



ITT CORPORATION  
A Member of The ITT Group

4005 Port Chicago Highway  
Concord, California 94520

N00236.000189  
ALAMEDA POINT  
SSIC NO. 5090.3



## **Fuel Remediation Measures**

### **Site 7 and Parcel 37**

### **Alameda Point, Alameda, California**

Environmental Remedial Action Contract Number N62474-98-D-2076, Contract Task Order 0013

Document Control Number 1538, Revision 1 – August 1, 2001

---

# **Final Project Plans**

---

**FINAL  
PROJECT PLANS  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

U.S. Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: Diane Silva

Date: 8/1/01

Controlled

Uncontrolled



August 1, 2001

**IT Corporation**

4005 Port Chicago Highway  
 Concord, CA 94520-1120  
 Tel. 925.288.9898  
 Fax. 925.288.0888

A Member of The IT Group

Ms. Joyce Howell-Payne, Code 06CH.JHP  
 BRAC Operations, Southwest Division  
 Naval Facilities Engineering Command  
 1230 Columbia Street, Suite 1100  
 San Diego, CA 92101

Attention: Mr. Greg Lorton, Code 06CA.GL  
 Contract: N62474-98-D-2076, Environmental Remedial Action Contract  
 Contract Task Order No.: CTO 13  
 Subject: **Submittal of Final Project Plans – Fuel Remediation Measures, Site 7 & Parcel 37, Alameda Point Alameda, California**

Dear Mr. Greg Lorton:

At the Navy's request, IT Corporation is transmitting replacement pages and signed figures and new bound copies of the Final Project Plans for the above-referenced project. The replacement pages and signed figures will be distributed to those who are in possession of the Draft Final Project Plans, dated June 15, 2001; full bound versions of the Final Project Plans will distributed to Mr. Andrew Dick (EFDSW), Mr. Daniel Murphy (DTSC), and Mr. Lynn Norman (IT). The enclosed Final Project Plan pages and signed figures should replace the existing pages as indicated in the following table:

Existing Pages / Figures:	Replace with revised:
<b>A. All Plans</b>	<b>A. All Plans</b>
Title / Signature Pages	Title / Signature Pages (signed)
<b>B. Work Plan</b>	<b>B. Work Plan</b>
Table of Contents (page i)	Table of Contents (page i)
Page 1-1	Page 1-1
Pages 4-2 through 4-7	Pages 4-2 through 4-7 (edit caused repagination of entire section)
Figures 1 through 15	Figures 1 through 15 (signed)
<b>C. QC Plan</b>	<b>C. QC Plan</b>
All pages	All pages (based on internal edits)
<b>D. Sampling and Analysis Plan</b>	<b>D. Sampling and Analysis Plan</b>
Field Sampling Plan -- Figures 1, 2, and 3	Field Sampling Plan -- Figures 1, 2, and 3 (signed)
<b>E. Site Health and Safety Plan</b>	<b>E. Site Health and Safety Plan</b>
Figures for Appendix B and Appendix F	Figures for Appendix B and Appendix F (signed)

Should you have any questions, please contact the Project Manager, Daniel Shafer, at (916) 565-4328, or the undersigned at (925) 288-2212.

Sincerely,  
IT CORPORATION



Daniel L. Shafer  
Project Manager  
CTO 13

cc: Steven Edde, Environmental Liaison  
Shirley Ng, ROICC  
Diane Silva, Admin Records  
Navy Basic Contract File  
Karla Brasaemle, TechLaw, Inc.  
Anna-Marie Cook, US EPA  
Chris Fennessy, TtEMI  
Brad Job, CRWQCB  
Dina Tasini, ARRA  
Michael John Torrey, RAB  
Tim Ault, IT Corporation  
Neil Hey, IT Corporation  
Mike Robinson, IT Corporation  
Project File



**IT CORPORATION**  
*A Member of The IT Group*

**IT TRANSMITTAL/DELIVERABLE RECEIPT**

**CONTRACT : N62474-98-D-2076**

**DOCUMENT CONTROL NUMBER : 1538.1**

**TO:** Administrative Contract Officer  
 Navy Regional Environmental Contracts  
 NAVFACENGCOM-SWDIV  
 Michelle Crook, 02R1.MC  
 1230 Columbia St., Suite 1100  
 San Diego, CA 92101

**Date :** August 01, 2001

**CTO :** 0013

**Location:** Alameda Point

**FROM:**

*[Signature]*  
 Dan Shafer  
 Project Manager

**DESCRIPTION** *Per Navy enclosed is the Final Project Plans, Fuel Remediation Measures IR Site 7 and Parcel 37, Dated August ENCLOSURE : 1, 2001. Insert Pages.*

*Please see the attached letter for instructions for inserting the pages into the Project Plans.*

**Appendices:**

- Work Plan
- Quality Control Plan
- Sampling and Analysis Plan
- Health and Safety Plan
- Environmental Protection Plan

**TYPE :** CTO Deliverable

**VERSION :** Final

**REVISION No :** 1

**ADMIN RECORD :** 0

**SCHEDULED DELIVERY DATE :** August 02, 2001

**ACTUAL DELIVERY DATE** August 01, 2001

*Date/Time Received* \_\_\_\_\_ / \_\_\_\_\_

**TO:** Administrative Contract Officer  
Navy Regional Environmental Contracts  
NAVFACENGCOM-SWDIV  
Michelle Crook, 02R1.MC  
1230 Columbia St., Suite 1100  
San Diego, CA 92101

**Date :** August 01, 2001

**CTO :** 0013

**Location:** Alameda

**NUMBER OF COPIES SUBMITTED TO THE NAVY: 1/O, 6/C, 10/E**  
[AS REQUIRED/DIRECTED BY THE SOW]

**COPIES TO :**

**SWDIV**

Basic Contract Files, 02R1 (10/1E)  
Jan Corbett, 071.JC (1C/1E)  
Andrew Dick, 5NEN.DA (1C/1E)  
Steven Edde, N/A (1C/1E)  
Greg Lorton, 06CA.GL (1C/2E)  
Shirley Ng, (1C/1E)  
Diane Silva, 4MGDS (1C/3E)

**IT CORPORATION**

Chron  
Tim Ault, Concord (1C/2E)  
IT Project File, Concord (1C/1E)  
Neil Hey, Concord (1C/1E)  
Concord Library, Concord (1C/1E)  
Lynn Norman, Concord (1C/1E)  
Emma Popek, Concord (1C/1E)  
Mike Robinson, Concord (1C/1E)  
Dan Shafer, Sacramento (1C/1E)  
Carey Von Williams, Concord (1C/1E)

**Other**

Karla Brasaemle, TechLaw, Inc. (1C/1E)  
Anna-Marie Cook, US Environmental Protection Agency  
(1C/1E)  
Chris Fennessy, Tetra Tech EMI (1C/1E)  
Brad Job, California Regional Water Quality Control Board  
(1C/1E)  
Daniel Murphy, Department of Toxic Substances Control  
(1C/1E)  
Dina Tasini, ARRA (1C/1E)  
Michael John Torrey, RAB (1C/1E)

*Date/Time Received* \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_



**DEPARTMENT OF THE NAVY**  
SOUTHWEST DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
1220 PACIFIC HIGHWAY  
SAN DIEGO, CA 92132-5190

5090  
Ser 06CA.GL\0627  
June 15, 2001

Mr. Brad Job, P.E.  
Regional Water Quality Control Board  
San Francisco Bay Region  
1515 Clay Street, Suite 1400  
Oakland, CA 94612

Dear Mr. Job:

**Subj: DRAFT WORK PLANS – FUEL REMEDIATION MEASURES, SITE 7 PARCEL 37,  
ALAMEDA POINT, ALAMEDA, CALIFORNIA**

Enclosed is one copy of the above-titled document. This document includes the work plan, quality control plan, sampling and analysis plan, site health and safety plan, and environmental protection plan. We appreciate your review of this document, and hope to receive your comments by July 13.

If you have any questions or comments, please feel free to call me at (619) 532-0953 or e-mail me at [lortonga@efdswnavfac.navy.mil](mailto:lortonga@efdswnavfac.navy.mil).

Sincerely,

A handwritten signature in cursive script that reads "Gregory A. Lorton".

