N00236.002970
ALAMEDA POINT
SSIC NO. 5090.3

Final

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) to Address Data Gaps at Installation Restoration Site 25 (Soil at Kollmann Circle), Site 32 (Groundwater), and Site 35 (Groundwater in Areas of Concern 1 and 23 and Soil in Area of Concern 6)

Alameda Point
Alameda, California

December 2007

Prepared for:
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared by:
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Prepared under:
Naval Facilities Engineering Command
Contract Number N68711-03-D-5104
Contract Task Order 0130

SULT.5104.0130.0029

SulTech

A Joint Venture of Sullivan Consulting Group and Tetra Tech EM Inc.

TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N68711-03-D-5104 Document Control No. SULT.5104.0130.0029

TO: Contracting Officer
Leanora Sili, Code 02RE.LS
Naval Facilities Engineering Command
Southwest Division
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DATE: 12/07/07
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LOCATION: Alameda Point, Alameda, California

FROM: [signature]

Steven Bradley, Contract Manager

DOCUMENT TITLE AND DATE:

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) to Address Data Gaps at Installation Restoration Site 25 (Soil at Kollmann Circle), Site 32 (Groundwater), and Site 35 (Groundwater in Areas of Concern 1 and 23 and Soil in Area of Concern 6)

TYPE: ☐ Contractual Deliverable ☒ Technical Deliverable (DS) ☐ Other (TC)

VERSION: Final (e.g., Draft, Draft Final, Final) REVISION #: Rev # or NA

ADMIN RECORD: Yes ☒ No ☐ CATEGORY: Confidential ☐

SCHEDULED DELIVERY DATE: 12/17/07 ACTUAL DELIVERY DATE: 12/17/07

NUMBER OF COPIES SUBMITTED TO NAVY: O/8C/6E/3D

O = original transmittal form
C = copy of transmittal form
E = enclosure
D = CD

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RESPONSE TO COMMENTS
RESPONSES TO REGULATORY AGENCY COMMENTS ON THE DRAFT SAP (FSP/QAPP) TO ADDRESS DATA GAPS AT IR SITES 32 AND 35 ALAMEDA POINT, ALAMEDA, CALIFORNIA

This document presents the U.S. Department of the Navy's responses to comments from the U.S. Environmental Protection Agency (EPA) Region IX and the California Department of Toxic Substances Control (DTSC), on the "Draft Sampling and Analysis Plan (SAP) Field Sampling Plan [FSP]/Quality Assurance Project Plan [QAPP]) to Address Data Gaps at Installation Restoration (IR) Site 32 (Groundwater) and IR Site 35 (Groundwater in Areas of Concern [AOC] 1 and 23 and Soil in AOC 6), Alameda Point, Alameda, California" dated October 4, 2007. The Navy received the comments addressed below from the EPA on November 1, 2007. The Navy received the comments addressed below from the DTSC on October 4, 2007. Several follow up comments were received by email on November 26, 2007.

REPONSES TO EPA COMMENTS

EPA's Comments from Anna-Marie Cook, received November 1, 2007

GENERAL COMMENTS

1. **Comment 1:** **AOC-1 Have you considered moving AOC1-HP-02 slightly to the north or northeast so that it lies downgradient from the storm sewer line but still upgradient of OWSs 063A and C? Near the manhole where the two storm sewer lines intersect might be a good location.**

   Response: The location of AOC1-HP-02 will be moved closer to the intersection of the two storm sewer lines. The actual location will be constrained by the presence of the utilities and the need to avoid them during drilling activities.

2. **Comment:** **AOC 23: I would prefer that Hydropunch samples be taken either in lieu of, or in addition, to monitoring wells.**

   Response: Given that contamination has been detected in the soil or groundwater already, the Navy believes the monitoring wells will provide a more accurate representation of the nature and extent of vinyl chloride groundwater contamination in AOC 23.

3. **Comment:** **I recommend that a groundwater Hydropunch sample be taken beneath the soil area of visible heavy staining to make sure that the soil is/was not a source of contamination to groundwater. A nearby monitoring well is located upgradient probably won't give us information on the staining, and the nearest soil sample is about a hundred feet away from the stained area (See Figures 11-9 and 4-1 in the draft final RI/FS to get a better idea of the area I'm concerned with).**

Response: Soil and groundwater samples were collected from the stained areas in AOC 23 during screening studies prior to the remedial investigation and during the remedial investigation. No volatile organic compounds were detected in soil or in groundwater beneath the stained areas. Consequently, the Navy does not believe additional sampling is warranted at this time.

REPONSES TO DTSC COMMENTS

Comments from DTSC's Michelle Dalrymple received October 4, 2007

GENERAL COMMENTS AND RECCOMENDATIONS

A. **Section 1.1.6.1 of the Draft Sampling and Analysis Plan (SAP) states that the delineation of vinyl chloride and chlorobenzene in groundwater to the west and northwest at Installation Restoration (IR) Site 32 will be addressed by the sampling proposed in the SAP. However, the scope of the investigation proposed in the SAP and the data quality objectives (DQOs) do not discuss the approach for further delineation of these chemicals in groundwater. Please present and discuss the approach that will be used to address further delineation of vinyl chloride and chlorobenzene in groundwater at IR Site 32.**

Response: The SAP will be revised to restate the objective. The SAP objective is to confirm contaminants and concentrations to support remedial action decision-making. Delineation of the plumes will be deferred to the remedial design/remedial action stages.

B. **Table 9 of the Draft SAP indicates that soil samples will be collected using Encore sampling devices for volatile organic compounds (VOCs). Table 4 of the Draft SAP indicates that a total of nine soil samples will be collected for VOCs. However, the text of the Draft SAP and the DQOs do not describe the purpose and proposed locations of the soil samples for VOC analysis. Please include the purpose of the soil samples proposed for VOC analysis and indicate the proposed locations and depths of these samples.**

Response: No soil samples are being collected for analysis of VOCs. Tables 4 and 9 will be revised to remove the incorrect reference.

C. **The basis for the proposed groundwater and soil sampling locations should be further supported by providing information on the distribution and levels of compounds of concern (COCs) from the previous investigations on the figures in the SAP. GSU requests that Figures 2 through 5 be revised to include the data for each COC upon which the sampling approach is based (see Specific Comment 5).**

Response: The basis for groundwater and soil sampling is the comments received from the regulatory agencies in conjunction with analysis of existing RI data. The focused sampling activities will provide additional information about the presence of contamination or confirming contaminant concentrations previously reported in the remedial investigation/feasibility study reports. The data requested will not be included on the SAP figures owing to time constraints and the fact that SAP requirements have been met, but the data can be provided in subsequent reports.

SPECIFIC COMMENTS AND RECOMMENDATIONS

1. <u>Section 1.1.8 – Technical or Regulatory Standards</u>. **This section incorrectly states that IR Site 32 is not intended for recreational use. However, the proposed future use of this site is a golf course. Please correct this statement.**

Response: The statement will be corrected to reflect the intended land use is recreational.

2. <u>Section 1.2.2 – Project Measurements.</u>

   a. **Please clarify that groundwater samples collected from Area of Concern (AOC) 1 be analyzed for the full-suite of VOCs using EPA Method 8260B, not just naphthalene as indicated in this section and in Step 3 of the DQOs (Table 3).**

Response: Naphthalene was the only constituent of interest identified as a data gap in agency comments on the remedial investigation report. The analytical list will not be expanded.

   b. **GSU also requests that natural attenuation parameters be added to the analyses performed on groundwater samples from IR Site 32 and AOC 1 in accordance with the DQOs.**

Response: Natural attenuation parameters will be added to water samples collected at IR Site 32 and in AOC 1.The omission of these parameters from certain tables was an editing error. The intent was always to collect information on the natural attenuation parameters.

   c. **The meaning of the last sentence of this section is unclear. Please revise this sentence to clarify the meaning.**

Response: The last sentence means that wherever groundwater samples are collected, certain parameters will be collected in the field. The sentence was revised to clarify the meaning.

3. **Section 1.3.1 – Data Quality Objectives. The text in Step 5 of the DQOs on Table 3 states that the data collected during groundwater sampling will be evaluated to determine whether or not monitored natural attenuation (MNA) is feasible relative to EPA criteria for MNA (USEPA 1998). However, the MNA criteria that will be evaluated are not provided. Please include a discussion of how the groundwater sampling data will be evaluated to determine whether MNA is feasible at IR Site 32, AOC 1, and AOC 23.**

Response: The MNA analytical parameters that will be analyzed are listed in Table 7. The SAP will provide data for use in a number of different documents. A data summary report will be prepared once the data are collected to discuss the use of the data.

4. **Section 1.3.2 – Measurement Quality Objectives for Chemical Data. GSU questions the number of field samples listed on Table 4 for natural attenuation parameters. The DQOs specify that groundwater samples from IR Site 32, AOC 1, and AOC 23 will all be analyzed for natural attenuation parameters. However, Table 4 indicates that only three field samples will be analyzed for these parameters. Table 7 indicates that samples from AOC 1 and AOC 23 will be analyzed for natural attenuation parameters, but not from IR Site 32. Please revise the information regarding the number and locations of samples for natural attenuation parameters to be consistent throughout the document.**

Response: Table 4 will be revised to restate the correct number of samples that will be analyzed for MNA parameters. All groundwater samples will be analyzed for MNA parameters in addition to the contaminants of interest.

5. **Section 2.1 – Sampling Process Design. This section states that groundwater sampling at AOC 23 will assess whether vinyl chloride concentrations in groundwater have attenuated to at or below the preliminary remedial goals. GSU questions whether the proposed sampling design will meet this objective since some of the monitoring wells are located in areas where vinyl chloride was not previously detected. One of the proposed wells (AOC23-MW-01) appears to be located upgradient from the area where vinyl chloride was detected and adjacent to a previous sample in which vinyl chloride was not detected. Well AOC23-MW-03 is located cross-gradient to the area where vinyl chloride was detected. AOC23-MW04 is located upgradient of the vinyl chloride detected at S21-DGS-DP20.**

   Please clarify the rationale for each proposed monitoring well location and consider moving wells, as necessary, to locations that will fulfill the objectives of the sampling program.

Response: The monitoring wells for AOC 23 are intended to confirm concentrations previously observed and determine if there is a vinyl chloride plume that would require remediation. The monitoring well at the northwest corner of Building 67 (AOC23MW-01) is near the location of the highest vinyl chloride concentration in groundwater observed in the site 35 remedial investigation report. The groundwater flow direction in the vicinity of AOC 23 is complex. In the area of MW-01, the remedial investigation report indicated that groundwater flow is to the northeast. Consequently, AOC23MW-01 is located downgradient of the highest reported concentration of vinyl chloride in groundwater. The monitoring well identified as AOCMW23-03 is located near the highest concentration of vinyl chloride reported in soil.

The monitoring well located west of Building 13 (AOC23MW-02) is intended to address potential vinyl chloride contamination of groundwater associated with contaminated soil reported at this location in the remedial investigation report. The location of the monitoring well south of Building 66 (AOC23MW-04) is intended to assess whether there is any possible connection between vinyl chloride contamination observed in the southern portion of AOC 23 and Installation Restoration Site 21 to the south. Review of previous groundwater data suggests that this is a small isolated exceedance unrelated to Site 21.

The Navy believes the wells are located appropriately to achieve these objectives. The figure has been revised to show the groundwater flow directions shown by the Site 35 remedial investigation report.

6. **Section 2.1.1 – Investigation of Soil and Groundwater.**

a. **This section states that groundwater samples will be collected from six temporary "microwells" as shown on Figure 3. However, Figure 3 shows three proposed "Hydropunch locations" and three proposed "Hydropunch or temporary piezometer locations." GSU requests that the Navy clarify the difference between microwells, Hydropunch locations, and temporary piezometer locations, as follows:**

- **Please clarify the meaning of the term microwells.**
- **Please clarify the methods that will be used for Hydropunch sample collection and clarify the difference between Hydropunch and temporary piezometers.**
- **Please explain why some locations were proposed for temporary piezometer installation and some were proposed for Hydropunch sampling.**

Response: The SAP will be revised to use a consistent terminology. The terms Hydropunch and microwell will be replaced with direct-push. All groundwater samples will be collected in AOC 1 using a direct-push technology such as Hydropunch. No microwells will be installed at this time. In addition, after the groundwater samples are collected, several of the holes will be developed as piezometers to allow continued monitoring of groundwater levels in the area.

b. **This section states that at AOC 23, groundwater samples will be collected from three new monitoring wells shown on Figure 5. However, Figure 5 shows four proposed monitoring well locations. Please clarify that four monitoring wells will be installed at AOC 23, not three. Please also change the information in Step 3 of the DQOs (Table 3) to indicate that four wells, not three, will be installed and sampled.**

Response: The figure will be modified to show that 4 new monitoring wells will be installed. A total of 4 groundwater samples will be collected from 4 new wells.

c. **Please check the sample depths for groundwater samples listed on Table 7. Table 7 indicates that some groundwater samples will be collected as shallow as 0.5 to 2 feet below ground surface (bgs) at IR Site 32. However, GSU requests that all groundwater samples be collected from the approximate middle of the well-screen as specified in Section 2.2.2 – *Groundwater Sampling Methods and Equipment*. Please collect groundwater samples from depths that correspond with the approximate middle of the well-screen, and revise Table 7 accordingly.**

Response: Table 7 will be revised to show that groundwater samples will be collected from the depth that corresponds to the middle of the well-screen interval.

d. **GSU requests that sample depths for groundwater samples collected at AOC 1 correspond to sample depths that were collected from this site during the remedial investigation for IR Site 35. Therefore, GSU requests that Table 7 be revised to indicate that groundwater samples will be collected from a depth of approximately 7 feet bgs at AOC 1.**

Response: Table 7 will be revised to show that groundwater samples will be collected at nominal depth of 7 feet below ground surface.

e. **This section states that Table 7 summarizes the proposed analytical suite for the environmental, investigation-derived waste, and quality control samples for this project. However, Table 7 only shows the proposed environmental samples. Please resolve this discrepancy.**

Response: The section will be revised to show that Table 7 only shows the proposed analytical suite for environmental samples.

7. <u>Section 2.2.1 – Well Installation and Development</u>.

a. **This section states that a typical boring log is shown in Appendix B. However, a boring log form is not included in Appendix B of the Draft SAP. Please include a boring log and well construction form in Appendix B.**

Response: A boring log form and well construction form will be included in Appendix B.

b. **Based on the design specifications of the monitoring wells, only one-foot of cement-bentonite grout will be used and therefore, the tremmie method of emplacement for the annular grout seal is not needed. Please clarify that the grout slurry will be poured into the annular space between the borehole and the well casing. Please also clarify the length of time that will be allowed for the annular grout seal to set prior to performing any additional work.**

Response: The text will be modified to allow the field crew to decide the most efficient method for placement of the cement-bentonite grout. A minimum of 24 hours will be specified to allow the grout seal to set prior to performing additional work.

c. *Temporary Well Installation* – **Please specify the proposed total depth of temporary wells and the approximate screen-length that will be used.**

Response: The text will be modified to specify a proposed total depth of 12 feet and a screen length of 2 feet.

8. <u>Section 2.2.2 – Groundwater Sampling Methods and Equipment</u>.

a. **Please specify that groundwater samples will not be collected from newly constructed monitoring wells until at least 72 hours have passed following well development.**

b. **Please clarify that low-flow or micropurge groundwater sampling techniques will be used for all wells sampled, not just those at AOC 1.**

c. **Please explain that water levels will be measured in monitoring wells prior to collecting groundwater samples and specify the procedure and equipment that will be used to measure water levels, including the time that will be allowed for atmospheric equilibration.**

d. **Please specify that total depth measurements will be taken following groundwater sample collection to verify the depths of the monitoring wells and to evaluate whether silting has occurred.**

e. **Please add temperature and turbidity to the list of stabilization parameters for groundwater sampling and specify the stabilization criteria for these parameters.**

f. **Please specify that the flow-rate for the collection of groundwater samples will be similar to the purge-rate (100 to 200 milliliters per minute) and clarify that sample tubing and VOA vials will be checked to ensure that no air bubbles are present.**

g. **Please specify the procedure that will be followed if the groundwater level does not stabilize to within 0.01 foot over two consecutive readings or stabilization of indicator parameters is not achieved. GSU recommends that groundwater samples be collected prior to purging the wells dry and that a field variance be used to document that stabilization was not achieved.**

h. **GSU recommends that the primary indicator parameters for groundwater stabilization should be specific conductance, pH, and dissolved oxygen. If stabilization of these three parameters and water level drawdown is achieved, groundwater sampling can proceed. A field variance should be used to document any indicator parameters that did not stabilize prior to sampling.**

Response: Recommendations listed above will be incorporated into the SAP.

9. **Section 2.2.3 – Soil Sampling Methods and Equipment. Please clarify the procedure for collecting and preserving soil samples that will be used for chemical analysis (polychlorinated biphenyls [PCBs] and VOCs). GSU recommends that soil samples for PCB analysis be homogenized and that a split sample be collected for quality assurance/quality control purposes.**

Response: Soil samples will only be collected for PCB analysis. The analytical laboratory will be directed to homogenize the sample before analysis. A minimum of 1 field duplicate will be collected. Table 8 will be modified to ensure laboratory duplicates (splits) of soil will be collected and analyzed for PCBs.

Supplemental DTSC comments received on November 26, 2007

1. **Response to Specific Comment 5. The groundwater flow direction arrow shown on Figure 5 does not support the information provided in this response about the northeasterly component of groundwater flow at AOC23. To avoid confusion, please correct the groundwater flow direction information on Figure 5.**

Response: The figure has been revised to show groundwater flow as depicted in the Site 35 Remedial Investigation Report.

2. **Response to Specific Comment 6(a). Does the Navy intend to survey the top-of-casing of the piezometers so that groundwater elevation data can be obtained and if**

so, what datum and degree of accuracy will be used? Also, please note that the response should be revised to state that all groundwater samples will be collected in "AOC 1" using a direct-push technology rather than in "AOC 23".

Response: The Navy does intend to survey the top-of-casing of the piezometers. The horizontal data will be North American Datum of 1987 (NAD87) and the vertical datum will be North American Vertical Datum of 1988. Accuracy will be sufficient to allow 0.01 foot resolution of water level depths. The previous response has been corrected.

3. <u>Response to Specific Comment 6(b).</u> **Please identify the existing well in the location of proposed well AOC23-MW-02 that the Navy plans to sample as indicated in this response and show its location on Figure 5. Please include a reference to the document that provides supporting information about the installation, development, and construction details of this existing monitoring well.**

Response: No well construction information could be found for the existing well. Consequently, the Navy will go forward with its original intention and install a new well. Comment 6(b) has been revised.

Final

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Alameda Point
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Contract Number N68711-03-D-5104; Contract Task Order 130
SulTech, A Joint Venture of Sullivan Consulting Group and Tetra Tech EM Inc.

Prepared for:

DEPARTMENT OF THE NAVY

REVIEW AND APPROVAL

SulTech

Project QA Officer: Kevin Hoch — Kevin Hoch — Date: 12/04/2007

Navy QA Officer: Narciso A. Ancog — Narciso A. Ancog — Date: 12/11/2007

T[illegible]E 1: ELEMENTS OF UFP-QAPP AND EPA QA/R-5 IN REL[illegible]ON TO THIS SAP

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Alameda Point, Alameda, California

UFP-QAPP WORKSHEET		EPA QA/R-5 SAP ELEMENT[a]		This SAP	VARIANCE FROM UFP-QAPP
1	Title and Approval Page	A1	Title and Approval Sheet	Title and Approval Sheet	
2	QAPP Identifying Information			1.0 Project Management/Objectives 2.0 Measurement/Data Acquisition 3.0 Assessment/Oversight 4.0 Data Review	
		A2	Table of Contents	Table of Contents	
3	Distribution List	A3	Distribution List	Distribution List	
4	Project Personnel Sign-Off Sheet			1.5 Special Training and Certification Appendix B	
5	Project Organization Chart	A4	Project/Task Organization	1.4 Project Organization Table 5	
6	Communication Pathways			1.4 Project Organization Table 5	
7	Personnel Responsibilities and Qualifications Table			1.4 Project Organization Table 5	
8	Special Personnel Training Requirements Table	A8	Special Training/Certification	1.5 Special Training and Certification	
9	Project Scoping Sessions Participants Sheet				All project scoping documents are retained in the NAVFAC Southwest Administrative Record.
10	Problem Definition	A5	Problem Definition/Background	1.1 Problem Definition and Background	
11	Project Quality Objectives/Systematic Planning Process Statements	A7	Quality Objectives and Criteria	1.3 Quality Objectives and Criteria Table 3	

UFP-QAPP WORKSHEET	EPA QA/R-5 SAP ELEMENT[a]	This SAP	VARIANCE FROM UFP-QAPP
12 Measurement Performance Criteria Table	B5 Quality Control	2.5 Quality Control 2.5.1 Field Quality Control Samples Table 9	
13 Secondary Data Criteria and Limitations Table			No secondary data will be used during this investigation.
14 Summary of Project Tasks	A6 Project/Task Description	1.2 Project Description Table 7, 8	
15 Reference Limits and Evaluation Table		Appendix C (UFP-QAPP Worksheet # 15)	
16 Project Schedule/Timeline Table		Table 2	
	A9 Documents and Records	1.6 Documents and Records	
17 Sampling Design and Rationale	B1 Sampling Process Design	2.1 Sampling Process Design	
18 Sampling Locations and Methods/SOP Requirement Table	B1 Sampling Process Design	2.1 Sampling Process Design Table 7, 8	
19 Analytical SOP Requirement Table	B2 Sampling Methods	2.2 Sampling Methods Table 10	
20 Field Quality Control Sample Summary Table	B5 Quality Control	2.5 Quality Control Table 4	
21 Project Sampling SOP Reference Table		Appendix B	
22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	B6 Instrument/Equipment Testing, Inspection, and Maintenance	2.6 Equipment Testing, Inspection, and Maintenance Appendix B	
23 Analytical SOP Reference Table	B4 Analytical Methods	2.4.1 Selection of Analytical Laboratories	SOPs are available at the subcontract laboratory.

TABLE 1: ELEMENTS OF UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
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UFP-QAPP WORKSHEET		EPA QA/R-5 SAP ELEMENT[a]		This SAP		VARIANCE FROM UFP-QAPP
24	Analytical Instrument Calibration Table	B7	Instrument/Equipment Calibration and Frequency	2.7.2	Calibration of Laboratory Equipment	Details for calibration of laboratory instruments are included in the laboratory SOPs and can be located at the selected subcontract laboratory.
25	Analytical Instrument and Equipment, Maintenance, Testing, and Inspection Table			2.6	Maintenance of Laboratory Equipment	
26	Sample Handling System			2.3.5 2.3.6	Chain of Custody Sample Shipment	
27	Sample Custody Requirements	B3	Sample Handling and Custody	2.3	Sample Handling and Custody	
28	QC Samples Table			2.5 Table 9	Quality Control	
29	Project Document and Records Table			Table 12		
30	Analytical Services Table			Section 1.6.2		Laboratories will be chosen from a list of pre-qualified laboratories.
31	Planned Project Assessment Table			3.1	Assessment Responsibilities	
		B8	Inspection/Acceptance of Supplies and Consumables	2.8	Inspection and Acceptance of Supplies and Consumables	
		B9	Nondirect Measurements	2.9	Nondirect Measurements	
		B10	Data Management	2.10	Data Management	
32	Assessment Findings and Response Actions	C1	Assessment and Response Actions	3.1	Assessment and Response Actions	

TABLE 1: ELEMENTS OF UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
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UFP-QAPP WORKSHEET		EPA QA/R-5 SAP ELEMENT[a]		This SAP		VARIANCE FROM UFP-QAPP
33	QA Management Reports Table	C2	Reports to Management	3.2	Reports to Management	
34	Sampling and Analysis Verification (Step 1) Process Table	D1	Data Review, Verification, and Validation	Table 11		
35	Sampling and Analysis Validation (Steps 2a and 2b) Process Table	D2	Validation and Verification Methods	Table 11		
36	Sampling and Analysis Validation (Steps 2a and 2b) Summary Table			Table 11		
37	Data Usability Assessment	D3	Reconciliation with User Requirements	4.2	Reconciliation with User Requirements	

Notes:

a EPA. 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." Office of Environmental Information. Washington, DC. EPA/240/B-01/003.

