradient (feet per feet)
θ_e	=	effective soil porosity (dimensionless)
S_d	=	source depth (feet)
S_w	=	source width (feet)

As such, model simulations using BIOSCREEN make use of data characterizing hydrogeologic conditions, source conditions, and the potential for chemical attenuation beneath the site. All model input parameters and assumptions are included in Table K-1, with key data summarized below.

Hydrogeological Data: Key hydrogeological data incorporated in the model included aquifer hydraulic conductivity, hydraulic gradient, and aquifer porosity. As indicated in the RI/FS Report, IR Site 6 encompasses 4.54 acres of asphalt, concrete, and gravel open space and is underlain by dredged fill and shoal deposits predominantly consisting of fine- to medium-grained sands, with varying proportions of shell fragments, silt, and clay. The dredged fill was emplaced on top of the shoal sands during the construction of Treasure Island, beginning in 1936. Younger Bay Mud consisting of interbedded sand, silt, and clay underlies the shoal sands. Use of aquifer hydraulic conductivity in the model was based conservatively on values estimated from aquifer testing of the fill layer performed across Treasure Island; this soil has been characterized as medium-grained sands with silt and clay lenses. The mean hydraulic conductivity value estimated from the field data approximates 3.6×10^{-3} centimeters per second. A uniform aquifer porosity of 0.25 was also used in the model. This value is considered representative of the observed sediments and hydraulic conductivity used in the model. Estimation of the hydraulic gradient of 0.004 foot per foot was based on quarterly field-measured groundwater elevations.

Source Data: In the absence of known residual sources of metals in soil and groundwater at IR Site 6, each source location was conceptualized as a continuous point source with a 10-foot width perpendicular to groundwater flow (i.e., source width), extending vertically to 10 feet beneath the water table. To include additional conservatism, it was further assumed that chemical sources remained constant in strength (concentration) and dimensions, serving as a continuous source of groundwater contamination without depletion over time. Source strengths used in the model correspond to those outlined in Table K-2.

Chemical Attenuation Data: The degree of contaminant transport and mixing predicted by the BIOSCREEN model is a function of the dispersion coefficients, retardation (adsorption) coefficients, and parameters governing Darcy's Law for groundwater flow (Todd, 1980). To focus DAF calculations on dispersion processes, processes such as adsorption, chemical reactions, and biodegradation were conservatively ignored in the model. To simulate the effects of dispersion along the path of travel to the strait, BIOSCREEN makes use of dispersivity coefficients to represent hydrodynamic dispersion, which results in chemical dilution and mixing due to the effects of sediment heterogeneities. The dispersivity values used in the model were estimated based on highly conservative formulas adopted by EPA (1990) and ASTM International (1995 and 1998), which are based on the shortest distances from the source areas (location of measured concentration) to aquatic receptors in the San Francisco Bay. These formulas are as follows:

$$\text{Longitudinal Dispersivity (feet)} = 0.1 \times \text{Distance from source location to San Francisco Bay (feet)}$$

$$\text{Transverse Dispersivity (feet)} = 0.33 \times \text{Longitudinal Dispersivity (feet)}$$

$$\text{Vertical Dispersivity (feet)} = 0.05 \times \text{Longitudinal Dispersivity (feet)}$$

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
22	BIOSCREEN model	Section 2.5.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section "9.2.2.2. BIOSCREEN Modeling Approach"

9.2.2.2. BIOSCREEN Modeling Approach

A conservative screening-level analysis based on the BIOSCREEN solute transport model was performed to evaluate the potential migration of chemicals to San Francisco Bay. BIOSCREEN is an analytical code based on the Domenico solute transport model (Domenico, 1987), with well-documented applications for analyses of risk-based corrective actions (EPA 1996; ASTM International, 1995 and 1998). The model was used by estimating chemical attenuation between point sources and groundwater discharge points to San Francisco Bay. Chemical attenuation was limited solely to the effects of mechanical dispersion. The modeling approach included several conservative assumptions, as listed below.

- The distance to the receptor was measured as the shortest distance from the point source location to San Francisco Bay, rather than the distance to the shoreline in the general direction of groundwater flow.
- The source of contamination was assumed to be infinite (i.e., continuous sources of groundwater contamination without depletion over time).
- No adsorption was assumed (i.e., no retardation).
- No biodegradation was assumed (i.e., no decay or reaction).
- No dilution due to mixing in the tidally influenced zone along the shoreline was assumed.
- No dilution upon discharge to the bay was assumed.
- For samples with concentrations less than LRLs, the LRL was assumed to be the chemical concentration in groundwater (except where the LRL was extremely elevated).
- For arsenic, the entire data set was considered in the evaluation, including samples that were not filtered prior to preservation that represent total, not dissolved, arsenic concentrations.

The model input parameters, including the hydrogeologic and contaminant transport characteristics, were derived from documented field data or published representative values that are applicable to the known site conditions. BIOSCREEN model simulations provided calculated attenuation factors and resulting concentrations at points of discharge to San Francisco Bay for each chemical and source area. The point sources were selected based on the highest concentrations detected in former or existing monitoring wells, as summarized below.

- UST 240 Area – Existing monitoring well 06-MW01 was selected as a point source for arsenic, benzene, ethylbenzene, naphthalene, toluene, and TTPH.
- UST 248 Area – Former monitoring wells 06-MW03, 06-MW21, and 06-MW22 were selected as point sources for TTPH. Wells 06-MW21 and 06-MW22 were selected as point sources for arsenic. Monitoring wells in the UST 248 Area have never reported elevated benzene, ethylbenzene, toluene, or naphthalene concentrations in groundwater.
- Former Helicopter Training Area – Former monitoring well 06-MW02 was selected as a point source for arsenic.

Models were run using three different contaminant source values, including:

1. The maximum source concentration
2. Average source concentration based on the entire data set
3. Average source concentration based on data from the last four sampling events

Table 1 in Appendix K summarizes model input parameters and assumptions.

9.2.2.3. BIOSCREEN Model Results

Appendix K summarizes the BIOSCREEN modeling results. Model screen shots depicting the simulation input data are presented in Attachment K1 of the appendix.

When the average source concentrations (average of all data or average of the last four measurements) were applied in the model, concentrations of chemicals would be less than the screening levels. When the maximum source concentrations were applied in the model, concentrations exceeding the groundwater screening levels would potentially occur for ethylbenzene and TTPH, both in well 06-MW01. These exceedances were based on the maximum source concentration scenario of 2,200 and 117,000 µg/L, for ethylbenzene and TTPH, respectively. The concentration for ethylbenzene at the point of groundwater discharge to San Francisco Bay was estimated at 68 µg/L, compared with the groundwater screening criterion of 43 µg/L. The concentration for TTPH at the point of groundwater discharge to San Francisco Bay was estimated at 3,596 µg/L, compared with the groundwater screening criterion of 1,400 µg/L.

The results of the BIOSCREEN model are considered highly conservative estimates of potential discharge concentrations to San Francisco Bay. As described in Section 9.2.2, a number of conservative assumptions was incorporated into the solute transport modeling simulation to estimate the concentrations of chemicals in groundwater discharging to the bay, including (1) the use of infinite point sources, (2) the simplified (e.g., steady-state and one-dimensional solution) formulation of the BIOSCREEN model, and (3) the absence of attenuation processes (e.g., adsorption, chemical reactions) for chemicals migrating toward the bay.

9.2.3. Summary and Conclusions

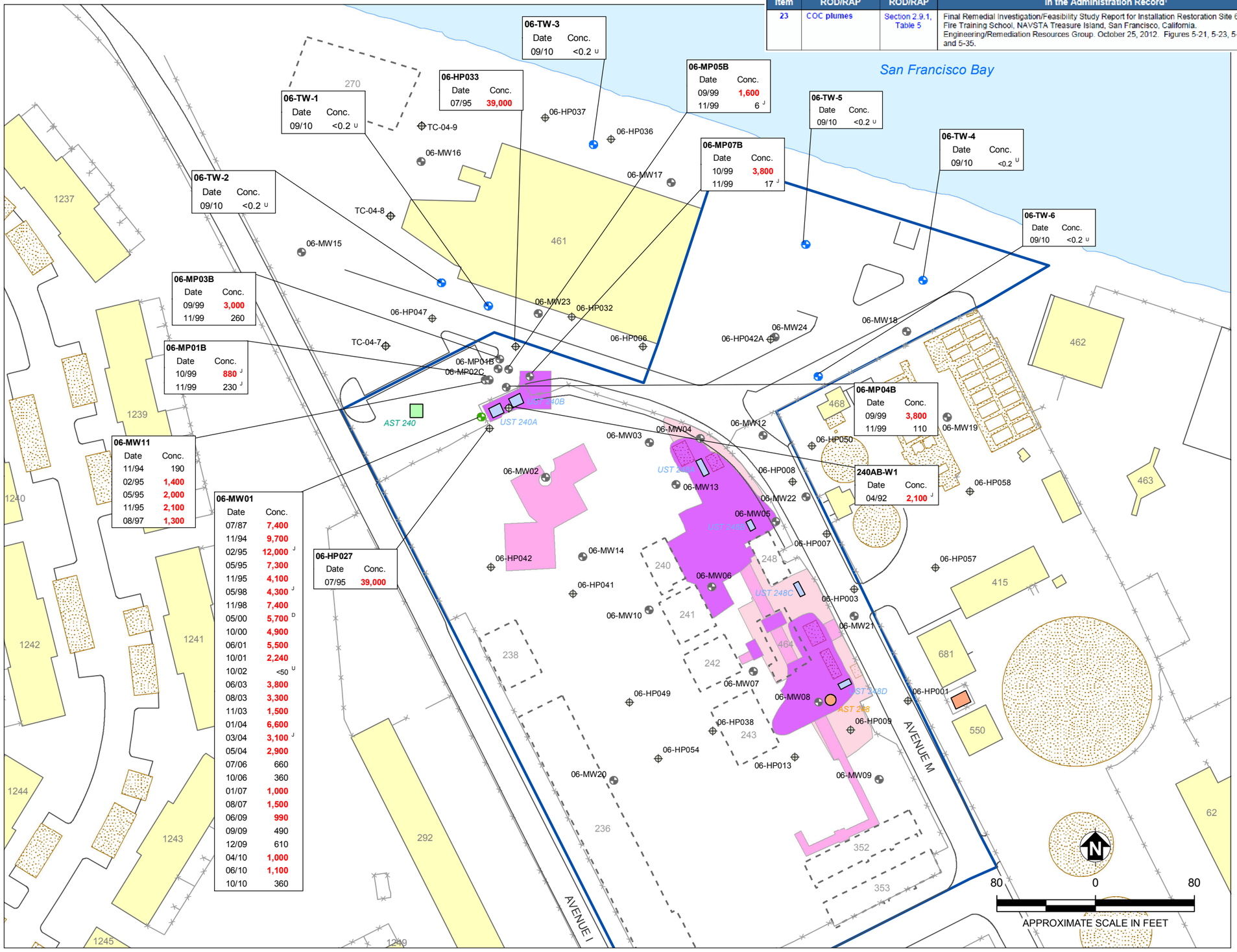
The following conclusions can be derived regarding potential aquatic impacts to ecological receptors in San Francisco Bay.

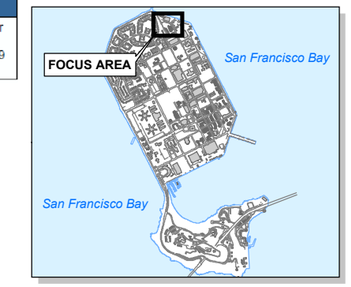
- If the average source zone concentrations are considered representative of site conditions, predicted chemical concentrations at discharge points along the IR Site 6 shoreline will be less than NAVSTA TI groundwater screening levels for all chemicals at all source areas.
- If the maximum source concentrations are considered representative of site conditions, ethylbenzene and TTPH in the vicinity of the UST 240 Area (source location MW-01) have the potential to pose a risk to aquatic receptors in San Francisco Bay. However, using the maximum source zone concentrations in the model produced surface water discharge concentrations within a reasonable range (same order of magnitude) of their associated groundwater screening levels.

- Applying the maximum source concentrations of chemicals (TTPH and arsenic) in the UST 248 Area predicted that concentrations at discharge points along the IR Site 6 shoreline will be less than NAVSTA TI groundwater screening levels.
- Groundwater data collected from six downgradient temporary wells in September 2010 did not detect arsenic, benzene, ethylbenzene, naphthalene, toluene, or TTPH concentrations exceeding groundwater screening levels, indicating that contaminants that pose potential risks to aquatic receptors have not reached San Francisco Bay (Section 4.6).

In summary, chemicals in groundwater from the UST 240 Area pose a potentially unacceptable risk only under very conservatively assumed conditions. Chemicals in groundwater from the UST 248 Area do not pose unacceptable risks to aquatic wildlife along the shoreline. The BIOSCREEN modeling confirmed the groundwater data collected during the 2010 data gaps investigation that chemicals are not present in groundwater at concentrations of concern adjacent to San Francisco Bay. However, the conservative assumptions and input parameters used in the BIOSCREEN model indicate that a low potential exists that contaminants from the UST 240 Area could migrate and eventually impact aquatic wildlife. Based on this evaluation, TTPH and ethylbenzene are considered chemicals of ecological concern (COECs) for IR Site 6.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
23	COC plumes	Section 2.9.1, Table 5	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Figures 5-21, 5-23, 5-27, 5-29 and 5-35.





LEGEND:

- Grab/Hydropunch Sample
- Existing Monitoring Well
- Former Monitoring Well
- Temporary Monitoring Well, Installed and Sampled in Sept. 2010
- Suspected Former AST
- Former AST
- Former UST
- IR Site 6 Boundary
- Building
- Former Building
- Appurtenance
- Road/Curbline
- Fence

Excavation Depth

- 1-2 ft bgs
- 2-5 ft bgs
- 5-9 ft bgs

Notes:
Groundwater screening level for benzene = 700 µg/L (Source: TtEMI, 2001)

240AB-W1 — Location ID
Date Conc.
04/92 2,100 J — Concentration (µg/L)
Sample Date (mm/yy)

D = Pattern resembles diesel
J = Estimated value
U = Not detected (numerical value is the reporting limit)

Concentrations highlighted in red exceed the groundwater screening level.

Excavations were conducted from May 2002 to January 2003.

This figure only shows benzene concentrations from:

1. Wells and hydropunches where at least one sample concentration exceeded the groundwater screening level, and
2. Temporary wells that were sampled in September 2010.

For samples that included a field duplicate, only the maximum concentration is shown on this figure.

All sample locations shown on this figure were sampled at least once for benzene.

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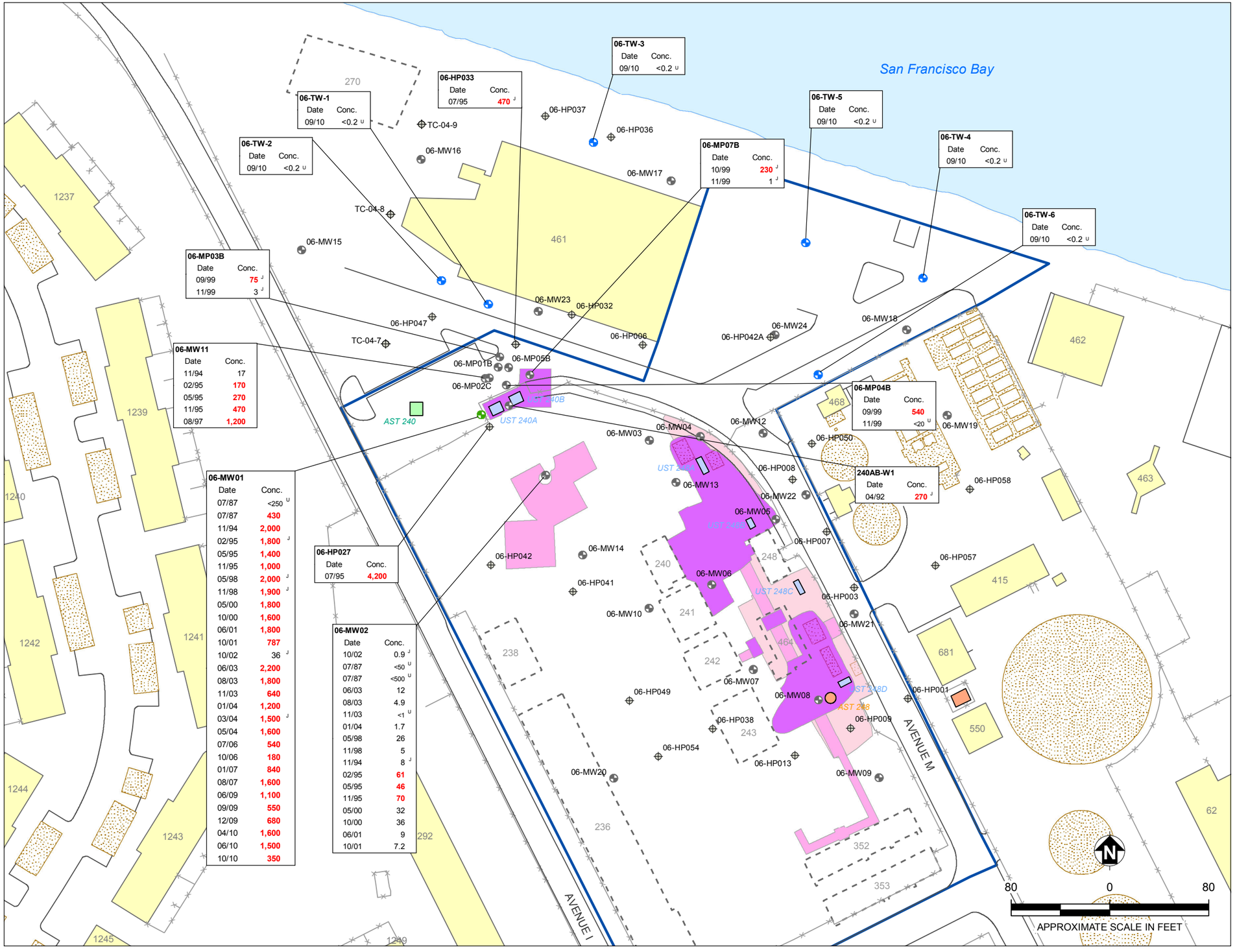
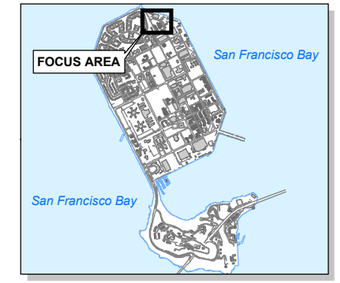
Former Naval Station Treasure Island, California
Department of the Navy, BRAC PMO West, San Diego

FIGURE 5-21

BENZENE IN GROUNDWATER

N:\Projects\2009_Projects\29-050_Navy_TI_Site06_RI\N_Maps_Drawings\GIS\Project\Site06\02_IntDrftRI\Water_new\Water_Benzene.mxd Last updated: 5/18/2012 at 9:30:27 AM





LEGEND:

- Grab/Hydropunch Sample
- Existing Monitoring Well
- Former Monitoring Well
- Temporary Monitoring Well, Installed and Sampled in Sept. 2010
- Suspected Former AST
- Former AST
- Former UST
- IR Site 6 Boundary
- Building
- Former Building
- Appurtenance
- Road/Curbline
- Fence

Excavation Depth

- 1-2 ft bgs
- 2-5 ft bgs
- 5-9 ft bgs

Notes:

Groundwater screening level for ethylbenzene = 43 µg/L (Source: TtEMI, 2001)

240AB-W1 — Location ID
Date Conc.
04/92 270 J — Concentration (µg/L)
Sample Date (mm/yy)

J = Estimated value
U = Not detected (numerical value is the reporting limit)

Concentrations highlighted in red exceed the groundwater screening level.