GREGORY A. LORTON, P.E., R.E.A.  
Remedial Project Manager

Ms. Anna-Marie Cook, U.S EPA Region IX  
Ms. Mary Rose Cassa, Cal/EPA DTSC  
Ms. Dina Tasini, City of Alameda  
Mr. Michael John Torrey, RAB Co-chair  
Ms. Karla Brasaemle, TechLawInc.  
Mr. Ted Splitter, Northgate Environmental  
Mr. Steve Edde, Alameda Point  
Mr. Chris Fennessy, Tetra Tech EMI  
✓ Ms. Diane Silva, SWDIV



**IT CORPORATION**  
*A Member of The IT Group*

**IT TRANSMITTAL/DELIVERABLE RECEIPT**

**CONTRACT : N62474-98-D-2076**

**DOCUMENT CONTROL NUMBER : 1538.0**

**TO:** Administrative Contract Officer  
 Navy Regional Environmental Contracts  
 NAVFACENGCOM-SWDIV  
 Michelle Crook, 02R1.MC  
 1230 Columbia St., Suite 1100  
 San Diego, CA 92101

**Date :** June 15, 2001

**CTO :** 0013

**Location:** Alameda

**FROM:**

*for Vincent D. Kelsing*  
 \_\_\_\_\_  
 Dan Shafer  
 Project Manager

**DESCRIPTION** *Draft Final Project Plans, Fuel Remediation Measures Site 7 and Parcel 37, Dated June 15, 2001*  
**OF** *Project Plans includes WP, QCP, SAP, SHSP and EPP*  
**ENCLOSURE :** *IT would appreciate receiving Navy comments on or before July 13, 2001.*

**TYPE :** CTO Deliverable

**VERSION :** Draft Final

**REVISION No :** 0

**ADMIN RECORD :** ~~No~~ **YES**

**SCHEDULED DELIVERY DATE** June 18, 2001

**ACTUAL DELIVERY DATE** June 15, 2001

**NUMBER OF COPIES SUBMITTED TO THE NAVY:** 1/O, 4/C, 8/E  
 [AS REQUIRED/DIRECTED BY THE SOW]

**COPIES TO :**

**SWDIV**

Basic Contract Files, 02R1 (10/1E)  
 Steven Edde, N/A (1C/1E)  
 Greg Lorton, 06CA.GL (1C/2E)  
 Shirley Ng, (1C/1E)  
 Diane Silva, 4MGDS (1C/3E)

**IT CORPORATION**

Chron  
 Tim Ault, Concord (1C/2E)  
 IT Project File, Concord (1C/1E)  
 Neil Hey, Concord (1C/1E)  
 Mike Robinson, Concord (1C/1E)  
 Dan Shafer, Sacramento (1C/1E)

**Other**

Karla Brasaemle, TechLaw, Inc. (1C/1E)  
 Mary Rose Cassa, California Environmental Protection Agency (1C/1E)  
 Anna-Marie Cook, US Environmental Protection Agency (1C/1E)  
 Chris Fennessy, Tetra Tech EMI (1C/1E)  
 Brad Job, California Regional Water Quality Control Board (1C/1E)  
 Dina Tasini, ARRA (1C/1E)  
 Michael John Torrey, (1C/1E)

*Date/Time Received* \_\_\_\_\_ / \_\_\_\_\_

***IT Corporation Response to Comments on the Draft Field Sampling Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Field Sampling Plan</i></b>				
1		Section 1.1	Phase 4: Typo, replace “its” with “their”	Comment noted. A correction has been made.
2		Section 4.1	Clarify whether the one groundwater sample from each site will be collected from a piezometer that does or does not contain free product. Tables 1 and 2 say that it will have free product. Groundwater samples collected from wells with free product may be contaminated by the free product and thus are not a good indicator of dissolved phase contaminant concentrations. Clarify how groundwater concentrations collected from these piezometers will be used to satisfy DQOs. In addition to MTBE , include other oxygenated fuels in the analyses.	Comment noted. The text of the 3 <sup>rd</sup> paragraph in Section 4.1 has been amended as follows: “The free product and groundwater samples will allow to determine the chemical and physical characteristics of free product and to estimate the highest possible concentration of dissolved contaminants in groundwater.” Also, see response to comment 1(b) to the QAPP. Other oxygenated compounds have been added to the list of analytes.
3		Section 4.2	Clarify whether the treatment train at Site 7 will include both a thermal or catalytic oxidizer and a GAC system to treat the offgas. This impacts the number of samples discussed in the text since only effluent from GAC systems will be analyzed.	Comment noted. Paragraph 2 of Section 4.2 has been revised as follows: “During the pilot-scale and full-scale operations, the extracted vapors will be treated through a thermal/catalytic oxidizer at Site 7. At Parcel 37 a GAC adsorption system will be used to treat the vapor, after which it will be discharged to the atmosphere.”

***IT Corporation Response to Comments on the Draft Field Sampling Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Field Sampling Plan (Continued)</i></b>				
4		Section 5.1	The list of analytical methods should be limited to the methods appropriate for the analytes of concern. If additional methods are included because they might be required by permits, then discuss this in the text, and add them to Tables 1 and 2. Review the method references given on pages 5-1 and 5-2 to ensure that they are the most current versions of these documents. The date given for the APHA reference does not agree with the date given for this reference in Section 7.0. Note that EPA Method 5035 does not appear in the list.	Comment noted. Methods for the POTW analyses have been included into Tables 1 and 2 of the FSP. Method references have been reconciled throughout the text and Method 5035 has been added.
5		Section 5.3	Insert “include” into 2 <sup>nd</sup> sentence between “will” and “trip”.	Comment noted. A correction has been made.
6		Section 6.1	If Tables 1 and 2 are correct and the groundwater samples will be collected from piezometers with free product, then this discussion of groundwater sampling procedures needs to discuss how free product will be cleared from the well prior to sampling. Tables 1 and 2 and Section 4.1 claim that only one groundwater sample will be collected from each site, but this discussion seems to imply that all of the newly installed piezometers will be sampled. Revise to clarify.	Commented noted. See response to comment #2 to the FSP. Also, the first sentence of Section 6.1 has been amended as follows: “Groundwater will be sampled at one location per site in accordance with the procedures described in IT SOP 9.1.”
7		Section 7.0	The date for the APHA reference is inconsistent between Section 7.0 and 5.1.	Comment noted. A correction has been made.
8		Tables 1 and 2	These tables indicate that groundwater samples will be collected from one piezometer from each site, and these two piezometers will have free product. Is this correct?	This is correct. See response to comment #2 to the FSP for additional clarification.

***IT Corporation Response to Comments on the Draft Field Sampling Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<b><i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i></b>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Field Sampling Plan (Continued)</i></b>				
9		Table 3	The metal analysis method number given in this table does not agree with the method given in other sections of the document (Tables 1 & 2, Section 5.1). Some of the analytes and methods listed in this table do not appear in the requested analyses discussed in the text and Tables 1 & 2: e.g. pesticides/PCBs, cyanide, phenols, SVOCs, etc. Review the appropriate sections and Tables and revise for consistency.	Comment noted. Metal analysis reference has been corrected. The additional analytes listed in Tables 1 and 2 are discussed in Section 4.3.1 of the FSP.
10			Incorporate comments. Provide responses to comments along with the revised version of the document for SWDIV QA approval prior to regulatory review and field implementation.	

***IT Corporation Response to Comments on the Draft Quality Assurance Project Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Quality Assurance Project Plan</i></b>				
1		Section 3.1	Quality Objectives –Only a few minor comments.	
(1a)		Section 3.1.1	As written, the 2 <sup>nd</sup> paragraph is not relevant to Step 1 of the DQO process. Revise to indicate that the effectiveness and optimal operating conditions for the DVE system at these sites are uncertain.	Comment noted. The paragraph has been revised as follows: “The effectiveness of free product removal using DVE is to be determined at the sites though pilot testing. This plan describes the pilot-scale DVE systems to be installed and provides preliminary plans for operating full-scale systems. Optimal operating conditions for the full-scale systems will be determined during the pilot tests.”
(1b)		Section 3.1.2	It is unclear how one sample collected from a well with free product could be used to resolve the 3 <sup>rd</sup> bullet under #1.	Comment noted. The text has been revised as follows: “1. What are the hydrogeologic conditions and the chemical speciation in the groundwater at the sites? What are depths to groundwater beneath the sites? What are the depths and thicknesses of the free product layers present at the sites? What are the concentrations of the dissolved phase products and their constituents in groundwater?”

***IT Corporation Response to Comments on the Draft Quality Assurance Project Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Quality Assurance Project Plan (Continued)</i></b>				
(1c)		Section 3.1.6	Consider revising this discussion of limits on decision error to distinguish between environmental samples and process stream samples. The discussion might be appropriate for the data collected to delineate the extent of free product, but most of the samples collected for analysis in this effort are related to either waste or process evaluation (i.e. collection of samples from process influent and effluent streams); therefore decision errors associated with sampling location are virtually eliminated and it may not be necessary to quantify limits on decision errors in the same manner that is required for “environmental” samples. Decision errors in this type of effort might be related to sampling frequency or analytical PARCC parameters.	Comment noted. The text has been revised as follows: “This step does not apply because sampling will not be based on probabilistic designs. The number of samples to be collected are based on existing experience with similar projects and the applicable regulatory guidance (for example, the frequency of wastewater sampling or of vapor monitoring). The sampling strategy was also influenced by cost considerations. To limit uncertainty in obtained environmental data, criteria for the PARCC parameters and reporting limits for the contaminants of concern have been developed. The data that meet these criteria will be of definitive quality and of less uncertainty than the estimated data that do not meet the criteria.”
2		Section 3.4 Section 5.1	The list of analytical methods should be limited to the methods appropriate for the analytes of concern. If additional methods are included because they might be required by permits, then discuss this in the text, and add them to Tables 1 and 2. Review the method references given on pages 5-1 and 5-2 to ensure that they are the most current versions of these documents. The date given for the APHA reference does not agree with the date given for this reference in Section 9.0. Note that EPA Method 5035 does not appear in the list.	Comment noted. Methods for the POTW analyses have been included into Tables 1 and 2 of the FSP. Method references have been reconciled throughout the text and Method 5035 has been added.