EPA U.S. Environmental Protection Agency
QAPP Quality Assurance Project Plan
SAP Sampling and Analysis Plan
SOP Standard operating procedure
UFP Unified Federal Policy

REVIEW AND APPROVAL

I certify that this SAP complies with the latest version of the UFP-QAPP and the EPA QA/R-5

SulTech

Project QA Officer: Kevin Hoch (signature) Date: 12/04/07

Kevin Hoch

Distribution List
QAPP Worksheet #3-NAVFAC SW SAP

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Note:
As additional project personnel are identified, this table will be updated.

PROJECT PERSONNEL SIGN-OFF SHEET

QAPP Worksheet #4-- NAVFAC SW SAP
(UFP-QAPP Manual Section 2.3.2)

Project Personnel	Organization	Title	Signature	Date QAPP Read
Craig Hunter	SulTech	Project Manager	Craig Hunter	December 10, 2007
Chris Ohland	SulTech	Project Chemist		
Doug Grant	SulTech	Field Team Leader		

Note:

As necessary, other personnel assigned to this project will review the SAP and sign above.

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Appendix

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BSU	Bay Sediment Unit
°C	Degrees Celsius
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chemicals of concern
CPR	Cardiopulmonary resuscitation
DO	Dissolved oxygen
DQO	Data quality objective
EBS	Environmental Baseline Survey
EDC	Economic Development Conveyance
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
ESL	Environmental Screening Level
°F	Degrees Fahrenheit
FS	Feasibility study
FSP	Field sampling plan
HASP	Health and safety plan
IDW	Investigation-derived waste
IR	Installation Restoration
IT	International Technology Corporation
LCS	Laboratory control sample
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
MCL	Maximum contaminant level
MDL	Method detection limit
mg/kg	Milligram per kilogram
mg/L	Milligrams per liter
MNA	Monitored Natural Attenuation

MS	Matrix spike
MSD	Matrix spike duplicate
msl	Mean sea level
MQO	Measurement quality objectives
NADEP	Naval Aviation Depot
NAS	Naval Air Station
NEDD	Naval Environmental Data Deliverable
NFESC	Naval Facilities Engineering Service Center
ORP	Oxidation reduction potential
OSHA	Occupational Safety and Health Administration
OU	Operable unit
OWS	Oil water separator
PAH	Polynuclear aromatic hydrocarbons
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCB	Polychlorinated biphenyls
PID	Photoionization detector
PP	Proposed plan
PRG	Preliminary remedial goal
PRRL	Project-required reporting limit
PSC	Preliminary Screening Criteria
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RG	Remedial goal
RI	Remedial investigation
RPD	Relative percent difference
SAP	Sampling and analysis plan
SDG	Sample delivery group
SOP	Standard operating procedure
SOW	Statement of work
SQL	Sample quantitation limit
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit

TCE	Trichloroethene
TCRA	Time-critical removal action
TDS	Total dissolved solids
Tetra Tech	Tetra Tech EM Inc.
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TSA	Technical systems audit
UST	Underground storage tank
VOC	Volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board

1.0 PROJECT DESCRIPTION AND MANAGEMENT

SulTech is conducting data gap sampling at Installation Restoration (IR) Sites 25, 32, and 35, located at Alameda Point in Alameda, California. The scope of this sampling involves groundwater samples at Site 32 and Areas of Concern (AOCs) 1 and 23 of IR Site 35, and soil samples at Kollman Circle in Site 25 and AOC 6 of IR Site 35. SulTech prepared this sampling and analysis plan (SAP), consisting of a field sampling plan (FSP) and a quality assurance project plan (QAPP) in an integrated format, to guide the field, laboratory, and data reporting efforts associated with this project. The data will be used to supplement the findings of the final remedial investigation and feasibility study (RI/FS) and to aid with remedy selection in the subsequent proposed plan (PP). SulTech is a joint venture of Sullivan Consulting Group and Tetra Tech EM Inc. (Tetra Tech).

Table 1 follows the approval page at the beginning of this SAP. The table demonstrates how this SAP addresses all the elements of a quality assurance project plan currently required by the U.S. Environmental Protection Agency (EPA) QA/R-5 guidance document (EPA 2001) as well as the Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005). Additionally, a cross reference to specific worksheets required in the Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005) is presented on all relevant tables and figures.

Appendix A lists method precision and accuracy goals, and Appendix B contains all field forms. Appendix C (UFP-QAPP Worksheet # 15) lists project-required reporting limits (PRRL), and Appendix D lists the Navy-approved laboratories SulTech has contracted to analyze environmental samples.

1.1 PROBLEM DEFINITION AND PROJECT DESCRIPTION

This section describes the following:

- Purpose of the Investigation (Section 1.1.1)
- Problem to be Solved (Section 1.1.2)
- Facility Descriptions (Section 1.1.3)
- Site Description (Section 1.1.4)
- Physical Setting (Section 1.1.5)
- Summary of Previous Investigations (Section 1.1.6)
- Principal Decision-Makers (Section 1.1.7)
- Technical or Regulatory Standards (Section 1.1.8)

1.1.1 Purpose of the Investigation

The purpose of field activities at IR Site 25 is to supplement previous sampling of an area of dark soil near Kollman Circle observed in an aerial photograph. The sampling at IR Site 32 is to obtain data to verify previous groundwater sampling results and to gather additional information to support remedial decisions. The data from IR Site 35 will be used to supplement the findings of the final RI/FS about remedy selection in the subsequent PP. The purpose of field activities at AOC 1, AOC 6, and AOC 23 of IR Site 35 is to assess groundwater quality in the vicinity of three oil/water separators (OWSs) at AOC 1; to help approximate the western extent of polychlorinated biphenyls (PCB) in soil contamination at AOC 6; and to evaluate the extent of volatile organic compounds (VOCs) in groundwater at selected locations in AOC 23, based on results from samples collected previously.

1.1.2 Problem to be Solved

Previous investigations of soil at IR Site 25 collected soil in an area of darkened soil observed in an historical aerial photograph. However, the soil was analyzed for a limited set of constituents related to underlying groundwater contamination. Regulatory agencies have asked for limited sampling to analyze for metals, semivolatile organic compounds (SVOCs), PCBs, pesticides, and petroleum hydrocarbons.

Groundwater is contaminated by VOCs at IR Site 32. The 2005 RI (Bechtel 2007a) concluded that the nature and extent of contamination have been adequately characterized; based on inhalation criteria, an FS was recommended to evaluate options to address VOC contamination in groundwater. Specific contaminants of concern (COCs) include chlorobenzene, trichloroethene, and vinyl chloride. Previous groundwater results must be verified, and additional data are required to support the analysis and decision-making for remedial options.

Previous investigations conducted at AOC 1 of IR Site 35 assessed groundwater quality and investigated the presence of oil near three OWSs (63A, 63B, and 63C), two of which (OWSs 63A and 63C) had been used as grease pits for a kitchen in this area. The third (OWS 63B) was used to manage run-off from the other two OWSs. No evidence of OWS 63B has been found since the 2005 site visit performed by Bechtel. Soil and groundwater samples were collected during previous investigations and the final (Bechtel 2007b). Naphthalene was detected, but the extent of the contaminant was not delineated. Previous groundwater results must be verified, and additional data are required to assess whether the extent of naphthalene in groundwater is localized around grease trap OWS 63A.

A 1986 transformer rupture at AOC 6 of IR Site 35 sprayed an unknown quantity of oil containing PCBs (Aroclor 1260) 15 feet west onto grass, trees, and fencing (International Technology Corporation [IT] 2001). A cleanup was performed, and contaminated material was removed; however, no confirmation samples were collected. Confirmation sampling was therefore recommended to define the western extent of Aroclor 1260 contamination in soil

(Bechtel 2007b) and to evaluate whether the contamination exceeds preliminary screening criteria (PSC).

Groundwater at AOC 23 of IR Site 35 is contaminated by VOCs. Results of the 2005 RI (Bechtel 2007b) concluded that the nature and extent of contamination associated with areas previously used for chemical storage and handling have been adequately defined. An FS was recommended to address vinyl chloride in groundwater and to verify that concentrations are above maximum contaminant levels (MCL) (Bechtel 2007b). The purpose of the groundwater sampling at IR Site 35 AOC 23 is to evaluate whether vinyl chloride concentrations in groundwater have attenuated to at or below the preliminary remedial goal (RG) identified in the FS, based on the inhalation pathway.

1.1.3 Facility Description

Alameda Island is located on the eastern side of San Francisco Bay, and Alameda Point (formerly Naval Air Station [NAS] Alameda) is located in the western portion of the island (Figure 1). Alameda Point operated as an active naval facility from 1940 to 1997. In September 1993, the U.S. Congress and the Base Realignment and Closure Commission designated NAS Alameda for closure. The general layout of Alameda Point and the location of the investigation sites are presented in Figure 1.

1.1.4 Site Descriptions

The following sections provided describe each of the sites discussed in this SAP.

1.1.4.1 Installation Restoration Site 25

IR Site 25 is 42 acres (Figure 2). IR Site 25 is used primarily for multi-family residential. The complex is known as North Village and consists of multi-unit housing structures, a park area, and a community center. Three Environmental Baseline Survey (EBS) parcels are located within IR Site 25. EBS Parcel 181 contains the housing structures, EBS Parcel 182 contains a park area, and EBS Parcel 183 contains the community center.

Historically, IR Site 25 was part of Alameda Annex and was used as a screening lot and scrap yard, where equipment and material was stored temporarily prior to resale or disposal (Engineering/Remediation Resources Group, Inc., 2004)

1.1.4.2 Installation Restoration Site 32

IR Site 32 is 5.8 acres (Figure 3). Most of IR Site 32 is open space covered with asphalt, gravel, weeds, and brush. A 75-foot-wide concrete taxiway crosses the northern portion of the site. Two buildings (Buildings 594 and 82) are located within a fenced compound in the southern portion of the site. Two 1,000-gallon fiberglass underground storage tanks (USTs) (594-1 and 594-2) were formerly located north of Building 594 and were used to store diesel fuel and gasoline. The two tanks were removed in 1994, and the soil around the tanks was excavated and backfilled. Although Building 594 was originally built to be used as storage and a repair shop for underwater weapons, there is no documentation that it was used as such. No documented releases of hazardous substances were reported to have occurred in the buildings or anywhere else on site. However, the open space in the eastern portion of the site was used to store equipment, vehicles, scrap, and aircraft prior to 1953 (Bechtel 2007a).

1.1.4.3 Installation Restoration Site 35, Area of Concern 1

AOC 1 of IR Site 35 is an approximately 0.5-acre area in the south-central portion of Site 35, which occupies 75 acres in the northeast portion of Alameda Point. AOC1 is near the northwestern boundary of Transfer Parcel Economic Development Conveyance (EDC)-5 and in the south-central portion of EBS Parcel 43 (Figure 4). A small portion of Building 3 is located in the eastern portion of AOC 1. The remainder of AOC 1 consists of a landscaped area in the south and two paved areas: a kitchen area in the eastern portion, and a loading dock area in the western portion of the AOC (Bechtel 2007b).

EBS Parcel 43 (and specifically Building 3) was historically used for housing and barracks. Chemical storage in these residential buildings was minimal, and only minor stains were observed indoors during the EBS (IT 2001a). Two grease pits, identified as OWS 063A and OWS 063C in the Solid Waste Management Unit (SWMU) Report (SulTech 2005a), were present outdoors in the rear kitchen area portion of Building 3. During a June 2005 site visit by Bechtel Environmental, Inc. (Bechtel), the locations of these OWSs were identified by identical fenced areas; each OWS was covered by a metal plate measuring approximately 5 by 7 feet. According to the SWMU report, the larger OWS (OWS 063C) measures 16 by 4 by 10 feet deep, and the smaller OWS (OWS 063A) measures 12 by 4.5 by 10 feet deep. The grease pits were connected to part of the sanitary sewer system but were not known to have received any hazardous materials. During the EBS, grease and oil stains, possibly from cooking, were observed outdoors near OWS 063C (Bechtel 2007b).

1.1.4.4 Installation Restoration Site 35, Area of Concern 6

AOC 6 is a 0.2-acre area in the north-central portion of IR Site 35, which occupies 75 acres of Alameda Point (Figure 5). The site consists of a parking area, grassy open spaces where buildings were formerly located, and Building 553. AOC 6 is completely within Environmental Baseline Survey (EBS) Parcel 87, immediately southwest of the intersection of Seattle Road and Pan Am Way. Historical uses of EBS Parcel 87 included officers' quarters and housing (Building 85, demolished in 1968), an electrical substation (Building 553, still present and maintained by Alameda Power and Telecom), and a parking lot. Stains associated with vehicle parking are visible in the parking area. A portion of Building 85 was formerly located in AOC 6; Building 553 is entirely within AOC 6 (Bechtel 2007b).

The EBS reported that a transformer located on a fenced pad adjacent to the west side of Building 553 overheated and ruptured in 1986. An unknown quantity of PCB-containing oil sprayed from the transformer 15 feet west onto grass, trees, and fencing (IT 2001a). The substation pad was removed prior to 1990 (Bechtel 2007b). A cleanup was performed, and contaminated material was removed; however, no confirmation samples were collected. The area and depth of the excavation are unknown (Bechtel 2007b).

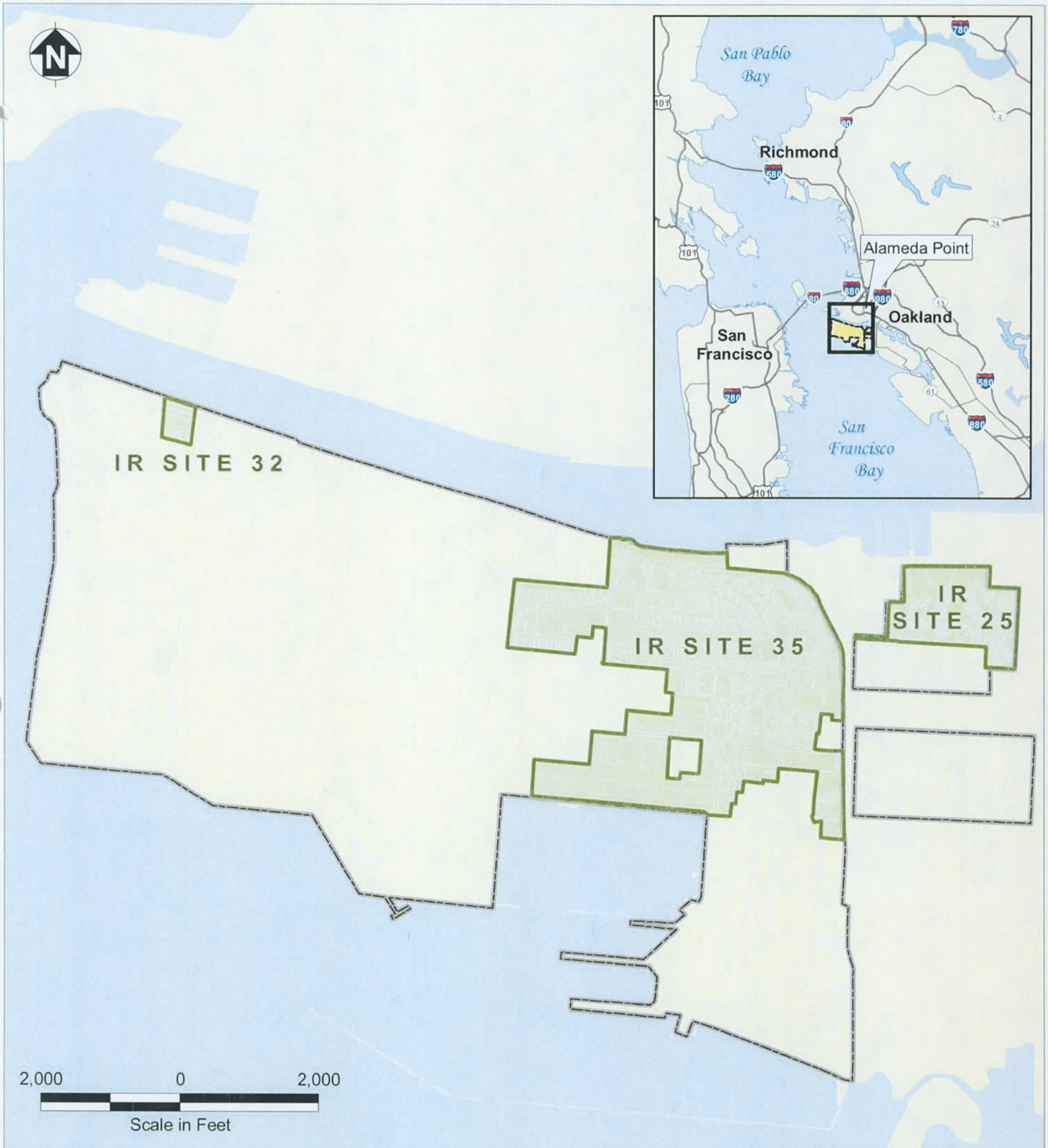
1.1.4.5 Installation Restoration Site 35, Area of Concern 23

AOC 23 is a 15.2-acre area in the south-central portion of IR Site 35 in the northeastern portion of Alameda Point (Figure 6). AOC 23 was established to address contaminants in soil and groundwater in areas previously used for chemical storage or handling at eight EBS parcels: EBS parcels 71, 72, 110, 121, 123, 124, 125, and 126. Complete site descriptions for each of the eight parcels can be found in the final RI report for IR Site 35 (Bechtel 2007b). Proposed sampling at AOC 23 will occur within EBS Parcels 123 and 124.

EBS Parcel 123 is in the east-central portion of AOC 23. EBS Parcel 123 was used as barracks, an aircraft ground support equipment shop, a switching substation, a field maintenance shop, a hazardous and flammable materials storehouse, an electrical substation, an industrial waste pump station, and for painting and sandblasting operations. The following chemicals were used or stored in buildings at the parcel: gasoline, fuels, diesel, oils, acetylene, argon, degreasing solution, fertilizer, solvents, corrosion inhibitors, break fluid, aluminum paint, and spray enamels. Building 263, an aircraft ground support equipment shop, was used historically to store oil, gasoline, diesel, and acetylene.

Hazardous wastes, including flammables, corrosives, batteries, aerosols, paint, used rags, and used spill kits, were stored inside Building 98 and the building's fenced enclosure (Bechtel 2007b). SWMU AOC 098 was used to store hazardous wastes, including petroleum products, corrosives, metals, asbestos, nonhalogenated organic compounds, solvents, lubricating oil, and corrosion inhibitors. SWMU AOC 098 is located inside Building 98 and was used as a 60-day temporary accumulation point where hazardous wastes were stored in 55-gallon drums on the concrete floor.

EBS Parcel 124 is in the central portion of AOC 23 and was historically used for lumber storage (Buildings 262 and 444), as a hazardous and flammable materials storehouse (Building 13), and for public works maintenance storage (Building 13). In general, hazardous wastes were stored in the southern half of Building 13, and hazardous materials were stored in the northern half. A portion of the parcel was used for sorting trash and scrap material (salvage and refuse) (Bechtel 2007b).



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Alameda Point
U.S Navy, BRAC PMO West, San Diego, CA

FIGURE 1
SITE LOCATION MAP

Sampling and Analysis Plan for Data Gap Sampling of Soil at IR Site 25, Groundwater at IR Site 32, Groundwater at IR Site 35 in Area of Concern 1, Soil in Area of Concern 6, and Groundwater in Area of Concern 23

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- Proposed Sample Location
- Dark-Colored Soil
- Sanitary Sewer Line
- Storm Sewer Line
- Building Footprint
- Paved Area and Roads

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U.S Navy, BRAC PMO West, San Diego, CA

FIGURE 2
IR SITE 25 PROPOSED LOCATIONS FOR COMPOSITE SAMPLING OF SOIL

Sampling and Analysis Plan for Data Gap Sampling of Soil at IR Site 25, Groundwater at IR Site 32, Groundwater at IR Site 35 in Area of Concern 1, Soil in Area of Concern 6, and Groundwater in Area of Concern 23

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FIGURE 3
IR SITE 32
MONITORING WELL LOCATIONS

Sampling and Analysis Plan for Data Gap Sampling of Soil at IR Site 25, Groundwater at IR Site 32, Groundwater at IR Site 35 in Area of Concern 1, Soil in Area of Concern 6, and Groundwater in Area of Concern 23

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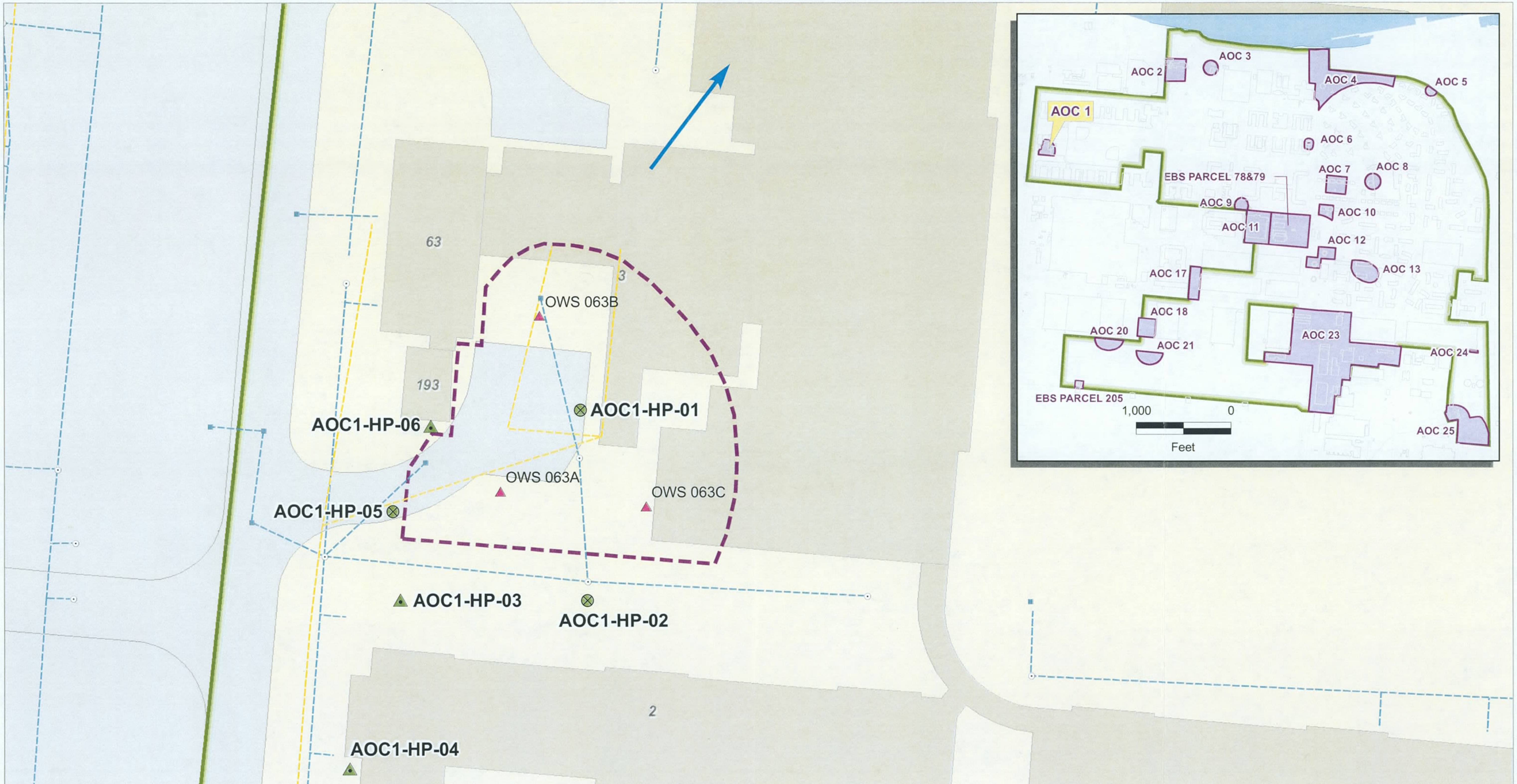

- Proposed Hydropunch Location
- Proposed Hydropunch or Temporary Piezometer Location
- Catch Basin
- Manhole
- SWMU Location
- Approximate Groundwater Flow Direction
- AOC 1 Boundary
- IR Site 35 Boundary
- Building Footprint
- Paved Area and Roads
- Sanitary Sewer Line
- Storm Sewer Line

Note Utility locations are approximate and have not been surveyed

N

50 0 50
Feet

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Alameda Point
U.S Navy, BRAC PMO West, San Diego, CA