Excavations were conducted from May 2002 to January 2003.

This figure only shows ethylbenzene concentrations from:

1. Wells and hydropunches where at least one sample concentration exceeded the groundwater screening level, and
2. Temporary wells that were sampled in September 2010.

For samples that included a field duplicate, only the maximum concentration is shown on this figure.

All sample locations shown on this figure were sampled at least once for ethylbenzene.

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Department of the Navy, BRAC PMO West, San Diego

FIGURE 5-23

ETHYLBENZENE IN GROUNDWATER

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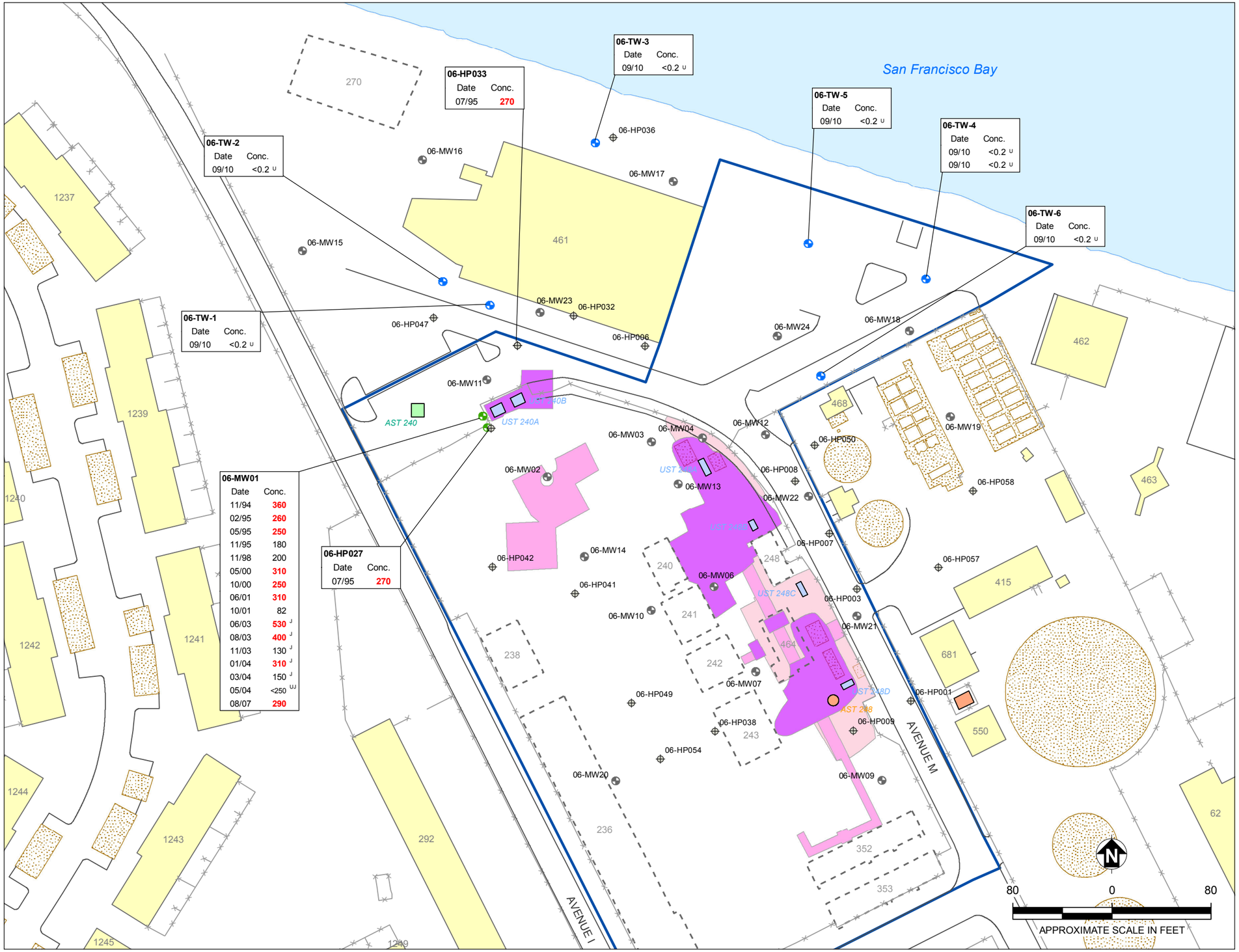

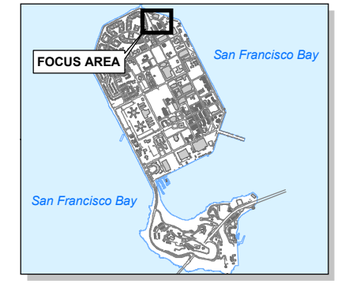

LEGEND:

- Grab/Hydropunch Sample
- Existing Monitoring Well
- Former Monitoring Well
- Temporary Monitoring Well, Installed and Sampled in Sept. 2010
- Suspected Former AST
- Former AST
- Former UST
- IR Site 6 Boundary
- 461 Building
- 240 Former Building
- Appurtenance
- Road/Curbline
- Fence

Excavation Depth

- 1-2 ft bgs
- 2-5 ft bgs
- 5-9 ft bgs

Notes:
Groundwater screening level for naphthalene = 235 µg/L (Source: TtEMI, 2001)

06-HP027 — Location ID
Date Conc.
07/95 270 — Concentration (µg/L)
Sample Date (mm/yy)

J = Estimated value
U = Not detected (numerical value is the reporting limit)

Concentrations highlighted in red exceed the groundwater screening level.

Excavtions were conducted from May 2002 to January 2003.

This figure only shows naphthalene concentrations from:
1. Wells and hydropunches where at least one sample concentration exceeded the groundwater screening level, and
2. Temporary wells that were sampled in September 2010.

For samples that included a field duplicate, only the maximum concentration is shown on this figure.

All sample locations shown on this figure were sampled at least once for naphthalene.

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Department of the Navy, BRAC PMO West, San Diego

FIGURE 5-27

NAPHTHALENE IN GROUNDWATER

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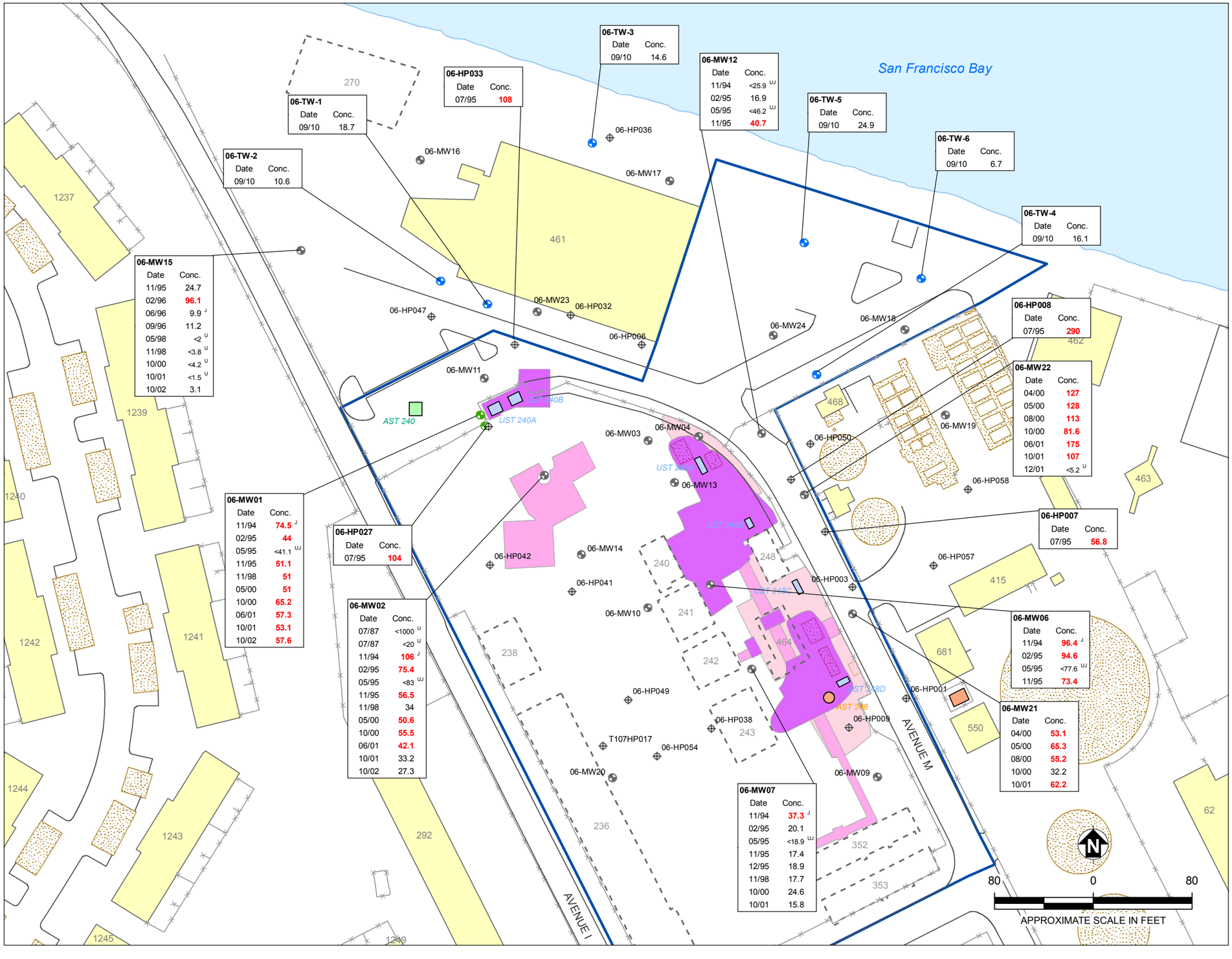

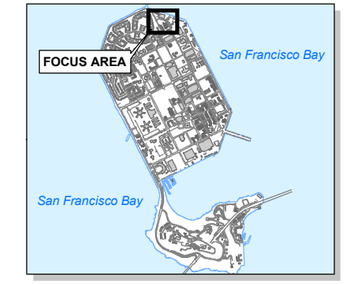

LEGEND:

- Grab/Hydropunch Sample
- Existing Monitoring Well
- Former Monitoring Well
- Temporary Monitoring Well, Installed and Sampled in Sept. 2010
- Suspected Former AST
- Former AST
- Former UST
- IR Site 6 Boundary
- 461 Building
- 240 Former Building
- Appurtenance
- Road/Curbline
- Fence

Excavation Depth

- 1-2 ft bgs
- 2-5 ft bgs
- 5-9 ft bgs

Notes:
Groundwater screening level for arsenic = 36 µg/L
(Source: SulTech, 2008)

TI ambient concentration for arsenic = 15 µg/L

06-HP027 — Location ID
Date Conc.
07/95 104 — Concentration (µg/L)
Sample Date (mm/yy)

J = Estimated value
U = Not detected (numerical value is the reporting limit)

Concentrations highlighted in red exceed the groundwater screening level.

Excavations were conducted from May 2002 to January 2003.

This figure only shows arsenic concentrations from:
1. Wells and hydropunches where at least one sample concentration exceeded the groundwater screening level, and
2. Temporary wells that were sampled in September 2010.

For samples that included a field duplicate, only the maximum concentration is shown on this figure.

All sample locations shown on this figure were sampled at least once for arsenic.

ERRG ENGINEERING/REMEDIATION RESOURCES GROUP, INC.

Former Naval Station Treasure Island, California
Department of the Navy, BRAC PMO West, San Diego

FIGURE 5-29

ARSENIC IN GROUNDWATER

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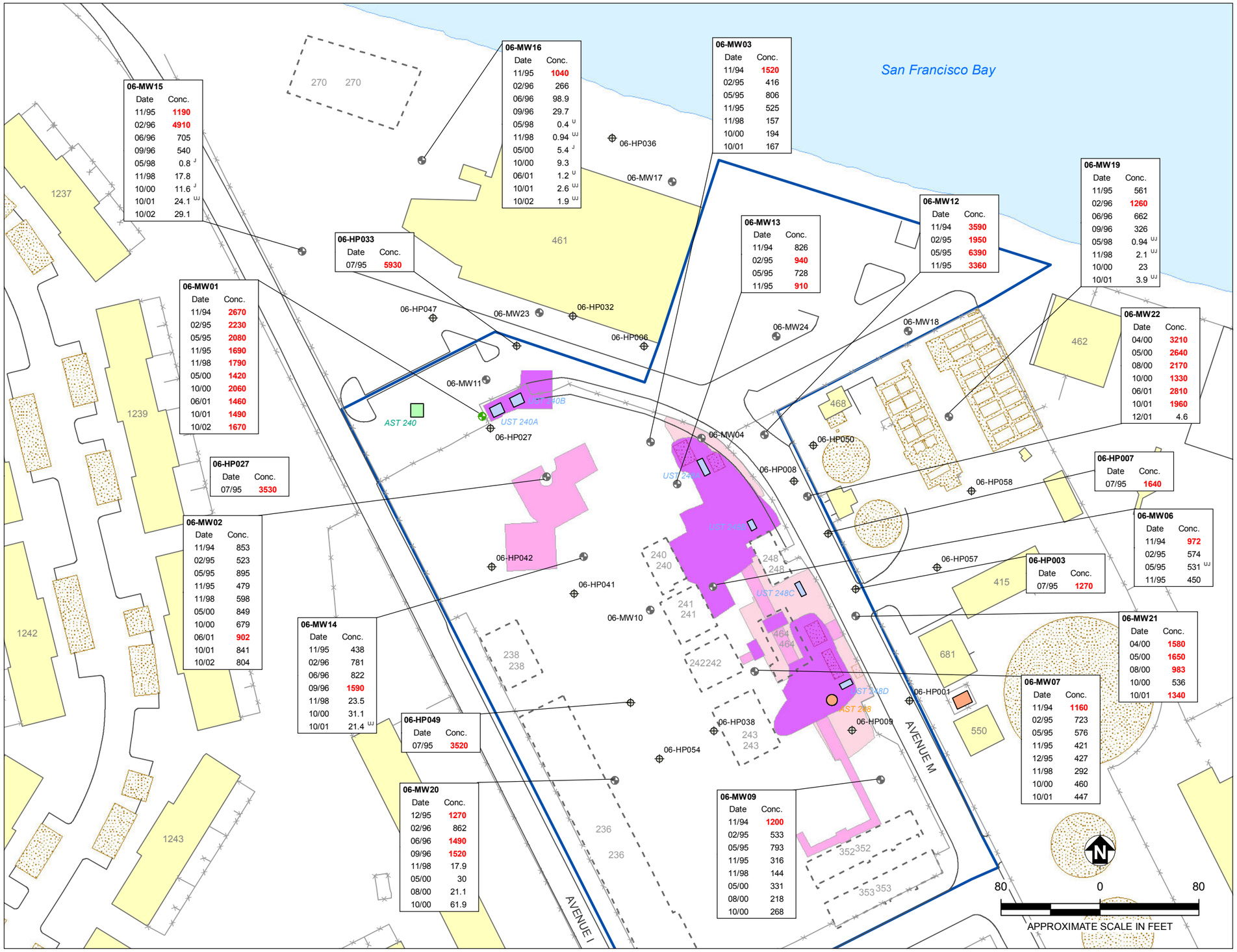

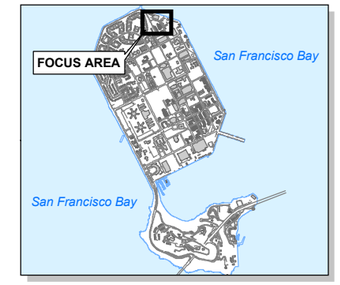

LEGEND:

- Grab/Hydropunch Sample
- Existing Monitoring Well
- Former Monitoring Well
- Suspected Former AST
- Former AST
- Former UST
- IR Site 6 Boundary
- 461 Building
- 240 Former Building
- Appurtenance
- Road/Curbline
- Fence

Excavation Depth

- 1-2 ft bgs
- 2-5 ft bgs
- 5-9 ft bgs

Notes:
Groundwater screening level for manganese = 900 µg/L (Source: SulTech, 2008)

TI ambient concentration for manganese = 900 µg/L

06-MW22 — Location ID
Date Conc.
04/00 3060 — Concentration (µg/L)
Sample Date (mm/yy)

J = Estimated value
U = Not detected (numerical value is the reporting limit)

Concentrations highlighted in red exceed the TI ambient concentration.

This figure only shows manganese concentrations from wells and hydropunches that exceeded the TI ambient concentration.