***IT Corporation Response to Comments on the Draft Quality Assurance Project Plan—Fuel Remediation Measures  
Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b><i>Draft Quality Assurance Project Plan (Continued)</i></b>				
3		Section 3.5	The reporting limits given in Tables 2 through 6 should be compared with project thresholds. What criteria form the basis for project thresholds in this effort (e.g. waste discharge reporting criteria, etc.)?	Comment noted with exception. There are no project thresholds at this time, as the waste permit has not been obtained yet. Typically, the proposed reporting limits are adequate for the wastewater discharge permit.
4		Section 7.2 Data Validation	–SWDIV EWI#1 does not require validation for process monitoring or waste characterization; therefore, it is not clear why the groundwater samples will be subjected to 100% validation. Groundwater samples collected from wells contaminated with free product cannot be used to characterize dissolved phase constituents or concentrations; therefore the purpose of this effort is unclear.	Comment noted. The text has been revised as follows: “Data review will be performed according to the Navy requirements (SWDIV, 1999a). Validation by a third party will not be required for any of the samples collected for this project, as none of the data will be used for characterization or confirmation purposes. All groundwater, vapor and waste stream data will be reviewed by an IT Project Chemist. The review will be in accordance with the QC criteria specified in this document. Data will be flagged with data qualifiers shown in Table 18.” Section 7.1.3, “Data Reporting”, has been revised to remove the requirement for Level IV data package for groundwater samples as standard laboratory packages will suffice.
5		Section 9.0 References	References -- This reference list seems to be incomplete when compared to Section 3.4. (ASTM reference is missing). The date for the APHA reference is inconsistent between Sections 9.0 and 3.4.	Comment noted. A correction has been made.
6		Figure 1	Provide a legend that defines the difference between solid and dashed lines on this figure.	Comment noted. A correction has been made.

***IT Corporation Response to Comments on the Draft Quality Assurance Project Plan  
Fuel Remediation Measures, Site 7 and Parcel 37, Alameda Point  
Alameda, California  
April 16, 2001***

<i>Comments by: Nars Ancog, U.S. Navy Quality Assurance Officer</i>				
<b>Comment No.</b>	<b>Page No.</b>	<b>Section, Figure, Table</b>	<b>Comments</b>	<b>Response</b>
<b>Draft Quality Assurance Project Plan (Continued)</b>				
7		Table 1	Update 4 <sup>th</sup> bullet under Program Chemist to reflect “point of contact with SWDIV QAO” not “EFA West QAO”.	Comment noted. A correction has been made.
8		Tables 2 through 6 Reporting Limits	Revise these tables to specify the applicable project threshold (PT) for each analyte. For convenience, the PT column should be located adjacent to the RL column. If the RL > PT, explain how data will be dealt with (footnotes are OK).	Comment noted with exception. There are no project thresholds at this time, as the waste permit has not been obtained yet. Typically, the proposed reporting limits are adequate for the wastewater discharge permit.
9			Incorporate comments. Provide responses to comments along with the revised version of the document for SWDIV QA approval prior to regulatory review and field implementation.	

**FINAL  
WORK PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

U.S. Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_

Date: \_\_\_\_\_

Controlled

Uncontrolled

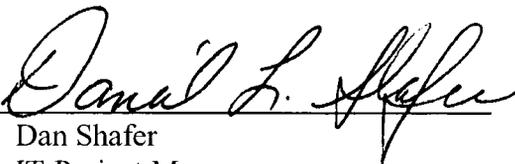
**FINAL  
WORK PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Approved by:

  
Dan Shafer  
IT Project Manager

Date: August 1, 2001

# Table of Contents

---

List of Figures .....	ii
List of Tables .....	ii
Acronyms and Abbreviations .....	iii
1.0 Introduction .....	1-1
1.1 Project Objectives .....	1-1
1.2 Technical Approach .....	1-2
1.3 Project Schedule .....	1-2
1.4 Permitting .....	1-3
2.0 Site Description and Background .....	2-1
2.1 Geology and Hydrogeology .....	2-1
2.2 Parcel 37 .....	2-4
2.3 Site 7 .....	2-6
2.4 Chemicals of Concern .....	2-8
3.0 Dual Vacuum Extraction (DVE) Pilot System Description .....	3-1
3.1 DVE Principle of Operation and Process Description .....	3-1
3.2 DVE Collection Trench Design .....	3-2
3.3 Major Process Equipment .....	3-3
3.3.1 Vapor Extraction and Treatment Systems .....	3-3
3.3.1.1 Vacuum Blower .....	3-4
3.3.1.2 Primary and Secondary Liquid/Vapor Separators .....	3-4
3.3.1.3 Vapor Treatment Unit .....	3-5
3.3.2 Liquid Extraction and Treatment System .....	3-5
3.3.2.1 Demulsification System/Receiving Tank .....	3-6
3.3.2.2 Oil/Water Separator and Equalization Tank .....	3-6
3.3.2.3 Particulate Filters and GAC Treatment System .....	3-7
3.4 Test Parameters .....	3-7
4.0 Field Implementation of Dual Vacuum Extraction Pilot Test .....	4-1
4.1 Site Setup .....	4-1
4.2 Free Product Delineation, Sampling, and Characterization .....	4-1
4.2.1 Piezometer Placement Strategy .....	4-2
4.2.2 Piezometer Installation and Construction .....	4-3
4.2.3 Product Measurement and Sampling .....	4-3
4.3 Piezometer Drilling Methods and Procedures .....	4-3
4.4 Tidal Influence Survey .....	4-4
4.5 Collection Trench Installation .....	4-5
4.6 System Construction .....	4-5
4.7 Pre-Operational Checkout .....	4-6
4.8 Baseline Field Measurement .....	4-6
4.9 Dual Vacuum Extraction Testing .....	4-6
4.10 Evaluation of Dual Vacuum Extraction System Test Results .....	4-7
4.11 Anticipated Full-Scale Construction, Operation, and Closure .....	4-7
5.0 Demobilization and Waste Handling .....	5-1

## **Table of Contents (continued)**

---

5.1	Preliminary Information .....	5-1
5.2	Procurement .....	5-1
5.3	Waste Accumulation and Storage.....	5-2
5.4	Sampling and Analyses .....	5-2
5.5	Waste Characterization.....	5-3
5.6	Waste Profiling.....	5-3
5.7	Shipment Preparation .....	5-4
5.8	Manifesting .....	5-4
6.0	Dual Vacuum Extraction Pilot Test Report and Closure Report .....	6-1
7.0	References.....	7-1

## **List of Figures**

---

Figure 1	Vicinity Map
Figure 2	Site Map—Former Fuel Loading Station Parcel 37
Figure 3	Fuel Hydrocarbon Distribution Map—SCAPS Data Isocontours Former Fuel Loading Station Parcel 37
Figure 4	Cross Section A-A' and B-B'—Schematic Fuel Hydrocarbon Distribution and Stratigraphy Parcel 37
Figure 5	Site Map—Site 7
Figure 6	Fuel Hydrocarbon Distribution Map—Site 7
Figure 7	Cross Section A-A'—Site 7
Figure 8	Cross Section B-B'—Site 7
Figure 9	Process Flow Diagram—Site 7
Figure 10	Process Flow Diagram—Former Fuel Loading Station Parcel 37
Figure 11	Proposed Collection Trench Layout—Site 7
Figure 12	Proposed Collection Trench Layout—Former Fuel Loading Station Parcel 37
Figure 13	DVE Accumulation Sump for Non-Tidal Use
Figure 14	Proposed Piping Network Layout—Site 7
Figure 15	Proposed Piping Network Layout—Former Fuel Loading Station Parcel 37

## **List of Tables**

---

Table 1	Project Schedule
Table 2	Major Equipment for Dual Vacuum Extraction Field Pilot Test, Site 7
Table 3	Major Equipment for Dual Vacuum Extraction Field Pilot Test, Parcel 37
Table 4	Preliminary Waste Information
Table 5	Sampling and Analysis Summary—Site 7 and Parcel 37