FIGURE 4
IR SITE 35 AOC 1
PROPOSED HYDROPUNCH LOCATIONS

Sampling and Analysis Plan for Data Gap Sampling of Soil at IR Site 25, Groundwater at IR Site 32, Groundwater at IR Site 35 in Area of Concern 1, Soil in Area of Concern 6, and Groundwater in Area of Concern 23

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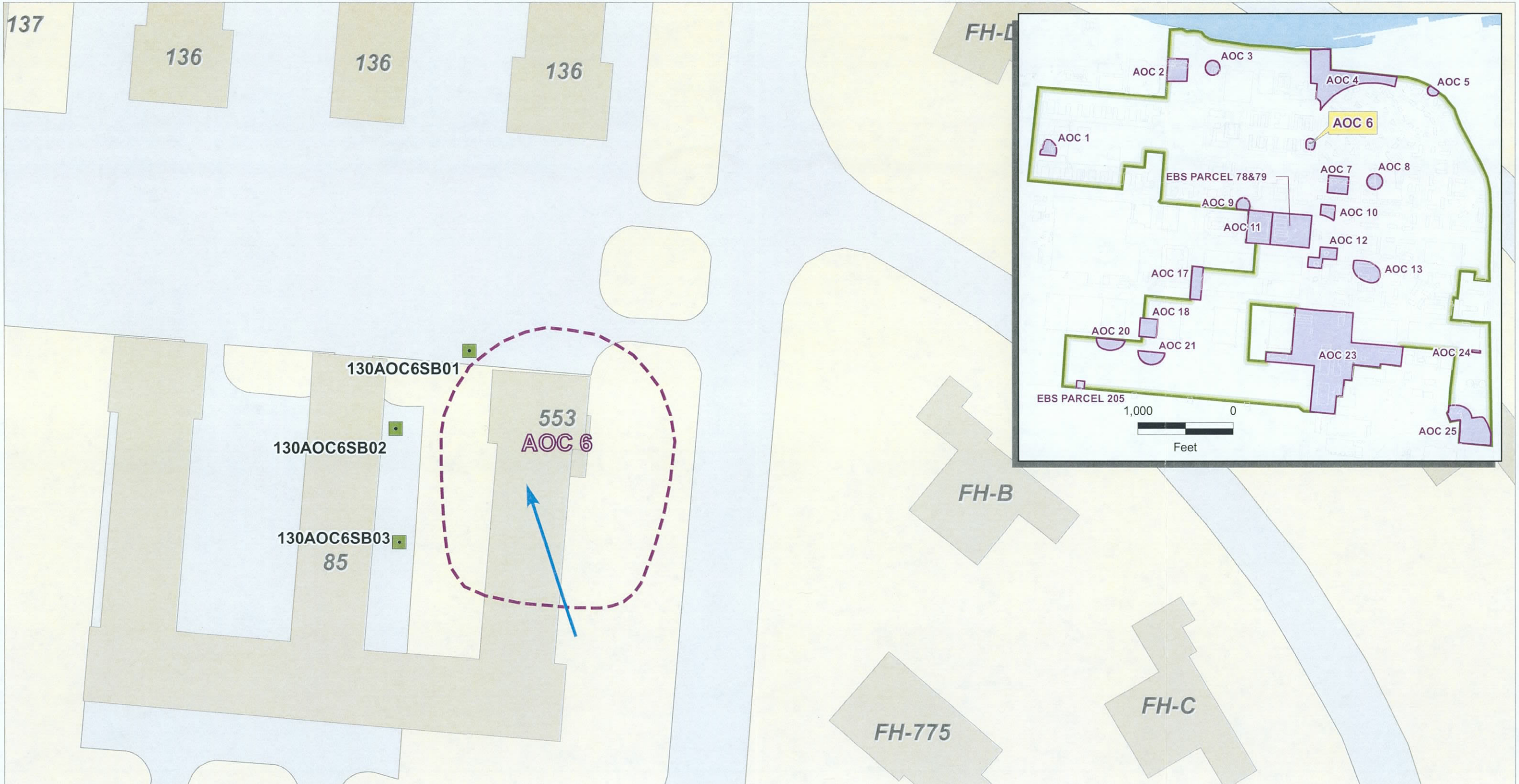

- Proposed Soil Boring Location
- Approximate Groundwater Flow Direction
- AOC 6 Boundary
- IR Site 35 Boundary
- Building Footprint
- Paved Area and Roads

N

40 0 40
Feet

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FIGURE 5
IR SITE 35 AOC 6
PROPOSED SOIL BORING LOCATIONS

Sampling and Analysis Plan for Data Gap Sampling of Soil at IR Site 25, Groundwater at IR Site 32, Groundwater at IR Site 35 in Area of Concern 1, Soil in Area of Concern 6, and Groundwater in Area of Concern 23

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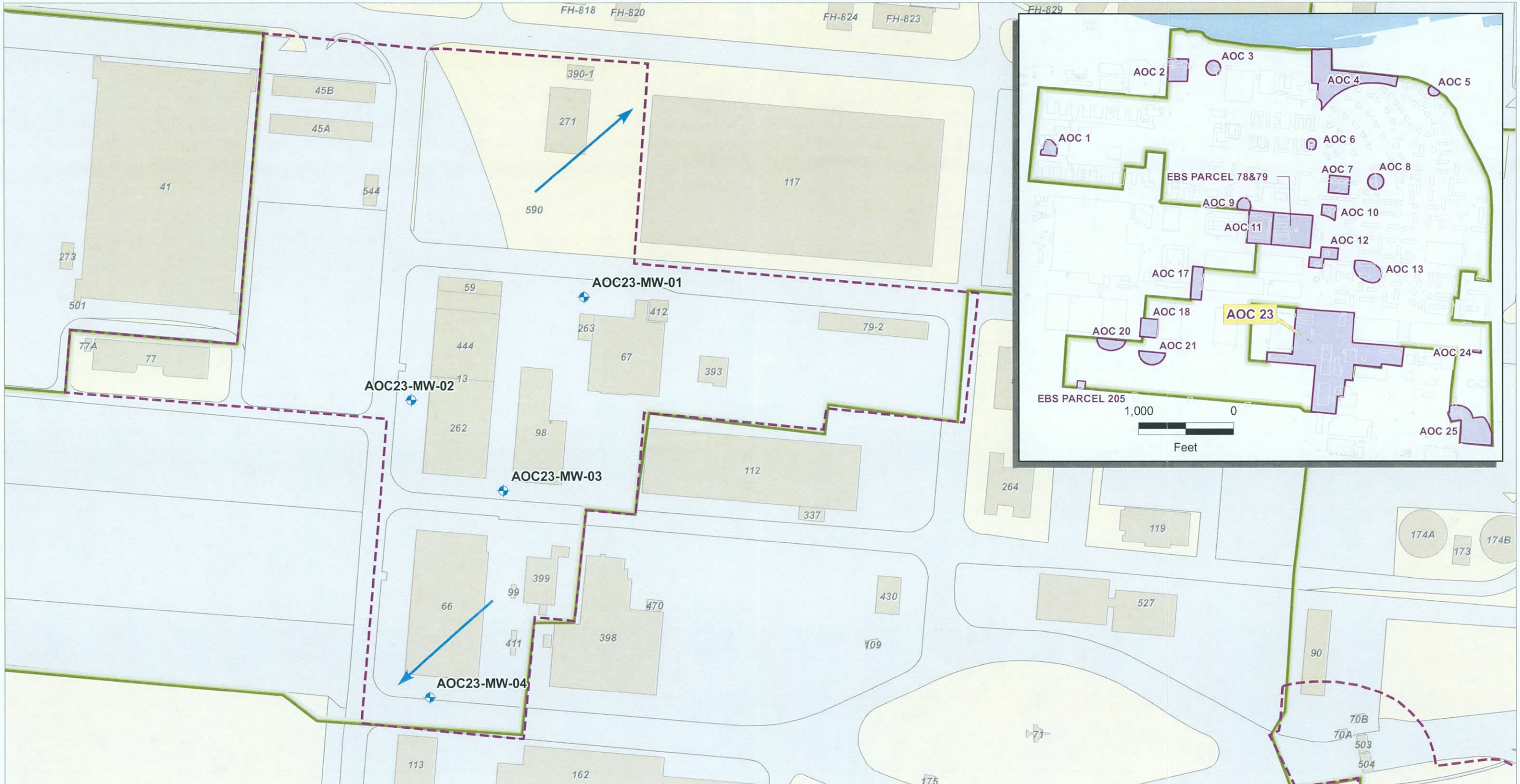

Proposed Monitoring Well Location

Approximate Groundwater Flow Direction

AOC 23 Boundary

IR Site 35 Boundary

Building Footprint

Paved Area and Roads

150 0 150

Feet

N

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Alameda Point
U.S Navy, BRAC PMO West, San Diego, CA

FIGURE 6
IR SITE 35 AOC 23 PROPOSED MONITORING WELL LOCATIONS

Sampling and Analysis Plan
for Data Gap Sampling of Groundwater at IR Site 32,
Groundwater at IR Site 35 in Area of Concern 1, Soil in
Area of Concern 6, and Groundwater in Area of Concern 23

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1.1.5 Physical Setting

This section provides an overview of the physical setting at Alameda Point, IR Site 32, and IR Site 35 at AOCs 1, 6, and 23. Topics discussed include climate, topography, geology, and hydrogeology. A more thorough discussion of the physical setting at IR Site 32 and IR Site 35 can be found in the "Final Remedial Investigation Report, IR Site 32, Northwestern Ordnance Storage Area" (Bechtel 2007a) and "Final Remedial Investigation/Feasibility Study Report, IR Site 35, Alameda Point" (Bechtel 2007b).

1.1.5.1 Alameda Point

The San Francisco Bay area is characterized by a Mediterranean climate with mild summer and winter temperatures. The mean annual precipitation at Alameda Point is 23 inches, with most of the precipitation generally occurring from October to April. Mean yearly low and high temperatures are 52 degrees Fahrenheit (°F) and 67 °F. The wind direction is predominantly from the west or northwest, with rare occurrences of gale-force or greater winds. Heavy fog that sometimes impairs visibility for navigation occurs on an average of 21 days per year (National Weather Service 2001).

Alameda Island is located on the eastern side of the San Francisco Bay and lies at the base of a gently westward-sloping plain that extends from the Oakland-Berkeley Hills in the east to the shore of the San Francisco Bay in the west. Alameda Island is characterized by a low topographic profile, with surface elevations varying from mean sea level (msl) to approximately 30 feet above msl. Alameda Point is located on the western portion of Alameda Island. The bay occupies a depression between the Berkeley Hills to the east and Montara Mountain and other mountains to the west. The depression and the hills were formed by two active faults: the San Andreas Fault, west of the San Francisco Bay, and the Hayward Fault, east of the San Francisco Bay. The San Andreas Fault is 12 miles west and the Hayward Faults is 5 miles east of the island.

Alameda Island and the San Francisco Bay are underlain by metamorphosed sandstone, siltstone, shale, graywacke, and igneous bedrock of Jurassic age, all of which constitute the Franciscan Formation. Alameda Island is underlain by 400 to 500 feet of unconsolidated sediment overlying the Franciscan Formation (Rogers and Figuers 1991). Alameda Island geology consists of five formations/units listed here in order of increasing age:

- Bay Sediment Unit (BSU)
- Merritt Sand Formation
- San Antonio Formation (lower and upper units)
- Alameda Formation
- Franciscan Formation

Most of the sedimentary deposits at Alameda Point are overlain by fill material, which is present at the ground surface. The thickness of the fill layer generally decreases from west to east across Alameda Point. As much as 40 feet of fill material is present at the western margin of Alameda Point, where offshore areas were filled to create new land. As little as 3 to 5 feet of fill material is present at the eastern margin of Alameda Point, where tidal marshes and estuarine channels were filled. The fill material is predominantly poorly graded, fine- to medium-grained sand, with silt and clay.

1.1.5.2 Installation Restoration Site 25

IR Site 25 is located in the northwester portion of Alameda Point. The area is flat with ground surface elevations of 8 to 12 feet above msl. The waters of the San Francisco Bay covered the area know as IR Site 25 until the early 1900s. In the mid-1920s, a commercial airport was constructed on a portion of what is now IR Site 25. Airport operations continued until 1941 when it was closed because of air traffic conflicts with nearby Naval Air Station Alameda.

The U.S. government purchased the property between 1946 and 1966. After acquisition by the government, the property was used as a supply center to serve various military operations.

Overall, the subsurface materials that comprise the soils at IR Site 25 is fill material classified as poorly sorted sands and silty sands. The primary source of fill material used at IR Site 25 is dredge spoils from San Francisco Bay and the Oakland Inner Harbor.

1.1.5.3 Installation Restoration Site 32

IR Site 32 is located in the northwestern portion of Alameda Point, adjacent to the Oakland Inner Harbor. The area is flat with ground surface elevations from approximately 8 to 11.5 feet above msl. The waters of the San Francisco Bay covered the area defined as IR Site 32 until the early 1900s. The 2-mile-long railroad causeway known as the Alameda Mole was constructed in 1883 across the open water of San Francisco Bay. Depth of the water at the terminal (located west of IR Site 32) was reportedly 20 feet (Hees 1997). Most of IR Site 32 remained submerged until sediments began to build up around the causeway. By 1927, a small area of land created by sedimentation was present in what is now the northern portion of IR Site 32, and the depth of water in the bay at this location had been reduced to 3 to 4 feet. Filling that created Alameda Point began in 1930, and most of the land area that is now IR Site 32 was created by 1937.

Overall, the subsurface materials encountered at IR Site 32 during field activities were predominantly poorly sorted sands and silty sands. The two lithologic units encountered at IR Site 32 were distinguished as follows:

- Fill material – Primarily poorly graded, fine-, medium-, or coarse-grained sand extending from the surface to depths of 14 to 20 feet below ground surface (bgs), with occasional layers of gravelly sand or clay.

Distinguished by brown to olive-brown color and variability among borings. Sometimes contains angular gravel, wood fragments, and concrete.

- BSU – Predominantly dark gray silt or clay first encountered at 14 to approximately 20 feet bgs.

Borings at IR Site 32 indicate that the contact between the fill material and the BSU varies but generally deepens to the south.

1.1.5.4 Installation Restoration Site 35, Area of Concern 1

Topography at AOC 1 is relatively flat. The average ground elevation is 9 feet above msl, based on elevation data from the three borings (A01SB01 through A01SB03) advanced during the final RI. Average groundwater depth in the three borings was approximately 3 feet bgs. Groundwater depth was measured in temporary casings before groundwater samples were collected. Total dissolved solids (TDS) concentrations analyzed in groundwater samples from the borings ranged from 444 to 2,490 milligrams per liter (mg/L), and the average TDS concentration was 1,800 mg/L. The groundwater monitoring well nearest to AOC 1 is M05-01, located 500 feet south of AOC 1. A review of groundwater depths in this well over time (August 1991 through March 2005) shows depth to water from approximately 6 to 8 feet bgs. The deepest historical groundwater measured in this well is approximately 4 feet above msl. This value, if subtracted from the ground elevation at AOC 1, would suggest groundwater in the vicinity of this AOC may have been as deep as 5 feet bgs (Bechtel 2007b).

1.1.5.5 Installation Restoration Site 35, Area of Concern 6

The topography at AOC 6 is relatively flat, with an average ground elevation of 9 feet above msl. Depth to groundwater at the nearest groundwater well (located 900 feet southwest of AOC 6) is 3 to 6.5 feet bgs, with a flow direction to the northwest (Bechtel 2007b). Based on tidal studies at other Alameda Point sites, tidal influence would not be expected at AOC 6. Soil encountered at the site during the RI consisted of silt and silt with sand to about 1 foot bgs, underlain by silty sand to about 2 feet bgs. Poorly graded sand was encountered beneath the silty sand extending to 4 feet bgs. Based on the lithology observed in borings north and south of AOC 6, it is estimated that the Young Bay Mud beneath the site is about 9 feet bgs. The Marsh Crust may be located beneath AOC 6; however, it was not encountered in borings advanced to 4 feet bgs during the final RI (Bechtel 2007b).

1.1.5.6 Installation Restoration Site 35, Area of Concern 23

The topography at AOC 23 is relatively flat, with an average ground elevation of 11 feet above msl. The average depth to groundwater based on measurements from two groundwater wells located at AOC 23 is approximately 5 to 7 feet bgs, with a northerly flow direction in the northern portion of AOC 23 and a southwesterly (toward Seaplane Lagoon) flow direction in the southern portion of the site (Bechtel 2007b). Based on tidal studies at other Alameda Point sites, tidal influence would not be expected at AOC 23. Soil encountered at the site during the final RI consisted of a variety of lithologies. Fill material, generally consisting of silty sand, clayey sand, poorly graded sand, and poorly graded sand with silt and clay, was found at thicknesses ranging from the ground surface to 3 to 8.5 feet bgs. The contact between the fill material and the underlying BSU is generally marked by a change in lithology to fine-grained bay sediments (Young Bay Mud) consisting of silt or lean clay. The thickness of the fill material was generally less in the eastern portion of AOC 23; the thickness increased toward the west. The Marsh Crust is not likely present beneath the site, and it was not encountered in borings advanced to 12 feet bgs during the final RI (Bechtel 2007b).

1.1.6 Summary of Previous Investigations

The following sections discuss previous investigations of IR Site 32, and IR Site 35 at AOCs 1, 6, and 23.

1.1.6.1 Installation Restoration Site 25

Previous investigations at IR Site 25 remedial investigations, groundwater monitoring, soil gas investigations. These investigations are discussed in detail in the "Final Remedial Investigation/Feasibility Study Report for Alameda Point Site 25/Annex IR-02" (Engineering/Remediation Resources Group, Inc., 2004). However, a data gap has been identified related to two areas of darkened soil on an aerial photograph taken in 1966. No soil samples were collected previously from these areas and analyzed for a complete suite of analytical parameters. Soil samples will be collected from the areas of darkened soil and analyzed for a selected suite of parameters based on discussions between Navy and the members of the BCT.

1.1.6.2 Installation Restoration Site 32

Previous investigations at IR Site 32 include UST removals, groundwater monitoring events, storm drain investigations, data gap sampling, polynuclear aromatic hydrocarbon (PAH) investigations, radiological surveys, and several remedial investigations. Previous investigations are discussed in detail in the "Final Remedial Investigation Report, IR Site 32, Northwestern Ordnance Storage Area" (Bechtel 2007a).

The following data gaps were identified during the 2005/2006 IR Site 32 RI and will be partially addressed by the sampling proposed in this SAP: verification of constituents in groundwater samples from monitoring wells. Groundwater samples at IR Site 32 will be collected to obtain data to verify previous groundwater sampling results and additional information to support remedial decisions (Bechtel 2007a). An additional data gap identified during the RI phase was the delineation of vinyl chloride and chlorobenzene to the west and northwest. This data gap will be addressed as necessary during remedial design.

1.1.6.3 Installation Restoration Site 35, Area of Concern 1

Previous investigations at IR Site 35 AOC 1 include an EBS, PAH study, and a solid waste management unit report. Soil and groundwater samples were collected at AOC 1 during the three previous investigations. The results are discussed in detail in Attachment A and Appendix B of the "Final Remedial Investigation/Feasibility Study Report, IR Site 35, Alameda Point" (Bechtel 2007b).

During the EBS, two surface soil samples (043-0001 and 043-0001M) were collected near OWS 063C from the most heavily stained area and analyzed for TPH (IT 2001a). TPH constituents reported in soil were below PSCs.

One soil boring (32EDC-5-2) was advanced in AOC 1 during the 2002 PAH study (Bechtel 2005a). Samples were collected from four depth intervals between 0 and 8 feet bgs and analyzed for PAHs. PAH reported in the samples were at concentrations below the PSC.

There is no PSC for naphthalene in groundwater. Naphthalene was reported at a concentration above detection limits in groundwater samples at AOC 1. VOCs were not reported above PSCs at AOC 1, although naphthalene was reported at a concentration of 1,200 micrograms per liter (µg/L) in one grab groundwater sample from boring A01SB03, adjacent to OWS 63A. The reported concentration of naphthalene in a saturated soil sample from this boring was below the PSC for soil. This concentration in a soil sample likely reflects the naphthalene concentration in groundwater, which could exceed the PSC for groundwater. Although the extent of naphthalene in groundwater at AOC 1 has not been completely defined (in the upgradient direction), it was not reported above detection limits in two other groundwater samples (from borings A01SB01 or A01SB02, located generally downgradient), suggesting that the extent of naphthalene in groundwater is limited (Bechtel 2007b).

1.1.6.4 Installation Restoration Site 35, Area of Concern 6

Previous investigations at IR Site 35 AOC 6 include a PAH time-critical removal action (TCRA) and an RI. Previous investigations are discussed in detail in Attachment F of the "Final Remedial Investigation/Feasibility Study Report, IR Site 35, Alameda Point" (Bechtel 2007b).

Remedial investigations were conducted at IR Site 35, including AOC 6, in November and December 2005. Soil samples were collected at AOC 6 from six borings west of Buildings 553; two samples were collected from each boring and analyzed for PCBs. The final RI results indicate that the western extent of Aroclor 1260 contamination in soil was not defined to concentrations below the PSC (Bechtel 2007b). Soil sampling is proposed in this SAP at AOC 6 to define the western extent of Aroclor 1260 in soil.

1.1.6.4 Installation Restoration Site 35, Area of Concern 23

Previous investigations at IR Site 35 AOC 23 include an EBS, soil and groundwater sampling events, data gap sampling, a PAH study, and an RI. A detailed discussion of previous investigation results can be found in Attachment R of the "Final Remedial Investigation/Feasibility Study Report, IR Site 35, Alameda Point" (Bechtel 2007b).

The 2005 RI results indicate that the nature and extent of contamination associated with areas previously used for chemical storage or handling have been adequately defined. Sampling proposed in this SAP for AOC 23 is based on the RI recommendation to address vinyl chloride in groundwater and to verify whether concentrations are above MCLs.

1.1.7 Principal Decision-Makers

The principal decision-makers for all environmental cleanups at Alameda Point include the Navy, the regulatory agencies (EPA, the Department of Toxic Substances Control, and the Regional Water Quality Control Board [Water Board]), and the interested public. These decision makers will use the data collected from this project, in conjunction with data generated during the previous investigations for the following purposes:

- to support remedial decisions at IR Site 25,
- to support remedial decisions at IR Site 32,
- to assess whether the extent of naphthalene in groundwater is localized around the grease trap oil water separator at IR Site 35 AOC 1,
- to further define PCB contamination in soil at IR Site 35 AOC 6, and
- to assess whether possible releases have contaminated groundwater at IR Site 35 AOC 23.

1.1.8 Technical or Regulatory Standards

At IR Site 25 Kollman Circle, U.S. EPA Region IX preliminary remediation goals will be used as comparison criteria for analytical results for metals, SVOCs, pesticides, and PCBs. San Francisco Water Quality Control Board Environmental Screening Levels will be as comparison criteria for TPH. Tables C-1 through C-5 presents the PRRLs for potential COCs in soil at IR Site 25.

At IR Site 32, preliminary remedial goals from the feasibility study were used to define a list of chemicals of interest during the 2005 RI (Bechtel 2007a). The FS established remedial goals for IR Site 32 based on the results of the RI. The remedial goals are used as the comparison criteria for groundwater data collected under this SAP. Samples will be analyzed for VOCs. Specific chemicals of concern (COC) at IR Site 32 include chlorobenzene, trichloroethene, and vinyl chloride. The preliminary remedial goals (RGs) listed below were determined to be sufficiently protective of the indoor air pathway for unrestricted future use of the sites. The site is intended for recreational use, but not residential use. Table C-6 presents PRRLs for the COCs in groundwater at IR Site 32. These PRRLs are based on the preliminary RGs determined in the FS.

IR Site 32	Chemical of Concern	Preliminary RG
	Chlorobenzene	700µg/L
	Trichloroethene	5 µg/L
	Vinyl Chloride	15 µg/L

The IR Site 35 final RI/FS defined the preliminary RGs for AOC 1, 6, and 23. Soil sampling results at AOC 6 and groundwater sampling results at AOCs 1 and 23 will be screened using the preliminary RGs identified in the final RI/FS. The COCs and the preliminary RGs are listed below. Table C-4 and Table C-6 present the PRRLs for the COCs in soil and groundwater respectively at IR Site 35.