For samples that included a field duplicate, only the maximum concentration is shown on this figure.

All sample locations shown on this figure were sampled at least once for manganese.

Excavations were conducted from May 2002 to January 2003.

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Former Naval Station Treasure Island, California
Department of the Navy, BRAC PMO West, San Diego

FIGURE 5-35

MANGANESE IN GROUNDWATER

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Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
24	nine evaluation criteria	Section 2.9.2	Final Remedial Investigation/Feasibility Study Report for Installation Restoration Site 6 Former Fire Training School, NAVSTA Treasure Island, San Francisco, California. Engineering/Remediation Resources Group. October 25, 2012. Section 14.0.

Section 14. Comparative Evaluation of Remedial Alternatives

This section provides a detailed analysis of each remedial alternative developed for soil and groundwater in Section 13, followed by comparative analysis. This information will be used to help select a final remedy for IR Site 6. The alternatives developed in Section 13 are evaluated using criteria based on statutory requirements of CERCLA, as amended by SARA, § 121; the NCP; and "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA, 1988).

The NCP specifies nine criteria to be used in the detailed analysis. The first two criteria are threshold criteria that must be satisfied for a remedy to be eligible for selection; the next five criteria are balancing criteria used to evaluate the comparative advantages and disadvantages of the remedial alternatives; and the final two criteria are modifying criteria generally considered after regulatory agency and public comments are received on the Proposed Plan. The nine criteria are listed below.

1. **Overall Protection of Human Health and the Environment:** This criterion describes how each alternative, as a whole, protects human health and the environment and indicates how each source of hazardous substances is to be eliminated, reduced, or controlled.
2. **Compliance with ARARs:** This criterion evaluates each alternative's compliance with ARARs, or, if an ARAR waiver is required, how the waiver is justified. ARARs consider location-specific, chemical-specific, and cleanup action-specific concerns.
3. **Long-Term Effectiveness and Permanence:** This criterion evaluates the effectiveness of each alternative in protecting human health and the environment after the response action is complete. Factors considered include magnitude of residual risks and adequacy and reliability of release controls.
4. **Reduction of Toxicity, Mobility, or Volume through Treatment:** This criterion evaluates the anticipated capability of each alternative's specific treatment technology to reduce the toxicity, mobility, or volume of hazardous substances.
5. **Short-Term Effectiveness:** This criterion addresses the effectiveness of each alternative in protecting human health and the environment during the construction and implementation phase. Factors considered include:
   - Exposure of the community during implementation
   - Exposure of the workers during construction

- Effects to the environment (as supported by the green and sustainable remediation [GSR] analysis in Appendix K)
- Time required to meet the RAOs

6. **Implementability:** This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of the required services and materials during its implementation. Factors considered include:
   - Ability to construct the technology
   - Reliability of the technology
   - Monitoring considerations
   - Availability of equipment and specialists
7. **Cost:** This criterion evaluates the capital and operation and maintenance (O&M) costs for each alternative. Capital and O&M cost estimates are order-of-magnitude-level estimates and have an expected accuracy of minus 30 to plus 50 percent (EPA, 2000b). Table 14-1 summarizes the estimated costs for each alternative.
8. **State Acceptance:** This criterion evaluates technical and administrative issues and concerns the state regulatory agencies may have about each alternative. This criterion will be assessed following receipt of regulatory agency comments on the RI/FS Report and the Proposed Plan.
9. **Community Acceptance:** This criterion evaluates issues and concerns the public may have regarding each alternative. This criterion will be assessed following receipt of public comments on the RI/FS Report and the Proposed Plan.

In the following sections, each remedial alternative is compared with the two threshold and five balancing NCP criteria, and subsequently compared with the other alternatives to assess their relative performance with respect to the NCP criteria. Comparison with the two modifying criteria of state and community acceptance will be included in the Record of Decision; further discussion of these criteria is not included in this RI/FS Report. Section 14.1 provides a detailed analysis of each soil remedial alternative, and Section 14.2 provides a comparative analysis of the soil remedial alternatives. Section 14.3 presents a detailed analysis of each groundwater remedial alternative, and Section 14.4 provides a comparative analysis of the groundwater remedial alternatives.

14.1. DETAILED ANALYSIS OF SOIL ALTERNATIVES

This section evaluates each soil alternative in comparison with the two threshold and five balancing NCP evaluation criteria discussed in Section 14. Table 14-1 summarizes the costs for each alternative, and Table 14-2 summarizes each alternative's rating under the two threshold and five balancing NCP evaluation criteria.

Item	Reference or Phrase in ROD/RAP	Location in ROD/RAP	Identification of Referenced Document Available in the Administration Record[1]
25	petroleum corrective action	Section 2.9.2.2	Final Post-Construction Summary Report for Underground Storage Tank and Aboveground Storage Tank 240 Area Naval Station Treasure Island San Francisco, California. October 2013. Section 6.0.

Section 6. Corrective Action Summary and Conclusions

Based on the results of the construction activities and data analysis, the following summary and conclusions are presented for the UST/AST 240 corrective action.

- Construction activities were conducted from November 19, 2012 through April 12, 2013, in coordination with the Navy RPM, RASO representative, CSO representative, and ROICC representative.
- TtEC prepared a RMP, approved by RASO, to support the field activities, and an RCA was established for the project.
- Petroleum-impacted soil was excavated to a depth of 8 feet bgs, and 35 confirmation soil samples were collected.
- In total, approximately 800 cubic yards of petroleum-impacted soil was excavated from the UST/AST 240 Area and placed on five RSPs for radiological screening.
- Stringent radiological controls were followed during all field activities, in accordance with the RMP. No radiation readings were found above background levels or the specified release criteria in soil from the excavation and screened at the RSPs or in soil screened within the excavation.
- Residual fuel product was removed from the excavation via dewatering and absorbents. Approximately 525 gallons of residual product mixed with groundwater was stored in a holding tank, profiled, and disposed of as a nonhazardous waste at Filter Recycling Services, Inc. facility in Bloomington, California.
- In total, 1,206 tons of excavated soil was transported as a Class II nonhazardous waste for disposal at the Potrero Hills Landfill located in Suisun City, California.
- Excavations were backfilled and compacted to the near-surface. ORM was applied as an incidental treatment measure to the excavation as part of the backfilling process. The parking lot area was resurfaced with asphalt, and the fencing was restored.
- TtEC performed an exit radiological survey and down-posted the RCA boundary.
- Two new monitoring wells (06-MW25 and 06-MW26) were installed at the UST/AST 240 Area.
- Twelve confirmation soil samples contained one or more of the following COCs at concentrations exceeding the screening levels: TPH-g, TPH-d, ethylbenzene, naphthalene, benzo(a)pyrene, and dibenz(a,h)anthracene.

- The concentration ranges for most of the COCs decreased overall by one order of magnitude in the postexcavation samples compared to the preexcavation samples.
- The estimated mass of contaminants removed during the corrective action was 7,381 pounds of TPH, 6 pounds of benzene, and 39 pounds of ethylbenzene.

Based on the findings of the corrective action, most of the petroleum-contaminated soil in the UST/AST 240 Area was removed and the corrective action complied with SWRCB criteria to remove residual free product and secondary sources to the extent practicable; therefore, the site warrants future consideration for a "no further action" status from the Water Board under the petroleum program. Future groundwater monitoring of the new wells will be performed to document reduction of dissolved-phase petroleum constituents with time. Other actions necessary to support closure of the UST/AST 240 Area, in accordance with Water Board and SWRCB guidance and consistent with the planned recreational reuse of the site, will be performed through the CERCLA process.

ATTACHMENT C
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

TABLE C-1: FEDERAL AND STATE CHEMICAL-SPECIFIC[A] APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6,
Former Naval Station Treasure Island, San Francisco, California

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
SOIL				
Federal				
Resource Conservation and Recovery Act (Title 42 U.S.C. Chapter 82, §§ 6901-6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on 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	These regulations are applicable to activities that generate waste to determine if the waste is hazardous. The Navy will generate waste during excavation. The Navy will determine whether the waste meets the definition of RCRA hazardous waste when it is generated.
State				
Department of Toxic Substances Control[b]				
Definition of non-RCRA, state regulated hazardous waste.	Waste.	Cal. Code Regs. tit. 22, §§ 66261.3(a)(2)(C) or (a)(2)(F), 66261.22(a)(3) and (a)(4), 66261.24(a)(2) – (a)(8), and 66261.101	Applicable	These regulations are applicable to activities that generate waste to determine if the waste is non-RCRA, state-regulated hazardous waste. The Navy accepts the substantive provisions of these requirements as state ARARs and will determine if the excavated soil meets the definition of non-RCRA, state-regulated hazardous waste when it is generated.
State Water Resources Control Board				
Definition of designated waste and nonhazardous waste.	Waste.	Cal. Code Regs. tit. 27, §§ 20210 and 20220	Applicable	These regulations are applicable to activities that generate waste to determine if the waste is a regulated waste. The Navy accepts the substantive provisions of these requirements as state ARARs and will determine if the excavated soil meets these definitions when it is generated.

TABLE C-1: FEDERAL AND STATE CHEMICAL-SPECIFIC[A] APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6,
Former Naval Station Treasure Island, San Francisco, California

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Federal				
Resource Conservation and Recovery Act (42 USC, ch. 82, §§ 6901 through 6991[i])c				
Groundwater protection standards. Owners and operators of RCRA treatment, storage, or disposal facilities must comply with conditions in these sections that are designed to ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed concentration limits for chemicals 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 July 26, 1982, or regulated units that ceased receiving hazardous waste prior to July 26, 1982, where chemicals in or derived from waste may pose a threat to human health or the environment.	Cal. Code Regs, tit. 22, § 66264.94 (a)(1), (a)(3), (c), (d), (e)	Relevant and appropriate	There is no RCRA-regulated unit at Site 6; therefore, these standards are not applicable. These standards are relevant and appropriate for developing concentration limits greater than background for the shallow groundwater at Site 6. The Navy has used this ARAR to develop site-specific concentration limits greater than background (called groundwater remediation goals) in main text of the ROD. The groundwater remediation goals were developed for: (1) the protection of future construction worker dermal contact with groundwater and inhalation of volatiles in groundwater in a construction trench; and (2) for the protection of aquatic receptors in San Francisco Bay if contaminated groundwater discharges to surface water. Construction worker exposure to chemicals in groundwater and the potential for groundwater to discharge to surface water are the only complete pathways identified for groundwater that present unacceptable risk. The groundwater remediation goals are protective of these pathways.
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	The Navy will construct new groundwater wells as part of the groundwater remedy of ICs and groundwater monitoring. This will result in the generation of waste for off-site disposal. These regulations are ARARs for waste generated by the Navy in constructing the monitoring wells. The Navy will determine if the waste is RCRA hazardous at the time it is generated.

TABLE C-1: FEDERAL AND STATE CHEMICAL-SPECIFIC[A] APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6,
Former Naval Station Treasure Island, San Francisco, California

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
State				
State and Regional Water Quality Control Boards[c]				
Authorizes SWRCB and Water Board to establish, in water quality control plans, beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality.	Waters of the state.	California Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360	Applicable	The Navy accepts the substantive provisions of these sections of the California Water Code as enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirement, and promulgated policies of the San Francisco Basin Plan as ARARs.
Describes the water basins in the San Francisco Region, establishes beneficial uses of groundwater and surface water, and establishes WQOs, including narrative and numerical standards	Waters of the state.	Comprehensive Water Quality Control Plan for the San Francisco Region (Basin Plan) Chapters 2 and 3 (California Water Code §13240), except the MUN designation	Applicable	The Navy accepts the substantive provisions of Chapters 2 and 3 of the Basin Plan, except the MUN designation, are ARARs. Groundwater at NAVSTA TI is not currently being used as a source of drinking water. According to the Basin Plan, which incorporates SWRCB Resolution 88-63, groundwater at NAVSTA TI is not a potential source of drinking water because naturally occurring TDS concentrations render it unlikely to be used in the future as a potential source of drinking water. The only beneficial use of groundwater at NAVSTA TI is freshwater replenishment of San Francisco Bay.
Designates all groundwater and surface waters of the state as drinking water, except where total dissolved solids are greater than 3,000 parts per million, the well yield is less than 200 gallons per day 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.	Waters of the state.	SWRCB Resolution 88-63	Applicable	The Navy accepts the substantive provisions of SWRCB Resolution 88-63 as ARARs for the groundwater at Site 6. In a letter dated January 2001, the Water Board determined that groundwater at NAVSTA TI is not a potential source of drinking water pursuant to SWRCB Resolution 88-63.

TABLE C-1: FEDERAL AND STATE CHEMICAL-SPECIFIC[A] APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6,
Former Naval Station Treasure Island, San Francisco, California

Notes:

a	Many action-specific ARARs contain chemical-specific limitations that are addressed in the action-specific ARAR tables.
b	Only the substantive provisions of the requirements cited in this table are ARARs.
c	Statutes and policies, and their citations, are provided as headings to identify general categories of 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 ARARs. Specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.
§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal. Code Regs.	California Code of Regulations
Div	Division
MUN	Municipal
NAVSTA TI	Naval Station Treasure Island
RCRA	Resource Conservation and Recovery Act
POC	Point of compliance
SWRCB	State Water Resources Control Board
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids
tit	Title
U.S.C.	United States Code
WQO	Water quality objective

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements

Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SOIL REMEDY: EXCAVATION AND OFF-SITE DISPOSAL AND ICs					
EXCAVATION					
Federal					
Resource Conservation and Recovery Act (Title 42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
On-site generation of waste	Person who generates waste shall determine if the waste is a hazardous waste	Generator of waste.	Cal. Code Regs. tit. 22, §§ 66262.10(a), and 66262.11	Applicable	These regulations are applicable to any operation that generates waste. The Navy will generate waste during excavation. The Navy will determine whether the waste is RCRA hazardous waste when it is generated.
On-site generation of waste	Requirements for analyzing waste for determining whether waste is hazardous	Generator of waste.	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable	These regulations are applicable to any operation that generates waste. The Navy will generate waste during excavation. The Navy will determine whether the waste is RCRA hazardous waste when it is generated.
Stockpiling soil for off-site disposal	Allows generators to accumulate solid remediation waste in an EPA-designated pile for storage only up to 2 years during remedial operations without triggering LDRs	RCRA hazardous waste temporarily stored in piles.	40 CFR, § 264.554(a), (d), (g), (h), (i), (j), and (k)	Relevant and appropriate	The Navy will temporarily stockpile excavated soil in staging piles for off-site disposal. The Navy does not anticipate that all excavated soil will be RCRA hazardous waste; however, the Navy has determined that these requirements are relevant and appropriate for all stockpiled soil.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Clean Water Act of 1977, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[b]					
Excavation	Owners and operators of construction activities must be in compliance with discharge standards, including substantive provisions of the general requirements for storm water plans and BMPs	Construction activities at least 1 acre in size.	Clean Water Act § 402, 40 CFR § 122.44(k)(2) and (4)	Applicable	Pursuant to CERCLA § 121(e), on-site response actions are exempt from permit requirements, including an NPDES permit. The excavation will disturb more than 1 acre; however, since the construction activity will take place as part of a remedial action within Site 6, the Navy will not get an NPDES permit. The Navy will implement the substantive provisions of state general stormwater discharge permit, Orders 2009-0009-DWQ as amended by 2010-0014-DWQ (adopted pursuant to Clean Water Act § 402), to comply with the federal Clean Water Act ARARs and water quality state ARARs for discharge to surface water. The federal and state ARARs require best management practices and a storm water plan to meet the substantive numeric effluent limit and action level requirements.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
State					
State Water Resources Control Board					
Excavation and off-site disposal of soil	Dischargers shall be responsible for accurate characterization of wastes	Waste.	Cal. Code Regs. tit. 27, § 20200(c)	Applicable	The Navy accepts the substantive provisions of these requirements as ARAR for operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.
Off-site disposal of soil	Requires that designated waste as defined at Cal. Water Code § 13173 be discharged to Class I or class II waste management units	Discharge of designated waste after July 18, 1997 (nonhazardous waste that could cause degradation of surface or ground waters), to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20210	Applicable	The Navy accepts the substantive provisions of these ARARs for operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.
Off-site disposal of soil	Requires that nonhazardous solid waste as defined at § 20220(a) be discharged to a classified waste management unit	Discharge of nonhazardous solid waste after July 18, 1997, to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20220(b), (c), and (d)	Applicable	The Navy accepts the substantive provisions of these ARARs for operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
INSTITUTIONAL CONTROLS					
State					
California Civil Code[a]					
Land use controls	Provides conditions under which land use restrictions will apply to successive owners of land	Transfer of property from the Navy to a non-federal agency.	Cal. Civil Code § 1471	Relevant and Appropriate	The Navy accepts the substantive provisions of this statute as ARARs for the implementation of ICs for soil at Site 6. This section is an ARAR because Site 6 is federal land that may be transferred to a non-federal agency. The substantive provisions of this statute are to create a covenant that runs with the land that requires subsequent owners "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 of 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 standards will be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer.
Land use controls	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses	Transfer of property from the Navy to a non-federal agency.	Cal. Health & Safety Code § 25202.5	Relevant and Appropriate	The Navy accepts the substantive provisions of this statute as an ARAR for the implementation of ICs for soil at Site 6. This section is an ARAR because Site 6 is federal land that may be transferred to a non-federal 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 . . ."

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land use controls	Provides a streamlined process to be used to enter into an agreement to restrict present and future uses of property	Transfer of property from the Navy to a non-federal agency.	Cal. Health & Safety Code §§ 25221 and 25355.5(a)(1)(C)	Relevant and Appropriate	The Navy accepts the substantive provisions of these statutes as ARARs for the implementation of ICs for soil at Site 6. This section is an ARAR because Site 6 is federal land that may be transferred to a non-federal agency. Generally, Cal. Health & Safety Code §§ 25221 and 25355.5(a)(1)(C) provide the authority for 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 § 25221 provisions are relevant and appropriate: the general narrative standard "restricting specified uses of the property…" and "…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination of these servitudes, 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 site."