## Acronyms and Abbreviations

---

BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BSU	bay sediment unit
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CCR	California Code of Regulations
CD	certificate of disposal
cfm	cubic feet per minute
CFR	Code of Federal Regulations
COC	chain of custody
CPT	Cone Penetrometer Test
cy	cubic yard
DOT	U.S. Department of Transportation
DTSC	Department of Toxic Substances Control
DVE	Dual Vacuum Extraction
EBMUD	East Bay Municipal Utilities District
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FAR	Federal Acquisition Regulations
ft/ft	feet per foot
FWBZ	First water bearing zone
GAC	granular activated carbon
gpm	gallons per minute
HDPE	high-density polyethylene
Hg	mercury
HMTA	Hazardous Materials Transportation Act
HP	horsepower
HWCL	Hazardous Waste Control Law
IATA	International Air Transport Association
IT	IT Corporation
JP-4	Jet Propellant – 4
JP-5	Jet Propellant – 5
LDR	land disposal restriction
LIF	laser-induced fluorescence
LNAPL	light nonaqueous phase liquid
mg/L	milligrams per liter
MTBE	methyl tertiary butyl ether
NAS	Naval Air Station
PID	photoionization detector
POTW	publicly-owned treatment works
PPE	personal protective equipment
ppm	parts per million
PQCP	Project Quality Control Plan
psig	pounds per square inch gage

## **Acronyms and Abbreviations (continued)**

---

PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
SCAPS	Site Characterization and Analysis Penetrometer System
scfm	standard cubic feet per minute
SHSP	Site Health and Safety Plan
SOP	standard operating procedure
STLC	soluble threshold leaching concentration
SVE	Soil Vapor Extraction
SW	solid waste
SWBZ	second water bearing zone
T&D	transportation and disposal
TPH	total petroleum hydrocarbons
TSDf	treatment, storage, and disposal facility
TTLC	total threshold leaching concentration
TtEMI	Tetra Tech EM, Inc.
UN	United Nations
USA	Underground Services Alert
UST	underground storage tank

## **1.0 Introduction**

---

This document presents the Work Plan for remediation of light, nonaqueous phase liquid (LNAPL) fuel hydrocarbons at two locations at the former Naval Air Station, Alameda, California. The two sites are designated Site 7 (former Navy Exchange Service Station at West Tower Avenue and Main Street) and Parcel 37 (the former Fuel Loading Station at Monarch Street and West Redline Avenue) on Alameda Point (Figure 1, "Vicinity Map"). The remediation technology to be used includes Dual Vacuum Extraction (DVE) of contaminated vapor and LNAPL (gasoline, diesel, and Jet Propulsion Fuel No. 4 and No. 5 (JP-4 and JP-5) from horizontal wells constructed in trenches at each site.

Most buildings and associated equipment from Site 7 and Parcel 37 were removed in or prior to 1998, and some petroleum hydrocarbon-impacted soil was overexcavated in 1998 and 1999. Results of various site investigations (see Section 7.0, "References") and excavation work indicate the presence of free-phase petroleum hydrocarbons in the subsurface at both Site 7 and Parcel 37.

DVE has been selected as a cost-effective, appropriate technology for vapor and LNAPL hydrocarbon removal at these two sites. DVE is a technology that uses vacuum to induce vapor and product flow to extraction points where it can be readily removed. This technology also promotes subsurface airflow that enhances volatilization and biodegradation. Results of additional free product delineation and a DVE pilot test will provide data for full-scale system design, implementation, and closure.

### **1.1 Project Objectives**

A free product investigation and DVE field pilot test will be performed at both project sites. Full-scale design, construction, operation, and closure activities will follow. The primary objectives are to accomplish the following:

- Delineate the extent of hydrocarbon free product floating on the water table
- Verify the depth to free product and groundwater
- Determine tidal influence
- Verify the applicability of DVE
- Finalize the collection trench layout and system design
- Establish optimal operating conditions for the full-scale system
- Implement full-scale construction and operation
- Close the sites after securing regulatory approval

## **1.2 Technical Approach**

The technical approach for this Work Plan is to perform the field activities in four phases in order to confirm that the selected remedial system and layout is appropriate for the anticipated site conditions. This phased approach has been designed to minimize field changes.

The first phase includes the installation of temporary piezometers within and surrounding the fuel hydrocarbon impacted areas as identified by previous investigations in order to complete delineation of the free product-fuel hydrocarbon plumes. These temporary piezometers will be monitored for product thickness, groundwater levels, and tidal influence. Product samples will be collected, measured for viscosity, and fingerprinted for fuel type. These data will be used to determine DVE collection trench layouts and depths. It is anticipated that these piezometers will afford a good range of site conditions (e.g., product thickness, viscosity, tidal influence) to be evaluated. If a piezometer does not have product, alternative locations will be selected based on additional data review, and temporary piezometers will be installed in those locations if needed.

The second phase will be installation of horizontal wells in collection trenches within the product plume as defined by the temporary piezometers. Eventually, all collection trenches will be placed in the free product plume area. After the first three collection trenches are installed, the DVE process equipment will be set up, and a pilot test will be conducted as described in Sections 3.0 and 4.0, respectively.

The third phase will include installation and operation of the full-scale system. The extent of the Phase 3 expansion will be based on results of the pilot test. Wells and equipment installed in earlier phases will be used in the full-scale test to the extent practicable.

The fourth phase will consist of closure activities including preparation, submittal, and regulatory approval of the site. Restoration and demobilization of the site will complete the project. Long-term monitoring has not been assumed, but it may be required by regulatory authorities.

## **1.3 Project Schedule**

The field activities for the DVE pilot test and any subsequent expansion to full scale for Parcel 37 and Site 7 at Alameda Point will be conducted in three main parts (preconstruction, procurement, and field activities), beginning with initial preconstruction activities. Upon notice to proceed from the Navy, the procurement activities will commence. Field activities will begin shortly after initial procurement activities are started. Field activities will consist of four phases, including Phase I, Contaminant Delineation; Phase II, DVE Pilot Test; Phase III, Full-Scale

Design, Construction, and Operation; and Phase IV, Closure. The main elements of the work are outlined in Table 1, "Project Schedule."

#### **1.4 Permitting**

Prior to the pilot test construction, an application for an air permit for the pilot test will be submitted to the Bay Area Air Quality Management District (BAAQMD). Excavation clearances will be obtained for all intrusive work, including installation of piezometers and collection trenches. The collection trenches will also be permitted and inspected by Alameda County.

IT will notify Underground Services Alert (USA) at least 48 hours prior to initiation of drilling and excavation activities, and secure the appropriate authorizations from the Caretaker Site Office. IT will maintain these clearances and authorizations for the duration of the field effort.

Contaminated water collected during the pilot test will be disposed of at the publicly-owned treatment works (POTW) operated by East Bay Municipal Utility District (EBMUD). Discharge limits for the sanitary sewer may be imposed by EBMUD that are consistent with operation of the POTW. During the pilot test, a groundwater sample from each test site will be analyzed for pretreatment constituents that may be specified by the POTW.

## **2.0 Site Description and Background**

---

The former Naval Air Station (NAS) Alameda, now renamed Alameda Point, is located on the western end of Alameda Island, south of Oakland, primarily in Alameda County, California (see Figure 1). Alameda Island is separated from Oakland by the Oakland Inner Harbor, which was constructed during the late 1800s and early 1900s. Prior to this time, Alameda consisted of a peninsula surrounded by marsh and tidal areas. After construction of the Inner Harbor, fill was placed over the marsh, tidal areas, and open waters, primarily at the northern and western end of the island. Alameda Point is constructed on this fill material. The exact source of much of the fill material is undocumented, although dredge spoils from the nearby waterways were likely used for much of the fill material. Numerous industries were present in the marsh and tidal areas of the Alameda Peninsula prior to and during various stages of filling in the mid- to late-1800s. Many of these industries were related to petroleum/coal storage and refining, natural gas manufacturing, and shipping.

### **2.1 Geology and Hydrogeology**

This section describes the general geology and hydrogeology of Alameda Point as documented in Tetra Tech's OU-1 Remedial Investigation Report dated March 23, 1999. Alameda Point is located in the central portion of the eastern side of the San Francisco Bay and occupies a depression between two uplifted areas: the Berkeley Hills on the east and the Montara and other mountains on the west. The depression and uplifted areas are formed by the two subparallel active faults: the San Andreas Fault to the west and the Hayward Fault to the east of the bay. Alameda Island is underlain by approximately 400 to 500 feet of unconsolidated sediments overlying consolidated Franciscan bedrock (Rogers and Figuers 1991).

Artificial fill is present throughout most of the installation and overlies all other late Quaternary sediments. The artificial material is composed of various soil and sediment types. The dominant fill type is poorly graded, fine- to medium-grained sand with silt and clay. The artificial fill layer thickness ranges from a few feet at the eastern portion of the installation to 20 feet at the western edge of the installation. The artificial fill materials are believed to be dredge spoils from the surrounding San Francisco Bay, the Seaplane Lagoon, and the Oakland Inner Harbor. The artificial fill has been observed to contain layers of less permeable material that may force contaminants to migrate in a horizontal direction. However, there are no laterally continuous layers that would preclude vertical contaminant migration to the top of the Bay Sediment Unit (BSU).