IR Site 35	Chemical of Concern	Preliminary RG
AOC 1	Naphthalene	100µg/L
AOC 23	Vinyl chloride	0.5 µg/L
AOC 6	PCBs	220 µg/kg

1.2 PROJECT DESCRIPTION

The following sections discuss the objectives and measurements of the project. Table 2 presents a schedule of sampling, analysis, and reporting for this project.

TABLE 2: IMPLEMENTATION SCHEDULE FOR SAMPLING, ANALYSIS, AND REPORTING
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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Milestone	Due Date	Anticipated Date
Draft Sampling and Analysis Plan to Navy and Regulatory Agencies	15 days after Navy Quality Assurance Manager comments on the Internal Draft SAP	October 5, 2007
Final Sampling and Analysis Plan to Navy and Regulatory Agencies	14 days after Regulatory comments on the Draft SAP	December 9, 2007
Conduct Field Activities	Fall 2007	December 12-23, 2007
Draft Summary Report	Approximately 90 days after samples are collected	February 15, 2008
Final Summary Report	Approximately 90 days after draft report is submitted	May 16, 2008

1.2.1 Project Objectives

The primary objectives of the data gap sampling at the four sites are:

- Obtain data to supplement analytical results from previous investigations in an area of darkened soil near Kollman Circle at IR Site 25.
- Obtain data to verify previous groundwater sampling results and obtain additional information to support remedial decisions at IR Site 32;
- Verify previous groundwater sampling results from direct-push samples at IR Site 35 AOC 1;
- Define the western extent of PCBs in soil at IR Site 35 AOC 6;
- Verify previous groundwater sampling results from direct-push samples and assess whether possible releases from historical activities have affected groundwater at IR Site 35 AOC 23.

The following field activities have been incorporated into the scope of work and will be carried out at Alameda Point to meet these objectives:

- Collection an analysis of soil samples from 5 soil borings at two different depths. The soil samples submitted for analysis will be composites of the 5 borings for each depth.
- Collection and analysis of groundwater samples from five groundwater monitoring wells at IR Site 32
- Collection and analysis of groundwater samples from six direct-push boreholes at IR Site 35 AOC 1
- Collection and analysis of soil samples from three soil borings (two samples per boring) at IR Site 35 AOC 6
- Collection and analysis of groundwater samples from four newly installed groundwater monitoring wells at IR Site 35 AOC 23

1.2.2 Project Measurements

Composite soil samples collected from the five soil borings at IR Site 25 will be analyzed for metals, SVOCs (except PAHs), PCBs, pesticides, and TPH (as motor oil and diesel). Groundwater samples collected from the five groundwater monitoring wells at IR Site 32 will be analyzed for VOCs. Groundwater samples collected from direct-push boreholes will be analyzed for naphthalene at IR Site 35 AOC 1. Soil samples collected from the three soil borings at IR Site 35 AOC 6 will be analyzed for PCBs. Groundwater samples collected from the newly installed wells at IR Site 35 AOC 23 will be analyzed for VOCs. In addition, all groundwater samples collected from IR Site 32, IR Site 35 AOC 1, and IR Site 35 AOC 23 will be analyzed for natural attenuation parameters, such as alkalinity, anions, dissolved gases, iron II, TDS, and total organic carbon (TOC). Project required reporting limits for the natural attenuation parameters are shown in Table C-7. Field parameters, including conductivity, DO, pH, and temperature of the groundwater will also be collected at all sites wherever groundwater samples are collected.

1.3 QUALITY OBJECTIVES AND CRITERIA

The overall project objectives of data gap sampling at IR Site 25, IR Site 32, and IR Site 35 AOC 1, AOC 6, and AOC 23 are outlined in Section 1.2.1. The following sections present the data quality objectives (DQOs) and measurement quality objectives (MQO) identified for this project.

1.3.1 Data Quality Objectives

DQOs are qualitative and quantitative statements developed through the seven-step DQO process (EPA 2000b, 2000e). The DQOs clarify the study objective, define the most appropriate data to collect and the conditions under which to collect the data, and specify tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support decision-making. The DQOs are used to develop a scientific and resource-effective design for data collection. The seven steps of the DQO process for this project are presented in Table 3.

1.3.2 Measurement Quality Objectives for Chemical Data

All analytical results will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project objectives. Of these PARCC parameters, precision and accuracy will be evaluated quantitatively by collecting the quality control (QC) samples listed in Table 4. Specific precision and accuracy goals for these QC samples are listed in Appendix A.

The following subsections describe each of the PARCC parameters and how they will be assessed within this project.

TABLE 3: DATA QUALITY OBJECTIVES

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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STEP 1: State the Problem

- The purpose of soil sampling at IR Site 25 is to collect soil samples from two specific areas where darkened soil was noted in historical aerial photos. The samples will be analyzed for selected analytical groups, namely metals, semivolatile organic compounds (SVOCs). except polycyclic aromatic hydrocarbons; polychlorinated biphenyls (PCBs); pesticides; and total petroleum hydrocarbons (TPH) as motor oil and diesel.
- The purpose of the groundwater sampling at IR Site 32 is to obtain analytical results for a second groundwater sampling event for the five monitoring wells installed in 2006 identified as a data gap by the regulatory agencies. The constituents of concern are vinyl chloride, trichloroethene, and chlorobenzene as described in the Final RI Report (Bechtel 2007a).
- The purpose of groundwater sampling at IR Site 35 AOC 1 is to assess whether the extent of naphthalene in groundwater is localized around OWS 63A.
- The purpose of soil sampling at IR Site 35 AOC 6 is to define the western extent of PCBs in soil around oil-water separator 63A.
- The purpose of groundwater sampling at IR Site 35 AOC 23 is to evaluate whether vinyl chloride concentrations in groundwater exceed the preliminary remedial goal identified in the FS.

STEP 2: Identify the Goals of the Study

- Are there constituents present in specific areas of soil at IR Site 25 above preliminary remedial goals?
- Is a remedial action needed to address groundwater at Site 32 in order for Site 32 to be suitable for unrestricted use?
- Is monitored natural attenuation a viable remedial action for VOCs in groundwater at Site 32 and Site 35?
- Is the area of naphthalene contamination in groundwater at IR Site 35 AOC 1 localized around OWS 063A?
- Are PCBs concentrations in soil above the preliminary remedial goals at IR Site 35 AOC 6?
- Is vinyl chloride present in monitoring well samples at IR Site 35 AOC 23 at concentrations above the preliminary remedial goal identified in the FS?

STEP 3: Identify Information Inputs

- Analytical results for two composited soil samples collected from five locations at two separate depths in the vicinity of Kollman Circle located within IR Site 25. The soil samples will be analyzed for metals, SVOCs, PCBs, pesticides, and TPH.
- Analytical results for groundwater samples collected from five groundwater monitoring wells at IR Site 32. Groundwater samples will be analyzed for natural attenuation parameters and VOCs, specifically vinyl chloride, trichloroethene, and chlorobenzene.
- Analytical results for groundwater samples collected from direct push borings in the first water-bearing zone at IR Site 35 AOC 1. Groundwater samples will be analyzed for naphthalene and

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natural attenuation parameters.

- Analytical results for soil samples collected from three soil borings at IR Site 35 AOC 6. Two soil samples will be collected per boring and analyzed for PCBs.
- Analytical results for groundwater samples collected from four newly installed groundwater monitoring wells at IR Site 35 AOC 23. Groundwater samples will be analyzed for vinyl chloride and natural attenuation parameters. Field parameters (pH, oxidation-reduction potential, electrical conductivity) of importance to project analysis will also be collected. See Section 2.2 "Sampling Methods" for more information regarding field parameters.

STEP 4: Define the Boundaries of the Study

- The approximate lateral boundaries of the investigation at IR Site 25 are shown on Figure 2. The vertical boundaries extend from ground surface to a depth of approximately 4 feet. Temporal boundaries extend through the period of performance of the task order.
- The approximate lateral boundaries of the investigation at IR Site 32 are shown in Figure 3. The vertical boundaries extend from ground surface to a depth of approximately 25 feet or the bottom of the well screens. Temporal boundaries extend through the period of performance for the task order.
- The approximate lateral boundaries of the investigation at IR Site 35 AOC 1 are shown in Figure 4. The vertical boundary is the base of the first water-bearing zone, which extends from ground surface to a depth of approximately 14 feet. Temporal boundaries extend through the period of performance of the task order.
- The approximate lateral boundaries of the investigation at IR Site 35 AOC 6 are shown in Figure 5. The vertical boundaries extend from ground surface to a depth of approximately 4 feet. Temporal boundaries extend through the period of performance for the task order.
- The approximate lateral boundaries of the investigation at IR Site 35 AOC 23 are shown in Figure 6. The vertical boundary is the base of the first water-bearing zone, which extends from ground surface to a depth of approximately 14 feet. Temporal boundaries extend through the period of performance of the task order.

STEP 5: Develop the Analytic Approach

- If detected concentrations for COCs in soil samples collected at IR Site 25 are greater than preliminary RG, remedial action may be proposed. Otherwise, remedial action will not be necessary.
- If detected concentrations for the COCs in the groundwater samples collected at IR Site 32 are at or below the IC termination criteria proposed in the feasibility study, the analytical results will support decisions about the lack of need for remedial action. See Table C-1 for project-required reporting limits (PRRLs). Otherwise, the remedial action will be necessary.
- If data collected during groundwater sampling show MNA is feasible relative to EPA criteria for MNA (USEPA 1998), the remedial design can include MNA as a component of the selected remedial alternative. Otherwise, remedial alternatives will not rely solely on MNA for groundwater remediation.
- If naphthalene concentrations decrease with distance from the naphthalene concentration

observed at OWS 63A, then it can be concluded that naphthalene in groundwater at IR Site 35 AOC 1 is localized. Otherwise, the remedial design will consider the naphthalene is widespread. The conclusion about a decrease with distance will be a collective decision of the BRAC cleanup team for Alameda Point.

- If PCBs are detected in the soil samples collected at IR Site 35 AOC 6 at concentrations above the preliminary RGs, remedial action may be proposed. Otherwise, remedial action will not be necessary.
- If results of groundwater samples from the newly installed wells show that vinyl chloride concentrations collected at IR Site 35 AOC 23 have attenuated to at or below the preliminary RG, the Navy will pursue the no-action alternative. Otherwise, remedial action will be implemented for vinyl chloride in groundwater.

STEP 6: Specify Tolerable Limits on Decision Errors

- Site-specific sampling objectives and the media to be investigated limit the use of statistical methods in selecting sampling locations for this investigation. Tolerable limits on decision errors cannot be precisely defined.

STEP 7: Optimize the Sampling Design

- The locations, analytical parameters, and sampling design at IR Site 25 were based on agreement among the Navy and regulatory agency members of the Base Realignment and Closure Cleanup team.
- The wells and analytical parameters selected for groundwater sampling at IR Site 32 were identified and documented in the final remedial investigation report for IR Site 32.
- The locations and parameters selected for groundwater sampling at OWS 63A in IR Site 35 AOC 1 are based on previous results reported in the remedial investigation report. .
- The locations for soil sampling at IR Site 35 AOC 6 were based on the results of previous sampling reported in the remedial investigation report.
- Sample locations and monitoring well locations at IR Site 35 AOC 23 were selected based on previous sampling results presented in the remedial investigation report. The sampling locations are sufficient to determine the need for remedial action for the selected COCs.

Reference: US Environmental Protection Agency (USEPA). 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. Office of Research and Development; Washington, DC. September.

Notes:

COCs	Chemicals of Concern
AOC	Area of concern
IR	Installation Restoration
BRAC	Base Realignment and Closure
PCB	Polychlorinated biphenyls
VOC	Volatile organic compounds
SVOC	Semi-volatile organic compounds

TABLE 4: FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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Parameter	Analytical Method	Matrix	Field Samples	Field Duplicates	Trip Blanks	Equipment Rinsate	Source Blank[a]	Total Number of Samples	MS/MSD (at 5%)
Alkalinity	SM 2320B	Water	15	2	None	1	1	6	NA
Anions[b]	EPA 300.0	Water	15	2	None	1	1	6	1
Dissolved gases[c]	RSK 175	Water	15	2	None	1	1	6	NA
Iron II	Hach 8146	Water	15	2	None	0	1	5	NA
Metals	SW 6010, 7000	Soil	2	0	None	1	1	4	1
Napthalene	EPA 8260B	Water	6	1	1	1	1	10	1
PCB	EPA 8082	Soil	8	1	None	1	1	11	1
Pesticides	EPA 8081A	Soil	2	0	None	1	1	4	1
pH	EPA 9040	Water	15	2	None	1	1	19	NA
SVOC	EPA 8270C	Soil	2	0	None	1	1	4	1
Sulfide	EPA 376.1	Water	15	2	None	1	1	19	1
TDS	SM2540C	Water	15	2	None	1	1	6	1
TPH	SW 8015 (modified)	Soil	2	0	None	1	1	4	1
TOC	EPA 9060A	Water	15	2	None	1	1	19	1
VOC	EPA 8260B	Water	9	1	1[d]	1	1	13	1

Notes:

a Equipment rinsate samples will be used to evaluate possible contamination from the decontamination process.
b Anions includes nitrate, nitrite, and sulfate.
c Dissolved gasses are methane, ethane, and ethene.
d Water samples for VOCs analysis require a trip blank in each ice chest.
EPA US Environmental Protection Agency
NA Not applicable
MS/MSD Matrix spike/matrix spike duplicate
PCB Polychlorinated biphenyl
RSK Robert S. Kerr
SM Standard Methods for the Examination of Water and Wastewater
SVOC Semi-volatile organic compound
TDS Total dissolved solids
TPH Total petroleum hydrocarbon
TOC Total organic carbon
VOC Volatile organic compound

1.3.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

$$RPD = \frac{|A-B|}{(A+B)/2} \times 100\%$$

where:

A = First duplicate concentration

B = Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicate samples. Field duplicates will be collected and analyzed at a frequency of 10 percent for groundwater samples.

Laboratory analytical precision is evaluated by analyzing laboratory duplicates or matrix spikes (MS) and matrix spike duplicates (MSD). The results of the analysis of each MS/MSD pair will be used to calculate an RPD for evaluating precision.

1.3.2.2 Accuracy

Field accuracy will be assessed by collecting and analyzing equipment rinsate, trip blank, and source water blank QC samples. These QC samples will be used to evaluate the potential for target analytes to enter samples as a result of sampling processes.

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control samples (LCS) or blank spikes, surrogate standards, and method blanks. MS and MSD samples will be prepared and analyzed at a frequency of 5 percent for groundwater samples. LCS or blank spikes are also analyzed at a frequency of 5 percent. Surrogate standards, where available, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy.

$$Percent\ Recovery = \frac{S-C}{T} \times 100$$

where:

S = Measured spike sample concentration

C = Sample concentration

T = True or actual concentration of the spike

Appendix A presents accuracy goals for the investigation based on the percent recovery of matrix and surrogate spikes. Results that fall outside the accuracy goals will be further evaluated based on the results of other QC samples.

1.3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition that they are intended to represent. Representative data will be obtained for this project through careful selection of sampling locations and analytical parameters. Representative data will also be obtained through proper collection and handling of samples to avoid interference and minimize contamination.

Representativeness of data will be ensured through the consistent application of established field and laboratory procedures. Field blanks (if appropriate) and laboratory blank samples will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be nonrepresentative, by comparison with existing data, will be used only if accompanied by appropriate qualifiers and limits of uncertainty.

1.3.2.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability is exceeded. When all data validation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 4.2, completeness will also be evaluated as part of the data quality assessment process (EPA 2000d). This evaluation will help determine whether any limitations are associated with the decisions to be made based on the data collected.

1.3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.3.2.6 Detection and Quantitation Limits

The method detection limit is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix. PRRLs are contractually specified maximum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the method detection limit to allow for matrix effects. PRRLs, which SulTech establishes in the scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance; actual laboratory quantitation limits may be substantially lower.

Analytical methods for this project have been selected so that the PRRLs for each target analyte are below the applicable regulatory screening criteria, wherever practical. Appendix C displays the PRRLs for the selected analytical methods and the appropriate benchmark. This comparison shows that the analytical methods selected and the associated PRRLs are capable of quantifying chemicals of concern in groundwater at concentrations below the applicable regulatory criteria.

1.4 PROJECT ORGANIZATION

Table 5 presents the responsibilities and contact information for key personnel involved in sampling at IR Site 32, IR Site 35 AOC 1, AOC 6, and AOC 23. In some cases, more than one responsibility has been assigned to one person. Figure 7 presents the organization of the project team.

1.5 SPECIAL TRAINING AND CERTIFICATION

This section outlines the training and certification required to complete the activities described in this SAP. Personnel working on this investigation have been trained in the field activities necessary to complete the investigation. In addition to the requirements in the following sections, personnel performing field tasks are required to read the SAP and sign their name and requested information on the sign-off sheet as provided at the front of this document. The following sections describe the requirements for SulTech and subcontractor personnel working on site.

1.5.1 Health and Safety Training

SulTech personnel who work at hazardous waste project sites are required to meet the Occupational Safety and Health Administration (OSHA) training requirements set forth in Title 29 Code of Federal Regulations (CFR) Part 1910.120(e). These requirements include (1) 40 hours of formal off-site instruction; (2) a minimum of 3 days of actual on-site field experience under the supervision of a trained and experienced field supervisor; and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in hazardous waste operations also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers requirements for training and personal protective equipment, the spill containment program, and health-hazard monitoring procedures and techniques. At least one member of every SulTech field team will maintain current certification in the American Red Cross "Multimedia First Aid" and "Cardiopulmonary Resuscitation (CPR) Modular," or equivalent.

TABLE 5: KEY PERSONNEL

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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Name	Organization	Role	Responsibilities	Contact Information
Frances Fadullon	Navy	Remedial Project Manager	Responsible for overall project execution and for coordination with base representatives, regulatory agencies, and Navy management Actively participates in DQO process Provides management and technical oversight during data collection	Naval Facilities Engineering Command, SWDIV San Diego, CA frances.fadullon.ctr@navy.mil (619) 532-0935
Narciso A. Ancog	Navy	Quality QA Officer	Responsible for QA issues for all Navy environmental work Provides government oversight of Tetra Tech's QA program Reviews and approves SAP and any significant modifications Has authority to suspend project activities if Navy quality requirements are not met	Naval Facilities Engineering Command, SWDIV San Diego, CA narciso.ancog@navy.mil (619) 532-3046
Craig Hunter	SulTech	Project Manager	Responsible for project management and coordination between Navy management and SulTech team. Ensures data collection activities in SAP are performed by project team in accordance with scope, budget, and schedule	Tetra Tech, Sacramento craig.hunter@ttemi.com (916) 853-5407
Greg Swanson	SulTech	Project QA Manager	Responsible for ensuring all SulTech activities are performed in accordance with current Navy and contract requirements.	Tetra Tech, San Diego, CA greg.swanson@ttemi.com (619) 525-7188
Kevin Hoch	SulTech	Project QA Officer	Responsible for providing guidance to SulTech team that is preparing SAPs. Verifies that data collection methods specified in the SAP comply with Navy and Tetra Tech requirements. Conducts laboratory evaluations and audits, as necessary.	Tetra Tech, San Francisco, CA kevin.hoch@ttemi.com (415) 222-8304

TABLE 5: KEY PERSONNEL (CONTINUED)
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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Name	Organization	Role	Responsibilities	Contact Information
Doug Grant	SulTech	Field team Leader	Responsible for directing day-to-day field activities conducted by SulTech and subcontractor personnel Verifies that field sampling and measurement procedures follow SAP Provides project manager with regular reports on status of field activities	Sullivan Group, San Francisco, CA dgrant775@charter.net (775) 448-9744
Hannah Thompson	SulTech	On-site Safety Officer	Responsible for implementing health and safety plan and for determining appropriate site control measures and personal protection levels Conducts safety briefings for SulTech and subcontractor personnel and site visitors Can suspend operations that threaten health and safety	Sullivan Group, San Francisco, CA hthompson@onesullivan.com (415) 321-1786
Chris Ohland	SulTech	Analytical Coordinator	Responsible for working with project team to define analytical requirements Assists in selecting a pre-qualified laboratory to complete required analyses (see Section 2.4 of SAP) Coordinates with laboratory project manager on analytical requirements, delivery schedules, and logistics Reviews laboratory data before they are released to project team	Sullivan Group, San Francisco, CA cohland@onesullivan.com (415) 321-1795
Wing Tse	SulTech	Database Manager	Responsible for developing, monitoring, and maintaining project database under guidance of project manager Works with Project Chemist during preparation of SAP to resolve sample identification issues	Tetra Tech, San Francisco, CA wing.tse@ttemi.com (415) 222-8326

TABLE 5: KEY PERSONNEL (CONTINUED)
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
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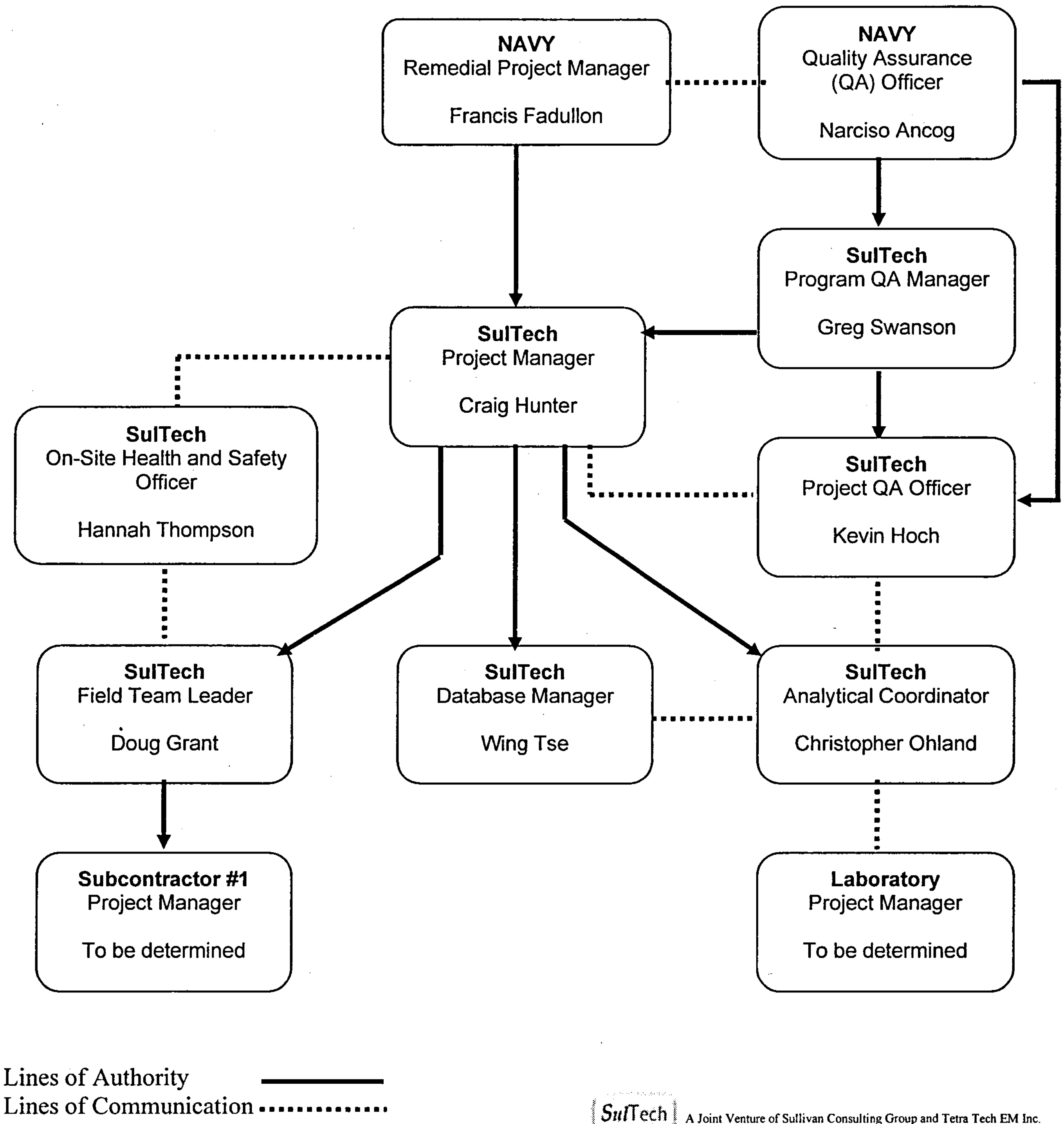
Name	Organization	Role	Responsibilities	Contact Information
To be determined	Laboratory	Project Manager	Responsible for delivering analytical services that meet requirements of SAP Reviews SAP to understand analytical requirements Works with SulTech Project Chemist to confirm sample delivery schedules Reviews laboratory data package before submittal	To be determined

Notes:

DQO Data quality objective
SAP Sampling and analysis plan
QA Quality assurance



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Alameda Point

U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7

PROJECT TEAM ORGANIZATION CHART

Sampling and Analysis Plan

Site 32 and Site 35

Copies of SulTech's health and safety training records, including course completion certifications for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained at SulTech's offices.