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land use controls	Provides processes and criteria for obtaining written variances from a land use restriction and for removing a land use restriction	Transfer of property from the Navy to a non-federal entity.	Cal. Health & Safety Code §§ 25223(c) and 25224	Relevant and Appropriate	The Navy accepts the substantive provisions of these statues as ARARs for the implementation of ICs for soil at Site 6. Cal. Health & Safety Code § 25223(c) sets forth substantive criteria for granting variances from land use restrictions based on specified environmental and health criteria. Cal. Health & Safety Code § 25224 sets forth the 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."
California Environmental Protection Agency, Department of Toxic Substances Control[a]					
Land use controls	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 that are not suitable for unrestricted use of the land.	Transfer of property from the Navy to a non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1(a) and (e)(1)	Relevant and Appropriate	The Navy accepts the substantive provisions of this regulation as ARARs for the implementation of ICs for soil at Site 6. 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 ARARs by the Navy. EPA Region 9 agrees that the substantive portions of the State regulation referenced in this section are ARARs. EPA Region 9 specifically considers subsections (a), (b), (d), and (e) of Cal. Code Regs., tit. 22 § 67391.1, to be ARARs. DTSC's position is that all of the regulation is an ARAR.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
GROUNDWATER REMEDY: ICs AND MONITORING					
The ARARs for groundwater ICs are the same as the ARARs identified for soil ICs					
Federal					
Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901-6991[i]) [b]					
Monitor groundwater	Chemicals of concern are the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from the waste contained in the regulated unit.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22, § 66264.93	Relevant and appropriate	The Navy has identified these requirements as ARARs for groundwater monitoring. These requirements are applicable to RCRA hazardous waste facilities and there are no RCRA hazardous waste facilities at Site 6. However, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of the remedy.
Monitor groundwater	Owner or operator of shall establish a groundwater monitoring system for each regulated unit and include a sufficient number of monitoring points installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the POC.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(D)(1) and (b)(1)(D)(2)	Relevant and appropriate	The Navy has identified these requirements as ARARs for groundwater monitoring. These requirements are applicable to RCRA hazardous waste facilities and there are no RCRA hazardous waste facilities at Site 6. However, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of the remedy.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Monitor groundwater	Requirements for monitoring well construction and sampling intervals	RCRA hazardous waste management unit	Cal. Code Regs. tit. 22, § 66264.97(b)(4), (5), (6), and (7)	Relevant and appropriate	The Navy has identified these requirements as ARARs for groundwater monitoring. These requirements are applicable to RCRA hazardous waste facilities and there are no RCRA hazardous waste facilities at Site 6. However, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of the remedy.
Monitor groundwater	Requirements for collecting samples.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22, § 66264.97(e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	Relevant and appropriate	The Navy has identified these requirements as ARARs for groundwater monitoring. These requirements are applicable to RCRA hazardous waste facilities and there are no RCRA hazardous waste facilities at Site 6. However, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of the remedy.
Monitor groundwater	Requirements for a detection monitoring program	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.98(e) (1) through (5)	Relevant and appropriate	The Navy has identified these requirements as ARARs for groundwater monitoring. These requirements are applicable to RCRA hazardous waste facilities and there are no RCRA hazardous waste facilities at Site 6. However, the Navy has determined that they are relevant and appropriate to the groundwater monitoring component of the remedy.

Table C-2: Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)

Record of Decision/Final Remedial Action Plan for Installation Restoration Site 6
Former Naval Station Treasure Island, San Francisco, California

Notes:

a	Statutes and policies, and their citations, are provided as headings to identify general categories of 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 ARARs. Specific ARARs follow each general heading, and only substantive requirements of the specific citations are considered ARARs.
§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
Cal.	California
Cal. Code Regs.	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DTSC	Department of Toxic Substances Control
DWQ	Department of Water Quality
EPA	U.S. Environmental Protection Agency
LDR	Land use restrictions
POC	Point of compliance
RCRA	Resource Conservation and Recovery Act
tit.	Title
U.S.C.	United States Code

ATTACHMENT D
PUBLIC MEETING NOTICE AND PUBLIC MEETING TRANSCRIPT

(*Provided on CD*)

Attachment E Public Meeting Notice and Public Meeting Transcript

SAN FRANCISCO PUBLIC NOTICES

This Notice contains important information that may pertain to you. Under the Settlement Agreement in Shemaria v. County of Marin, No. CV 082718, County of Marin has agreed to spend $15 million, with a minimum allocation of one million dollars annually, to improve programmatic access for persons with mobility disabilities, at all County facilities. In exchange, class members who are all members with mobility disabilities will release the County of Marin from all claims for injunctive or declaratory relief that they may have against the County for its alleged failure to make County owned or maintained facilities accessible to persons with mobility disabilities.
On June 3, 2008, Plaintiffs filed this class action lawsuit for declaratory and injunctive relief against the County of Marin claiming its facilities were not accessible to persons with mobility disabilities. The Superior Court has now granted preliminary approval of the proposed class settlement in this case.. The general terms of the proposed settlement are laid out in the Notice which can be accessed at http://maringovstg.marinpublic.com/main/shemaria-class-action-lawsuit, or via request at Schneider Wallace Cottrell Konecky LLP, 180 Montgomery Street, Suite 2000, San Fransisco, CA 94104, tel. (415) 421-7100, fax. (415) 421-7105, attention Sam Marks, or the Office of the County Counsel, 3501 Civic Center Drive, Suite 275, San Rafael, CA 94903, tel. (415) 473-6117, fax. (415) 473-3796. The Court has ordered a Fairness Hearing for April 9, 2014 at 8:30 am. All class members who wish to object to the settlement must do so by April 3, 2014.
Para ver este aviso en espanol, se puede visitar http://maringovstg.marinpublic.com/main/shemaria-class-action-lawsuit o llamar a Rebecca Rosales, (415) 421-7100, o Sheila Lichtblau, (415) 473-6117.

SAN FRANCISCO PUBLIC NOTICES

NOTICE OF AVAILABILITY OF PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN AND PUBLIC COMMENT PERIOD FOR SITE 6
FORMER NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA
The Department of the Navy, in coordination with state (Department of Toxic Substances Control [DTSC] and Regional Water Quality Control Board) and federal environmental regulatory agencies, encourages the public to comment on the Proposed Plan/Draft Remedial Action Plan (RAP) for Installation Restoration Site 6, at the former Naval Station Treasure Island in San Francisco, California. Comments may be submitted in writing during the public comment period or may be presented verbally or in writing at the public meeting.
Site 6 is located in the northeastern portion of Treasure Island. The Proposed Plan/Draft RAP summarizes the remedial alternatives the Navy evaluated and explains the basis for identifying the preferred alternative to address contamination at Site 6. The Navy's preferred remedial alternative is to remove and dispose of contaminated soil in selected areas; conduct groundwater monitoring, and implement institutional controls.
PUBLIC COMMENT PERIOD
The Navy invites interested members of the public to review and comment on the Proposed Plan/Draft RAP during the 30-day public comment period from February 28, 2014 through March 31, 2014. Public comments must be submitted in writing and postmarked or e-mailed no later than March 31, 2014. Please send comments to Mr. Keith Forman, BRAC PMO West, 1455 Frazee Road, Suite 900, San Diego, California 92108-4310, keith.s.forman@navy.mil, fax (619) 532-0995.
CALIFORNIA ENVIRONMENTAL QUALITY ACT
Pursuant to the California Environmental Quality Act (CEQA), DTSC, as the state lead agency, has prepared a Notice of Exemption, having determined that the proposed project for the approval of the Proposed Plan/Draft RAP for Site 6, where Institutional Controls are proposed, has no potential for a significant impact on the environment. The draft Notice of Exemption is also available for review during the public comment period at the locations listed below. Please send comments related to CEQA to Ms. Remedios Sunga, DTSC Project Manager, 700 Heinz Avenue, Suite 200, Berkeley, California 94710, rsunga@dtsc.ca.gov, (510) 540-3840.
PUBLIC MEETING
The Navy will host a public meeting to present the Proposed Plan/Draft RAP and will accept verbal and written comments at the meeting. The Navy will conduct a formal presentation at 6:30 p.m. This presentation will be followed by an open house until 8:30 p.m., when you can view information displays at your own pace and speak one-on-one with representatives of the Navy and the regulatory agencies.
Date: Wednesday, March 12, 2014
Time: 6:30 p.m. to 8:30 p.m. Location: Casa de la Vista
191 Avenue of the Palms, Building 271
Treasure Island, San Francisco, California
FOR MORE INFORMATION
The Proposed Plan/Draft RAP is available on the Navy Base Realignment and Closure Program Management Office website, www.bracpmo.navy.mil. The Proposed Plan/Draft RAP and other site documents, including the Feasibility Study and Remedial Investigation Report, are available for review at:
San Francisco Public Library
Government Publications Section
100 Larkin Street
San Francisco, CA 94102
(415) 557-4400 Navy BRAC Caretaker Support Office
1 Avenue of the Palms, Suite 161
Treasure Island
San Francisco, CA 94130-1806
(415) 743-4729 DTSC File Room
700 Heinz Avenue
Berkeley, CA 94710
(510) 540-3800
(Call for an appointment)
All documents are also available on DTSC'S Envirostor webpage: www.envirostor.dtsc.ca.gov/public
Enter "San Francisco" for the City, click "Get Report," then click "Report" next to "Naval Station Treasure Island/Site 6".
TDD users can obtain additional information about the Naval Station Treasure Island by using the California State Relay Service (1-888-877-5378) to reach Radhika Majhail at (916) 255-6681.

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SAN FRANCISCO PUBLIC NOTICES

Candlestick Point in San Francisco Opportunity to Perform ENVIRONMENTAL ASSESSMENT during the development of CANDLESTICK POINT in San Francisco.
Lennar Urban is requesting qualified, interested construction firms to respond to a public request for proposals to perform environmental assessment for Candlestick Point Redevelopment. For more information, please visit:http://mission.sfgov.org/OCABidPublication/BidDetail.aspx?K=7728
The Successor to the San Francisco Redevelopment Agency (SFRA) has established the 50% Small Business Enterprise (SBE) Participation goal for Construction Subcontracting. Respondents are encouraged to check this website regularly for updates.Pre-Bid Coordination Meeting: February 26th at 10:00 AM Candlestick Park Conference Room 450 Jamestown Ave Room #397 San Francisco, CA 94124 Proposals must be submitted by March 13, 2014 @ 2:00 PM (PST).

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SAN FRANCISCO PUBLIC NOTICES

Candlestick Point in San Francisco Opportunity to PerformDEMOLITION, MASS GRADING & SURCHARGE during the development of CANDLESTICK POINT in San Francisco.
Lennar Urban is requesting qualified, interested construction firms to respond to a public request for proposals to perform demolition, mass grading and surcharge services forCandlestick Point Redevelopment Subphase CP-01 Stage 1. For more information, please visit:http://mission.sfgov.org/OCABidPublication/BidDetail. aspx?K=7694
The Successor to the San Francisco Redevelopment Agency (SFRA) has established the 50% Small Business Enterprise (SBE) Participation goal for Construction Subcontracting. Respondents are encouraged to check this website regularly for updates.Pre-Bid Coordination Meeting and Job Walk: February 18th at 10:00 AM Building 101
101 Horne Ave.
Hunters Point Shipyard
San Francisco, CA 94124
Proposals must be submitted by March 4, 2014.

FICTITIOUS BUSINESS NAME STATEMENT FILED NO. A-0355677-00. The following is doing business as ARCHETYPE DESIGN 2940 16th #216 St. San Francisco, CA 94103. The business is conducted by an individual. Registrant commenced business under the above-listed fictitious business name on: N/A. This statement was signed by Jesse Van Fleet. This statement was filed by Jennifer Wong, Deputy County Clerk, on 1/03/2014.
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PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN

INSTALLATION RESTORATION SITE 6

REPORTER'S TRANSCRIPT OF MEETING

MARCH 12, 2014

191 Avenue of the Palms, Treasure Island
Casa de la Vista, Building 271
San Francisco, California

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

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A T T E N D E E S

FACILITATOR:

KEITH FORMAN - United States Navy

SPEAKERS:

BRYCE BARTELMA - U.S. Navy

RADHIKA MAJHAIL - Department of Toxic Substances Control (DTSC)

CONSULTANTS, REGULATORS, UNITED STATES NAVY:

DAVID CLARK - U.S. Navy

YASHEKIA EVANS - Tetra Tech, Inc.

DENNIS KELLY - Tetra Tech, Inc.

COLIN LEE - Tetra Tech, Inc.

REMEDIOS SUNGA - DTSC

TOMMIE JEAN VALMASSY - Tetra Tech, Inc

MYRIAM ZECH - San Francisco Bay Regional Water Quality Control Board

---oOo---

PUBLIC AUDIENCE ATTENDEES:

BOB BECK - Treasure Island Development Authority (TIDA)

AARON DALUGDUG - ImageSource

MIKE DALY - Community groups

CAROL HARVEY

KEN LOMBARDI - San Francisco Fire Department

KATHRYN LUNDGREN - Treasure Island Health Network, resident

ANDREA McHENRY - TI resident

C. RAIN - Langan Treadwell Rollo

GLENDA WILLIAMS

---oOo---

TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

WEDNESDAY, MARCH 12, 2014, 6:41 P.M.

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MR. KEITH FORMAN: Okay. I want to welcome everybody here today. Thank you. The Navy appreciates you on your off time coming to this meeting. This an important meeting in the Naval Station Treasure Island environmental cleanup program for the Navy.

First off, we're here because this is a public meeting for the Proposed Plan and Draft Remedial Action Plan for Site 6. Site 6 used to be the former fire training school at former Naval Station Treasure Island.

I'd like to introduce a few folks that are up in the front of the room here tonight. First of all, we have Dave Clark. Dave Clark is the lead program manager for the entire environmental program at Treasure Island. And then you have Bryce Bartelma. Bryce is the project manager for Site 6 that we're discussing tonight.

And then at this table, we have California State regulators, and I'll let them introduce themselves.

MS. MAJHAIL: Hi. I'm Radhika Majhail. I am public participation specialist with Department of Toxic

Substances Control and welcome tonight's meeting.

MS. SUNGA: Hi. I'm Medi Sunga, or Remedios Sunga, my full name; and I'm the project manager for Treasure Island environmental cleanup.

MR. FORMAN: Thank you.

MS. ZECH: I'm Myriam Zech with the Water Board.

MR. FORMAN: Great. Thank you.

Okay. So we have our two California state agencies here with the Navy.

And I'd like to also introduce Dennis Kelly. Dennis Kelly works with Tetra Tech, and he works very closely with Bryce on this project. He's our point contact for the contractor.

And then we have tonight the unsung hero of this meeting. Her name is Christine. Christine is taking down a recording of the meeting, and her fingers work very busily throughout the night.

So while I'm on the topic, I'd like to say, myself included, perhaps most of all, to talk slowly and clearly so that Christine can get you down into the transcript that she's required to hold for the meeting tonight. It's very important that she have a complete transcript, and so we need to work with her. And then if the meeting does go past a certain point tonight,

then we'll take a break for Christine's benefit.

Okay. So we're here tonight for the Site 6 Proposed Plan meeting. I'm hoping many of you got a chance to look. We have got seven blowup posters around the room, and that takes parts of our Proposed Plan document and shows it to you.

This [indicating] is the copy of the Proposed Plan that you may have received in the mail -- I hope you do -- or saw it on our Web site where it's been posted. This Proposed Plan document again pertains to Site 6, and we're going to talk about all of that tonight.

Okay. So first this is the agenda tonight. This is not carved into stone. This is based on community input, public input, and how it goes tonight. And we'll adjust the schedule to accommodate all of you.

But this is just generally the flow of things. I'm going to -- I'm in the midst of a welcome right now, the introductions; and then I'm going to go over a few -- a few rules that we must live by for this meeting tonight.

And then we're going to have the main presentation, which is basically Bryce and I and Radhika talking about this Proposed Plan for Site 6 and the Draft Remedial Action Plan, which is the California

version of that.

And then we will open it up for requests for public comments. This is very important because this meeting is a requirement under the law for the Navy to hold, and we must talk about Site 6 exclusively during our presentation in this meeting.

And then I'm asking all of you to only comment on Site 6 during this part of the agenda. The reason for that is: We are required by law to take down comments specific to the Site 6 Proposed Plan, and then we're required by law to take down each of these comments and respond to them. And that becomes part of the permanent public record.

And when we go to the next step, which is called the Record of Decision, you will see -- if you make a comment, you will see your comment in that document and the official Navy response to it. We are required to do this, and that's why we welcome you here. You can make as many comments during this part of the meeting as you want on Site 6.

And again, the Navy is required to come back and respond to you in writing in the document. And so it's a very important part of the document, and we can't go on without this.

Now, after that we will go to what we call the

open house with public comments. At that time, we can do this a number of different ways.

I'm allowed to adjourn the meeting if everyone has their comments for the record, and then we can go -- and you can talk about any topic you want while we're here to -- with us, with any of the regulators that are here or any of the Navy members that are here. And that's not part of Christine's transcripts, per se.

But many of you come, I know, for specific questions that pertain to your interests, right? And you may have come here tonight because you were available to, and I want to be able to talk to you about that interest even if it's outside the scope of this meeting.

But to do that I really need to do it right. I need to adjourn the meeting, and then we can go to just basically an open house and talk about your specific comments if they're leading in a different direction, which is fine.

Okay. So there's a couple things here. Before we get into that -- the meat of the presentation about Site 6, a couple little rules.

We -- we really want your input. There's a couple of different ways to do this. You can always E-mail me, and I'll have my points of contact at the end

of this presentation along with Medi Sunga's point-of-contact information. You can reach out to either of us and -- via E-mail and have your comments for Site 6.

Or you can submit -- you can submit comments tonight, written comments with this form that's available at the back table. If you want assistance on that, Tommie Jean, who's at the back of the room there, can help you with this. And then we can capture your written comment if you don't wish to give your comment to us verbally.

And then lastly -- and this is really the core of this meeting -- is if you wish to let the community know, let stakeholders like Mr. Bob Beck in the audience know, let the regulators and the Navy know, you can come up to this podium. Please speak into the mic, and give us your comment and/or your question for the record.