The BSU—(young Bay Mud) consists of silt and gray-to-black clay with laterally discontinuous poorly graded, silty and clayey sand layers. A layer with high organic content, which coincides with the surface of buried tidal flats, typically marks the top of the unit throughout most of the installation. However, in the eastern portion of the central region (near Site 7) a vegetative debris or peat layer, which coincides with the surface of buried tidal marshland, is often found at the top of the unit, also known as the Marsh Crust. The thickness of the BSU ranges from 10 to 110 feet throughout the installation. However, the BSU is thin or absent in the southeastern region of the installation. The BSU is laterally continuous in the western and central regions of the installation, behaving as a local semi-confining layer. Over most of the installation, the Merritt Sand Formation underlies the BSU.

The Merritt Sand is composed of brown, fine- to medium-grained, poorly graded sand. The formation is up to 60 feet thick and is thickest at the southern and southeastern portions of the installation. The Merritt Sand is laterally continuous throughout the installation, except where it is bisected by a major paleochannel. The Merritt Sand does not pose a barrier to groundwater flow or contaminant migration.

The upper unit of the San Antonio Formation generally underlies the Merritt Sand unit and consists of interbedded layers of sand and clay with a thickness of up to 70 feet. The lower unit of the San Antonio Formation is the Yerba Buena Mud (old Bay Mud), which consists of firm, gray silty clay and clay. The total thickness of the Yerba Buena Mud at Alameda Point is reported to range from 55 to 90 feet. The Yerba Buena Mud is believed to be both locally and regionally continuous and a significant barrier to potential contaminant migration.

In the western and central regions of the installation, the five geologic units form four hydrogeologic units (from top to bottom): the first water-bearing zone (FWBZ) in the artificial fill layer, the BSU, the second water bearing zone (SWBZ) in the Merritt Sand unit and upper San Antonio Formation, and the Yerba Buena Mud aquitard.

The FWBZ is an unconfined (water table) aquifer composed of the artificial fill material. The FWBZ is found at approximately 6 feet below ground surface (bgs). The saturated thickness of the FWBZ ranges from less than 10 feet in the central region to over 30 feet at the western region. Seasonal fluctuations in the depth to water range from approximately 1 to 4 feet.

The SWBZ in the central and western regions is confined and composed of the lower portion of the BSU, the Merritt Sand Formation (where present), and the upper unit of the San Antonio Formation. The SWBZ varies in thickness from 0 to 50 feet as a result of erosion activity

associated with the northeast to west-trending paleochannel. The SWBZ is underlain by the Yerba Buena Mud aquitard, which appears to be thick and continuous throughout the entire installation. The Yerba Buena Mud aquitard is believed to be an effective hydraulic barrier between the SWBZ and the underlying Alameda Formation. There is no connection between the shallow aquifer system on Alameda Island and the Oakland mainland due to the Oakland Inner Harbor bisecting the Merritt Sand unit. The Merritt Sand unit is hydraulically isolated from mainland aquifers.

Hydraulic conductivity in the FWBZ varies throughout the western and central regions. Aquifer testing in the western and central regions has yielded hydraulic conductivity value ranges of  $1.06 \times 10^{-2}$  to  $4.13 \times 10^{-2}$  feet per minute (ft/min) and  $6.30 \times 10^{-3}$  to  $1.46 \times 10^{-2}$  ft/min, respectively. Hydraulic conductivity is also believed to vary across the depth of the unconfined aquifer due to the stratification of the fill material. Aquifer storage coefficients ranged from 0.0013 to 0.012 and the specific yield of the unit from 0.005 to 0.23. Groundwater flow in the FWBZ is horizontal and generally flows radially from the central portions of each region toward San Francisco Bay, the Oakland Inner Harbor, and the Seaplane Lagoon. Shallow groundwater in the vicinity of Site 7 actually flows inland rather than westward toward the San Francisco Bay in part because of a drainage ditch east of the site. This phenomenon is local to Site 7 due to the presence of the drainage ditch.

Water levels in the vicinity of industrial buildings indicate localized regions of groundwater mounding or groundwater sinks. Groundwater recharge to the FWBZ is attributed to vertical infiltration from precipitation, horticultural irrigation, and leaking water supply, sewer, and stormwater pipes. Tidal inundation of wetland areas and storm water conveyance lines may also contribute recharge to the FWBZ. The FWBZ is tidally influenced on the north, west, and south sides of Alameda Point. Tidal influence studies indicate the region of influence extends approximately 250 to 300 feet inland on the north and south sides of Alameda Island and approximately 1,000 to 1,500 feet on the west side. Diurnal tidal fluctuations measured in the FWBZ range from 0.1 to 4 feet (TtEMI 1997).

Vertical hydraulic communication between the FWBZ and the SWBZ through the BSU is believed to be minimal. Local vertical hydraulic gradients between the FWBZ and SWBZ determined at various locations in the western and central regions ranged from 0.01 to 0.02 feet per foot (ft/ft). The vertical gradient varied from an upward to downward direction on a seasonal basis, depending on the most recent precipitation event. The FWBZ responds to precipitation events while the SWBZ does not due to the presence of the BSU. Local horizontal gradients calculated at similar locations throughout the year ranged from 0.001 to 0.003 ft/ft in

both the FWBZ and SWBZ. Hydraulic conductivity values determined using slug tests for the silty clays of the BSU are typically on the order of  $7.1 \times 10^{-5}$  ft/min, while hydraulic conductivity values for the FWBZ determined using aquifer tests are on the order of  $6.3 \times 10^{-3}$  ft/min.

The SWBZ appears to be a confined or semiconfined aquifer and is composed of the silty sands within the lower portion of the BSU, the Merritt Sand unit, and the upper unit of the San Antonio Formation. Multiple slug tests performed in wells screened in the SWBZ of the western region indicate the hydraulic conductivity of the SWBZ ranges from  $1.22 \times 10^{-3}$  to  $3.7 \times 10^{-3}$  ft/min. The recharge in the SWBZ is mainly by lateral flow (through the Merritt Sand) from upgradient areas on Alameda Island. The sources of recharge water for the Merritt Sand unit are precipitation, irrigation, and water supply, sewer, and stormwater pipe leakage. The SWBZ is believed to discharge through lateral groundwater flow to San Francisco Bay, the Oakland Inner Harbor, and the Seaplane Lagoon.

Groundwater in the FWBZ at Alameda Point consists of a thin lens of fresh water (0 to 20 feet bgs) that floats on brackish-to-saline water. The interface between the fresh water and brackish-to-saline water, across the western and central regions of Alameda Point, appears to be abrupt and coincides with the contact between the artificial fill and BSU, where the BSU is present. Below the contact between the artificial fill and BSU, groundwater is defined as brackish-to-saline. The Yerba Buena Mud separates the shallow, brackish-to-saline groundwater from deeper, regional fresh water aquifers across the East Bay region and at Alameda Point.

## **2.2 Parcel 37**

Parcel 37, also known as the Fuel Loading Station, refers to the area to the south of Taxiway Number 3, north of West Redline Avenue, and the northern terminus of Monarch Street (see Figure 2, "Site Map—Parcel 37"). The Fuel Loading Station consisted of a fenced area that held two wooden sheds, three concrete fueling islands, three truck storage pads, and a concrete bermed area containing an aboveground water separator system in-line with the jet fuel pipelines. The site was previously used as a filling station for trucks used to service aircraft on base. Areas where fuel was transferred into the service trucks, and where these trucks were parked when not in use, had surface drains or sumps to collect any fuel spilled onto the ground. These drains led to an oil interceptor pit where the fuel could be recovered and the water discharged.

In December 1998, one 10,000-gallon, waste oil underground storage tank (UST) and one 65-barrel (2,730-gallon), fuel drain vault were removed. These USTs were used to store the fuel and fuel-contaminated water recovered by the oil interceptor pit, and the aboveground water separator system. The oil interceptor pit and aboveground water separator system were

also removed in December 1998. The associated surface drains and above- and below-ground piping were either removed, or abandoned-in-place by grouting the full length of the pipe. The shed and other surface structures associated with the USTs and oil interceptor pit were also removed. In addition, approximately 5,000 gallons of fuel and water were removed from the excavation. Figure 2 shows a site plan of the area after the waste oil UST, fuel drain UST, and oil interceptor pit were removed and the excavation backfilled.

Work was also performed in the fuel loading station immediately south of these former USTs. In late October to early November 1998, a Site Characterization and Analysis Penetrometer System (SCAPS) survey identified a roughly 300-foot diameter fuel plume centered around the southwest quadrant of the fuel loading station (Figure 3, "Fuel Hydrocarbon Distribution Map—Parcel 37"). A portion of this fuel hydrocarbon contamination was removed by IT in January 1999, when approximately 5,000 cubic yards of fuel hydrocarbon contaminated sandy soil was excavated from the fuel loading station area. This excavation is outlined on the SCAPS survey map in Figure 3. The excavation was a roughly 250-foot long by 150-foot wide by 5-foot deep pit between the south fence line of the fuel loading station and the south edge of the waste oil UST excavation. The aboveground water separators, curbed concrete pad, and fuel pump stations were removed. Although not all of the fuel hydrocarbon contamination was removed, this action resulting in the removal of a significant quantity of contaminated soil from the most highly impacted part of the site and allowed the Navy to protect the storm drain system in the area until a fuel remediation system could be implemented.