Before work begins at a specific hazardous waste project site, SulTech personnel are required to undergo site-specific training that thoroughly covers the following areas:

- Names of personnel and alternates responsible for health and safety at a hazardous waste project site
- Health and safety hazards on site
- Selection of the appropriate personal protection levels
- Correct use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazardous substances
- Contents of the site-specific health and safety plan.

1.5.2 Subcontractor Training

Subcontractors who work on site will certify that their employees are trained for work on hazardous waste project sites. Training will meet OSHA requirements defined in Title 29 CFR 1910.120(e). Before work begins at the project site, subcontractors will submit copies of the training certification for each employee to SulTech.

All employees of associate and professional services firms and technical services subcontractors will attend a safety briefing and complete the "Project Personnel Sign-Off Sheet" before they conduct on-site work. The safety briefing covers topics described in Section 1.5.1 and will be conducted by SulTech's on-site health and safety officer or other qualified person.

Subcontractors are responsible for conducting their own safety briefings. SulTech personnel may audit these briefings.

In addition to the health and safety requirements described above, all personnel are required to be trained in the specific aspects of this project for which they are responsible. Field personnel responsible for collecting groundwater samples will be proficient in the use of low-flow or micro-purge sampling using bladder pumps, soil sampling, and well installation procedures.

1.5.3 Specialized Training and Certification Requirements

No special training or certification is required for the site beyond the basic health and safety requirements described above. SulTech personnel experienced in collecting groundwater and soil samples following the techniques described in this SAP will collect all samples to ensure they are properly obtained.

1.6 DOCUMENTS AND RECORDS

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages.

1.6.1 Field Documentation

Complete and accurate documentation is essential to demonstrate that field measurement and sampling procedures are carried out as described in the SAP. Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbook will list the contract name and number, the delivery order number, the site name, and the names of subcontractors, the service client, and the project manager. At a minimum, the following information will be recorded in the field logbook:

- Name and affiliation of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolution
- Discussions of deviations from the SAP or other governing documents
- Description of all photographs taken

The field team will also use the various field forms included in Appendix B to record field activities.

1.6.2 Summary Data Package

The summary data package for the sampling will consist of a case narrative, copies of all associated chain-of-custody forms, sample results, and quality assurance (QA) and QC summaries. The case narrative will include the following information:

- Subcontractor name, project name, delivery order number, project order number, sample delivery group (SDG) number, and a table that cross-references client and laboratory sample identification numbers
- Detailed documentation of all sample shipping and receiving, preparation, analytical, and quality deficiencies
- Thorough explanation of all instances of manual integration
- Copies of all associated nonconformance and corrective action forms that will describe the nature of the deficiency and the corrective action taken
- Copies of all associated sample receipt notices

Additional requirements for the summary data package are outlined in Table 6. The subcontracting laboratory will provide SulTech with two copies of the summary data package within 21 days after it receives the last sample in the SDG.

1.6.3 Full Data Package

When a full data package is required, the laboratory will prepare it in accordance with the instructions provided in the EPA Contract Laboratory Program Statements of Work (EPA 1999a, 2000a). Full data packages will contain all of the information from the summary data package and all associated raw data. Requirements for the full data package are outlined in Table 6. Full data packages are due to SulTech within 21 days after the last sample in the SDG is received. Unless otherwise requested, the subcontractor will deliver one copy of the full data package.

1.6.4 Data Package Format

The subcontracted laboratory will provide electronic data deliverables (EDD) for all analytical results collected during the quarterly groundwater sampling. An automated laboratory information management system must be used to produce the EDDs. Manual creation of the deliverable (data entry by hand) is unacceptable. The laboratory will verify EDDs internally before they are issued. The EDDs will correspond exactly to the hard-copy data. No duplicate data will be submitted. EDDs will be compatible with the Navy Environmental Data Deliverable (NEDD) format. Results that should be included in all EDDs are as follows:

- Target analyte results for each sample and associated analytical methods requested on the chain-of-custody form
- Method and instrument blanks and preparation and calibration blank results reported for the SDG
- Percent recoveries for the spike compounds in the MS, MSDs, blank spikes, or LCSs
- Matrix duplicate results reported for the SDG
- All re-analysis, re-extractions, or dilutions reported for the SDG, including any associated with samples and the specified laboratory QC samples

Electronic data must be retained for a minimum of 3 and 10 years, respectively, after final data have been submitted. The subcontractor will use an electronic storage device capable of recording data for long-term, off-line storage. Raw data will be retained on an electronic data archival system. Data will be submitted to the Naval Installation Restoration Information Solution (NIRIS) within 30-days of receipt of final validated data. Additionally, at the end of the project, all raw data and validation reports will be submitted to the NAVFAC Southwest Administrative Record.

1.6.5 Reports Generated

A technical memorandum will be prepared at the conclusion of the field and laboratory work to present the results of the data gap sampling. The report will include a summary of the results of previous related investigations, field and sampling procedures for the field activities, analytical results and associated QC data, conclusions, and recommendations.

2.0 DATA GENERATION AND AQUISITION

This section describes the requirements for the following:

- Sampling Process Design (see Section 2.1)
- Sampling Methods (see Section 2.2)
- Sample Handling and Custody (see Section 2.3)
- Analytical Methods (see Section 2.4)
- Quality Control (see Section 2.5)
- Equipment Testing, Inspection, and Maintenance (see Section 2.6)
- Instrument Calibration and Frequency (see Section 2.7)
- Inspection and Acceptance of Supplies and Consumables (see Section 2.8)
- Non-Direct Measurements (see Section 2.9)
- Data Management (see Section 2.10)

TABLE 6: REQUIREMENTS FOR SUMMARY AND FULL DATA PACKAGES

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

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Requirements for Summary Data Packages – Organic Analysis

Section I Case Narrative

1. Case narrative
2. Copies of nonconformance and corrective action forms
3. Chain-of-custody forms
4. Copies of sample receipt notices
5. Internal tracking documents, as applicable

Section II Sample Results – Form I for the following:

1. Environmental samples, including dilutions and re-analysis
2. TIC (VOC only)

Section III QA/QC Summaries – Forms I through XI for the following:

1. System monitoring compound and surrogate recoveries (Form II)
2. MS and MSD recoveries and RPDs (Forms I and III)
3. Blank spike or LCS recoveries (Forms I and III-Z)
4. Method blanks (Forms I and IV)
5. Performance check (Form V)
6. Initial calibrations with retention time information (Form VI)
7. Continuing calibrations with retention time information (Form VII)
8. Quantitation limit standard (Form VII-Z)
9. Internal standard areas and retention times (Form VIII)
10. Analytical sequence (Forms VIII-D and VIII-Z)
11. GPC calibration (Form IX)
12. Single component analyte identification (Form X)
13. Multicomponent analyte identification (Form X-Z)
14. Matrix-specific MDL (Form XI-Z)

Requirements for Summary Data Packages – Inorganic Analysis

Section I Case Narrative

1. Case narrative
2. Copies of nonconformance and corrective action forms
3. Chain-of-custody forms
4. Copies of sample receipt notices
5. Internal tracking documents, as applicable

Section II Sample Results - Form I for the following:

1. Environmental sample including dilutions and re-analysis

Section III QA/QC Summaries - Forms II through XIV for the following:

1. Initial and continuing calibration verifications (Form II)
2. PRRL standard (Form II)
3. Detection limit standard (Form II-Z)
4. Method blanks, continuing calibration blanks, and preparation blanks (Form III)
5. ICP interference-check samples (Form IV)
6. MS and post-digestion spikes (Forms V and V-Z)
7. Sample duplicates (Form VI)
8. LCS (Form VII)
9. Method of standard additions (Form VIII)
10. ICP serial dilution (Form IX)
11. IDL (Form X)
12. ICP interelement correction factors (Form XI)
13. ICP linear working range (Form XII)

TABLE 6: REQUIREMENTS FOR SUMMARY AND FULL DATA PACKAGES (CONTINUED)
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Requirements for Full Data Packages -- Organic Analysis	Requirements for Full Data Packages -- Inorganic Analysis
Sections I, II, and III **Summary Package**	**Sections I, II, III** **Summary Package**
Section IV **Sample Raw Data - indicated form, plus all raw data**	**Section IV** **Instrument Raw Data - Sequential measurement readout records for ICP, graphite furnace atomic absorption (GFAA), flame atomic absorption (AA), cold vapor mercury, cyanide, and other inorganic analyses, which will contain the following information:**
1. Analytical results, including dilutions and re-analysis (Forms I and X) 2. TICs (Form I — VOC only)	1. Environmental samples, including dilutions and re-analysis 2. Initial calibration 3. Initial and continuing calibration verifications
Section V **QC Raw Data - indicated form, plus all raw data** 1. Method blanks (Form IV) 2. MS and MSD samples (Form III) 3. Blank spikes or LCSs (Form III)	4. Detection limit standards 5. Method blanks, continuing calibration blanks, and preparation blanks 6. ICP interference check samples 7. MS and post-digestion spikes 8. Sample duplicates
Section VI **Standard Raw Data - indicated form, plus all raw data** 1. Performance check (Form V) 2. Initial calibrations, with retention-time information (Form VI) 3. Continuing calibrations, with retention-time information (Form VII) 4. Quantitation-limit standard (Form VII-Z) 5. GPC calibration (Form IX)	9. LCS 10. Method of standard additions 11. ICP serial dilution **Section V** **Other Raw Data** 1. Percent moisture for soil samples 2. Sample digestion, distillation, and preparation logs, as necessary
Section VII **Other Raw Data** 1. Percent moisture for soil samples 2. Sample extraction and cleanup logs 3. Instrument analysis log for each instrument used (Form VIII-Z) 4. Standard preparation logs, including initial and final concentrations for each standard used 5. Formula and a sample calculation for the initial calibration 6. Formula and a sample calculation for soil sample results	3. Instrument analysis log for each instrument used 4. Standard preparation logs, including initial and final concentrations for each standard used 5. Formula and a sample calculation for the initial calibration 6. Formula and a sample calculation for soil sample results

TABLE 6: REQUIREMENTS FOR SUMMARY AND FULL DATA PACKAGES (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Notes:

ICP	Inductively coupled plasma
IDL	Instrument detection limit
GPC	Gel permeation chromatography
LCS	Laboratory control sample
MDL	Method detection limit
MS/MSD	Matrix spike/matrix spike duplicate
PRRL	Project-required reporting limit
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
TIC	Tentatively identified compounds
VOC	Volatile organic compound

2.1 SAMPLING PROCESS DESIGN

Soil sampling at IR Site 25 Kollman Circle will confirm the presence or absence of selected potential contaminants in specific areas where darkened soil was observed previously. Groundwater samples collected at IR Site 32 will verify previous groundwater sampling results and provide additional information to support remedial decisions. Groundwater samples collected at IR Site 35 AOC 1 will help assess groundwater quality in the vicinity of OWS 63A. Soil samples collected at IR Site 35 AOC 6 will define the western extent of PCB soil contamination at AOC 6. Groundwater sampling at IR Site 35 AOC 23 will be used to confirm previous sampling results and assess whether vinyl chloride concentrations in groundwater have attenuated to at or below the preliminary remedial goals. The following sections present the proposed sample locations and planned analytical suite.

2.1.1 Investigation of Soil and Groundwater

Groundwater samples will be collected from five existing monitoring wells at IR Site 32. IR Site 32 groundwater sampling locations are shown on Figure 3. At IR Site 35 AOC 1, groundwater samples will be collected from six locations using a direct push technology (such as Hydropunch®), which are shown in Figure 4. After groundwater sampling, several locations shown on Figure 4 will be developed as piezometers to allow continued monitoring of groundwater levels. At IR Site 35 AOC 6, two soil samples will be collected from each of three soil boring locations, for a total of six samples (Figure 5). At IR Site 35 AOC 23, groundwater samples will be collected from four newly installed monitoring wells shown on Figure 6. The locations for soil and groundwater samples, the sample identification numbers, and the analytical suite are presented in Table 7.

Samples for chemical analysis will be submitted to California state-certified laboratories that have been approved by the Navy. Table 7 summarizes the proposed analytical suite for the environmental and QC samples for this project.

2.1.2 Rationale for Selecting Analytical Parameters

Analytical parameters were selected to provide focused coverage of potential contaminants in groundwater and soil. The specific analytical parameters for the sites were selected based on the available historical information and regulatory requirements.

2.2 SAMPLING METHODS

This section describes the procedures for sample collection, including sampling methods and equipment, sample preservation requirements, decontamination procedures, and management of investigation-derived waste.

2.2.1 Well Installation and Development

Permanent Well Installation and Development

Installation and development of new groundwater wells under this SAP is needed only at IR Site 35 AOC 23 where four groundwater monitoring wells will be installed at the locations indicated on Figure 6. These locations were selected because they coincide with the sampling locations where the highest concentrations of vinyl chloride in soil and groundwater were reported during IR Site 35 final RI sampling (Bechtel 2007b). Monitoring wells will be installed in accordance with Alameda County Public Works Agency, Water Resources Office, and State of California guidelines, as well as Tetra Tech standard operating procedures (SOP).

Before any drilling begins, an underground utility location contractor will clear each location at IR Site 35 AOC 23 using electromagnetic and other utility location techniques. During soil boring, a photoionization detector (PID) will be used to screen the soil cuttings at 5-foot intervals. If concentrations of VOCs exceed the levels set forth in the site-specific health and safety plan (HASP), the contingency procedures in the HASP will be followed. Each soil boring will be fully described on a log sheet. An example of a typical boring log is shown in Appendix B. The site geologist will log the boring as it is being drilled by recording relevant data, including the following:

- Identification number and location of the boring
- Depths in feet and tenths of a foot
- Lithologic description of soil types
- Waste types encountered (such as trash, glass, or other debris
- Depth to water as first encountered during drilling
- A general description of the drilling equipment used, including such information as rod size, bit type, rig manufacturer, and model
- Dates and times of start and completion of boring
- Names of contractor, driller, and on-site geologist who logs the soil boring
- Size and length of casing used in each boring
- Observations of visible contamination such as discoloration, debris, and odor
- Field instrument readings

Soils will be classified in accordance with the Unified Soil Classification System and American Society for Testing and Materials (ASTM) Method D2488-00, "Standard Practice for Description and Identification of Soils, Visual-Manual Procedure" (ASTM 2000). These classifications will be made in the field by the on-site geologist or engineer and will be subject to revision based on subsequent review. Any changes to field logs will be annotated as to the basis of the change, initialed, and dated.

A screened monitoring well with filter pack will be installed in the boring. Wells will be set with a 10-foot screen interval at approximately 14 feet bgs. A 2-inch-diameter, flush-threaded polyvinyl chloride (PVC) well screen with an attached end cap will be used. The blank section will be composed of flush-threaded, 2-inch-diameter Schedule 40 PVC pipe. No organic solvents or adhesives will be used in coupling sections of the well casing. Well screens will be made of new, decontaminated, flush-threaded, 2-inch-diameter, machine-slotted pipe.

The primary objective of the filter pack and well screen design is to minimize the turbidity of groundwater samples collected from the well, while allowing sufficient infiltration of groundwater into the well. Sand used for the filter pack and the size of the slot in the well screen depend on the classification of the formation in the water-bearing zone. Based on previous well installations at Alameda Point, a 2/12 filter pack sand and well screen slot size of 0.010 inch will be used for the new wells.

The wells will be constructed by placing filter pack materials in the annulus between the hollow stem auger casing and the 2-inch inner monitoring well casing. During sand placement, the rising surface of the sand will be repeatedly measured using a weighted line to monitor the depth and prevent bridging. The filter pack will be placed around the screen from approximately 1 foot below the bottom of the screen end cap to approximately 1 foot above the top of the well screen. A 1-foot-thick bentonite seal will be emplaced above the annular filter pack. A minimum of 1 hour will be allowed for hydration of the bentonite before the annular grout seal is placed.

An annular grout seal of Type I/II Portland/Bentonite grout will then be tremied (or other efficient method for placing the grout into the borehole) into place from the top of the bentonite seal to approximately 1 foot bgs. The grout will be mixed in the following proportions: 94 pounds of neat Type I Portland or American Petroleum Institute Class A cement, 3 to 5 pounds of pure sodium bentonite powder, and 6.5 gallons of potable water. This mixture is equivalent to 15 sacks of cement and 1 sack of bentonite per 100 gallons of water. After the grout seal is in place, no additional work will be performed on the well for a minimum of 24 hours until the grout seal has set.

Wellheads will be completed flush mount, with the well cover raised above grade and the surrounding concrete pad sloped so that water drains away from the cover. The wellhead will include a locking, watertight cap on the inner well casing. The well will be locked with a padlock immediately after the wellhead is constructed.

The newly installed monitoring wells will be developed to (1) maximize the flow of formation water into the well casing, (2) remove any fluids that may potentially be introduced during drilling, (3) allow the groundwater and potential chemicals to equilibrate after they are disturbed during drilling, and (4) create representative aquifer conditions near the monitoring well before sampling. Established well development techniques will be used, including surging and pumping, but development will be non-aggressive to minimize the effect on the concentration of dissolved oxygen (DO) in the wells. Development will begin no sooner than 24 hours after well installation is complete. A minimum of three casing and filter pack volumes will be removed. Field parameters, including temperature, pH, conductivity, and turbidity, will be measured to evaluate the stability of the groundwater parameters. Field forms for groundwater development are included in Appendix B. Groundwater samples from the newly installed wells will not be collected until 72 hours after well development has been completed.

Temporary Well Installation

Temporary piezometers will be installed using the direct–push method. After completing the soil borings, a temporary well casing will be inserted into soil borings. The casing will consist of 1-inch diameter, Schedule 40, flush-threaded, 0.020-inch machine-slotted polyvinyl chloride (PVC) well screen. Low flow peristaltic or bladder pumps will be used for groundwater sampling.

2.2.2 Groundwater Sampling Methods and Equipment

All groundwater samples will be collected using low-flow or micropurge techniques. Groundwater samples will be collected from five existing monitoring wells at IR Site 32, six direct push boreholes at IR site 35 AOC 1, and four newly installed groundwater wells at IR Site 35 AOC 23. Groundwater samples will be collected from the wells using a bladder pump. Groundwater will be pumped from the middle of the well screen with a bladder pump and dedicated plastic tubing. The groundwater will be pumped at a rate of approximately 200 milliliters per minute. The groundwater will flow through a flow-through cell, and a water quality meter will measure the conductivity, DO, pH, and temperature of the groundwater. The depth to groundwater will be monitored with a water level indicator such as a Solinst® water level indicator. Depths to groundwater should be collected only after the monitoring well has equilibrated to atmospheric conditions (approximately 2 to 5 minutes). The depth to groundwater and water quality parameters will be recorded every 2 to 5 minutes. Groundwater will be considered stable when the groundwater level varies less than 0.01 foot over two consecutive readings and the groundwater chemistry does not fluctuate by more than the following ranges over three successive readings: ±0.1 pH; ±3 percent for specific conductivity; and ±10 percent for DO. After the groundwater has stabilized, the flow-through cell will be disconnected and a sample will be collected in a laboratory-prepared container at the same flow rate as purging. Sample tubing and VOA sample vials will be checked to ensure that no air bubbles are present. Table 7 presents the proposed identification numbers for groundwater samples and the analytical suite. After sampling is complete at monitoring wells, the total depth of the well should be determined and recorded in the field notes.

If any field parameter did not achieve stability during purging, groundwater samples should be collected before the well is purged dry. A field variance form should be prepared to document the deviation from the SAP and resulting action.

2.2.3 Soil Sampling Methods and Equipment

Five soil samples will be collected from two depths at each of five boring locations at IR Site 25 Kollman Circle. All five soil samples from each depth increment (0 to 2 feet bgs and 2 to 4 feet bgs) will be mixed to prepare a single composite sample from each depth increment for submission to the lab. Thus, a total of two samples will be submitted to the lab. Soil samples will be collected using a direct-push sampler.

Two soil samples will be collected from three boring locations at IR Site 35 AOC 6, for a total of six soil samples at AOC 6. Soil borings will be drilled following the procedures discussed in Section 2.2.1. Soil samples will be collected using a direct-push sampler with acetate sleeves. The direct-push sampler is advanced into the soil boring using a hydraulic ram attached to a drill rod. After the direct-push sampler is driven to the intended sampling depth, the acetate sleeve is removed from the casing and opened. The soil is then used to visually classify the sample, and the entire sample is retained for analysis or disposal. Table 7 presents the proposed identification numbers for soil samples, the proposed sampling depths, and the analytical suite.

2.2.4 Decontamination

After soil borings are complete, drilling and any other potentially contaminated, nondisposable equipment will be properly decontaminated. Dedicated sampling equipment will be used for all groundwater samples collected, except for the bladder pump. The bladder pump will be decontaminated after each sample is collected, and new bladders will be installed. Decontamination procedures will include, at a minimum, a pressurized rinse (or brush rinse) using tap water with phosphate-free detergent and a tap water rinse. Equipment will be inspected to ensure that all soil has been removed before the field team initiates activities at the new well. Decontamination water will be collected daily in a storage drum or tank and will be profiled for disposal at an appropriately licensed disposal facility.

2.2.5 Management of Investigation-Derived Waste

Minimal quantities of IDW will be generated during this investigation. IDW will include monitoring well purge water and wastewater from decontamination procedures and soil cuttings from drilling. Aqueous IDW and soil cuttings will be containerized in properly labeled, U.S. Department of Transportation-approved 55-gallon drums. Wastes generated will be profiled to determine the appropriate method of disposal. Waste will be analyzed for contaminants identified as potential contaminants in conjunction with the profiling requirements of the disposal facility chosen.

2.3 SAMPLE HANDLING AND CUSTODY

The sections below describe sample handling procedures, including sample identification and labeling, documentation, chain of custody, and shipping.

2.3.1 Sample Identification

Sample identification numbers are included in Table 7 and will be used as a primary sample identifier on each sample label.

2.3.2 Sample Containers and Holding Times

Table 9 presents the type of sample containers, sample volumes, preservation requirements, and the maximum holding times for samples prior to analysis.