And then Christine, of course, will have that in the transcript, and that will become part of the permanent record for our Record of Decision for Site 6, which is the next step in the process.

I do ask, though, when you come to the microphone that you speak clearly and slowly, and state your name first; and then you can move forward with your comment or your questions so that she can really

carefully get that down. It is required that she do that for this meeting.

Okay. Think I've covered everything. So we'll begin the presentation now on Site 6. This will consist of three speakers: Myself, Bryce, who's the project manager, and then Radhika, who's going to talk about the California portion of this.

As you may know, the U.S. Navy is a federal agency. We're part of the federal government, and we have federal requirements.

But we work very closely -- we're required to work very closely with the State of California, and they have a separate set of requirements. And the Navy on Treasure Island is required to meet both the federal and the state requirements, and Radhika will enlighten us on that part of the program tonight.

Okay. So here's some of the laws affecting the cleanup at Treasure Island. We are -- we are governed by federal and state laws. There's also local laws that apply. But for the purposes of this document, it's federal and state laws where the Navy is the lead agency federally.

And we work under something called the Comprehensive Environmental Response, Compensation, & Liability Act, very long name. CERCLA is known to the

public as -- generally speaking, as Superfund law. Okay?

So we conduct our environmental program. The titles of our documents, the way we do it step by step, is governed by this Superfund law known as CERCLA. And it requires cleanup of past sites, such as former Naval Station Treasure Island.

And a critical part of this process has to do with the public. The -- the law when it was written focused public comment on the Proposed Plan stage, right where we're at now at Site 6, the Proposed Plan stage in the whole cleanup process. And it's very important that we get your input on Site 6 Proposed Plan because of that.

Now, Radhika will go into some more detail here. But this lead state agency is the California Department of Toxic Substances Control. They are known to many people just as one of the major branches of the California EPA, the state's version of the Environmental Protection Agency. And they require something called a Remedial Action Plan, a RAP, and Radhika will talk a little bit about that.

Okay. So the thing about Superfund law is it was enacted in 1980, and it requires the cleanup of past waste sites; and it provides a path forward to do that.

And those of you that have attended many of our meetings and know about our process, people like Kathryn Lundgren who's here tonight, knows that there's a certain process that we have in place. And Site 6 follows this process, which means it is a CERCLA site on former Naval Station Treasure Island.

So the process really leads up to the decision-making about how to clean up a waste site, a past waste site, okay?

And the Proposed Plan is at the part where you have all these alternatives that have been laid out and analyzed, and now it comes down to selecting which one of these alternatives or which combination of the alternatives are we going do to clean up this particular site.

And that's where we are at now, and that's why we need your help with the public -- the community input to help guide the decision, both for the regulators to guide their decision and the Navy to guide theirs, before we can make a decision in the next document, which will be a Record of Decision.

So some of the requirements for public outreach include some of the things that we have just talked about.

There's a Proposed Plan, which if you don't

have an electronic copy or a written copy from the mail, Tommie Jean has copies at the back table there, and that's available for you. You can take that with you after this meeting.

And hold a public meeting. The public meeting requirement, which we're doing tonight, is that there's a specific public meeting on this document, the Proposed Plan, on this site, Site 6, where the Navy is not allowed to combine it with a Restoration Advisory Board meeting or another community meeting that we're having. We are required to have a standalone meeting, and that's why we're meeting tonight on the Proposed Plan; and that's why it's also important at least during the first part of this meeting that your comments be directed on the record about this site.

And then the public comment period on the Proposed Plan. The public comment period for this Proposed Plan ends on March 31st, which is a Monday. And you need to have your comments in either via postmark date if you go snail mail or just an E-mail to me by midnight on the 31st or an E-mail to Medi.

And then we will compile all those. And then again, the Navy is required to answer every one of them and put them in the Record of Decision.

Okay. So in this process, Site 6 followed the

regular CERCLA process. As you can see here [Slide 5], there's all these different types of documents.

We did investigation here -- it's called a site inspection -- where we gathered some data. And then we basically moved on to a remedial investigation where we collected a lot more data, and we did a risk assessment and a Feasibility Study.

And then we moved forward to looking at all the data and proposing -- and looking at the alternatives that were presented in the Feasibility Study, the second part of this document.

We have now made our tentative choices in the Proposed Plan, saying we think these are the preferred ways to go. And basically we're saying, What do you think? And that's part of what this meeting us -- serves us is to give us a better idea what do you think about the choices that we've made.

And then you have to finally make a decision, and that's in the Record of Decision. But part of the Record of Decision it's required to, again, document your comments here tonight or any comments you send to me by March 31st, and then we're required to respond to those and address those concerns.

And then the regulators have to review that and the Navy has to review that before we finalize our

Record of Decision on how to clean up this particular site.

And then from there then we create a design as to how to do what we said we would do, and then we go out in the field to do it, which is called remedial action implementation. And then we have to document it, and then we have to continue to maintain it.

Okay. Okay. And then I'm going to -- now I'm going to turn it over to Radhika who's going to talk to you a little bit about State of California.

Oh, I'm sorry.

MS. MAJHAIL: Thank you, Keith.

Good evening, everybody. I'm Radhika, and I'm going to talk to you about the California requirements.

Today we are going to talk about California Environmental Quality Act, or CEQA. Now, what does CEQA do, or what does it entail?

It actually requires all the government agencies and public agencies to examine and to do environmental studies to make sure, you know, there are no impacts or whatever impacts. If there are any, what impacts are going to happen due to this project? So if this project is being cleaned up, what impacts will that cleanup bring to the community and how they're -- or how would that impact the environment?

So for this project, we did -- DTSC did go ahead and did conduct a CEQA study, and we are proposing that it is Negative Declaration, which means that there is no significant impact to the environment because of this cleanup for Site 6 Proposed Plan.

And this document, the CEQA Negative Declaration, or it's in short you might have heard the term Neg. Dec, this is also available for public review. So it's out for public review right now during the public comment period. So it is available for public to comment on it.

Again, it is a 30-day comment period, and the comment period started on February 28th through March 31st. And please send in your comments on the Proposed Plan as well as the CEQA document to either Keith or Medi and by -- by the dead -- by the March 31st.

MR. FORMAN: Okay. Thank you, Radhika.

Okay. So what the Proposed Plan does -- and you can see this on -- we'll do a couple slides on it, but also you can see it here -- we have groundwater, which is water underneath the ground, that is one of the areas that had contamination that we had to address; and then we have the soil.

This is very typical at sites, to separate the

choices that you have between groundwater and soil. So you list the different choices that we have analyzed, and then you can see which ones we have selected as what we believe are the preferred alternatives for this site. Okay?

And again, you can submit comments during this 30-day public comment period, which ends now on March 31st. You might wonder, well, we're already into the comment period then. And one of the things that's recommended is to hold the meeting about close to the midpoint of the public comment period; and again, that's why we selected March 12th here.

MS. ZECH: Why is that? I'm sorry. Why is it recommended that it's held in the middle?

MR. BARTELMA: So that folks get an opportunity to review the materials; and if they have come to the public meeting, they have a chance to ask questions.

MS. ZECH: Thanks.

MR. FORMAN: Okay. Thank you. Okay?

So here is -- first of all, I'm going to start very generally, and then we will move to much greater detail with Bryce, the project manager.

But in general, if you wanted to know essentially the summary of what the Navy's chosen to do is we're going to remove and dispose of contaminated

soil in selected areas that we'll show you on the site that have contaminants that we believe the best solution again is to -- we have the data. We know where they are at. We would go there, dig them up, and remove them, transport them off the site.

Also, we believe that we need to conduct some groundwater monitoring. We've done other actions on this site that Bryce can talk about prior to today's date that we have accomplished. But we believe that what we need to really do for the groundwater is basically do continuing monitoring at this point.

And then we're going to use something very common at really the vast majority of our sites include things called institutional controls nowadays. And at Site 6, we are recommending some institutional controls.

An example of that is when we finish the cleanup and determine that it's successful, we're going to have an institutional control, which is like a rule, right, or a restriction on a property, such as you're not allowed to dig drinking water wells and pump wa- -- drinking -- and use the wells -- well water for drinking water on this site. You're not allowed to do that. That would be one of the restrictions, for instance, that we would put on a piece of property.

And we'll have institutional controls on this property as well. It will restrict it to specific land uses and certain activities that you can use the property for. And Bryce will go into the details of that.

Bryce?

MR. BARTELMA: Okay. Thank you.

And hello, everyone. Again, I'm Bryce Bartelma and project manager for the Navy on Site 6 here at TI.

And you can see Site 6 is up here in the northeast portion of the site. It's this area outlined in blue [Slide 11]. It was, as Keith said, a former firefighting training area. So that's the aerial photo of the site, and to the right is a photo of what it looks like if you were to drive by today. It's basically an empty lot. Some parts are paved; some parts aren't.

In the background there, you can see where there's a building. That's actually not part of Site 6. I think it's Building 461. And -- and to the right of it, which would be to the south of it, you can kind of catch a glimpse of the wastewater treatment facility.

Okay. So as I mentioned, it was used for firefighter training. And so when that -- when you

think about that, what comes to mind for me is fire and water, right? They start fires. They extinguish them. They -- they practice firefighting and -- and that sort of thing. So the site was used for that pur- -- type of purpose for almost 50 years, quite a long time.

And again, when I think of fires, I think, well, you take wood, and you start a fire, and you put it out. They could have used wood. They could use diesel. They could use oil, anything that would burn and combust so that they can practice their techniques.

The majority of the work occurred -- or the training, I should say, occurred in the main yard area, which is essentially this portion [indicating] of the site.

And as I mentioned for burning gasoline or diesel or whatever the -- the petroleum fuel was, they would have to store all those materials on site as well. So there was, I think, seven USTs, ASTs, underground storage tanks, aboveground storage tanks, that were on the site that they held the materials that they would use to start these fires and then extinguish them.

And also for the site, in 1993 all of the buildings were demolished, and that's why you saw the one photo showing it just as a blank, vacant lot.

Okay. So we have something that's called the site model, and essentially what that is is a three-dimensional picture of the site with all the features shown on it, past features, buildings, tanks, et cetera; and I say three dimensional too because we not only look into the ground surface, but we also look subsurface for contamination in the soil and groundwater.

And just really briefly I wanted to just point out that this -- the blue dashed line is what we represent as the water table. It's about 5 or 6 feet below the ground surface. The soil goes from being unsaturated to saturated.

And when we have a site model, what we're looking for is when we put all the site features on there and we know where there is contamination area, does it all make sense? Is what we're doing seem appropriate for what the past land use was? And with regard to Site 6, it actually all does.

So we have these former tank locations across the site, and we have petroleum contamination in those tank areas, which that makes sense, right? If there was tanks there and they had a spill or perhaps a leak from the tank, we would expect to find contamination in those areas.

Okay. Nature and extent of contamination. I've kind of hit on some of this already with the petroleum. There's two main areas in Site 6 where we found soil contamination; and, of course, it's where those tank locations were.

And then in addition to the soil, the petroleum that was either spilled or leaked from the tanks would have gone through the unsaturated zone of the soil and hit the water table. And petroleum by nature is just lighter than water, so it will sit on that water surface and spread out that way. So we expect to find petroleum in groundwater or saturated soil right at that interface, about 5, 6 feet below ground surface.

Another -- Other chemicals for the site. And this is primary the one we're tackling going forward. Dioxins were found, which -- what are dioxins? They are a by-product of combustion.

So let's say you have fire, and there's a soot material, say, from wood or from oil or whatever. There -- That's the by-product 'cause it creates dioxins.

And so using the site model, if they had a fire at the ground surface; they put it out; there was some soot on the ground, we would expect to find dioxins in the shallow soil. And that's exactly what we have. The

dioxins are found in the near surface soil at the site.

And then in isolated locations, we have a few other chemicals, for example, an herbicide and some metals. With regard to soil gas, we've actually -- there's no major soil gas concerns for Site 6. And then in groundwater we have identified that there are petroleum impacts, but we did determine that there's no significant migration to the bay. So that's a positive for Site 6 as well.

Okay. And this is just a figure [Slide 15] showing some of the areas -- it's very general -- at Site 6 where we found these areas of dioxins and petroleum, et cetera.

ANDREA McHENRY: Is that the green?

MR. BARTELMA: Actually, I should point that out. These areas of orange are former excavation areas. These arrows are kind of generally pointing to where we found the remaining contamination at the site.

In a couple slides -- maybe in the next slide -- we'll talk a bit about the historical work that's been done at Site 6 because it's been a site for, I want to say, 20 years; and a lot of work has been done to date. So we're primarily in the seventh inning. We're near the -- finishing the work at Site 6.

And there it is [Slide 16]. So starting in

1986, the site was discovered for petroleum compounds that were in the soil and groundwater. All seven tanks were removed in the '90s. And there's been some cleanup work in 2002, 2003; and about that time is when we discovered the dioxins in the burned materials in the shallow soil.

MS. McHENRY: What year?

MR. BARTELMA: So --

I'm sorry?

MS. McHENRY: What year was that?

MR. BARTELMA: It would have been around 2003 is when the additional site investigations occurred.

So there's been follow-on investigations since then. We've discovered that there was additional contamination at UST 240 area, which -- we have a figure handy? -- it was in the -- this area up here [indicating] is the UST 240 area.

This [indicating] is 240 -- UST 240 area. Extensive work done in this area [indicating].

More recent work done here [indicating]. In fact, you can see this outline here is where an excavation was done just two years ago.

So like I said, over the last two decades, there's been a lot of petroleum work done at this site. But there hasn't been a lot done on the dioxin stuff,

and that's why we are here tonight and will be addressing that primarily going forward.

So I just mentioned the corrective action and some new monitoring well locations. That is a closer look at the excavation area. We had installed a monitoring well within the excavation footprint and downgradient of it. Groundwater at this portion of the base flows to the north towards the bay.

Here is just a couple of quick pictures of some of the excavation work. I don't know if you can all see it from back here, but you can actually see some staining in the soil. That's the petroleum-impacted soil; and sure enough, it's about 5, 6 feet below the ground surface.

This is actually the water table of the area. So when we excavate down to below 6 feet, over the course of an evening, an excavation will fill up with groundwater because it's saturated. And we actually pump that water from the ground and disposed of it as well.

And then at the completion of all this excavation work, we did something which is referred to as oxidant -- oxygen-releasing material, ORM, or ORC. These are amendments that are put in the ground to, just like the term means, release oxygen.

Well, what does that mean?

So there are naturally bacteria in the ground, in the soil, groundwater, that can degrade the petroleum naturally. And when these bugs are -- I call them "bugs." When the bugs are, bacteria, doing this process, it uses oxygen. So if we add oxygen, it continues the process, keeps it moving, and we can naturally degrade petroleum products.

So I wanted to point this out because this was a significant effort that was just recently done to address the 240 -- UST 240 area.

Okay. So site risks for Site 6 [Slide 19]. Site 6 itself has been subdivided into three areas. This is done because there are different potential future land uses at Site 6.

For example, Subareas 1 and 3 -- this is 1 [indicating]; this is 3 up here [indicating] -- they are primarily going to be used or planned use is recreational. So we have looked at hazards for recreational or construction workers who would construct those recreational areas.

And then for Subarea 2, we also looked at recreational and construction workers, but we also looked at occupational workers because there's a potential for that portion of Site 6 to be expa- -- the

wastewater treatment facility to potentially expand into that area.

And all of these future uses and receptors through completion of the Human Health Risk Assessment determine that additional action was needed.

Okay. So in addition to a Human Health Risk Assessment, we did an Ecological Risk Assessment, or Screening-Level Ecological Risk Assessment; and this study determined that soil there was no risk to terrestrial receptors under the anticipated land uses.

However, there is a potential risk to aquatic receptors of the bay. So we want to make sure that the petroleum and naphthalene, which is a by-product of petroleum, did not reach the bay.

And if you remember from a few slides back, I had mentioned there's no significant migration to the bay. But part of the alternative selection process is to kind of confirm, or ensure, that that is still the case. Okay.

So when we're looking at selecting an alternative for this site, we need to set goals. And that's exactly what this means here: establishing remediation goals for the chemicals of concern for each one of the subareas for both soil and groundwater.

And I believe this poster over here, if anyone

is interested in learning a little bit more about the individual chemicals, the individual goals for soil and groundwater, you can view it on this poster board over here [indicating].

And then our efforts will be considered complete. We can close this site when we have attained these remediation goals.

Okay. So when we're -- as Keith had mentioned, we're looking at several different alternatives for both soil and groundwater. And to determine what is the Navy's preferred alternative, we use a comparison criteria, which is what's laid out here [Slide 22]; and there's a poster board in the back on that as well.

Right up front there's threshold criteria: absolutely must protect human health and the environment and be in -- compliant with the law.

Then we get into the balancing criteria and the modifying criteria. And this is looking at how effective it is long term, short term, how much does it cost, how easy or difficult is it to implement, state acceptance, community acceptance.

So the modifying criteria is basically where we're at today. We want to make sure that everyone agrees with the Navy's preferred alternative going forward.

Okay. So this is on some of the slides here too for both soil and groundwater.

We have four alternatives for the soil remedial alternative, and it's the same -- here's the list of alternatives, and across the top is the different comparison criteria. And then we -- we nearly do what is like a Consumer Reports read of the different alternatives and how well or ineffective they are, how poor or excellent they are, to meet the different criteria.

So as you fill this out, right off the bat we see Alternative 1, no action. That's not going to work because it's not protective of human health and the environment, and it doesn't comply with the law.

So then we start to move down to some of these other ones, and you look Alternative S-3, Alternative S-4. They're pretty mu- -- They're pretty similar as far as how they meet the criteria.

So then you think, okay, cost, oh, it might be a little cheaper to do S-3. But S-3 is only excavating the top 2 feet of soil, and we know we had some stuff that might be a little bit deeper. And so for just a few dollars more -- $500,000 more -- we can do Alternative S-4, and that was what the Navy had selected as a preferred alternative.

And then for groundwater I did want to point out right away that this table [Slide 24] was prepared prior to the work that we had done for the corrective action at UST 240, those slides I had showed about the excavations, 'cause when you go through this, you might think that GW-4 looks to be the better choice merely on all the criteria, but what Alternative 4 is is essentially what we did already.