As shown in Figure 3, results of the SCAPS investigations are plotted at the fuel spill location in terms of cone penetrometer readings and assessments of total petroleum hydrocarbons (TPH) using laser-induced fluorescence (LIF). The data are presented with conclusions about suspected contaminant zones and areas of free product. Figure 4, "Cross Sections A-A' and B-B'—Parcel 37," displays geologic cross sections along with fuel hydrocarbon distribution indicated by the SCAPS data. The SCAPS data for Parcel 37 reveal:

- Petroleum hydrocarbon impact was encountered from 0.2 feet to 6.4 feet bgs with the average range from 2 feet to 4.2 feet bgs.
- Approximate depth to groundwater was 3.5 feet below ground surface (AN West, 1996).
- Free product thickness was measured from none to approximately 0.36 feet (SCAPS location APT-03).
- Tidal changes may influence product thickness; ranging from greater product thickness associated with low tide to no free product at high tide.

The form of TPH detected was primarily jet fuel.

### **2.3 Site 7**

Site 7 consists of the former Alameda Point service station (Building 459) and the surrounding area including an unpaved vacant lot to the north (Figure 5, "Site Map—Site 7"). The former service station, located at the corner of Main Street and West Tower Avenue, operated from 1966 to 1997. It included an auto repair shop, a small convenience store, and nine USTs. Five 10,000-gallon USTs (UST Nos. 459-1, 459-2, 459-3, 459-4, and 459-5) and one 8,000 gallon UST (UST No. 459-6) were used for storing and dispensing gasoline; one 1,400-gallon UST (UST No. 506-1) was used for holding lubricating oil; and two 500-gallon USTs (UST Nos. 459-7 and 459-8) were used for holding waste oil. One of the 500-gallon USTs (UST No. 459-8) was reportedly used for storing solvents.

One of the 10,000-gallon gasoline UST (UST No. 459-5) and the 8,000-gallon gasoline UST (UST No. 459-6), located west of the pump islands, were abandoned in place due to leakage, date unknown. A petroleum hydrocarbon odor was detected at the site during the excavation, and signs of contamination were observed around the perimeter of the excavation. Underground piping associated with these two USTs were removed up to the edge of the excavation and capped. In 1987 an investigation was initiated at Site 7 (ERM-West, 1987). The investigation included drilling 17 borings and constructing monitoring wells in three of the soil borings (W-1, W-2, and W-3). Soil samples results identified petroleum hydrocarbon impact in all the borings. The hydrocarbon concentrations were generally higher in the shallow samples and decreased with depth. Although no free product was identified in any of the three monitoring wells, elevated concentrations of BTEX compounds were detected in three groundwater samples (ERM-West, 1987). Accumulated free product was identified near the two abandoned USTs west of the pump islands.

In January 1995, two 500-gallon waste oil and fuel oil/solvent USTs (UST Nos. 459-7 and 459-8) and their associated piping were removed. In February 1995, one 1,400-gallon lubricating oil UST (UST No. 506-1) was removed along with associated vent and product line piping from the northern area of Site 7. The tank removal report stated that the tank was in good condition and that neither the excavation nor the groundwater showed any visible signs of contamination. In November 1998, four 10,000-gallon, gasoline USTs (UST Nos. 459-1, 459-2, 459-3, and 459-4), along with their associated fuel lines and pumps were removed. A strong hydrocarbon odor was present during the excavation, and contamination was observed in the soil and groundwater within the excavation. No free product was observed in the monitoring wells during the groundwater sampling conducted in May 1998. Figure 6, "Fuel Hydrocarbon

Distribution Map—Site 7,” displays isopleths for the average TPH concentrations detected in groundwater between 1994 and 1996 as provided by Tetra Tech Engineering Management, Inc. (TtEMI, 1999a). While free product has not been observed in site monitoring wells, free product has been observed in the UST excavations and field observations suggest its presence in the vicinity of the pump islands.

Potential sources of contamination identified at Site 7 include USTs formerly holding gasoline, fuel lines associated with the USTs, and pump islands. Other potential contamination sources include the industrial, sanitary, and storm sewer lines located around Site 7.

Remedial investigations conducted at Site 7 included a soil gas survey and soil, groundwater, and sediment sampling. The soil gas survey conducted in 1991 targeted chlorinated hydrocarbons and BTEX compounds to aid in the selection of monitoring well and soil boring locations (Canonie, 1990; PRC and JMM, 1992). Cone Penetrometer Tests (CPTs) were completed to investigate site lithology during the follow-on investigation. Groundwater investigation activities included well installation, groundwater sampling, and Hydropunch™ groundwater sampling. Twelve monitoring wells were installed for the groundwater investigation in addition to the three wells (W-1, W-2, and W-3) installed during previous investigations. The monitoring well locations are shown in Figure 5.

The first geologic unit encountered at the site was the fill material. Geotechnical analyses indicated the fill soil to be silty to clayey sand (SM-SC). The second geologic unit encountered was the BSU. The BSU ranged from 30 to 50 feet in thickness, with the thickest portion south and east of Building 459. The third geologic unit encountered was the Merritt Sand Formation at depths ranging from 35 to 45 feet bgs. The fourth geologic unit encountered was the Upper San Antonio Formation. The Upper San Antonio Formation beneath Site 7 is comprised of grayish olive silty sand (SM). Figure 7, “Cross Section A-A’,” and Figure 8, “Cross Section B-B’,” show the stratigraphy in the zone of remediation for Site 7.

Three hydrogeologic units were identified at Site 7: FWBZ, BSU, and SWBZ. The fill material comprises the FWBZ. The FWBZ at Site 7 is thin because the fill material at the site is thin. The Merritt Sand Formation and Upper San Antonio Formation comprise the SWBZ. The Merritt Sand Formation disappears in the eastern portion of the site before reaching the pump islands, so that the Upper San Antonio Formation alone comprises the SWBZ on the eastern portion of the site. The BSU separates the two water-bearing zones. Underlying the SWBZ is the Yerba Buena Mud Aquitard.

In situ permeability was determined from slug tests at four wells screened in the fill material and bay sediment. Vertical permeability tests were conducted on five geotechnical samples from both the fill and bay sediment. Hydraulic conductivity values determined for the fill material ranged from  $3.7 \times 10^{-4}$  ft/min to  $7.9 \times 10^{-4}$  ft/min. The slug tests yielded values of  $3.3 \times 10^{-4}$  ft/min to  $1.6 \times 10^{-4}$  ft/min. Hydraulic conductivity values determined for the bay sediment ranged from  $2.0 \times 10^{-7}$  ft/min to  $7.5 \times 10^{-8}$  ft/min. Slug tests yielded values between  $4.5 \times 10^{-6}$  ft/min to  $9.6 \times 10^{-6}$  ft/min.

Six monitoring wells at Site 7 are screened in the FWBZ (although part of the screened interval is within the BSU), and six of the monitoring wells are fully screened in the BSU. Three monitoring wells are screened in the SWBZ either in the Merritt Sand Formation or the Upper San Antonio Formation. None of the Site 7 monitoring wells were determined to be tidally influenced. During monitoring well installation, groundwater was encountered between 0.2 and 5.6 feet bgs within a clayey unit of the FWBZ.

The groundwater flow direction in the FWBZ is likely to be influenced by preferential flow paths caused by storm and sanitary sewer lines, as well as leaks in these sewer lines. The drainage ditch that runs north-south east of Site 7 along Main Street also influences the shallow groundwater flow direction. Although the drainage ditch is predominantly dry for most of the year, a local gradient toward the ditch results in the local eastward flow rather than the westward regional flow. The drainage ditch leads north to a pump station, which discharges to the Bay. Vertical gradients were calculated between three clusters of wells screened between the upper portion of the BSU and SWBZ. The individual gradients based on April 1998 data ranged between 0.0013 ft/ft to 0.0077 ft/ft downward.

## **2.4 Chemicals of Concern**

Based on historical use and previous investigations, the chemicals of concern for Parcel 37 include TPH as JP5. For Site 7, contaminants of concern include TPH as gasoline, MTBE, and BTEX compounds. The approach for safely handling the chemicals of concern during the plume investigation phase, the DVE pilot test, and any subsequent construction and operation is addressed in the Site Health and Safety Plan, a companion document to this Work Plan.

Field sampling rationale is summarized in Section 4.0, "Field Implementation of DVE Pilot Test." This section also outlines the sampling strategy during the contaminant plume delineation phase (Section 4.2), which precedes the DVE pilot test.