TABLE 7: PROPOSED SOIL AND GROUNDWATER SAMPLES, RATIONALE, AND ANALYTICAL SUITE
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

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Sampling Location/ID Number	Matrix	Sample Depth (feet bgs)	Analytical Group	Sampling SAP Reference
IR Site 25, Kollman Circle				
IR25KC-SBC-01	Soil	0 to 2	Metals (EPA 6010B), SVOC (EPA 8270), pesticides(EPA 8081A), PCBs (EPA 8082), TPH (SW 8015)	SAP Section 2.2.3
IR25KC-SBC-02	Soil	2 to 4	Same as above	Same as above
Installation Restoration Site 32				
IR32-MW-01/130GW001	Water	10 to 15	VOC (EPA 8260B); alkalinity (SM2320B); anions[c] (EPA 300.0); dissolved gases[d] (RSK 175); sulfide (EPA 376.1); iron II (Hach 8146); pH (EPA 9040); TDS (SM2540C); TOC (EPA 9060A	SAP Section 2.2.2
IR32-MW-02/130GW002	Water	10 to 15	Same as above	Same as above
IR32-MW-03/130GW003	Water	10 to 15	Same as above	Same as above
IR32-MW-04/130GW004	Water	10 to 15	Same as above	Same as above
IR32-MW-05/130GW005	Water	10 to 15	Same as above	Same as above

TABLE 7: PROPOSED SOIL AND GROUNDWATER SAMPLES, RATIONALE, AND ANALYTICAL SUITE (CONTINUED)
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Sampling Location/ID Number	Matrix	Sample Depth (feet bgs)	Analytical Group	Sampling SAP Reference
Site 35, Area of Concern 1				
130AOC1-DP-01/130DP001	Water	7	VOC (EPA 8260B); alkalinity (SM2320B); anions[c] (EPA 300.0); dissolved gases[d] (RSK 175); sulfide (EPA 376.1); iron II (Hach 8146); pH (EPA 9040); TDS (SM2540C); TOC (EPA 9060A)	SAP Section 2.2.2
130AOC1-DP-02/130DP002	Water	7	Same as above	Same as above
130AOC1-DP-03/130DP003	Water	7	Same as above	Same as above
130AOC1-DP-04/130DP004	Water	7	Same as above	Same as above
130AOC1-DP-05/130DP005	Water	7	Same as above	Same as above
130AOC1-DP-06/130DP006	Water	7	Same as above	Same as above
Site 35, Area of Concern 6				
130AOC6-SB-01/130SB001	Soil	0 to 2	PCB (EPA 8082)	SAP Section 2.2.3
130AOC6-SB-01/130SB002	Soil	2 to 4	Same as above	Same as above
130AOC6-SB-02/130SB003	Soil	0 to 2	Same as above	Same as above
130AOC6-SB-02/130SB004	Soil	2 to 4	Same as above	Same as above
130AOC6-SB-03/130SB005	Soil	0 to 2	Same as above	Same as above
130AOC6-SB-03/130SB006	Soil	2 to 4	Same as above	Same as above

TABLE 7: PROPOSED SOIL AND GROUNDWATER SAMPLES, RATIONALE, AND ANALYTICAL SUITE (CONTINUED)
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Sampling Location/ID Number	Matrix	Sample Depth (feet bgs)	Analytical Group	Sampling SAP Reference
Site 35, Area of Concern 23				
AOC23-MW-01/130GW009	Water	10 to 15	VOC (EPA 8260B); alkalinity (SM2320B); anions[c] (EPA 300.0); dissolved gases[d] (RSK 175); sulfide (EPA 376.1); iron II (Hach 8146); pH (EPA 9040); TDS (SM2540C); TOC (EPA 9060A)	SAP Section 2.2.2
AOC23-MW-02/130GW010	Water	10 to 15	Same as above	Same as above
AOC23-MW-03/130GW011	Water	10 to 15	Same as above	Same as above
AOC23-MW-04/130GW012	Water	10 to 15	Same as above	Same as above

Notes:

a	Duplicate sample location will be chosen by field personnel based on field conditions
b	Water samples for VOCs analysis require a trip blank in each ice chest
c	Anions includes nitrates, nitrite, and sulfate
d	Dissolved gasses are methane, ethane, and ethene
bgs	Below ground surface
EPA	US Environmental Protection Agency
ID	Identification
Na	Not applicable
PCB	Polychlorinated biphenyls
RSK	Robert S. Kerr
SAP	Sampling and analysis plan
SOP	Standard operating procedure
SM	Standard Methods for the Examination of Water and Wastewater
SW	EPA Solid Waste 846 methods
TDS	Total dissolved solids
TOC	Total organic carbon
VOC	Volatile organic compound

TABLE 8: MEASUREMENT PERFORMANCE CRITERIA TABLE – FIELD AND LABORATORY QC SAMPLES

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

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QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	Anions, alkalinity, dissolved gases, iron II, metals, PCB, pH, SVOC, sulfide, TDS, TOC, VOC	10%	Precision - overall	RPD≤ 50%	S & A
Laboratory Duplicate	Anions, alkalinity, dissolved gases, metals, pH, SVOC, sulfide, TDS, TOC,	5%[1]	Precision - Laboratory	RPD≤ 30%	A
Surrogate Spike	PCB, VOC	Every sample	Accuracy	See Appendix A	A
Laboratory Control Sample	Anions, alkalinity, dissolved gases, PCB, sulfide, TDS, TOC, VOC	5%[1]	Accuracy	See Appendix A	A
Matrix Spike	Anions, metals, PCB, sulfide, SVOC, TDS, TOC, VOC	5%[1]	Precision/Accuracy	See Appendix A	S & A
Matrix Spike Duplicate	PCB, VOC	5%[1]	Precision/Accuracy	See Appendix A	S & A

TABLE 8: MEASUREMENT PERFORMANCE CRITERIA TABLE – FIELD AND LABORATORY QC SAMPLES (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

QAPP Worksheet #12-NAVFAC SW SAP

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Equipment Blank	Anions, alkalinity, dissolved gases, metals, PCB, pH, SVOC, sulfide, TDS, TOC, VOC	1 per day	Accuracy/ Contamination	No target compounds > PRRL	S & A
Method Blank	Anions, alkalinity, dissolved gases, PCB, sulfide, TDS, TOC, VOC	5%[1]	Accuracy/ Contamination	No target compounds > PRRL	A
Trip Blank (water matrix only)	VOC	Each ice chest	Contamination	No target compounds > PRRL	S&A

Notes:

1 One per analytical batch of no more than 20 samples
% Percent
PCB Polychlorinated biphenyl
PRRL Project required reporting limit
QC Quality control
RPD Relative percent difference
TDS Total dissolved solids
TOC Total organic carbon
VOC Volatile organic compound

TABLE 9: SAMPLE CONTAINER, HOLDING TIME, AND PRESERVATIVE REQUIREMENTS
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

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Parameter	Method Number	Sample Volume	Sample Container	Preservative	Holding Time[a]
Water					
Alkalinity	SM 2320B	1-L bottle	Polyethylene	Cool, 4 ± 2 °C	14 days
Anions	EPA 300.0	500-mL bottle	Polyethylene	Cool, 4 ± 2 °C	48 hours for nitrate and nitrite 28 days for sulfate
Dissolved gasses	RSK 175	3 40-mL VOA vials	Amber or clear glass with Teflon-lined lid	Cool, 4 ± 2 °C[b]	14 days
Iron II	Hach 8146[c]	NA	NA	NA	Analyze immediately in field
pH	EPA 9040B, SW-846	250 mL bottle	Polyethylene	Cool, 4 ± 2 °C	48 hours
Sulfide	EPA 376.1	1 500-mL bottle	Polyethylene	ZnAc/NaOH	28 Days
TDS	EPA 160.1	500-mL bottle	Polyethylene	Cool, 4 ± 2 °C	7 days
TOC	EPA 9060A	2 250-mL bottles	Amber glass	pH<2 with HCl[c], Cool, 4 ± 2 °C	28 days
VOC	EPA 8260B	3 40-mL VOA vials	Amber or clear glass with Teflon-lined lid	pH<2 with HCl, Cool, 4 ± 2 °C	14 days for extraction/ 40 days for analysis
Soil					
Metals	SW 6010B, 7700	250-mL jar	Glass jar with a Teflon-lined lid	Cool, 4 ± 2 °C	180 days, except mercury is 28 days
PCB	EPA 8082	250-mL jar	Glass jar with a Teflon-lined lid	Cool, 4 ± 2 °C	14 days
Pesticides	EPA 8081A	250-mL jar	Glass jar with a Teflon-lined	Cool, 4 ± 2 °C	14 days

TABLE 9: SAMPLE CONTAINER, HOLDING TIME, AND PRESERVATIVE REQUIREMENTS (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

QAPP Worksheet #19-NAVFAC SW SAP

Parameter	Method Number	Sample Volume	Sample Container	Preservative	Holding Time[a]
			lid		
TPH	SW 8015 (modified)	250-mL jar	Glass jar with a Teflon-lined lid	Cool, 4 ± 2 °C	14 days
SVOC	EPA 8270	250-mL jar	Glass jar with a Teflon-lined lid	Cool, 4 ± 2 °C	14 days

Notes:

More than one analysis can be performed from the same sample container. The sample quantities listed in the table are necessary if only the specific analysis is requested. The laboratory will indicate which of the analyses can be performed from the same container, so that a smaller quantity of sample can be collected at each depth.

a	"x" days/"y" days refers to the maximum number of days from sampling to extraction/the maximum number of days from extraction to analysis.
b	HCl is not required as a preservative but does not interfere with the analysis.
c	Ascorbic acid is not added during the procedure.
°C	Degree Celsius
EPA	U.S. Environmental Protection Agency
HCl	Hydrochloric acid
HNO_3	Nitric acid
L	Liter
mL	Milliliter
NA	Not applicable
NaOH	Sodium hydroxide
PCB	Polychlorinated biphenyl
RSK	Robert S. Kerr
SIM	Selected ion monitoring
SM	Standard Methods for the Analysis of Water and Wastewater
SW	EPA Solid Waste 846 methods
TOC	Total organic carbon
TDS	Total dissolved solids
VOA	Volatile organic analysis
VOC	Volatile organic compound
ZnAc	Zinc acetate

2.3.3 Sample Labels

A sample label will be affixed to all sample containers. The label will include the following information, written in indelible ink:

- Project name and location
- Sample identification number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Analysis required

After it is labeled, each groundwater sample will be refrigerated or placed in a cooler that contains ice to maintain the sample temperature at 4 ± 2 °C.

2.3.4 Sample Documentation

Documentation during sampling is essential to ensure proper sample identification. SulTech personnel will adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black ink.
- All entries will be legible.
- Errors will be corrected by crossing out with a single line and then dating and initialing the lineout.
- Any serialized documents will be maintained at SulTech and referenced in the site logbook.
- Unused portions of pages will be crossed out, and each page will be signed and dated.

2.3.5 Chain of Custody

SulTech will use standard sample custody procedures to maintain and document sample integrity during collection, transportation, storage, and analysis. A sample is considered to be in custody if one of the following statements applies:

- It is in a person's physical possession or view.
- It is in a secure area with restricted access.
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Chain-of-custody procedures provide an accurate written record that traces the possession of individual samples from the time they are collected in the field to the time they are accepted at the laboratory. The chain-of-custody record (see Appendix B) also will document all samples collected and the analysis requested. Information field personnel will record on the chain-of-custody record includes the following:

- Project name and number
- Sampling location
- Name and signature of sampler
- Destination of samples (laboratory name)
- Sample identification number
- Date and time of collection
- Number and type of containers filled
- Analysis requested
- Preservatives used (if applicable)
- Filtering (if applicable)
- Sample designation (grab or composite)
- Signatures of individuals involved in custody transfer, including the date and time of transfer
- Air bill number (if applicable)
- Project contact and phone number

Unused lines on the chain-of-custody record will be crossed out. Field personnel will sign chain-of-custody records that are initiated in the field, and the air bill number will be recorded. The record will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. Signed air bills will serve as evidence of custody transfer between field personnel and the courier, and between the courier and the laboratory. Copies of the chain-of-custody record and the air bill will be retained and filed by field personnel before the containers are shipped.

Laboratory chain of custody begins when samples are received and continues until samples are discarded. Laboratories must follow custody procedures at least as stringent as are required by the EPA Contract Laboratory Program (CLP) Statements of Work (SOW) (EPA 1999a, 2000a). The laboratory should designate a specific individual as the sample custodian. The custodian will receive all incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record all pertinent information on the samples, including the person(s) who delivered the samples, the date and time they were received, the sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample identification numbers, and any unique laboratory identification numbers for the samples. This information should be entered into a computerized laboratory information management system. When the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for all samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples requiring special handling, including samples that are heat- or light-sensitive, radioactive, or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

2.3.6 Sample Shipment

The following procedures will be implemented when samples collected during this project are shipped:

- The cooler will be filled with bubble wrap, sample bottles, and packing material. Sufficient packing material will be used to prevent sample containers from breaking during shipment. Enough ice will be added to maintain the sample temperature of below 4 +/- 2 degrees Celsius (°C).
- The chain-of-custody records will be placed inside a plastic bag. The bag will be sealed and taped to the inside of the cooler lid. The air bill, if required, will be filled out before the samples are handed over to the carrier. The laboratory will be notified if the sampler suspects that the sample contains any substance that would require laboratory personnel to take safety precautions.
- The cooler will be closed and taped shut with strapping tape around both ends. If the cooler has a drain, it will be taped shut both inside and outside of the cooler.
- Signed and dated custody seals will be placed on the front and side of each cooler. Wide clear tape will be placed over the seals to prevent accidental breakage.

- The chain-of-custody record will be transported within the taped sealed cooler. When the cooler is received at the analytical laboratory, laboratory personnel will open the cooler and sign the chain-of-custody record to document transfer of samples.

Multiple coolers may be sent in one shipment to the laboratory. The outside of the coolers will be marked to indicate the number of coolers in the shipment.

2.4 ANALYTICAL METHODS

Analytical methods that will be used to analyze samples collected during this project are presented in Table 9, and the MQOs and control limits for sample analysis are provided in Appendix A. Individual target analytes for this investigation and their associated PRRLs are identified in Appendix C. The analytical laboratories will attempt to achieve the PRRLs for all the investigative samples collected. If problems occur in achieving the PRRLs, the laboratories will contact the SulTech analytical coordinator immediately and other alternatives will be pursued (such as analyzing an undiluted aliquot and allowing nontarget compound peaks to go off scale) to achieve acceptable reporting limits. In addition, results below the reporting limit but above the method detection limit (MDL) will be reported with appropriate flags to indicate the greater uncertainty associated with these values.

The analytical methods required for this investigation are EPA SW-846 methods (EPA 1996) or other EPA methods. Protocols for laboratory selection and to ensure laboratory compliance with project analytical and QA/QC requirements are presented in the following sections.

2.4.1 Selection of Analytical Laboratories

Laboratories for this investigation will be selected from a list of prequalified laboratories developed by SulTech to support Navy contracts. Prequalification streamlines laboratory selection by reducing the need to compile and review detailed bid and qualification packages for each individual investigation. Prequalification also improves flexibility in the program by allowing analysis to be directed to a number of different capable laboratories with available capacity when samples are collected.

SulTech's laboratory prequalification and selection process relies on (1) a standard procedure to evaluate and prequalify laboratories for work under the contract, and (2) the "Tetra Tech EM Inc. Laboratory Analytical Statement of Work" for Navy contracts (Tetra Tech 2006), a contractual document that specifies standard requirements for analyses that are routinely conducted. SulTech establishes a basic ordering agreement that incorporates and enforces the laboratory SOW with each prequalified laboratory. Individual purchase orders can then be written for specific investigations. These aspects of laboratory selection are further described in the following sections, along with SulTech's procedures for selecting laboratories when the laboratory statement of work (SOW) does not specifically address project-specific analytical methods or QC requirements.

2.4.1.1 *Laboratory Evaluation and Prequalification*

Laboratories that support the Navy directly or through subcontracts are evaluated and approved for Navy use by the Naval Facilities Engineering Service Center (NFESC). Laboratories that support SulTech under Navy contracts have been selected from the list of laboratories approved by NFESC and evaluated by SulTech to assure that the laboratory can meet the technical requirements of the laboratory SOW and produce data of acceptable quality. The laboratories are evaluated in accordance with the NFESC *Installation Restoration Chemical Data Quality Manual* (NFESC 1999). The laboratory evaluation includes the following elements:

- **Certification and approval.** Laboratories must be currently certified by the California State Health Department, Environmental Laboratory Accreditation Program, for analysis for each method specified. Laboratories must also have or obtain similar approval from NFESC. The accreditation program certification and NFESC approval must be obtained before the laboratory begins work.

- **Performance evaluation samples.** Each laboratory must demonstrate initially and yearly its ability to satisfactorily analyze single-blind performance evaluation samples for all analytical services it will provide under Navy contracts. At its discretion, SulTech may submit one or more double-blind performance evaluation samples at SulTech's cost. When the results for the performance evaluation sample are deficient, the laboratory must correct any problems and analyze (at its own cost) a subsequent round of performance evaluation samples for the deficient analysis.

- **Audits.** Laboratories must demonstrate initially and yearly their qualifications by submitting to one or more audits by SulTech. The audits may consist of (1) an on-site review of laboratory facilities, personnel, documentation, and procedures, or (2) an off-site review of hardcopy and electronic deliverables, or magnetic tapes. When deficiencies are identified, the laboratory must correct the problem and provide SulTech with a written summary of the corrective action that was taken.

Appendix D provides a current list of subcontractor laboratories that have passed this evaluation program. Each laboratory was evaluated before it was added to the list, and each is reevaluated annually. If a laboratory fails to meet any of the evaluation criteria, it is removed from the list of approved laboratories.

2.4.1.2 *Laboratory Statement of Work*

The laboratory SOW establishes standard requirements for the analytical methods that are most commonly used under Navy contracts. For each method, the laboratory SOW specifies standard method-specific target analyte lists and PRRLs; QC samples and associated control limits; calibration requirements; and miscellaneous method performance requirements. The laboratory SOW also specifies standard data package requirements, electronic document EDD formats, data qualifiers, and delivery schedules. In addition, the laboratory SOW outlines support services (such as providing sample containers, trip blanks, temperature blanks, sample coolers, and custody forms and seals) that are expected of laboratories. The laboratory SOW incorporates Navy QA policy, as well as applicable EPA and state QA guidelines, as appropriate.

SulTech's laboratory SOW is based on EPA CLP methods for VOCs and PCBs. The laboratory SOW also addresses frequently used non-CLP methods for a variety of organic, inorganic, and physical parameters. Non-CLP methods include the methods published by EPA in SW-846 (1996). Laboratories on SulTech's approved laboratory list can elect to provide all or a portion of the analytical services specified in the laboratory SOW.

As noted above, the laboratory SOW is incorporated into all laboratory subcontracts established for analytical services that support Navy projects. Thus, the prequalified laboratories commit to meeting the requirements in the laboratory SOW during the contracting process before they receive samples. SulTech reviews and revises the laboratory SOW regularly to incorporate new methods and requirements, modifications or updates to existing methods, changes in Navy QA policy or regulatory requirements, and any other necessary corrections or revisions.

2.4.1.3 Laboratory Selection and Oversight

After project-specific analytical and QA/QC requirements have been identified and documented in the SAP, the SulTech project chemist works closely with a SulTech procurement specialist to select a laboratory that can meet these requirements. When project-specific analytical and QC requirements are consistent with SulTech's laboratory SOW, the project chemist identifies one or more prequalified subcontractor laboratories that are capable of carrying out the work. As part of this process, the project chemist typically contacts the laboratories to discuss the analytical requirements and project schedule. The project chemist then forwards the name of the recommended laboratory (or laboratories) to the SulTech procurement specialist, who issues a purchase order for the work. When analytical requirements are consistent with SulTech's laboratory SOW and multiple prequalified laboratories are capable of performing the work, a specific laboratory is typically selected based on laboratory workload and project schedule considerations.

SulTech follows a similar procedure when project-specific analytical and QC requirements are nonstandard and differ from those specified in SulTech's laboratory SOW. The project chemist contacts analytical laboratories, beginning with those on SulTech's prequalified list, to discuss the analytical and QA/QC requirements in the SAP and to assess the laboratories' ability to meet the requirements. In many cases, SulTech works cooperatively with analytical laboratories to develop and refine QC requirements for nonstandard analyses or matrices.

If the project chemist is unable to identify one or more prequalified laboratories that can accept the work, additional laboratories are contacted. In general, the additional laboratories must be evaluated as described in Section 2.4.1.1 before they will be allowed to analyze any samples, although some steps in the evaluation may be waived for certain investigations and circumstances (for example, unusual analytes, urgent project needs, experimental methods, mobile laboratories, or on-site screening analyses). After additional laboratories have been identified, the project chemist forwards their names to the procurement specialist. The procurement specialist prepares a solicitation package, including the project-specific analytical and QC requirements, and submits the package to the laboratories. The procurement specialist, in cooperation with the project chemist and project manager, then evaluates the proposals that are received and selects a laboratory that meets the requirements and provides the best value to the Navy and SulTech. Finally, the procurement specialist issues a purchase order to the selected laboratory that incorporates the project-specific analytical and QA/QC requirements.

After a laboratory has been selected, the project chemist holds a kickoff meeting with the laboratory project manager. The kickoff meeting is held regardless of whether project-specific analytical and QA/QC requirements are consistent with SulTech's laboratory SOW or are outside the SOW. The SulTech project manager, procurement specialist, and other key project and laboratory staff may also be involved in this meeting. The kickoff meeting includes a review of analytical and QC requirements in the SAP, the project schedule, and any other logistical support that the laboratory will be expected to provide.

2.4.2 Project Analytical Requirements

One or more prequalified subcontractor laboratories will analyze samples off site. The laboratories will be selected before the field program begins based on their ability to meet the project analytical and QC requirements, as well as their ability to meet the project schedule. The analytical methods selected for groundwater sampling are standard EPA methods that are described in SulTech's laboratory SOW (Tetra Tech 2006).

This SAP documents project-specific QC requirements for the selected analytical methods. Sample volume, preservation, and holding time requirements were specified in Table 9. Requirements for laboratory QC samples were described in Table 4 and are discussed in Section 2.5. Appendix A includes project-specific precision and accuracy goals for the methods. PRRLs for each method are documented in Appendix C.

2.5 QUALITY CONTROL

SulTech will assess the quality of field data through regular collection and analysis of field QC samples. Laboratory QC samples will also be analyzed in accordance with referenced analytical method protocols to ensure that laboratory procedures are conducted properly and that the quality of the data is known.

2.5.1 Field Quality Control Samples

QC samples are collected in the field and analyzed to check sampling and analytical precision, accuracy, and representativeness. The following section discusses the types and purposes of field QC samples that will be collected for this project.

2.5.1.1 *Field Duplicates*

Field and laboratory precision is evaluated by collecting and analyzing field duplicates. Field duplicate samples are collected at the same time and from the same source as the original sample and submitted as separate samples to the laboratory for analysis. One field duplicate will be collected for every 10 groundwater samples collected. One field duplicated of soil will be collected at IR Site 35 AOC 6.

2.5.1.2 *Equipment Rinsate Samples*

To verify that decontamination is effective, an equipment rinsate sample will be collected at the rate of 1 per type of sampling equipment per day. For Bladder pumps rinseates will be collected by drawing clean source water (distilled, deionized, or from an industrial or residential water source) through the bladder pump after decontamination. For re-useable soil sampling equipment, clean source water will be pured over the equipment following decontamination and collected for analysis. Rinseates will be analyzed for the same suite of analysis as the field samples.

2.5.1.3 *Source Water Blank Samples*

To verify that the water used for the final decontamination is not contaminated, one source water blank will be collected for each sampling event and for each source of water (distilled, deionized, or from an industrial or residential water source) used for decontamination.

2.5.1.4 *Temperature Blanks*

A temperature blank demonstrates the temperature of samples within a cooler has remained chilled during transport to the laboratory. The temperature blank originates at the laboratory and is returned in shipping coolers with project samples. The temperature is recorded when it is received at the laboratory and must be between 4 +/- 2 C.

2.5.2 Laboratory Quality Control Samples

The types of laboratory QC samples for this project are discussed in the following sections. Table 8 presented the required frequencies for laboratory QC samples, and Appendix A presents project-specific precision and accuracy goals for these samples.

2.5.2.1 *Method Blanks*

Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

2.5.2.2 Matrix Spike and Matrix Spike Duplicates

MS and MSD samples for water matrices require collection of an additional volume of material for laboratory spiking and analysis; additional sample volume is generally not required for soil matrices. MS/MSD samples will be collected at a frequency of 5 percent. The percent recoveries will be calculated for each of the spiked analytes and used to evaluate analytical accuracy. The relative percent difference between spiked samples will be calculated to evaluate precision. Project-specific precision and accuracy goals are presented in Appendix A.

2.5.2.3 Laboratory Control Samples

LCSs, or blank spikes, will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

2.5.2.4 Surrogate Standards

Surrogate standards consist of known concentrations of non-target organic analytes that are added to each sample, method blank, and MS/MSD before samples are prepared and analyzed. The surrogate standard measures the efficiency the analytical method in recovering the target analytes from an environmental sample matrix. Percent recoveries for surrogate compounds are evaluated using laboratory control limits. Surrogate standards provide an indication of laboratory accuracy and matrix effects for every field and QC sample that is analyzed by gas chromatography for volatile and extractable organic constituents. Surrogate compounds are used in the analysis of VOCs to monitor purge efficiency and analytical performance, whereas surrogates are used in the analysis of extractable organic compounds to monitor the extraction process and analytical performance.

2.5.3 Additional Laboratory Quality Control Procedures

In addition to the analysis of laboratory QC samples, subcontractor laboratories will conduct the QC procedures discussed in the following sections.

2.5.3.1 Method Detection Limit Studies

The MDL is the minimum concentration of a compound that can be measured and reported. The MDL is a specified limit at which there is 99 percent confidence that the concentration of the analyte is greater than zero. The MDL takes into account sample matrix and preparation. The subcontractor laboratory will demonstrate the MDLs for all analyses, except inorganic analysis and physical properties test methods.