In situ -- "ISB" is in situ bioremediation, and that's a fancy term for in the ground, in situ; bioremediation is allowing the bacteria in the ground to remediate the contaminants. And when you do in situ bioremediation, that is essentially putting amendments into the ground to aid in the natural biodegradation of the petroleum.

So we have already done this. So we don't necessarily want to do that over again. Now we're looking at Alternative GW-2, which is ensuring that it's worked.

Okay. And here [Slide 25] is just a quick summary of all the alternatives again with the cost, and then we have bolded the areas where we have shown our preferred alternative. Okay?

So for Alternative S-4, it's the excavation and off-site disposal of unsaturated zone soil. If you

remember back to the site model I showed you, that's the area essentially from ground surface to the water table, about 5 or 6 feet below ground surface. It's not a complete excavation of all of that area. It's these areas that we shaded. The green ones are from up to 2 feet deep. These yellow ones are to 4, and then these purple ones are to 5.5.

And you might wonder, what's with the pattern? Why are we kind of doing random areas? There's been a lot of work done in the past. So this area that's kind of whited out, that's actually already been removed.

And then for the groundwater, this is again just kind of a depiction of the area where the excavation had previously been done, the monitoring wells that were installed. We may not need to install all those monitoring wells out there, but essentially what we're saying is we're going to monitor the groundwater to ensure that that worked.

Okay.

MR. FORMAN: Thank you, Bryce.

Okay. So what's next? You've seen his summary, and hopefully you've had a chance to look at this Proposed Plan/Draft Remedial Action Plan that we presented tonight.

And we'll need to have your comments. They can

either come tonight, or they can come anytime until March 31st.

And then as I had mentioned, there's -- there's a number of ways for us to receive this input from you.

Tonight verbally if you wish to give us a comment in front of everyone, we'd like that. We have a podium there with a mic where we'd ask you to come and state your name, and then state either your question or your comment on the Site 6 Proposed Plan.

Or we have in the back you can get a form from Tommie Jean. I'm not sure where that is.

Thank you. Okay.

So there's a form where you can simply write your comment and turn it in to Tommie Jean, and then she'll get it to us later on. You can do that.

Or at any time during this comment period, you can E-mail myself or Medi and -- or just mail it to our address anytime before the 31st if you don't wish to do it tonight, which there's no pressure to do that tonight.

And just letting you know, so the next step in the Superfund, the CERCLA, process is a Record of Decision/Remedial Action Plan, which is -- that document's due to come out in the fall of this year. And part of that document -- it will do two things: It

will show your comments and our responses from tonight and all the comments we received until the end of March. It's the first thing it will do.

The second thing is it will come to a conclusion: What is --? What did the regulators and the Navy -- after public input, what did they agree on to do about the groundwater? What did they agree on to do about the soil to clean up this site?

And again, here's the points of contact [Slide 29] -- these are also on the Proposed Plans that are -- that are available here -- again for myself and for Ms. Sunga. I rep -- I'm representing the Navy, of course, and she's representing the State of California here.

And so you have our phone number, fax number. You can also, of course, fax the comments to us, or you can go what's probably easiest for most people to do, E-mail. And again, we request that we receive comments no later than March 31st, 2014.

Okay. So now it's time for the public comments on the Proposed Plan. So what we can do is we can open it up for that, and I would just request that one at a time someone come up to the podium. Again, state your name slowly, and you might even wait and see that Christine has nodded so she's got that, and then go

ahead and give us your comment.

One of the advantages of not having a full-house attendance tonight is: We're not going to have to, I believe, put any time limits or anything on it. Go ahead and make your statement; and when you're done, the next person will follow.

Okay. I'm now -- I will now turn this over to the public, and Christine will record.

COMMENT

BY KATHRYN LUNDGREN:

Kathryn Lundgren, resident tonight.

So I just had a couple of questions. I'm so happy that I can take your whole evening up. I'm just really excited. I'm just kidding.

So Bryce, my question is actually to something -- as I was going through, I kind of had the same thoughts. And you said tonight that the -- that the soil goes from not saturated to saturated?

Okay. And then in other areas of this, it says that, you know, like, for instance, the dioxins on Table 2 kind of list it in the soil but not in the groundwater at all. Is that because you actually test the groundwater and not found any evidence of it or acceptable level of it?

I mean, because groundwater and soil, they must

interact in some way if there's a raising and a lowering of the groundwater levels. I mean, there must be some residue. Is it just so minimal that it's not a recordable or alarming amount? What's actually happening there?

MR. BARTELMA: We address comments here or . . . ?

MR. FORMAN: You might as well; go ahead and address them.

MS. LUNDGREN: I just want to try to understand, like -- I mean, it says in here that those things exist in the site, and so I want to make sure that I'm clear on whether it's actually infiltrating the soil even though it says it -- or the groundwater, even though it says it doesn't.

MR. FORMAN: Okay. So normally we take the comments tonight, and we respond to them in the Record of Decision. So what we can do here is if you're requesting an immediate response from Bryce, then we can have Bryce speak to this briefly tonight --

MS. LUNDGREN: Okay.

MR. FORMAN: -- put that from the transcript into the responsiveness summary in the ROD; and then we -- the Navy will probably augment that, as we really should, with additional comments from the staff after

this comment tonight.

MS. LUNDGREN: Okay. I appreciate --

MR. FORMAN: Okay?

MS. LUNDGREN: -- that because it helps me frame the questions that I will send to you. Like, it kind of --

MR. FORMAN: Okay.

MS. LUNDGREN: -- helps me analyze a little bit better --

MR. FORMAN: Okay.

MS. LUNDGREN: -- so that I'm not misinterpreting it.

MS. McHENRY: Only two of us here. You might as well go ahead.

MS. LUNDGREN: Thank you.

MS. McHENRY: Okay.

MS. LUNDGREN: I just had one other.

MR. BARTELMA: Yeah. No. That's a very good question. And the first thing that came to mind is -- going back to the site model, is the dioxins in the shallow soil are because that's where the burning took place. So if they were burning material, you know, we would expect to find it in that soot-like material right at that ground surface.

MS. LUNDGREN: Right.

MR. BARTELMA: As far as migrating downward to the groundwater, it's possible. I'm just not certain if -- if the RI -- if the remedial investigation looked at that.

MR. FORMAN: Okay.

MR. CLARK: And Bryce is accurate regarding going to the RI/FS for the most recent information.

The data gaps investigation, which was conducted, oh, was it 2012 time frame? Something like that. Temporary wells were installed to supplement the current groundwater data set. And the TPH, VOCs, or arsenic were detected at concentrations -- or no concentrations exceeded the screening level.

So we supplement the existing data set with new data. And so that's why you don't have these groundwater issues 'cause we have real data or recent data not making them exceeding these screening levels.

MS. LUNDGREN: Okay. All right.

The other question -- I guess I'll kind of skip over, but I'm sure that you're aware that there's -- so we're not talking about rad at all in this area, even though that's the location of the storage area currently? So it's not an issue at this point?

MR. FORMAN: No, it's not an issue in the CERCLA process, right.

What we have done when you have a storage area for rad, you do a -- when you close out that storage area, you do a screening.

MS. LUNDGREN: Okay.

MR. FORMAN: But that's not due to a release, a rad release, or anything. So it's not really part of CERCLA.

MS. LUNDGREN: So it's just a precaution?

MR. FORMAN: Yes, be- - just to make sure that you do good housekeeping when you picked up your storage area.

MS. LUNDGREN: Okay.

MR. BARTELMA: Right. And I would just add to that that the storage containers and the screening he was speaking of will all be done before we go into the field. So it will be free-released for us to go and do our work there for there would be no radiological aspects.

MS. LUNDGREN: Okay. And that applies to asbestos, all those things that we've always been concerned about, right? I'm assuming.

He's shaking his head.

Yes, it applies to all of those potential hazards? You're kind of doing a full scope, full --

MR. CLARK: Full --

MS. LUNDGREN: -- spectrum?

MR. CLARK: Yeah, that are chemicals of concern.

MS. LUNDGREN: On that site?

MR. FORMAN: Yes.

MS. LUNDGREN: Okay. All right.

And finally -- then I'll let everyone else have a moment. Sorry -- is -- is actually more of a request.

So when you guys enter into this Site 6 or any site in the future -- I'm going to just -- it's more of a statement, actually -- can we extend the barriers, even though it may not be indicative of the actual perimeter that you need to work within, and kind of reinforce those barriers? because, as you know, I mean, many of them are just -- they are just messy, and they get knocked down. And I want to make sure that it's a safe perimeter. So if we could extend that.

I mean, you actually have the luxury of doing that? just to be sure that it isn't -- that people aren't able to walk by.

I know this isn't really -- you know, this area will blow into the bay and Berkeley, which is ano- -- whole other concern for me. But if we could just extend that and maybe make it a little bit more secure, then I

think that would make the residents near it a little safer. And even if it isn't about safety, just to make them feel better.

Thank you. I appreciate it.

MR. FORMAN: Thank you. Thank you.

MS. LUNDGREN: Sure.

MR. FORMAN: Appreciate it.

Okay. Next.

COMMENT

BY MIKE DALY:

Good evening. My name is Mike Daly, D-a-l-y. I'm speaking as a community member. I have also over 40 years' experience project managing, construction managing, and so forth.

First I want to thank and congratulate your team, especially Tetra Tech, for these exceptional documents you prepared. This has streamlined my ability to understand what's needed to be said tonight.

I have two recommendations that I'd like to submit to you.

First, I would like to ask that prospective bidders, general contractors coming to you to actually implement the remedial plan, give to you some simple statement of their qualifications not only to do the work, but also to work successfully with your team

throughout the submittal process, through the insurance documentation, attending meetings, the whole thing.

My second request is that these companies give to you some assessment of their ability to hire local people either from the Job Corps or CityBuild or perhaps from the mayor's forces.

This is a voluntary thing. We're not trying to do what's going on at Hunters Point. This is totally voluntary. But it generates great goodwill for the people who live here and work here.

Thank you.

MR. FORMAN: Thank you. I appreciate your comments, Mr. Daly.

Okay. Next person who wishes to speak.

MS. LUNDGREN: I was teasing. I said I had more, but I'm going to draw it out for you.

MR. FORMAN: Okay. You are -- you are allowed to come to the podium more than once if -- if you wish. Okay.

Miss --

CAROL HARVEY: Can I ask a baby question?

Okay. This question will reveal my complete ignorance of the entire subject, but let's go for it anyway. Can you hear me?

MR. FORMAN: Ma'am, please state your name

first.

MS. HARVEY: Oh. I'm Carol Harvey.

MR. FORMAN: Thank you.

MS. HARVEY: This is the question of someone completely untutored, but I did read the report completely.

How did the Navy think to check those sites? This is really a baby question. How did it come about that you checked those sites to find -- that site to find the petroleum, to find the naphthalene, to find the contaminants that were there?

MR. BARTELMA: Yeah. That -- This goes back to the early stages of the CERCLA process with what's called a site investigation.

So when the Navy had decided to close the base and start the process, they looked at all the different areas of the base that had past activities that had the potential for contamination in the soil or groundwater.

So they went around and sampled all the areas, and they -- when they discovered that certain areas of the site had contamination, it was designated as a site. This one was one of the earlier ones. So it has an early number, Site 6. And it's called an installation restoration site.

So the early part of the CERCLA process is when

a site is identified, and then that's when we go into the remedial investigation where we define the nature and extent of contamination for the site.

So I hope -- hopefully, that answers your question.

MS. HARVEY: Okay. May I --

MR. BARTELMA: Yes, please.

MS. HARVEY: -- piggyback this on?

Did you --? You couldn't possibly have checked every inch of Treasure Island, the surface and the subsurface. So what criteria did you use to determine what sites you were going to check?

MR. BARTELMA: So I would say things like former gas stations that were on the base, former dry cleaners that were on the base, areas where they did firefighting training, that sort of thing.

MS. HARVEY: Suspicious areas?

MR. BARTELMA: Suspicious areas where past activities would -- we would expect to find, yeah.

MS. HARVEY: Thank you.

MR. FORMAN: I'll just augment that a bit.

So the process involves different approaches. You have records. Records are never complete. It's never crystal clear what happened decade after decade, but you do look at the records.

Aerial photography is big help to us because what the Navy did at most of its installations through the -- through the years is they did a pretty good job of cataloging what the base looked from the air. So we have quite a few aerial photographs to go to.

In addition to that, like Bryce mentioned, the Navy would lay out a base usually by function. So at Site 6, we know from the training manuals, from the correspondence, that this was the firefighter training area. And we have pictures of the buildings with the name on it and so forth, and we have aerial photographs showing the activities in that area over the years.

So that was just not the ending point but the starting point of where to go into the ground and punch holes into the ground and take samples. And when you did that and got that back, the initial data back, then you'd have to look at that and say, Okay, where do we go out for a second and a third round of gathering this data?

And this process that I just described, it's -- as you can imagine, it doesn't happen over one year or two years. It's a pretty long process. And we understand that some people feel it's too long of a process. But in the end, what we have is a complete

picture of the contamination of that site only by doing different steps like this.

So we really look at a lot of things. But in the end, the decisions are driven by the data, by the sampling data that we get back for the soil and for the groundwater.

And then what usually occurs on a site, even after you -- we've made a decision on how to clean up, when we go out into the field and we have a design plan as to what to do about it, you know, where to dig and what equipment to use, we have to do more sampling because you don't know when you're under the ground, which is where the contamination is or in the groundwater, you don't know that you've gotten it all until you sample. It's not just a purely visual thing.

So when Bryce goes out with whoever the future contractor to do this work is, he actually has to take confirmation samples in the sides of the hole and the bottom of the holes to make sure that he got all the contamination that he was supposed to get. And then that also becomes a step-by-step process. So it's a pretty thorough process in the end for cleanup.

MR. BARTELMA: I was just going to say, when we take the confirmation samples, the goal at which we look at those results are -- is on our table over here.

That -- Those are our goals, the numbers that we want to reach in those samples that we collect.

MR. FORMAN: We're ready for the next comment.

MS. LUNDGREN: Go ahead. I'll go after you.

COMMENT

BY ANDREA McHENRY:

My name is Andrea McHenry, A-n-d-r-e-a, M-c-H-e-n-r-y.

MS. HARVEY: Hi.

MS. McHENRY: This is a lot of information. It's very formally written. It's overwhelming. I know we all got it mailed to our house; but as you can see, there's only a few people here from the -- there's hundreds and hundreds of people that live here.

So I would like to suggest that you maybe create something that's easier to read and not quite so scientific.

I'd also like to know what are the long-term and short-term health effects of being exposed to all these chemicals. I don't see that in any of your papers, and I usually look at them.

Can you do that?

MR. FORMAN: Okay. We'll take that comment down for the record, and then we'll figure out a response.

MS. McHENRY: And let's see, what was the other.

I see under the -- you've mentioned that there's going to be proposed usages and that some of your alternatives are -- you're finding that the soil will be safe and the water will be safe for your proposed use of the -- for the proposed use of the land.

But what if we have a tsunami or an earthquake, or what if, you know, a hundred years from now when we're all dead they start to use this land for something else if it's still here? You know, how are you going to -- is there a long-term plan?

MR. FORMAN: Okay. So we'll respond to that too in writing to you. Okay. Thank you.

MS. McHENRY: I thought I had something else. Oh.

MR. FORMAN: Oh, sure.

MS. McHENRY: I completely don't understand that chart there. I think it makes perfect sense to you. From listening to your talk, I think it means these are your alternatives. But they all have, you know, not acceptable; and they all have just fine, and I don't understand.

MR. FORMAN: Okay, ma'am. Can you --? If --

Can you stay just after the meeting and we'll have somebody talk you through it?

MS. McHENRY: Sure.

MR. FORMAN: Great. I appreciate that.

MS. McHENRY: Or make one that we can understand. Going back to my first thing is this is rather scientific.

All right. Thank you.

MR. FORMAN: Thank you. Thank you very much.

COMMENT

BY KATHRYN LUNDGREN:

Sorry. Sorry. Kathryn Lundgren again.

MR. FORMAN: Okay.

MS. LUNDGREN: Actually, so I brought up kind of that there's other issues in that area -- or right outside of that fence or the perimeter of that site. There's a ton of asbestos out there on the ground.

And so at what point in this process do we include those things that are on the island and accessible?

At what point do we add that to the mix of what we need to clean up before the site is certified okay?

MR. FORMAN: Okay. Site 6 --

MS. LUNDGREN: Is that ever considered or --? 'cause it's important.

MR. FORMAN: Yeah. Understand that it's overall important. For the purposes of this program and for Site 6, it's not a factor.

MS. LUNDGREN: Okay, because I actually walk around there a lot and bike-ride.

And so friable asbestos, it's -- so that's my comment is that maybe at this point it would be good to do a little walk-around, and I'd be happy to take you. But I think that that's something that needs to be included in this con- -- in this conversation that we're having because I think that that is the most accessible contaminant to the humans and animals.

MR. FORMAN: Okay.

MS. LUNDGREN: So that's my suggestion is to add that in every future action that we need to take as something that is of concern 'cause it's very concerning.

And also the other question is about current firehouse that is now in the current fire training building. Are they using the same chemicals as they did in the past?

I mean, is this a reoccurring thing so now we have another fire safety training site that is in the future going to be a repeat of Site 6?

You know, 'cause if that was the former fire

training school --

MR. FORMAN: Yes.

MS. LUNDGREN: -- and they deposited those items --

MR. FORMAN: Yes.

MS. LUNDGREN: -- then is that also happening --

MR. FORMAN: No.

MS. LUNDGREN: -- somewhere further down?

MR. FORMAN: Yeah, the Navy used it -- no. And it -- I -- if I understand your comment correctly, that makes perfect sense. Why would you be cleaning up the site that's going to get recontaminated by the present activity being a lot like that past activity?

MS. LUNDGREN: No. Just in a different area, because now so they're -- they're, you know, couple -- okay.

MR. FORMAN: No. We're -- So we're talk -- we're talking about Navy firefighting training school that did things completely different than they would today. And --

MS. LUNDGREN: So they, you think --?

MR. FORMAN: -- I believe the footprint of the firefighters now there, right, it is not a training facility the way the Navy had a training facility, which

is geared differently.