Sampling locations and identification of probable waste streams generated during the pilot test are discussed in Section 5.0, "Demobilization and Waste Handling." Details of the sampling and analysis protocol are found in the Sampling and Analysis Plan, another companion document to this Work Plan.

## **3.0 Dual Vacuum Extraction (DVE) Pilot System Description**

---

### **3.1 DVE Principle of Operation and Process Description**

The principle of operation of the DVE technology is based on free-phase fuel hydrocarbons in the contaminated zone being mobilized by applying a vacuum in a well near the water or free product level. In this application, subsurface vapor flow preferentially promotes or draws the lighter-than-water hydrocarbons toward collection trenches operated under vacuum. Product flow to the collection trenches is established along the capillary fringe and is influenced more by vacuum than by gravity. The use of vacuum-enhanced extraction has been found to increase product yield 2 to 3 times that of conventional pumping and drawdown, which depends on the principle of gravity. With the use of an extraction tube placed within vertical members of a horizontal collection trench, extraction of fluid is focused on the floating hydrocarbon layer. Vapors sweeping over the surface of the groundwater/hydrocarbon layer are drawn into the horizontal collection trench and accelerated vertically upward with entrained hydrocarbon/water droplets in the extraction tube. Vapor and entrained liquids flow up the tube and are processed as described below. This extraction method minimizes groundwater removal and disposal. Smearing of hydrocarbon liquid in soil near the water table is less than that observed during drawdown of typical pump-and-treat systems. Depending on soil type and permeability, a slight far-field depression and near-field ascension of the water table may occur in the vicinity of the collection trenches.

Maximum mass removal rate is a component of system optimization. For the pilot test, the DVE system, comprised of three horizontal collection trenches for each site, will be run at four different vacuum settings. Product removal rates will be calculated for each run. The optimum setting, i.e., highest practical product removal rate, will be used for design of the full-scale system.

This DVE system will consist of collection trenches, collection trench-accumulation sumps, vapor/liquid separators, a vacuum blower, a demulsifier system, an oil/water separator, equalization tanks, a fuel holding tank, a clean water holding tank, particulate filters, emissions control equipment, instrumentation, and associated pumps, piping, and hoses. Liquids and vapors will be extracted simultaneously by the vacuum blower from the collection trenches, using a down-hole extraction tube in the vertical members of the horizontal collection trench-accumulation sumps. Air, drawn to the collection trench-sumps through the subsurface pore space, will entrain liquid droplets consisting of water, free product, air, and volatile hydrocarbons. The fluid stream will be separated into its vapor and liquid components and

processed through their respective vapor-phase treatment system and a liquid-phase separation and treatment system. Free product will be recovered and disposed of off-site at a recycling facility. Recovered water will be processed through liquid phase-granular activated carbon (GAC) beds and discharged into a clean water holding tank pending discharge to the sanitary sewer and POTW. Figure 9, “Process Flow Diagram—Site 7,” and Figure 10, “Process Flow Diagram—Parcel 37,” present the process flow for the two systems. The following sections describe collection trench design, construction and installation, and major process equipment in detail.

### **3.2 DVE Collection Trench Design**

The proposed collection pipelines, based on earlier SCAPS data, are shown in Figure 11, “Proposed Collection Trench Layout—Site 7,” and Figure 12, “Proposed Collection Trench Layout—Parcel 37.” However, the proposed free product delineation may indicate a larger or smaller plume than that assumed by previous investigations. The DVE pilot test will be conducted with three horizontal collection trenches at each site. The installation of additional collection trenches for full scale will depend on plume delineation and DVE pilot test performance.

The collection trench systems will consist of parallel trenches excavated to approximately 3 ft bgs in which are horizontal collection pipes comprised of 4-inch-diameter, 0.02-inch slotted PVC well screen in-line with vertical DVE accumulation sumps (see Figure 13, “DVE Accumulation Sump for Non-Tidal Use”). Between accumulation sumps, the horizontal collection screen low-intake area shall be placed at or just above mean high tide elevation. The accumulation sumps will be comprised of (approximately) 5-foot long, 4-inch diameter, vertical PVC risers completed aboveground. The trenches will be backfilled with the excavated artificial fill material (sand) and covered with a 20-foot wide plastic liner over its entire length, assuring a good booted seal around the vertical sump risers. The entire area to be remediated (including the previously covered trenches) will be covered with another plastic liner. The area wide liner will be covered with clean sand to enable light vehicular traffic, and a gravel foundation will be placed for the process equipment. The liners are used to reduce the short-circuiting of air from the ground surface. An alternative method to using liners is to cover the entire area with asphalt.

Two types of fluid extraction devices may be tested, if appropriate. They include a V-notch tube and a self-adjusting floating tube. If tidal changes are not extreme, the most probable accumulation sump will be equipped with a stationary, V-notch vacuum extraction tube. This extraction tube will be made of 2-inch diameter clear PVC vacuum hose attached to an open-ended 2-inch diameter PVC pipe with a v-notch cut into its end. Application and

positioning of the stationary tube will be evaluated during pilot testing. Figure 13, "DVE Accumulation Sump for Non-Tidal Use," shows the details of this extraction tube. If tidal influence is extreme (unlikely), the accumulation sumps may be equipped with a self-adjusting vacuum tube, designed to accommodate tidal changes. This extraction tube will be made of 2-inch diameter clear PVC vacuum hose and 2-inch diameter flexible PVC hose. A 10-inch length of 1½-inch diameter Schedule 80 PVC slotted pipe will be attached to the hose. A PVC float will be attached to maintain the extraction tube slots above the water surface at all times.

### **3.3 Major Process Equipment**

Major process equipment will be connected using hoses with camlock fittings and Schedule 40 PVC pipe. Pressure and temperature gauges and flow meters will be installed to monitor the system operation. The process flow diagrams for Site 7 and Parcel 37 are shown in Figures 9 and 10, respectively. The major process equipment, sizes, and descriptions for Site 7 and Parcel 37 are listed in Table 2, "Major Equipment for DVE Field Pilot Test, Site 7," and Table 3, "Major Equipment for DVE Field Pilot Test, Parcel 37," respectively. The following sections describe the key components in further detail.

#### **3.3.1 Vapor Extraction and Treatment Systems**

The vapor extraction and treatment systems will consist of dual liquid/vapor separators, dual GAC beds (Parcel 37) or a thermal/catalytic oxidizer (Site 7), and a positive displacement type blower.

At Site 7, vapors from the collection trench header will be pulled through two liquid/vapor separators piped in series into a downstream vacuum blower. The blower discharge will be routed through a thermal/catalytic oxidizer and discharged to atmosphere. At Parcel 37, vapors from the collection trench header will be pulled through two liquid/vapor separators piped in series and then two GAC beds piped in series to a downstream vacuum blower. In this arrangement the blower is located at the end of the vapor-phase treatment process and discharges to atmosphere.

The DVE system has been designed for the removal and treatment of petroleum hydrocarbons. However, low levels of chlorinated hydrocarbons (<15 ug/L) have been observed in groundwater at Parcel 192, located northwest of Site 7 and Parcel 37. Although IT does not anticipate that chlorinated hydrocarbons, vinyl chloride in particular, will be a problem at Site 7 and Parcel 37, IT will collect headspace vapor samples from the well heads and analyze them for chlorinated hydrocarbons using field methods to determine if significant quantities are present in the vapor phase. Concentrations of chlorinated hydrocarbons, if present, will likely be disproportionately

small compared to the concentrations of petroleum hydrocarbons, thus, IT fully expects that any chlorinated hydrocarbons present will be fully cometabolized with the petroleum hydrocarbons under the aerobic conditions that will exist during SVE operation. However, if field monitoring indicates that significant quantities of chlorinated hydrocarbons are present and vinyl chloride is extractable in the vapor phase, the secondary GAC vessel will be replaced with a vessel containing layered zeolite in order to appropriately treat the waste stream. IT would consider this an engineering change and costs to install layered zeolite have not been included in the original cost estimate.

Liquids that have been removed from the vapor stream will be pumped to the liquid recovery and treatment system. For each site, this system is comprised of product holding tanks, demulsifier units, oil/water separators, and liquid-phase GAC units to further treat the extracted liquids. Thereafter, the treated liquids will be stored, tested, and discharged to the sanitary sewer and POTW.

#### **3.3.1.1 Vacuum Blower**

The vacuum blower will be a positive displacement type, with a maximum capacity of 1,000 cfm at 12-in Hg vacuum. The blower will be equipped with an explosion-proof motor and motor controls and overload protection devices. The blower system will also consist of an air filter at the inlet and a silencer at the outlet. The blower will be operated under automatic controls for safety shutdown under emergency conditions, such as high vacuum level at blower suction inlet. At Parcel 37 the blower will be located downstream of the liquid/vapor separators and GAC vessels. At Site 7 the blower will be located downstream of the liquid/vapor separators and upstream of the thermal/catalytic oxidizer.