MDL studies will be conducted annually, or more frequently if any method or instrumentation changes. Each MDL study will consist of seven replicates spiked with all target analytes of interest at concentrations no greater than required quantitation limits. The replicates will be extracted and analyzed in the same manner as routine samples. If multiple instruments are used, each will be included in the MDL study. The MDLs reported will be representative of the least sensitive instrument.

2.5.3.2 Sample Quantitation Limits

Sample quantitation limits (SQL), also referred to as practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRLs presented in Appendix C are chemical-specific levels that a laboratory should be able to routinely detect and quantitate in a given sample matrix. The PRRL is usually defined in the analytical method or in laboratory method documentation. The SQL takes into account changes in the preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

2.5.3.3 Control Charts

Control charts document data quality in graphic form for specific method parameters such as surrogate standards and blank spike recoveries. A collection of data points for each parameter is used to statistically calculate means and control limits for a given analytical method. This information is useful in determining whether analytical measurement systems are in control. In addition, control charts provide information about trends over time in specific analytical and preparation methodologies. Although they are not required, SulTech recommends that subcontractor laboratories maintain control charts for organic and inorganic analysis. At a minimum, method-blank surrogate recoveries and blank spike recoveries should be charted for all organic methods. Blank spike recoveries should be charted for inorganic methods. Control charts should be updated monthly.

2.6 EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

This section outlines the testing, inspection, and maintenance procedures that will be used to keep both field and laboratory equipment in good working condition.

2.6.1 Maintenance of Field Equipment

Preventive maintenance for most field equipment is carried out in accordance with procedures and schedules recommended in (1) the equipment manufacturer's literature or operating manual, or (2) standard operating procedures that describe equipment operation associated with specific applications of the instrument. However, more stringent testing, inspection, and maintenance procedures and schedules may be required when field equipment is used to make critical measurements.

A field instrument that is out of order will be segregated, clearly marked, and not used until it is repaired. The field team leader will be notified of equipment malfunctions so that service can be completed quickly or substitute equipment can be obtained. Unscheduled testing, inspection, and maintenance should be conducted when the condition of equipment is suspect. Any significant problems with field equipment will be reported in the daily field QC report.

2.6.2 Maintenance of Laboratory Equipment

Subcontractor laboratories have internal procedures for maintaining for each instrument used to analyze samples associated with the work for this project. All instruments will be serviced at scheduled intervals necessary to optimize factory specifications. Routine preventive maintenance and major repairs will be documented in a maintenance logbook.

An inventory of items to be kept ready for use in case of instrument failure will be maintained and restocked as needed. The list will include equipment parts subject to frequent failure, parts that have a limited lifetime of optimum performance, and parts that cannot be obtained in a timely manner.

The laboratory's QA plan and written standard operating procedures describe specific preventive maintenance procedures for equipment maintained by the laboratory. These documents identify the personnel responsible for major, preventive, and daily maintenance procedures, the frequency and type of maintenance performed, and the procedures for documenting maintenance.

Laboratory equipment malfunctions will require immediate corrective action. Actions should be documented in laboratory logbooks. No other formal documentation is required unless data quality is adversely affected or further corrective action is necessary. On-the-spot corrective actions will be taken as necessary in accordance with the procedures described in the laboratory QA plan and standard operating procedures.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

The following sections discuss calibration procedures that will be followed to ensure the accuracy of measurements made using field equipment. Proper maintenance of the laboratory equipment is the responsibility of the individual laboratories.

2.7.1 Calibration of Field Equipment

Field equipment (water quality meter, PID, and helium leak detector) will be calibrated at the beginning of each field day and the calibration checked after samples are collected. The instruments will be calibrated as recommended by the manufacturer.

Detailed calibration procedures for field equipment are available from the specific manufacturers' instruction manuals. All calibration information will be recorded in a field logbook or on field forms.

2.7.2 Calibration of Laboratory Equipment

Laboratory calibrations are conducted by the laboratories as part of routine operations. Procedures and frequencies for calibration of laboratory equipment will follow the requirements in the methods referenced in Section 2.4 of this SAP. Qualified analysts will calibrate laboratory equipment and document the procedures and results in a logbook.

The laboratory will obtain calibration standards from commercial vendors for both inorganic and organic compounds and analytes. Stock solutions for surrogate standards and other inorganic mixes will be made from reagent-grade chemicals or as specified in the analytical method. Stock standards will also be used to make intermediate standards that will be used to prepare calibration standards. Special attention will be paid to expiration dating, proper labeling, proper refrigeration, and freedom from contamination. Documentation on receipt, mixing, and use of standards will be recorded in the appropriate laboratory logbook. Logbooks must be permanently bound. Additional specific handling and documentation requirements for the use of standards may be provided in subcontractor laboratory QA plans.

2.8 INSPECTION AND ACCEPTANCE OF SUPPLIES AND CONSUMABLES

SulTech project managers have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete Navy projects and are responsible for determining acceptance criteria for these items.

Supplies and consumables can be received either at a SulTech office or at a work site. When supplies are received at an office, the project manager or field team leader will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order, and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the SulTech project manager or field team leader will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards described in "Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers" (EPA 1992).

2.9 NONDIRECT MEASUREMENTS

No data for project implementation or decision-making will be obtained from non-direct measurement sources.

2.10 DATA MANAGEMENT

Field and analytical data collected from this project and other environmental investigations at Alameda Point are critical to site characterization efforts, development of the comprehensive conceptual site model, risk assessments, and selection of remedial actions to protect human health and the environment. An information management system is necessary to ensure efficient access so that decisions based on the data can be made in a timely manner.

After the field and laboratory data reports are reviewed and validated, the data will be entered into SulTech's database for Alameda Point. The database contains data for (1) summarizing observations on contamination and geologic conditions, (2) preparing reports and graphics, (3) using with geographic information systems, and (4) transmitting in an electronic format compatible with NEDD requirements. The following sections describe SulTech's data tracking procedures, data pathways, and overall data management strategy for Alameda Point.

2.10.1 Data Tracking Procedures

All data that are generated in support of the Navy program at Alameda Point are tracked through a database created by SulTech. Information related to the receipt and delivery of samples, project order fulfillment, and invoicing for laboratory and validation tasks is stored in the program, SAMTRAK. All data are filed according to the contract task order and SDG number.

2.10.2 Data Pathways

Data pathways must be established and well documented to evaluate whether the data have been accurately loaded into the database in a timely manner. Data for this work are generated from two primary pathways: from field activities and from laboratory analysis. Data generated during field activities are recorded using field forms (see Appendix B).

Data generated during laboratory analysis of the samples are recorded in hard copy and in EDDs after the samples have been analyzed. The laboratory will send the electronic copy and EDD records to the project chemist. The project chemist reviews the data deliverable for completeness, accuracy, and format. After the format has been approved, the electronic data are manipulated and downloaded into the Alameda Point database. SulTech data entry personnel will then update SAMTRAK with the total number of samples received and the number of days required to receive the data.

After data are validated, the project chemist reviews the data for accuracy. SulTech will then update the Alameda Point database with the appropriate data qualifiers. SAMTRAK is also updated to record associated laboratory and data validation costs.

2.10.3 Data Management Strategy

SulTech's short- and mid-term data management strategies require that the database for Alameda Point be updated monthly. The data consist of chemical and field data from Navy contractors, entered into an Oracle (Version 7.3) database. The database can be used to generate reports using available computer-aided drafting and design and contouring software. All electronic data from this database will be stored and maintained in a format compatible with the NEDD. Following the updated Navy Environmental Work Instruction #6, data will be transmitted to the Naval Installation Restoration Information Solution (NIRIS) within 30-days of receipt of the final third-party validation report.

To satisfy long-term data management goals, the data will be loaded into the database at SulTech for storage, further manipulation, and retrieval after laboratory and field reports are reviewed and validated. The database will be used to provide data for chemical and geologic analysis and for preparing reports and graphic representations of the data. Additional data acquired from field activities are recorded on field forms (see Appendix B) that are reviewed for completeness and accuracy by the project chemist or field team leader (Table 10). Hard copies of forms, data, and chain-of-custody forms are filed in a secure storage area according to project and SDG numbers. Laboratory data packages and reports will be archived at SulTech or Navy offices. Laboratories that generated the data will archive hard-copy data for a minimum of 10 years (Table 11).

TABLE 10: VERIFICATION PROCESS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

QAPP Worksheet #34-NAVFAC SW SAP

Verification Input	Description	Internal (I)/ External (E)	Responsible for Verification (Name, Organization)
Chain-of-custody forms	Chain-of-custody forms will be reviewed internally when they are completed and verified against the packed sample coolers they represent. The shipper's signature on the chain of custody should be initialed by the reviewer, a copy of the chain-of-custody form retained in the project file, and the original and remaining copies taped inside the cooler for shipment.	I	Field team leader (Doug Grant, SulTech)
Audit reports	When they are completed, a copy of all audit reports will be included in the project file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the project file. At the beginning of each week, and at the end of the site work, project file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the project manager will be notified to ensure that action is taken.	I	Project Manager (Craig Hunter, SulTech)
Field notes/logbook	Field notes will be reviewed internally and included in the project file. A copy of the field notes will be attached to the final report.	I	Field team leader (Doug Grant, SulTech)
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy before they are submitted. All data packages received will be verified externally according to the data validation procedures specified in Section 2.10 of the SAP.	I, E	Laboratory and data validators (TBD)

TABLE 11: PROJECT DOCUMENTS AND RECORDS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

QAPP Worksheet #34-NAVFAC SW SAP

Document	Where Maintained
Field notes/logbook	Project file
Chain-of-custody forms	Project file
Laboratory raw data package (compact disc)	Project file , NAVFAC SW Administrative Record
Audit/assessment checklists/reports	Project file and laboratory
Corrective action forms/reports	Project file and laboratory
Laboratory equipment calibration logs	Laboratory
Sample preparation logs	Laboratory
Run logs	Laboratory
Sample disposal records	Laboratory
Validated data	Project file, NAVFAC SW Administrative Record

3.0 ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during this project, the personnel responsible for conducting the assessments, the corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to SulTech and Navy management.

3.1 ASSESSMENT AND RESPONSE ACTIONS

SulTech and the Navy will oversee collection of environmental data using the assessment and audit activities described below. Any problems encountered during an assessment of field investigation or laboratory activities will require corrective action to ensure that the problems are resolved. This section briefly describes the types of assessments that may be completed, SulTech and Navy responsibilities for conducting the assessments, and corrective action procedures to address problems identified during an assessment.

3.1.1 Field Assessments

SulTech conducts field technical systems audits (TSA) on selected Navy projects to support data quality and encourage continuous improvement in the field systems that involve environmental data collection. The SulTech QA program manager selects projects for field TSAs quarterly based on available resources and the relative significance of the field sampling effort. During the field TSA, the assessor will use personnel interviews, direct observations, and reviews of project-specific documentation to evaluate and document whether procedures specified in the approved SAP are being implemented. Specific items that may be observed during the TSA include:

- Availability of approved project plans such as the SAP and health and safety plan
- Documentation of personnel qualifications and training
- Sample collection, identification, preservation, handling, and shipping procedures
- Sampling equipment decontamination
- Equipment calibration and maintenance
- Completeness of logbooks and other field records (including nonconformance documentation)

During the TSA, the SulTech assessor will verbally communicate any significant deficiencies to the field team leader for immediate correction. These and all other observations and comments will also be documented in a TSA report. The TSA report will be issued to the SulTech project manager, field team leader, program QA manager, and project QA officer in electronic (e-mail) format within 7 days after the TSA is completed.

The SulTech program QA manager determines the timing and duration of TSAs. Generally, TSAs are conducted early in the project so that any quality issues can be resolved before large amounts of data are collected.

The Navy QA officer may also independently conduct a field assessment of any SulTech project. Items reviewed by the Navy QA officer during a field assessment may be similar to those described above.

3.1.2 Laboratory Assessments

As described in Section 2.4.1, NFESC assesses all laboratories before they are allowed to analyze samples under Navy contracts. SulTech also conducts a pre-award assessment of each laboratory before they are included on the approved list for work under the contract (see Appendix D). These assessments include (1) reviews of laboratory certifications, (2) initial and annual demonstrations of the laboratory's ability to analyze satisfactorily single-blind performance evaluation samples, and (3) laboratory audits. Laboratory audits may consist of an on-site review of laboratory facilities, personnel, documentation, and procedures, or an off-site evaluation of the ability of the laboratory's data management system to meet contract requirements. SulTech also conducts an assessment when an approved laboratory has been selected for non-routine analysis or when a laboratory that is not on the approved list must be used.

3.1.3 Assessment Responsibilities

SulTech personnel who conduct assessments will be independent of the activity evaluated. The SulTech program QA manager will select the appropriate personnel to conduct each assessment and will assign them responsibilities and deadlines for completing the assessment. These personnel may include the program QA manager, project QA officer, or senior technical staff with relevant expertise and experience in assessment.

When an assessment is planned, the SulTech program QA manager selects a lead assessor who is responsible for the following:

- Selecting and preparing the assessment team
- Preparing an assessment plan
- Coordinating and scheduling the assessment with the project team, subcontractor, or other organization being evaluated

- Participating in the assessment
- Coordinating preparation and issuance of assessment reports and corrective action request forms
- Evaluating responses and resulting corrective actions.

After a TSA is completed, the lead assessor will submit an audit report to the SulTech program QA manger, project manager, and project QA officer; other personnel may be included in the distribution as appropriate. Assessment findings will also be included in the quality control summary report for the project (see Section 3.2.3).

The Navy QA officer is responsible for coordinating all audits that may be conducted by Navy personnel under this project. Responsibilities for preparing, completing and reporting the audit for Navy auditors would be similar to those described above.

3.1.4 Field Corrective Action Procedures

Corrective action procedures in the field will depend on the type and severity of the finding. SulTech classifies assessment findings as either deficiencies or observations. Deficiencies are findings that may have a significant impact on data quality and that will require corrective action. Observations are findings that do not directly affect data quality, but are suggestions for consideration and review.

As described in Section 3.1.1, project teams are required to respond to deficiencies identified in TSA reports. The project manager, field team leader, and project QA officer will discuss the deficiencies and the appropriate steps to resolve each deficiency by completing the following:

- Determining when and how the problem developed
- Assigning responsibility for problem investigation and documentation
- Selecting the corrective action to eliminate the problem
- Developing a schedule for completing the corrective action
- Assigning responsibility for implementing the corrective action
- Documenting and verifying that the corrective action has eliminated the problem
- Notifying the Navy of the problem and the corrective action taken

In responding to the TSA report, the project team will include a brief description of each deficiency, the proposed corrective action, the individual responsible for selecting and implementing the corrective action, and the completion dates for each corrective action. The project QA officer will use a status report to monitor all corrective actions.

The SulTech program QA manager is responsible for reviewing proposed corrective actions and verifying that they have been effectively implemented. The program QA manager can require data acquisition to be limited or discontinued until the corrective action is complete and a deficiency is eliminated. The program QA manager can also request the reanalysis of any or all samples and a review of all data acquired since the system was last in control.

3.1.5 Laboratory Corrective Action Procedures

The SulTech project chemist will review the data. Any questions that arise will be communicated to the Navy and, as directed, will be addressed in consultation with the laboratory. Internal laboratory procedures for corrective action and descriptions of out-of-control situations that require corrective action are contained in laboratory QA plans. At a minimum, corrective action will be implemented when any of the following three conditions occurs: control limits are exceeded, method QC requirements are not met, or sample holding times are exceeded. The laboratory will report out-of-control situations to the SulTech project chemist within 2 working days after they are identified. In addition, the laboratory project manager will prepare and submit a corrective action report to the SulTech project chemist. This report will identify the out-of-control situation and the steps that the laboratory has taken to rectify it.

3.2 REPORTS TO MANAGEMENT

Effective management of environmental data collection requires (1) timely assessment and review of all activities, and (2) open communication, interaction, and feedback among all project participants. SulTech will use the reports described below to address any project-specific quality issues and to facilitate timely communication of these issues.

3.2.1 Daily Progress Reports

SulTech will prepare a daily progress report to summarize activities throughout the quarterly sampling events. This report will describe sampling and field measurements, equipment used, SulTech and subcontractor personnel on site, QA and QC and health and safety activities, problems encountered, corrective actions taken, deviations from the SAP, and explanations for the deviations. The daily progress report is prepared by the field team leader and submitted to the project manager and to the Navy remedial project manager, if requested. The content of the daily reports will be summarized and included in the final report submitted for the field investigation.

3.2.2 Project Monthly Status Reports

The SulTech project manager will prepare a monthly status report to be submitted to SulTech's program manager and the Navy remedial project manager. Monthly status reports address project-specific progress and issues and facilitate their timely communication. The monthly status report will include (as applicable) the following quality-related information:

- Project status
- Instrument, equipment, or procedural problems that affect quality and recommended solutions
- Objectives from the previous report that were achieved
- Objectives from the previous report that were not achieved
- Work planned for the next month

If appropriate, SulTech will obtain similar information from subcontractors who are participating in the project and will incorporate the information into the monthly status report.

3.2.3 Quality Control Summary Report

The QC summary includes a summary and evaluation of QA/QC activities, including any field or laboratory assessments, completed during the investigation. The QC summary also indicates the location and duration of storage for the complete data packages. Particular emphasis is placed on evaluating whether project DQOs were met and whether data are of adequate quality to support required decisions. The scope of work for SulTech does not include a QC summary for this field investigation.

4.0 DATA VALIDATION AND USABILITY

This section describes the procedures to review, verify, and validate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet DQO and measurement quality objectives for the project.

4.1 DATA REVIEW, VERIFICATION, AND VALIDATION

Validation and verification of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Verification and validation methods for field and laboratory activities are presented below.

4.1.1 Field Data Verification

Project team personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

4.1.2 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any non-conformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

4.1.3 Laboratory Data Validation

All data collected as part of the quarterly sampling events will undergo validation through an independent third-party contractor in accordance with current EPA national functional guidelines (EPA 1999b). The data validation strategy will be consistent with Navy guidelines. For this project, 80 percent of the data for contaminants of concern will undergo cursory validation, and 20 percent of the data for contaminants of concern will undergo full validation. Requirements for cursory and full validation are listed below.

4.1.3.1 Cursory Data Validation

Cursory validation (Level 3) will be completed on 80 percent of the summary data packages for analysis of contaminants of concern. The data reviewer is required to notify SulTech and request any missing information needed from the laboratory. Elimination of the data from the review process is not allowed. All data will be qualified as necessary in accordance with established criteria. Data summary packages will consist of sample results and QC summaries, including calibration and internal standard data.

4.1.3.2 Full Data Validation

Full validation (Level 4) will be completed on 20 percent of the full data packages for analysis of contaminants of concern. The data reviewer is required to notify SulTech and request any missing information needed from the laboratory. Elimination of data from the review process is not allowed. All data will continue through the validation process and will be qualified in accordance with established criteria. Data summary packages will consist of sample results, QC summaries, and all raw data associated with the sample results and QC summaries.

4.1.3.3 Data Validation Criteria

Table 12 lists the QC criteria for both cursory and full data validation. The data validation criteria selected from Table 12 will be consistent with the project-specific analytical methods referenced in Section 2.4 of the SAP.

4.2 RECONCILIATION WITH USER REQUIREMENTS

After environmental data have been reviewed, verified, and validated in accordance with the procedures described in Section 4.1, the data must be further evaluated to determine whether DQOs have been met.

To the extent possible, SulTech will follow EPA's data quality assessment process to verify that the type, quality, and quantity of data collected are appropriate for their intended use. Data quality assessment methods and procedures are outlined in EPA's "Guidance for Data Quality Assessment, Practical Methods for Data Analysis" (EPA 2000d). The data quality assessment process includes five steps: (1) review the DQOs and sampling design; (2) conduct a preliminary data review; (3) select a statistical test; (4) verify the assumptions of the statistical test; and (5) draw conclusions from the data.

TABLE 12: DATA VALIDATION CRITERIA

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

QAPP Worksheets #35 and 36-NAVFAC SW SAP

Analytical Parameter Group	Cursory Data Validation Criteria	Full Data Validation Criteria
Non-CLP Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG
Non-CLP Inorganic Analyses	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample Field duplicate sample analysis Other laboratory QC specified by the method Detection limits Analyte identification Analyte quantitation Sample results verification Overall assessment of data for an SDG

Notes:

CLP Contract Laboratory Program
QC Quality control
SDG Sample delivery group

SulTech will systematically assess data quality and data usability when the five-step data quality assessment process is not completely followed because the DQOs are qualitative. This assessment will include the following:

- A review of the sampling design and sampling methods to verify that they were implemented as planned and are adequate to support project objectives
- A review of project-specific data quality indicators for precision, accuracy, representativeness, completeness, and comparability and quantitation limits (defined in Section 1.3.2) to determine whether acceptance criteria have been met
- A review of project-specific DQOs to determine whether they have been achieved by the data collected
- An evaluation of any limitations associated with the decisions to be made based on the data collected. For example, if data completeness is only 90 percent compared with a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence.

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

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APPENDIX A
METHOD PRECISION AND ACCURACY GOALS

TABLE A-1: VOLATILE ORGANIC COMPOUNDS (VOC), METHOD 8260B, SW-846 METHOD PRECISION AND ACCURACY GOALS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Laboratory Control Sample and Matrix Spike Limits

	Water		Soil	
Spike Compound	% Recovery	RPD	% Recovery	RPD
1,1-Dichloroethene	75-126	35	65-136	30
Benzene	82-122	35	73-126	30
Chlorobenzene	82-121	35	75-123	30
Toluene	83-121	35	71-127	30
Trichloroethene	82-121	35	77-124	30

Surrogate Control Limits

Spike Compound	Water % Recovery	Soil % Recovery
4-Bromofluorobenzene	78-129	52-151
Dibromofluoromethane	80-124	61-134
Toluene-d8	81-119	57-135

Notes:

% Percent

RPD Relative percent difference

TABLE A-2: POLYCHLORINATED BIPHENYLS (PCB), METHOD 8082, SW-846 METHOD PRECISION AND ACCURACY GOALS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Laboratory Control Sample and Matrix Spike Limits

	Soil	
Analyses	% Recovery	RPD
Aroclor 1016	40-140	50
Aroclor 1260	60-130	50

Surrogate Control Limits

Surrogate Compound	Soil % Recovery
Tetrachloro-m-xylene	70-125
Decachlorobiphenyl	60-125

Notes:

% Percent

RPD Relative percent difference

TABLE A-3: OTHER ANALYSES METHOD PRECISION AND ACCURACY GOALS
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Laboratory Control Sample, Matrix Spike, and Sample Duplicate Control Limits

	Water			
	LCS	Matrix Spike	MSD	Sample Duplicate
Matrix Spike Compound	**% Recovery**	**% Recovery**	**RPD**	**RPD**
RSK-175[a] – Dissolved Gasses				
Methane	73-117	73-117	50	50
Ethane	75-122	75-122	50	50
Ethene	73-122	73-122	50	50
Miscellaneous Analytes				
Alkalinity	NA	NA	NA	10
Iron II	NA	NA	NA	30
Nitrate	80-120	75-125	NA	20
Nitrite	80-120	75-125	NA	20
pH	N/A	N/A	NA	10
Sulfate	80-120	75-125	NA	20
Sulfide	80-120	80-120	NA	20
TDS	80-120	75-125	NA	20
TOC	80-120	75-125	NA	20

Notes:

a	Complete EPA Method references are provided in Section 2.4 of this SAP.
%	Percent
EPA	U.S. Environmental Protection Agency
LCS	Laboratory Control Sample
MSD	Matrix Spike Duplicate
NA	Not Applicable
RPD	Relative percent difference
RSK	Robert S. Kerr
TDS	Total dissolved solids
TOC	Total organic carbon

TABLE A-4: METALS METHOD PRECISION AND ACCURACY GOALS
Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
for Ad-Hoc Sampling of Groundwater Monitoring Wells in Site 32, Soil in AOC 6 of Site 35, and Groundwater and Soil in AOC 23 of Site 35, Alameda Point, California

Laboratory Control Sample, Matrix Spike, and Sample Duplicate Control Limits

	Water			Soil		
	% Recovery			% Recovery		
Analyses	LCS	MS	RPD	LCS	MS	RPD
Metals – Method 6010B, SW-846[a]						
All Metals[b]	80-120	80-120	20	80-120	80-120	20
Metals – Method 6020, SW-846[a]						
All Metals[b]	80-120	75-125	20	80-120	75-125	20
Mercury – Method 7470A, SW-846[a]						
Mercury	80-120	80-120	20	80-120	80-120	20
Mercury – Method 7471A, SW-846[a]						
Mercury	80-120	80-120	20	80-120	80-120	20

Notes:

a Complete EPA Method references are provided in Section 2.4 of this SAP.
b The target analyte list for each method is in Appendix D.