MS. ZECH: Yeah, I just -- I don't think that -- I don't think they knew what they know now, you know --

MR. FORMAN: Right.

MS. ZECH: -- at the time.

So they were just using these things to -- you know, for their training without thinking that, ooh, it comes down to the ground. People -- people weren't thinking in those days -- in those terms back in the days. They didn't have CERCLA. They didn't have a concept of we have to keep it clean and all of that.

But now it's different. So even though you might have similar activity, they -- they wouldn't do it this way. So they wouldn't contaminate it in the same way.

MS. LUNDGREN: Okay. I appreciate it. That's something I'll look into to see if the actual process is different than what's currently happening.

I'm pretty sure, like you said, that they have upped their, you know, capabilities of understanding not to dump certain things or they have certain drainage systems in place. I'm pretty -- I'll look into it, but I'm pretty confident that that is the case. But it just sounded similar; and so I'm, like, well, are we going to

have the same --

MS. ZECH: Right.

MS. LUNDGREN: -- conversation, and what can we do to prevent it from being similar --

MS. ZECH: Right. And --

MS. LUNDGREN: -- in the future?

MS. ZECH: -- when you have the same situation happening again, but it's a different world than, you know --

MS. LUNDGREN: Sometimes it is.

MS. ZECH: Well, yes.

MS. LUNDGREN: But yeah.

MS. ZECH: In terms of technical stuff, this is a different world.

MS. LUNDGREN: Okay. That's also --

MS. ZECH: People --

MS. LUNDGREN: -- reassuring.

MS. ZECH: People are the same, but you view the environment in a very different way. You know, a hundred years ago back in the '50s, you know, the earth had no limits back then. Now it's very finite. You know what I mean?

MS. LUNDGREN: Right, yeah. The concept of earth was much different.

Okay.

MR. FORMAN: Okay.

MS. LUNDGREN: That's pretty much it. Thanks, gentlemen --

MR. FORMAN: Thank you very much.

MS. LUNDGREN: -- and ladies.

MS. McHENRY: I have one more.

MR. FORMAN: Okay.

MS. McHENRY: Andrea McHenry again.

A while back somebody from, I think, this group called me and interviewed me over the phone.

I don't know if it happened with you too, Kathryn.

But one of the -- they just asked me if I had any questions about the toxic waste out here.

And I mentioned that in our leases, the backyards are our responsibility inside of our fenced areas in our backyards. The management takes care of our front yards and the lawns, but they don't do anything in our backyards, not even mowing.

And so we're also supposed to not dig in the soil. So if you can imagine if we're not digging or working in our backyards, the weeds would be up to the fence tops back there. So we're sort of obligated to, you know, do what -- what's in our lease -- to go against our lease if you want to have a backyard that

you can use.

And nobody ever got back to me on that. He said he would, and he never did, whoever it was that interviewed me. It wasn't --

MR. FORMAN: Okay, ma'am. This is -- okay. So I will -- what I recommend you do is that you talk to us later and to Mr. Bob Beck here who's with TIDA, okay. He -- That's a really more appropriate avenue for this. I have to keep these kind of comments to --

MS. McHENRY: Okay.

MS. LUNDGREN: -- Site 6.

MS. McHENRY: That's okay.

MR. FORMAN: Well, no. But since you're here tonight, what we'll do is Mr. Beck will be available, and we can talk to you about that. But that is a completely different issue, subject, just --

MS. McHENRY: And then to Carol's question -- "Carol"?

MS. HARVEY: Yeah.

MS. McHENRY: Oh.

I had a -- one of the employees from Shaw Environmental rent my -- a room in my apartment temporarily. And he told me -- and I think other people have said -- that back in the day, the Na- -- whatever they were doing out here when it was the Navy base, they

actually bulldozed things all over the place. They don't really know where anything is.

So I'm wondering -- I guess you did do random samplings all over the island?

MR. FORMAN: Yes. Part of the conceptual site. Again, this is not for the record for Site 6. This is a different topic.

MS. McHENRY: Well, you know --

MR. FORMAN: It actually is a different topic.

MS. McHENRY: Okay.

MR. FORMAN: If you're talking to Site 12, I'll talk to you after the meeting. It has to do with the site model that we talked about actually last community and RAB meeting we had last month, and we talked about that.

It's pretty well known that there were grading -- there was grading on a large scale done, probably with bulldozers and other equipment, that is responsible for, yeah, contaminants moving around within Site 12. That's actually -- That part of it is accurate.

Now, the part about not knowing where anything is, you don't typically know where anything is or certain until you go out and sample and gather the data, and it's only through step-by-step process of gathering

the data that you really determine and what we call characterize a site. And for a site to be well characterized, you've got to have a good body of data, and that tells you the contaminant levels and where they are at, and that's the only way you truly know.

MS. McHENRY: So you're finding the concentrations in the places that you thought they would be and not --

MR. FORMAN: Yeah, we have -- Yes.

MS. McHENRY: -- hundreds of yards away?

MR. FORMAN: In our presentation, we can -- it's actually on the Web site, but we can talk to you more about this later.

We have the Site 12 contaminants that we talked about in the Feasibility Study document well characterized, although we do have some more data-gathering we're going to do before we go out and actually do the final cleanup.

MS. McHENRY: Okay.

MR. FORMAN: Okay. Thank you very much.

All right. Anything more?

All right. Well, so I mentioned Mr. Beck is here from the Treasure Island Development Authority. If you have any questions for him after the meeting, I believe he'll stay around for that.

And we'll have someone help you with looking at the alternatives and trying to read that.

And then we'll be here for some questions after this meeting is adjourned, and then we can broaden the discussion into anything.

I really appreciate you attending and -- and helping meet the requirement for Site 6 community and public input. Really appreciate you showing up tonight.

And this meeting is adjourned.

(Off record at 7:46 p.m., 3/12/14.)

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CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified Shorthand Reporter of the State of California, do hereby certify that this 58-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 7th day of April, 2014.

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

ATTACHMENT E
RESPONSIVENESS SUMMARY

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

Spoken comments by Kathryn Lundgren, community member, received at the public meeting held March 12, 2014

Comment Number	Comment	Response
1	So Bryce, my question is actually to something -- as I was going through, I kind of had the same thoughts. And you said tonight that the – that the soil goes from not saturated to saturated? Okay. And then in other areas of this, it says that, you know, like, for instance, the dioxins on Table 2 kind of list it in the soil but not in the groundwater at all. Is that because you actually test the groundwater and not found any evidence of it or acceptable level of it? I mean, because groundwater and soil, they must interact in some way if there's a rising and a lowering of the groundwater levels. I mean, there must be some residue. Is it just so minimal that it's not a recordable or alarming amount? What's actually happening there? I mean, it says in here that those things exist in the site, and so I want to make sure that I'm clear on whether it's actually infiltrating the soil, even though it says it -- or the groundwater, even though it says it doesn't.	As noted by the commenter, with the exception of dioxin, Table 2 of the Proposed Plan/Draft RAP provides groundwater (GW) remediation goals for all Chemicals of Concern/Chemicals of Ecological Concern (COC/COEC) that were identified in the soils. Remedial goals (RG) are not provided for dioxins in GW, however, because they are unlikely to be present "due to their low solubility and their relatively low concentrations in soil" as documented in the "*Final Work Plan for Groundwater and Soil Gas Monitoring at Installation Restoration Sites 6, 12, 21, and 24 Former Naval Station Treasure Island, San Francisco, California, December 2013."* This rationale is consistent with U.S. Environmental Protection Agency (EPA) dioxin fact sheets that indicate dioxins and furans in soil have limited mobility and are not expected to leach (EPA Undated). The fact sheets state that, as a rule, the amount of dioxin and furans detected more than a few inches below the soil surface has been approximately 1/10 or less than that detected in the first few inches.
2	The other question—I guess I'll kind of skip over, but I'm sure that you're aware that there's—so we're not talking about rad at all in this area, even though that's the location of the storage area currently? So it's not an issue at this point?	Site 6 has no history of the storage, release, or disposal of radiological materials from activities while TI was an active Naval Station. Site 6 has been designated as radiologically impacted in the Historical Radiological Assessment Supplemental Technical Memorandum (in progress May 2014) because Site 6 was used as a temporary staging area for roll-off bins to support the ongoing non-time critical removal action for low-level radiological waste (LLRW) at Site 12. A Multi-Agency Radiation Survey and Site Investigation Manual Final Status Survey is planned to verify that the lack of radiological contamination at the site. Completion of the Site 6 radiation survey and final status survey is planned before the intrusive remedial actions (that is, excavations) proposed for Site 6.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

Spoken comments by Kathryn Lundgren, community member, received at the public meeting held March 12, 2014

Comment Number	Comment	Response
3	So when you guys enter into this Site 6 or any site in the future, can we extend the barriers? Even though it may not be indicative of the actual perimeter that you need to work within, and kind of reinforce those barriers? Because, as you know, many of them are just messy, and they get knocked down. And I want to make sure that it's a safe perimeter. So if we could extend that. I mean, you actually have the luxury of doing that? Just to be sure that it isn't—that people aren't able to walk by. I know this isn't really—you know, this area will blow into the bay and Berkeley, which is another whole other concern for me. But if we could just extend that and maybe make it a little bit more secure, then I think that would make the residents near it a little safer. And even if it isn't about safety, just to make them feel better.	The Navy will take this comment into consideration in identifying the footprint of future fencing at Site 6. In addition, Navy construction oversight personnel will increase vigilance to ensure fencing is properly erected and maintained during future work at Site 6.
4	Actually, so I brought up kind of that there's other issues in that area—or right outside of that fence or the perimeter of that site. There's a ton of asbestos out there on the ground. And so at what point in this process do we include those things that are on the island and accessible? At what point do we add that to the mix of what we need to clean up before the site is certified okay?	Protection of residents from issues not necessarily related to the environmental restoration program (such as traffic, loose roof tiles with asbestos containing glues, or poor lighting) is addressed as part of overall Treasure Island operations. Per the cooperative agreement with the Navy, the City of San Francisco via the Treasure Island Development Authority (TIDA) addresses issues such as deteriorating roofing materials.
5	And also the other question is about current firehouse that is now in the current fire training building. Are they using the same chemicals as they did in the past? I mean, is this a reoccurring thing so now we have another fire safety training site that is in the future going to be a repeat of Site 6? You know, 'cause if that was the former fire training school and they deposited those items then is that also happening somewhere further down?	The fire training facility referred to in the comment is 0.25 mile south-southeast of Site 6 and is operated by the San Francisco Fire Department (SFFD). This new fire training facility does not use the same chemicals as the former Navy fire training facility at Site 6. The new SFFD facility uses only propane to fuel fires for training purposes. In addition, the firefighting foams used in training do not include aqueous film forming foams (AFFF) (Tetra Tech 2014a).

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA		
Spoken comments by Mike Daly, community member, received at the public meeting held March 12, 2014		
Comment Number	**Comment**	**Response**
1	First, I would like to ask that prospective bidders, general contractors coming to you, to actually implement the remedial plan, give to you some simple statement of their qualifications not only to do the work, but also to work successfully with your team throughout the submittal process, through the insurance documentation, attending meetings, the whole thing.	Navy contracting is conducted in conformance with existing law and regulation. The Federal Acquisition Regulation (FAR) is the primary regulation used by federal executive agencies, such as the Navy, in acquisition of supplies and services with appropriated funds. The FAR requires that proposers provide a statement of qualifications when responding to all types of procurements. The Navy evaluates these statements of qualifications, in part, for demonstrations of past experience working with the Navy and implementing similar projects. The Navy is required to ensure that bidders are fully qualified and experienced to meet requirements of the remedial action scope of work and have the necessary expertise to successfully perform the work in compliance with specifications.
2	My second request is that these companies give to you some assessment of their ability to hire local people either from the Job Corps or City Build or perhaps from the mayor's forces. This is a voluntary thing. We're not trying to do what's going on at Hunters Point. This is totally voluntary. But it generates great goodwill for the people who live here and work here.	Navy procurements of contractors give preference to subcontracting with local businesses—as well as small, minority-owned, and disadvantaged businesses—a preferred practice. This issue has been and remains a rating factor in Navy procurements associated with Treasure Island Environmental Response.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA		
Spoken comments by Carol Harvey, community member, received at the public meeting held March 12, 2014		
Comment Number	**Comment**	**Response**
1	This is the question of someone completely untutored, but I did read the report completely. How did the Navy think to check those sites? This is really a baby question. How did it come about that you checked those sites to find—that site to find the petroleum, to find the naphthalene, to find the contaminants that were there?	The Navy determines which sites to check by following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup process described on page 2 of the Proposed Plan/Draft RAP. This process begins with site discovery for possible releases of hazardous substances. The Navy conducted a preliminary assessment/site inspection (PA/SI) of former Naval Station Treasure Island to investigate site conditions and target sites with a potential for release of hazardous substances requiring response actions (Navy 1988). The PA/SI primarily consisted of records reviews, interviews with former Naval Station Treasure Island personnel, visual inspection of the entire base, and limited sampling to confirm the presence or absence of contaminants that could be of concern to human health and the environment. The PA/SI identified Site 6 as requiring further investigation through a remedial investigation/feasibility study (RI/FS). The Site 6 RI/FS delineated the nature and extent of contamination through intrusive testing, determined cleanup goals to protect human health and the environment, assessed various options and technologies to meet the cleanup goals, and evaluated the effectiveness, potential performance and costs among a group of alternatives identified for remedial action.
2	You couldn't possibly have checked every inch of Treasure Island, the surface and the subsurface. So what criteria did you use to determine what sites you were going to check?	Please see the response to Comment 1, immediately above.
3	This is a lot of information. It's very formally written. It's overwhelming. I know we all got it mailed to our house; but as you can see, there's only a few people here from the—there's hundreds and hundreds of people that live here. So I would like to suggest that you maybe create something that's easier to read and not quite so scientific.	Your comment is noted and the Navy will continue to develop documents that clearly communicate information to the wide range of readers, from residents to regulatory technical specialists.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA		
Spoken comments by Carol Harvey, community member, received at the public meeting held March 12, 2014		
Comment Number	**Comment**	**Response**
4	I'd also like to know: What are the long-term and short-term health effects of being exposed to all these chemicals? I don't see that in any of your papers, and I usually look at them. Can you do that?	The health effects of exposure to the COCs are addressed in the Proposed Plan/Draft RAP in the Section titled "Summary of Site Risks" and, more particularly, in the subsection titled "Human Health Risk Assessment." The baseline human health risk assessment provides much more detail and can be found in the RI/FS for Site 6. It is important to note that the risk calculations in each of the above assessments are based on site conditions before the proposed cleanup and, therefore, the calculations represent only risk under the no action alternatives (S-1 and GW-1). The remaining alternatives all meet the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) threshold criteria, meaning that they are protective of human health under reasonably anticipated future land uses at Site 6. The term "protective of human health" typically means a human health carcinogenic risk of no greater than in the range of one in ten thousand to one in a million and a hazard index (HI) of 1 or less. The hazard index is a summation of hazard quotients for all chemicals to which an individual is exposed. A hazard index value of 1 or less indicates that no adverse human health effects (noncancer) are expected to occur.
5	I see under the—you've mentioned that there's going to be proposed usages and that some of your alternatives are—you're finding that the soil will be safe and the water will be safe for your proposed use of the—for the proposed use of the land. But what if we have a tsunami or an earthquake, or what if, you know, a hundred years from now when we're all dead they start to use this land for something else if it's still here? You know, how are you going to—is there a long-term plan?	Issues such as significant natural events are generally evaluated during the RI/FS process. Section 11 of the Site 6 Final RI/FS addresses potential federal and State of California applicable or relevant and appropriate requirements (ARAR). For instance, had the remedy included a constructed cover or cap, this section would have addressed the design requirements for a maximum credible earthquake. No requirements were identified for tsunamis or earthquakes in the ARARs analysis. The long-term protectiveness of the Site 6 remedy will be evaluated in 5-year reviews to ensure their continued effectiveness.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

Written comments received from Gregor Blackburn, CFM, Branch Chief, on behalf of the U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region IX, Floodplain Management and Insurance Branch in a letter dated February 28, 2014, via e-mail

Comment Number	Comment	Response
1	Please review the current effective countywide Flood Insurance Rate Maps (FIRMs) for the County and City of San Francisco (Community Number 060298), Maps revised October 16, 2012. Please note that the City of San Francisco, San Francisco County, California is a participant in the National Flood Insurance Program (NFIP). The minimum, basic NFIP floodplain management building requirements are described in Vol. 44 Code of Federal Regulations (44 CFR), Sections 59 through 65. A summary of these NFIP floodplain management building requirements are as follows: • All buildings constructed within a riverine floodplain, (i.e., Flood Zones A, AO, AH, AE, and AI through A30 as delineated on the FIRM), must be elevated so that the lowest floor is at or above the Base Flood Elevation level in accordance with the effective Flood Insurance Rate Map. • If the area of construction is located within a Regulatory Flood way as delineated on the FIRM, any development must not increase base flood elevation levels. The term development means any man-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials. A hydrologic and hydraulic analysis must be performed prior to the start of development, and must demonstrate that the development would not cause any rise in base flood levels. No rise is permitted within regulatory floodways.	Comment noted. The Navy is responsible for implementation of the selected remedy for Site 6 that will protect human health and the environment. The CERCLA process followed by the Navy to arrive at remedy selection considered anticipated land use consistent with the approved local reuse plan published by the TIDA. After transfer of Site 6 property, TIDA or its successors in interest will be responsible for compliance with regulations that may be applicable to site redevelopment.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

Written comments received from Gregor Blackburn, CFM, Branch Chief, on behalf of the U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region IX, Floodplain Management and Insurance Branch in a letter dated February 28, 2014, via e-mail

Comment Number	Comment	Response
	• All buildings constructed within a coastal high hazard area, (any of the "V" Flood Zones as delineated on the FIRM), must be elevated on pilings and columns, so that the lowest horizontal structural member, (excluding the pilings and columns), is elevated to or above the base flood elevation level. In addition, the posts and pilings foundation and the structure attached thereto, is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. • Upon completion of any development that changes existing Special Flood Hazard Areas, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision. In accordance with 44 CFR, Section 65.3, as soon as practicable, but not later than six months after such data becomes available, a community shall notify FEMA of the changes by submitting technical data for a flood map revision. To obtain copies of FEMA's Flood Map Revision Application Packages, please refer to the FEMA website at http://www.fema.gov/business/nfip/forms.shtm.	