EPA U.S. Environmental Protection Agency
LCS Laboratory control sample
MS Matrix spike
RPD Relative percent difference

TABLE A-5: TOTAL PETROLEUM HYDROCARBON, METHOD PRECISION AND ACCURACY GOALS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
for Ad-HocData Gap Sampling of Groundwater Monitoring Wells in Site 32, Soil in AOC 6 of Site 35, and Groundwater and Soil in AOC 23 of Site 35, Alameda Point, California

Laboratory Control Sample and Matrix Spike Limits

	Water		Soil	
Analyses	% Recovery	RPD	% Recovery	RPD
TPH - Diesel 8015B, SW-846[a]				
Diesel	36-150	40	43-139	40

Surrogate Control Limits

Analysis	Surrogate Compound	Water % Recovery	Soil % Recovery
TPH-Diesel	Orthoterphenyl[b]	57-132	47-142

Notes:

% Percent
a Complete EPA Method references are provided in Section 2.4 of this SAP.
b Or other suitable surrogate compound

RPD Relative percent difference
TPH Total petroleum hydrocarbon

APPENDIX B
FIELD FORMS

- Field Instrument Calibration Log
- Groundwater Level Measurement Log
- Monitoring Well Sampling Data Sheet
- Chain-of-Custody Record
- Tailgate Safety Meeting Form
- Well Completion Form

TETRA TECH EM INC
FIELD INSTRUMENT CALIBRATION LOG

Project No.: ____________________

Project Name: ____________________

Instrument Type	Instrument Serial Number	Calibration Type	Date	By

WATER LEVEL DATA SHEET

Monitoring Well ID	Top of Casing (ft msl)	Total Depth (ft) Date	Water Level from top of casing (ft) Jun-07				Comments

Note: Readings taken from the north notch on the top of the well casing.

ft	Feet
msl	Mean sea level

Tetra Tech EM, Inc.
Sacramento, California
(916) 852-8300

Monitoring Well Sampling Sheet

Date: ____________________

Monitoring Well No.: ______________________________ Chain of Custody No.: ____________________

Personnel: ____

Organic Vapor Concentration TOC (ppm): ____________________ Breathing Zone (ppm): ____________________

Well Volume: 2 inch well = water column x 0.163 gal/ft

Depth to Well Bottom (ft.): ______________________________ 3-inch well = water column x 0.367 gal/ft

Depth to Water (ft.): ______________________________ 4-inch well = water column x 0.652 gal/ft

Water Column (ft.): ____________________ Well Volume Calculation (gal.): ____________________

Time	Volume Purged (_____)	Flow Rate (_____)	Water Level (_____)	pH	Conduct-ivity (_____)	Tempera-ture (C°/F°)	Turbidity (NTU)	D. O. (mg/L)	O. R. P. (_____)

Begin Purge: ________ Method of Purging: ______________________________ Purged Dry?: ____________________

End Purge: ________ Total Volume Purged: ________ How Measured?: ______________________________

QA/QC Sample Collected Here? Duplicate ☐ Matrix Spike ☐ Equip. Blank ☐ No QA/QC Sample

Date and Time of Sample Collection: ______________________________ Sample Number(s): ____________________

Comments: ____

____

Tt Tetra Tech EM Inc.
San Francisco Office

135 Main St. Suite 1800
San Francisco, CA 94105
415-543-4880
Fax 415-543-5480

Chain of Custody Record No. 7734

Page ____ of ____

Lab PO#:	Lab:

Project name:	TtEMI technical contact:	Field samplers:
Project (CTO) number:	**TtEMI project manager:**	**Field samplers' signatures:**

						No./Container Types								Analysis Required															
														Preservative Added															
Sample ID	Sample Location (Pt. ID)	Date	Time	Matrix	MS / MSD	40 ml VOA	1 liter Amber	500 ml Poly	Sleeve	Glass Jar				VOA	SVOA	Pest/PCBs	Metals	TPH Purgeables	TPH Extractables										

	Name (print)	Company Name	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Turnaround time/remarks:

Fed Ex #:

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM

Date: ______________ Time: ________________ Project No.: ________________

Client: __________________________________ Site Location: ____________________

Site Activities Planned for Today: ____

____

Safety Topics Discussed
Protective clothing and equipment:
Chemical hazards:
Physical hazards:
Environmental and biohazards:
Equipment hazards:
Decontamination procedures:
Other:
Review of emergency procedures:
Employee Questions or Comments:

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM (Continued)

Attendees	
Printed Name	**Signature**

Meeting Conducted by:

Name ______________________ Title ______________________

Signature ______________________

MONITORING WELL COMPLETION RECORD

MONITORING WELL

MONITORING WELL NO.: ______
PROJECT: ______
SITE: ______
BOREHOLE NO.: ______
WELL PERMIT NO.: ______
TOC TO BOTTOM OF WELL: ______

DRILLING INFORMATION

DRILLING BEGAN:
DATE: ______ TIME: ______
WELL INSTALLATION BEGAN:
DATE: ______ TIME: ______
WELL INSTALLATION FINISHED:
DATE: ______ TIME: ______
DRILLING CO.: ______
DRILLER: ______
LICENSE: ______
DRILL RIG: ______
DRILLING METHOD:
- ☐ HOLLOW STEM AUGER
- ☐ AIR ROTARY
- ☐ OTHER: ______

DIAMETER OF AUGERS:
ID: ______ OD: ______

WELL CASING

☐ SCHEDULE 40 PVC
☐ OTHER: ______
PRODUCT: ______
MFG. BY: ______
CASING DIAMETER:
ID: ______ OD: ______
LENGTH OF CASING: ______

WELL SCREEN

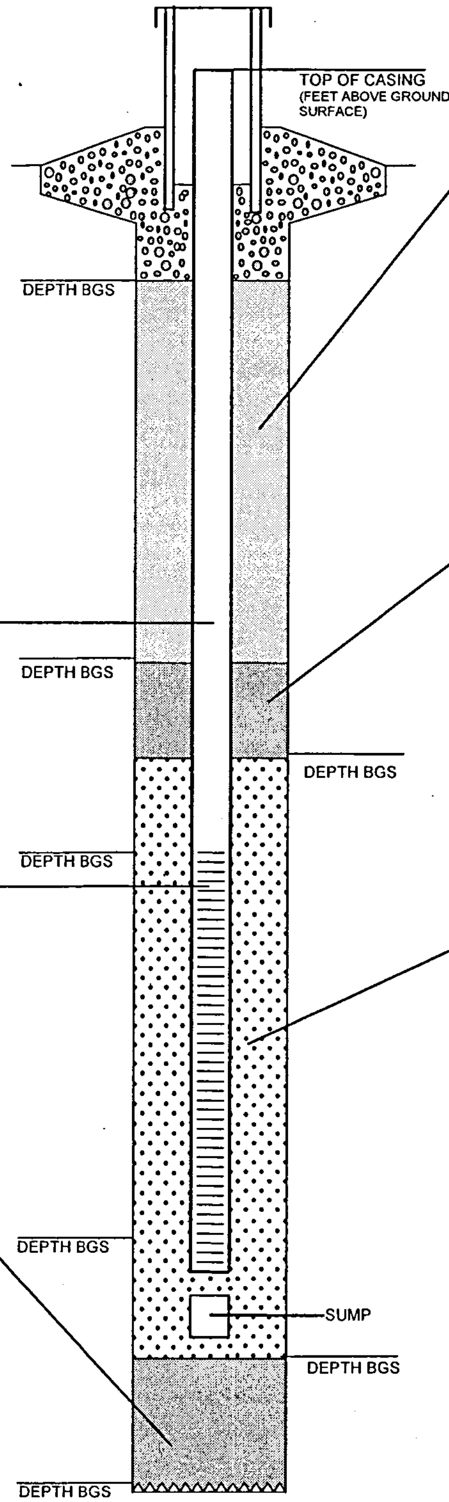
☐ SCHEDULE 40 PVC
☐ OTHER: ______
PRODUCT: ______
MFG. BY: ______
CASING DIAMETER:
ID: ______ OD: ______
SLOT SIZE: ______
LENGTH OF SCREEN: ______

BOREHOLE BACKFILL

AMOUNT CALCULATED: ______
AMOUNT USED: ______
☐ BENTONITE CHIPS, SIZE: ______
☐ BENTONITE PELLETS, SIZE: ______
☐ SLURRY: ______
☐ FORMATION COLLAPSE: ______
☐ OTHER: ______
PRODUCT: ______
MFG. BY: ______
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER: ______

SURFACE COMPLETION

☐ FLUSH MOUNT
☐ ABOVE GROUND WITH BUMPER POST
☐ CONCRETE ☐ ASPHALT



SURVEY INFORMATION

TOC ELEVATION: ______
GROUND SURFACE ELEVATION: ______
NORTHING: ______
EASTING: ______
DATE SURVEYED: ______
SURVEY CO.: ______

ANNULAR SEAL

VOLUME CALCULATED: ______
AMOUNT USED: ______
☐ GROUT FORMULA (PERCENTAGES)
PORTLAND CEMENT: ______
BENTONITE: ______
WATER: ______
☐ PREPARED MIX
PRODUCT: ______
MFG. BY: ______
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER: ______

BENTONITE SEAL

VOLUME CALCULATED: ______
AMOUNT USED: ______
☐ PELLETS, SIZE: ______
☐ CHIPS, SIZE: ______
☐ OTHER: ______
PRODUCT: ______
MFG. BY: ______
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER: ______
AMOUNT OF WATER USED: ______

FILTER PACK

☐ PREPACKED FILTER
VOLUME CALCULATED: ______
AMOUNT USED: ______
☐ SAND, SIZE: ______
PRODUCT: ______
MFG. BY: ______
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER: ______
WATER LEVEL: ______
(BTOC AFTER WELL INSTALLATION)

CENTRALIZERS USED?

☐ YES ☐ NO;
CENTRALIZER DEPTHS: ______ ______

BGS = BELOW GROUND SURFACE
BTOC = BELOW TOP OF CASING
N/A = NOT APPLICABLE
NR = NOT RECORDED
TOC = TOP OF CASING

APPENDIX C
PROJECT-REQUIRED REPORTING LIMITS

TABLE C-1: COMPARISON OF PROJECT-REQUIRED REPORTING LIMITS AND ACTION LEVELS, METALS METHOD 6010B, 6020, AND 7000 SERIES, SW-846 FOR SOIL

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Analyte	Residential Soil PRG (mg/kg)	Soil PRRL[a] (mg/kg)	Soil PRRL Below PRG?
Metals – Method 6010B, SW-846			
Aluminum	76,000	20	Yes
Barium	5,400	10	Yes
Beryllium	150	0.5	Yes
Cadmium	37	0.5	Yes
Calcium	NA	100	NA
Chromium	210	1	Yes
Cobalt	900	1	Yes
Copper	3,100	1	Yes
Iron	23,000	10	Yes
Lead	400	0.3	Yes
Magnesium	NA	100	NA
Manganese	1,800	1	Yes
Molybdenum	390	1	Yes
Nickel	1,600	2	Yes
Potassium	NA	100	NA
Selenium	390	0.5	Yes
Silver	390	1	Yes
Sodium	NA	100	NA
Vanadium	78	1	Yes
Zinc	23,000	2	Yes
Metals – Method 6020, SW-846			
Antimony	31	0.003	Yes
Arsenic	0.062	0.02	Yes
Thallium	5.2	0.002	Yes
Mercury – Method 77470A, SW-846			
Mercury	**23**	33	No[a]

Notes:

a	The PRRL listed is the reporting limit provided by Paragon Analytics
µg/L	Microgram per liter
EPA	U.S. Environmental Protection Agency
mg/kg	Milligram per kilogram
NA	Not available
PRG	Preliminary remediation goal (EPA 2004e)
PRRL	Project-required detection limit

TABLE C-2: COMPARISON OF PROJECT-REQUIRED REPORTING LIMITS AND ACTION LEVELS, SVOC, METHOD 8270C FOR SOIL

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

UFP-QAPP Worksheet # 15

Analyte	Soil Action Level* (µg/kg)	Soil PRRL (µg/kg)	Soil PRRL Below PRG?
1,2,4-Trichlorobenzene	30,000[b]	500	Yes
1,2-Dichlorobenzene	30,000[b]	500	Yes
1,3-Dichlorobenzene	30,000[b]	500	Yes
1,4-Dichlorobenzene	3,400	500	Yes
2,4,5-Trichlorophenol	10,000[b]	1,600	Yes
2,4,6-Trichlorophenol	6,100	500	Yes
2,4-Dichlorophenol	10,000[b]	500	Yes
2,4-Dimethylphenol	1,200,000	500	Yes
2,4-Dinitrophenol	120,000	2,500	Yes
2,4-Dinitrotoluene	120,000	500	Yes
2,6-Dinitrotoluene	61,000	500	Yes
2-Chloronaphthalene	NA	10	NA
2-Chlorophenol	63,000	500	Yes
2-Methyl-4,6-dinitrophenol	6,100	2,500	NA
2-Methylphenol	3,100,000	500	Yes
2-Nitroaniline	180,000	2,500	Yes
2-Nitrophenol	NA	500	NA
3,3'-Dichlorobenzidine	1,100	1,000	Yes
3-Nitroaniline	18,000	2,500	Yes
4-Bromophenyl Phenyl Ether	NA	500	NA
4-Chloro-3-methylphenol	NA	500	NA
4-Chloroaniline	240,000	1,.000	Yes
4-Chlorophenyl Phenyl Ether	NA	500	NA
4-Methylphenol	310,000	500	Yes
4-Nitroaniline	23,000	2,500	Yes
4-Nitrophenol	NA	2,500	NA
Benzoic acid	150,000	2,500	Yes
Benzyl alcohol	11,000	500	Yes
Bis(2-chloroethoxy)methane	NA	500	NA
Bis(2-chloroethyl)ether	220	500[a]	No
Bis(2-chloroisopropyl)ether	2,900	500	Yes

TABLE C-2: COMPARISON OF PROJECT-REQUIRED REPORTING LIMITS AND ACTION LEVELS, SVOC, METHOD 8270C FOR SOIL (CONTINUED)

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

UFP-QAPP Worksheet # 15

Analyte	Soil Action Level* (µg/kg)	Soil PRRL (µg/kg)	Soil PRRL Below PRG?
Bis(2-ethylhexyl)phthalate	35,000	500	Yes
Butyl Benzyl Phthalate	12,000,000	500	Yes
Diethyl Phthalate	49,000,000	500	Yes
Dimethyl Phthalate	100,000,000	500	Yes
Di-n-butyl Phthalate	6,100,000	500	NA
Di-n-octyl Phthalate	2,400,000	500	Yes
Hexachlorobenzene	300	500[a]	No
Hexachlorobutadiene	6,200	500	Yes
Hexachlorocyclopentadiene	370,000	500	Yes
Hexachloroethane	35,000	500	Yes
Isophorone	510,000	500	Yes
Nitrobenzene	20,000	500	Yes
N-Nitrosodi-n-propylamine	69	500[a]	No
N-Nitrosodiphenylamine	99,000	500	Yes
Pentachlorophenol	3,000	2,500	Yes
Phenol	40,000[b]	500	Yes
2-Methylnaphthalene	NA	500	NA

Notes

*	Soil Action Levels are EPA Region 9 PRGs for residential soil unless another source is referenced.
a	PRRL exceeds vapor intrusion screening criterion. The analytical method selected provides the lowest reporting limits available using routinely accepted methodology. Elevated reporting limits for a non-detect result may lead to an overestimation of risk and the impact will be discussed in the uncertainties section of the HHRA.
b	San Francisco Bay Area Regional Water Quality Control Board Environmental Screening Levels for Urban Area Ecotoxicity (Water Board 2005).

µg/kg	Microgram per kilogram
EPA	U.S. Environmental Protection Agency
HHRA	human health risk assessment
NA	Not available
PRG	Preliminary remediation goal (EPA 2004a)
PRRL	Project-required reporting limit

TABLE C-3: COMPARISON OF PROJECT-REQUIRED REPORTING LIMITS AND ACTION LEVELS, ORGANOCHLORINE PESTICIDES IN SOILS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Analyte	Soil Action Levels* (µg/kg)	Soil PRRL (µg/kg)	Soil PRRL Below PRG?
Alpha-BHC	90	1.7	Yes
Beta-BHC	320	1.7	Yes
Delta-BHC	NA	1.7	NA
Gamma-BHC	440	1.7	Yes
Heptachlor	110	1.7	Yes
Aldrin	29	1.7	Yes
Chlordane	1,600	50	Yes
Heptachlor epoxide	53	1.7	Yes
Endosulfan I	370,000	1.7	Yes
Dieldrin	30	3.3	Yes
4,4'-DDE	1,700	3.3	Yes
Endrin	60[a]	3.3	Yes
Endosulfan II	370,000	3.3	Yes
4,4'-DDD	2,400	3.3	Yes
Endosulfan sulfate	NA	5	NA
4,4'-DDT	1,700	3.3	Yes
Methoxychlor	310,000	17	Yes
Endrin ketone	NA	3.3	NA
Endrin aldehyde	NA	3.3	NA
Alpha-Chlordane	NA	1.7	NA
Gamma-Chlordane	NA	1.7	NA

Notes:

* Soil Action Levels are EPA Region 9 PRGs for residential soil unless another source is referenced.

a San Francisco Bay Area Regional Water Quality Control Board Environmental Screening Levels for Urban Area Ecotoxicity (Water Board 2005)

µg/kg Microgram per kilogram
EPA U.S. Environmental Protection Agency
NA Not available
PCB Polychlorinated biphenyl
PRG Preliminary remediation goal (EPA 2004a)
PRRL Project-required reporting limit

TABLE C-4: DEVELOPMENT OF PROJECT-REQUIRED REPORTING LIMITS FOR PCBs IN SOIL

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

UFP-QAPP Worksheet # 15

Analyte	CAS #	EPA Region 9 Residential Soil PRG (µg/kg)	Soil PRRL (µg/kg)	Method Detection Limit (µg/kg)	Soil PRRL Below PRG?
PCBs – Method 8082, SW-846					
Aroclor 1016	12674-11-2	3,900	33	0.025	Yes
Aroclor 1221	11104-28-2	220	67	0.050	Yes
Aroclor 1232	11141-16-5	220	33	0.025	Yes
Aroclor 1242	53469-21-9	220	33	0.025	Yes
Aroclor 1248	12672-29-6	220	33	0.025	Yes
Aroclor 1254	11097-69-1	220	33	0.025	Yes
Aroclor 1260	11096-82-5	220	33	0.025	Yes

Notes

ug/kg	Microgram per kilogram
CAS	Chemical Abstracts Service
EPA	U.S. Environmental Protection Agency
PCB	Polychlorinated biphenyl
PRG	Preliminary remedial goal (EPA 2004a)
PRRL	Project-required reporting limit

TABLE C-5: COMPARISON OF PROJECT REQUIRED REPORTING LIMITS AND ENVIRONMENTAL SCREENING LEVELS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

Analyte	Preliminary Remediation Criteria Residential Soil (mg/kg)	Soil PRRL (mg/kg)	Soil PRRL Below PRG?
TPH - Diesel 8015B, SW-846			
Diesel	1,380[a]	10	Yes
Motor oil	1,900[a]	20	Yes

Notes

a Residential soil action level developed for the Alameda, California (Navy 2001)

µg/L Microgram per liter
mg/kg Milligram per kilogram
NA Not available
PRRL Project-required reporting
TPH Total petroleum hydrocarbons

TABLE C-6: DEVELOPMENT OF PROJECT-REQUIRED REPORTING LIMITS VOC METHOD 8260B, SW-846 FOR WATER

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

UFP-QAPP Worksheet # 15

Analyte	CAS #	Preliminary RGs (µg/L)	Water PRRL (µg/L)	Method Detection Limit (µg/L)	Water PRRL Below Screening Level?
Chlorobenzene	108-90-7	700	1	0.016	Yes
Trichloroethene (TCE)	79-01-6	5	1	0.0063	Yes
Naphthalene	91-20-3	100	1	0.0022	Yes
Vinyl Chloride	75-01-4	15/0.5[a]	1	0.035	Yes

Notes:

Where the preliminary RG is exceeded, the method detection limit will be used as the screening criteria. The analytical method selected provides the lowest reporting limits available using routinely accepted methodology.

a IR Site 32 and Site 35 (IR Site 32/35) have different preliminary RGs according to the FS.

µg/L Microgram per liter
RG remedial goal
PRRL Project-required reporting limit
VOC Volatile organic compound
CAS Chemical Abstracts Service

TABLE C-7: DEVELOPMENT OF PROJECT-REQUIRED REPORTING LIMITS AND ENVIRONMENTAL SCREENING LEVELS

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater) and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

UFP-QAPP Worksheet # 15

Compound	CAS #	Groundwater Screening Criteria (mg/L)	Water PRRL (mg/L)	Method Detection Limit (mg/L)	Water PRRL Below Screening Criterion?
Dissolved Gasses - RSK-175[a]					
Ethane	74-84-0	NA	4.3	0.05	NA
Ethene	74-85-1	NA	4	0.05	NA
Methane	74-82-8	NA	2.3	0.05	NA
Miscellaneous Analytes					
Alkalinity [a]	NA	NA	5	NA	NA
Iron II [a]	7439-89-6	NA	20	0.10	NA
Nitrate [a]	7697-37-2	NA	1	0.01	NA
Nitrite [a]	14797-65-0	NA	1	0.01	NA
pH [a]	NA	NA	0.01 [b]	NA	NA
Sulfate [a]	14808-79-8	NA	5	0.05	NA
Sufide [a]	18496-25-8	NA	2	0.05	NA
TDS [a]	NA	NA	20	NA	N/A
TOC [a]	NA	NA	5	NA	N/A

Notes
The screening criteria are not being used for comparison. They are only being used for MNA analysis.

a No screening levels are available for these compounds.
b pH is reported to the nearest 0.01 pH unit.

CAS Chemical Abstracts Service
mg/L Milligrams per liter
MNA Monitored Natural Attenuation
NA Not Available
PRRL Project-required reporting limit
RSK Robert S. Kerr
TDS Total dissolved solids
TOC Total organic carbon

APPENDIX D
APPROVED LABORATORIES

TABLE D-1: NAVY-APPROVED LABORATORIES UNDER BASIC ORDERING AGREEMENT

Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan)
to address Data Gaps at Installation Restoration Site 25 (Soil at Kollman Circle), Site 32 (Groundwater)
and Site 35 (Groundwater at Areas of Concern 1 and 23 and Soil in Area of Concern 6)
Alameda Point, Alameda, California

GPL Laboratories	
Lab Address:	883 W. 2525 S.
	Syracuse, UT 84075
Point of Contact:	Tim Mikesell
Phone:	(801) 525-0456
Fax:	(801) 525-0457
Business Size:	SB
E-mail	mikesellts@earthlink.net

Paragon Analytics	
Lab Address:	225 Commerce Drive
	Fort Collins, CO 80524
Point of Contact:	Ken Campbell
Phone:	(800) 443-1511 / (970) 490-1511
Fax:	(970) 490-1522
Business Size:	LB
E-mail	kcampbell@paragonlabs.com

Laucks Laboratories	
Lab Address:	940 S. Harney Street
	Seattle, WA 98108
Point of Contact:	Mike Baxter / Joyell (Joy)
Phone:	(206) 957-2422 / (206) 957-2449
Fax:	(206) 767-5063
Business Size:	SB/SDVOSB
E-mail	mikeb@laukslabs.com

EMAX Laboratories Inc.	
Lab Address:	1835 205th Street
	Torrance, CA 90501
Point of Contact:	Kam Pang / Ye Myint
Phone:	(310) 618-8889
Fax:	(310) 618-0818
Business Size:	SB/WO
E-mail	kpang@emaxlabs.com ymyint@emaxlabs.com

Severn Trent Laboratories	
Lab Address:	880 Riverside Parkway
	West Sacramento, CA 95605
Point of Contact:	Nilo Ligi
Phone:	(916) 373-5600
Fax:	(916) 372-1059
Business Size:	LB
E-mail	nligi@stl-inc.com

Notes:

LB	Large business
SB	Small business
SDVOSB	Small Disadvantaged Veteran-owned Small Business
WO	Woman-owned