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

Written comments received from Dale Smith, on behalf of Naval Station Treasure Island Restoration Advisory Board, in a letter dated March 28, 2014, via e-mail

Comment Number	Comment	Response
1	**Remedial Alternative Soils:** ICs and engineered controls should be minimized as they are ignored by subsequent land users. Examples are the Site 12 misunderstandings by tenants in spite of warnings about hazards and restrictions on use and Bay Port in Alameda where violations of the controls are detected only if permits are sought. Otherwise, S-4 is a strong solution to highly contaminated soil.	If land use controls are selected as part of the final remedy, associated institutional controls (IC) will be memorialized in the deed. Oversight of such ICs will be memorialized in a Covenant to Restrict the Use of Property. Furthermore, ICs will be subject to monitoring, enforcement, and tracking by the Navy and the DTSC through 5-year reviews.
2	**Remedial Alternative Groundwater:** Because the Water Board rejected the request for NFA in 2006, the site remained in the CERCLA program for cleanup of dioxins and furans. This resulted in the selection of an expensive alternative to address dioxins and furans, leaving little remaining in the site remediation budget for groundwater remediation. There are only two monitoring wells for the entire site and none for tracking pollution movement from the burn areas in the UST 248 tank area. The chosen alternative is the cheapest, but based on the NCP criteria it is the lowest rated (2.5) but highest in implement ability because $0.92MM will go to monitoring only and not remediation. GW-5 is rated the poorest (2) based on the reduction of mobility, toxicity and volume through removal, traditionally the most protective solution. The short-term effectiveness and implement ability of GW-3 and GW-4 have different values, even though the Feasibility Study rates them equal. The only difference is cost, giving GW-4 a lower rating (3 vs. 3.5). The implication is that the Navy had decided on an amount for clean-up of the site without regard for the NCP criteria. Then those criteria were manipulated to select the one alternative that came closest to the Navy's budget, not the best alternative. For 20 years I have asked the navy to identify the chemical composition of the firefighting foam used at the fire training site.	**Remedial Alternative Groundwater:** The selected remedies were chosen in conformance with the NCP threshold and primary balancing criteria as discussed in the Proposed Plan. While costs are considered when the NCP criteria are applied, the selection of the remedies for soil and groundwater was not solely driven by Navy budget considerations, which is evidenced by the fact that the more expensive soil Alternative S-4 was selected even though two soil alternatives (S-3 and S-4) are equally rated in the comparative analysis. Please note that, with the exception of the no-action alternative, all remedial alternatives identified and evaluated in the feasibility study for Site 6 are protective of human health and the environment, and comply with ARARs. The groundwater alternative selected by Navy for groundwater (GW-2) is a lower rated and less costly alternative than Alterative GW-4, as noted by the commenter. However, as was pointed out in the public meeting on March 12, 2014, the groundwater alternatives and the analysis presented in the Proposed Plan/Draft RAP are based on the RI/FS, which was completed before the recent Underground Storage Tank (UST) 240 corrective action. That corrective action excavated source zone soil in the UST 240 area and added amendments to the excavation, accomplishing one of the three process options specified in Alternative GW-4.

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 6, Former Naval Station Treasure Island, San Francisco, CA

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Comment Number	Comment	Response
	The Navy has consistently stated that is unknown. Last week I learned from a newspaper reporter, of all people, that the Navy did know that since the mid-1970s until the school was closed in 1993, perfluorooctane- sulfonic acid (PFOS) was used. Researchers at UC Berkeley have determined that the lack of vigor witnessed in harbor seals in the Bay is a result of bioaccumulation of PFOS. It appears the Navy has been attempting to avoid addressing this serious contamination by not identifying it as a component of the firefighting foam used, not testing for it and, in personal communication, asserting that it is highly biodegradable and short-lived in the environment. According to EPA Fact Sheet 505 F 11 002 it does not hydrolyze, photolyze or biodegrade under environmental conditions and is extremely persistent in the environment (half-life of 41 years); it has the potential to bioaccumulate and biomagnify in wildlife and has the potential to have adverse developmental, reproductive and systematic effects. Methods that should be used to detect it include activated carbon filters and reverse osmosis, neither of which were used in previous investigations. It is therefore very likely this contaminant persists at the site. Recommended treatments include photochemical oxidation and thermally-induced reduction, which was rejected because it entailed stringent regulatory oversight. None of the alternatives address the contamination at USTs 248, 248A, 248B, 249C and 248D where PFOS would most likely have been used. Until a thorough assessment has been conducted for PFOS or evidence that it was investigated and not found, groundwater remediation should not be allowed to move forward.	The Navy selected Alternative GW-2 in consideration of the fact that implementing Alternative GW-2 in conjunction with the work done in the corrective action is equivalent to response actions identified in Alternative GW-4. Finally, Alternative GW-2 includes installation of up to seven additional monitoring wells to augment the existing two wells at Site 6. The design of the groundwater monitoring well network will be detailed in the remedial action work plan. **Fire Fighting Foam:** Firefighting foams have been used at the Naval Station Treasure Island (NSTI) Damage Control School firefighting facility since at least the end of World War, II, as evidenced by photographs in the History of Treasure Island (Navy 1946). These foams were likely protein foams, which are produced by the hydrolysis of granulized keratin protein such as hoof and horn meal and chicken feathers (National Foam Inc. 2002). Protein foams are not fluorinated and do not contain PFOS (German Federal Environment Agency 2013). While protein firefighting films have been used at the NSTI firefighting school, no evidence has been found that aqueous film-forming foams (AFFFs) were used. The initial environmental investigation of Site 6 identified that "Fires have been extinguished with water from the domestic supply that is treated with biodegradable emulsifiers." (Harding Lawson and Associates 1987). AFFFs were developed for firefighting by the United States Navy and 3M Co. in the mid-1960s and as noted by the commenter contains PFOS. Since then, AFFFs have been used for fuel and oil fires because of their effectiveness and their ease of application, but despite their widespread adoption within the Navy no evidence of their use in the firefighting training facility has been found. During the 1995

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Comment Number	Comment	Response
	In conclusion, S-4 is a good choice for soil remediation if ICs and engineered controls are minimized. GW-2 is unprotective of the environment if this is to be a quality wildlife habitat, as stated in the proposed Plan. Only GW-3 has the possibility of addressing all the contaminants present, although poorly for PFOS, which makes further investigation prior to making a decision a necessity.	environmental baseline survey, the entire base was inspected for the presence of hazardous materials and 5-gallon drums of AFFF were noted stored in Building 262 (storage facility) on Yerba Buena Island and Building 99 (dry cleaning facility) on Treasure Island. No stores of AFFF were noted in or around the Naval Technical Training Center (NTTC) fire training facility. Similarly, it is likely that although AFFF was commonly deployed in the fleet at the time, the fact that its use in training would have required extensive cleanup, which would have been disruptive to training schedules, likely prohibiting its use. According to a 1983 Training Effectiveness Evaluation (Navy 1983) and a 1991 Military Handbook, it is known that other training facilities that did use foam in training used a surrogate rather than AFFF for cost and environmental reasons (Department of Defense 2004). In addition, the Navy recently interviewed two former NSTI firefighters with experience in the training facility. The information obtained from the interviews is consistent with historical evidence that use of AFFFs at Site 6 is unlikely. The first interviewee was hired as a firefighter rear step hoseman on June 29, 1966, and advanced to the position of Battalion Chief from which he retired on June 30, 1986 (Tetra Tech 2014b). He was familiar with the Navy's firefighter training school because NSTI personnel would use the facility to practice live firefighting. He and other members of the NSTI fire department would participate in training at the firefighting training school mockups on a frequency of about once per quarter to practice their profession. He participated in this training throughout his tenure on NSTI. Training was conducted using only water, and he never saw or heard of AFFF being used in the firefighting

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Comment Number	Comment	Response
		training facility. AFFF was carried by the base firefighting units, but again he reported that he never saw it used while he was on watch. He explained that the base fire department used Purple-K (a dry chemical) on the automobile fires where AFFF might have been used because the Purple-K was easier to use than foam. He explained that there was a disincentive to using AFFF because once it had been used it had to be washed down and that process was "quite an operation." The second firefighter that was interviewed went through firefighting training on NSTI while on active duty in the United States Coast Guard in 1980 (TetraTech 2014c). He recalled using firefighting foams to extinguish a petroleum fire in a round open tank or pool located outside on the training facility grounds. He did not recall using foam in the forecastle or boiler room mockups. The foaming agent that was used was a dark reddish brown and easily distinguishable from AFFF foam concentrates, which are clear. In addition, he recalled that the dark reddish brown foam was described to him at the time as being made from animal byproducts (protein foam). Based on the aforementioned, the weight of evidence indicates that AFFF was not used at the NSTI firefighting training center and use of AFFF does not fit the Site 6 conceptual model. Therefore, AFFF does not warrant further investigation. **Remedy Selection:** It is unknown whether wildlife habitat will be constructed in the future. There was no documentation of such plans throughout the course of the CERCLA process until the most recent TIDA development plan. As a result of the absence of such plans when the ecological risk assessment

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Comment Number	**Comment**	**Response**
		was prepared for Site 6, the assessment did not include construction of wildlife habitat. The Proposed Plan/Draft RAP includes additional ICs to require that the transferee or developer conduct an ecological risk assessment and any additional remedial action necessary to address potential risks to future aquatic ecological receptors if the transferee or developer constructs wetland habitat on Site 6. These additional requirements were imposed because TIDA is now considering construction of wetland habitat at Site 6 as documented in a recent reuse plan.

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Tetra Tech. 2014b. Telephone Conversation between Mr. Dennis Kelly of Tetra Tech Inc. and Mr. Paul Wallace, retired Battalion Chief, former Naval Station Treasure Island. April 21.

Tetra Tech. 2014c. Telephone Conversation between Mr. Dennis Kelly of Tetra Tech Inc. and Mr. Tony Simpson, retired Naval Station Treasure Island firefighter. April 25.

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ATTACHMENT F
STATEMENT OF REASONS

STATEMENT OF REASONS
SITE 6
FORMER NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Site 6 is located at former Naval Station Treasure Island (NAVSTA TI) in San Francisco, California. Former NAVSTA TI is a closed military facility under the custody and control of the Navy. The Navy is addressing the release or threatened release of hazardous substances at Site 6 according to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and their implementing regulations in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Department of Defense (DoD) was delegated the authority to address the release or threatened release of CERCLA hazardous substances by Executive Order 12580. The DoD, in turn, delegated its authority to respond to releases of CERCLA hazardous substances on property under the custody and control of the Navy to the Navy. The Navy prepared this Record of Decision/Final Remedial Action Plan (ROD/Final RAP) and selected the remedy for Site 6 according to CERCLA, SARA, and the NCP.

The Navy has prepared this Statement of Reasons as an attachment to the ROD/Final RAP to demonstrate substantive compliance with state law in *California Health and Safety Code* Section (§) 25356.1. This Statement of Reasons describes how the Navy's investigations, assessment of risk to human health and the environment, and evaluation of remedial alternatives under CERCLA result in compliance with *California Health and Safety Code* § 25356.1. Relevant provisions of *California Health and Safety Code* § 25356.1(d) require that all remedial action plans be based on the NCP and six additional factors listed in *California Health and Safety Code* § 25356.1(d). The ROD/Final RAP describes how it is based on and complies with the NCP. The sections below describe how the ROD/Final RAP substantively complies with *California Health and Safety Code* § 25356.1(d).

The Navy developed four remedial alternatives to address chemicals of concern (COC) and chemicals of ecological concern (COEC) in soil and groundwater at Site 6, which include dioxins and furans, total petroleum hydrocarbons (TPH), volatile organic compounds (VOC), semivolatile organic compounds (SVOC), methylchlorophenoxypropionic acid (MCPP), and metals. These chemicals are present at levels that could present potential risk to human health and the environment. The Navy presented its preferred alternative to the public on March 12, 2014, and has selected a remedy in this ROD/Final RAP. The remedy for soil is excavation and off-site disposal of soil and institutional controls (IC). The remedy for groundwater is ICs and groundwater monitoring.

<u>California Health and Safety Code § 25356.1(d)(1) – Health and Safety Risks</u>

Section 2.5.1 and 2.5.2 of the ROD/Final RAP describe the human health and ecological risk evaluations completed for Site 6. The Navy evaluated potential risks to human health and ecological receptors in the final remedial investigation (RI) report from chemicals released at Site 6 using data collected from more than two decades of environmental cleanup investigations.

These investigations complied with CERCLA, U.S. Environmental Protection Agency (EPA), and Department of Toxic Substances Control (DTSC) requirements and guidelines. The Navy used the human health risk and ecological risk assessments as the basis for the identifying COCs and COECs that must be addressed to protect human health and the environment.

California Health and Safety Code § 25356.1(d)(2) – Effect of contamination on present, future, and probable beneficial uses of contaminated, polluted, or threatened resources

Section 2.4 of the ROD/Final RAP presents the current and potential future uses of Site 6. Currently, the main portion of the site is secured by chain-link fencing and is used as a temporary staging area for low-level radiological waste contained in roll-off bins to support ongoing cleanup actions for other parts of NAVSTA TI. The former parking and storage area of Site 6 is also secured with fencing and is currently being managed to support ongoing environmental restoration actions.

The 2011 Final Environmental Impact Report (EIR) lists the proposed future uses of the portion of NAVSTA TI. The proposed future uses of Site 6 include public open space, public services, and civic and institutional uses. The proposed futures uses of the area around Site 6 include public open space, parklands, and institutional uses, including a new wastewater treatment and recycled water plant and a 4- to 6- acre parcel that the San Francisco Public Utilities Commission may use for renewable energy projects. Improvements to the public open space that surrounds and includes Site 6 could include new roads, hiking and walking trails, picnic areas, playgrounds, sports fields, a café and snack bar, and other public-park outdoor areas and recreational spaces. In addition, the proposed future uses would require above- and below-ground public infrastructure and utility systems, which would have to be constructed.

When the remedy is complete, Site 6 will be available for the proposed future reuses identified in the 2011 EIR. However, concentrations of hazardous substances will not be at levels that allow for unlimited use and unrestricted exposure. Therefore, the Navy will implement ICs to restrict certain uses of soil and groundwater.

California Health and Safety Code § 25356.1(d)(3) – Effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses, and the availability of treatment technologies to significantly reduce the volume, toxicity, or mobility of the hazardous substances

Groundwater is not currently used as a source of drinking water, and naturally occurring concentrations of total dissolved solids (TDS) render the groundwater unlikely to be used in the future as a source of drinking water. In January 23, 2001 the Regional Water Quality Control Board (Water Board) concurred in the determination that the groundwater does not have a beneficial use as a source of drinking water. The only beneficial use of the groundwater at Site 6 is surface water replenishment. Currently, groundwater from Site 6 is not discharging to the bay at concentrations that negatively affect the bay or the surface water replenishment beneficial use. The Navy will continue groundwater monitoring at Site 6 to evaluate whether TPH and naphthalene in groundwater are discharging to the bay at concentrations that pose potential risk to aquatic receptors.

In addition, as part of the soil excavations, the Navy may add an oxygen release compound into the excavation to treat COCs and COECs in groundwater. Therefore, the remedy the Navy is selecting may include treatment to reduce the volume of TPH and TPH-related compounds in groundwater.

The remedy for soil does not include treatment based on considerations that involve cost, effectiveness, and difficulty of implementation.

California Health and Safety Code § 25356.1(d)(4) – Site-specific characteristics and the potential for off-site migration

Section 2.3 and Table 1 of the ROD/Final RAP present a summary of previous investigations of Site 6. The only beneficial use of groundwater for Site 6 is surface water replenishment because groundwater from Site 6 could discharge to surface water in the bay. There is the potential for TPH and naphthalene in the groundwater at Site 6 to migrate and discharge into the bay at concentrations that could affect aquatic receptors in the bay. Currently, TPH and naphthalene in the groundwater at Site 6 are not discharging to the bay at concentrations that could affect the aquatic receptors. Naphthalene was eliminated as a COPC for aquatic receptors in the final remedial investigation/feasibility study (RI/FS) based on BIOSCREEN modeling results and a comparison of groundwater data against screening criteria. Naphthalene was not detected in groundwater samples collected from six downgradient temporary wells in September 2010, which indicates contaminants that pose potential risks to aquatic receptors have not reached San Francisco Bay. Similarly, the results of the 2012 annual groundwater monitoring demonstrate that total petroleum hydrocarbons (TPH) levels have been reduced to levels below the remedial goal (RG). The RG is based on BIOSCREEN modeling conducted in the RI/FS to ensure that the concentration of TPH at the point of compliance does not exceed 43 µg/L. The Navy will monitor the potential for TPH to discharge to surface water in the bay as a component of the remedy.

California Health and Safety Code § 25356.1(d)(5) – Cost effectiveness of the remedial action

Section 2.9 and Tables 6 and 7 of the ROD/Final RAP present the comparative analysis of the alternatives evaluated for Site 6, including the costs associated with each alternative. The selected remedies for soil and groundwater are cost-effective and will provide the best overall effectiveness proportional to cost.

California Health and Safety Code § 25356.1(d)(6) – Potential environmental impacts of the remedial action

Section 2.9.2 and Tables 6 and 7 of the ROD/Final RAP present the comparative evaluation of alternatives against the nine NCP criteria, including the short-term environmental impacts associated with implementation of the selected remedy.

California Health and Safety Code § 25356.1(e) requires that state remedial action plans contain a preliminary non-binding allocation of responsibility (NBAR) among all identifiable potentially

responsible parties (PRP). The sole purpose of the NBAR is to establish which PRPs will have an aggregate allocation in excess of 50 percent and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to DTSC, is not binding on anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are *de novo* and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in California Health and Safety Code § 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation, or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to Cal. Health and Safety Code § 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary nonbinding allocation of responsibility for the former NAVSTA TI: The Department of the Navy is allocated 100 percent responsibility.