#### **3.3.1.2 Primary and Secondary Liquid/Vapor Separators**

Liquid-vapor separation will be accomplished in the first two components in the aboveground process train. The liquid/vapor separators will be used to remove entrained liquid (i.e., groundwater and free product) from the extracted vapor stream. Extracted vapor will pass through two liquid/vapor separators and into the off-gas abatement unit located upstream (Parcel 37) or downstream (Site 7) of the vacuum blower unit. Liquids that have been removed from the vapor stream will be pumped to the liquid recovery and treatment system.

The primary liquid/vapor separator will be a vertical vessel with approximately 150 gallons of liquid holding capacity between high and low levels. The secondary liquid/vapor separator is similarly designed with a demister unit, pump and controls, but with smaller liquid batch capacity of approximately 100 gallons. At high liquid level, the liquid transfer pumps will

automatically begin pumping accumulated liquid to a 500-gallon receiving tank. The pumps will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the separators will trigger shut down of the entire DVE system.

### **3.3.1.3 Vapor Treatment Unit**

At Parcel 37, GAC adsorption vessels will be used for emission abatement of up to 1,000 cfm extracted vapors. The GAC adsorption units will be operated in series and be placed at the suction inlet of the blower unit. Each vessel will contain up to 5,500 pounds of virgin or regenerated activated carbon for polishing vapor laden with petroleum hydrocarbons. Each vessel will be constructed of carbon steel and designed for vacuum applications. The treated off-gas will be discharged to the atmosphere through the downstream vacuum blower.

At Site 7, a thermal/catalytic oxidizer will be used for emission abatement of up to 1,000 cfm extracted vapors. The thermal/catalytic oxidizer will be placed on the discharge side of the blower unit. The treated off-gas from the thermal/catalytic oxidizer will be discharged to the atmosphere.

Selected abatement measures at the two sites differ due to the difference in the volatility of hydrocarbons at each site. Gasoline, the primary constituent at Site 7, is readily extractable in the vapor phase, thereby requiring a high frequency of carbon replacement. O&M costs associated with this abatement method are likely to be cost prohibitive. Use of a thermal/catalytic oxidizer is a more cost-effective abatement measure, given the nature and concentration of site contaminants. However, JP-5, the primary constituent at Site 37, is less volatile (< 15 percent by mass), and GAC is more cost-effective.

### **3.3.2 Liquid Extraction and Treatment System**

The liquid recovery and treatment systems will consist of a demulsifier system, a receiving tank, an oil/water separator, a product holding tank, an equalization tank, primary and secondary dual particulate filters, dual GAC beds, and a clean water holding tank.

Liquids that have been removed from the liquid/vapor separators will be pumped into a receiving tank. A demulsification solution will be injected into the liquid stream prior to entering the receiving tank. The liquids will be pumped from the receiving tank through an oil/water separator into an equalization tank. Free product separated from the liquid stream by the oil/water separator will gravity flow into the product holding tank. The water collected in the equalization tank will be pumped through dual particulate filters, dual liquid-phase GAC vessels, and into a clean water holding tank.

### **3.3.2.1 Demulsification System/Receiving Tank**

Liquids recovered from the liquid/vapor separators will be pumped into a receiving tank where the free-phase hydrocarbons and emulsions will be allowed to coalesce and separate from the air- and water-phase by gravity. In the liquid transfer pipe from the liquid/vapor separators to the receiving tank, a demulsifying agent will be injected into the liquid stream to reduce emulsions. All liquids accumulated in the receiving tank will be pumped to the oil/water separator.

The demulsification system will consist of a positive displacement-type injection pump and a drum of demulsifier solution. The receiving tank will be a cross-linked polyethylene-type vessel with a minimum of 500 gallons of liquid holding capacity between high and low levels. At high liquid level, the liquid transfer pump will automatically begin pumping accumulated liquids to the oil/water separator. The pump will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the receiving tank will trigger shut down of the entire DVE system.

### **3.3.2.2 Oil/Water Separator and Equalization Tank**

The oil/water separator will be used to separate free-phase petroleum hydrocarbons from the liquid stream. The equalization tank will be used to capture any free-phase hydrocarbons not removed by the oil/water separator. The free-phase hydrocarbons accumulated in the equalization tank will be gravity drained by an operator to the product holding tank. Water in the equalization tank will be automatically pumped from the bottom of the tank through parallel dual particulate filters and dual liquid-phase GAC vessels in series to a clean water holding tank.

An oil/water separator capable of removing oil droplets 15 microns or greater in diameter from a 50 gpm liquid stream will be used. Phase-separated hydrocarbons recovered from the oil/water separator will gravity flow into a 500-gallon product holding tank pending disposal. The product holding tank will contain a high level switch which shuts down the DVE system when the tank is full. A subcontractor licensed to transport and reclaim or dispose of petroleum hydrocarbons will be retained to evacuate the product tank when it is near full. The equalization tank will be a cross-linked, polyethylene-type tank with a minimum of 300 gallons of liquid holding capacity between high and low levels. At high liquid level, the liquid transfer pump will automatically begin pumping accumulated water through the particulate filters and water treatment system. The pump will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the equalization tank will trigger shut down of the entire DVE system.

### **3.3.2.3 Particulate Filters and GAC Treatment System**

Dual particulate filters connected in series will be used to reduce sediment loading in the liquid-phase GAC beds. The GAC adsorption vessels will be used for treatment of up to 50 gpm of extracted liquids. Bag-type filters capable of removing particulates 10 microns or greater in diameter from the 50-gpm liquid stream will be used. The filters will be operated in parallel and be placed at the inlet to the GAC vessels. Spent particulate filters will be drummed and chemically profiled. A subcontractor licensed to transport and dispose of contaminated filters will be retained to transport and dispose of the filters.

The GAC adsorption units will be operated in series and placed at the discharge of the particulate filter bank. Each vessel will contain up to 2,000 pounds of virgin or regenerated activated carbon for polishing water laden with petroleum hydrocarbons. Each vessel will be constructed of carbon steel and designed for pressure applications. The treated water from the GAC vessels will be discharged into a 6,900-gallon, clean water holding tank pending discharge. The clean water holding tank will contain a high-level switch, which shuts down the entire DVE system when the tank is full. Spent GAC will be removed from the vessels, transported, and disposed of by a licensed subcontractor.

## **3.4 Test Parameters**

During the pilot test construction and operation, samples will be collected from soil borings, from well liquid and vapor streams, and from process liquid and vapor streams. Results of sample analyses will be used to determine the extent and nature of subsurface contamination in the test area and under pilot test operational conditions. A summary of sampling and analysis of all anticipated process streams is presented in Table 5, "Sampling and Analysis Summary – Site 7 and Parcel 37." The Sampling and Analysis Plan presents the locations and detailed procedures for collecting and analyzing samples.

The following parameters associated with system design and operations will be determined or verified from the pilot test:

- The vapor extraction radius of influence of the DVE well(s) under various vacuum conditions
- The vapor extraction rates and concentrations under various vacuum conditions applied at the test well
- Free product and groundwater removal rates under various vacuum conditions applied at the test well
- The vapor and liquid extraction rates at various depths of the extraction tube under various operating vacuum conditions applied at the test well

Data collection procedures and application of the key parameters listed above for full-scale system design are described in detail in Section 4.0. Results of the pilot test will be documented in the Pilot Test Report described in Section 6.0.

## **4.0 Field Implementation of Dual Vacuum Extraction Pilot Test**

---

Field activities to be implemented as part of the pilot test include the following:

- Site setup
- Piezometer installation and monitoring
- Collection trench installation
- Construction and checkout of aboveground extraction system
- Baseline field measurement
- Dual vacuum extraction tests
- Waste handling and demobilization

Each of the aforementioned tasks is further described in the following subsections.

### **4.1 Site Setup**

Prior to any field activities, photographs will be taken to note the pre-existing site conditions and be submitted to the Navy.

The major task of site setup will be identifying the piezometer locations, installation of the pilot test collection trench, and setting up the DVE equipment and materials staging areas. Other zones, such as contaminant reduction areas, will also be constructed as deemed appropriate. Further details of site health and safety requirements and procedures as well as zone delineation are provided in the Site Health and Safety Plan.

The process equipment staging areas are shown in Figure 14, “Proposed Piping Network Layout – Site 7,” and Figure 15, “Proposed Piping Network Layout – Parcel 37.” They have been selected to minimize excessive pipe and hose runs between the test wells and the aboveground extraction equipment. Equipment will be placed within an impervious membrane-lined, bermed containment area. The test and equipment staging areas will be delineated in the field with barricades and/or warning tapes.

### **4.2 Free Product Delineation, Sampling, and Characterization**

Prior to the installation of the DVE systems, pre-installation data will be collected to assist in the determination of system dimensions, to establish a baseline volume of contaminated media, and to determine initial chemistry of the free product. Pre-installation data will be collected at both DVE system locations (Site 7 and Parcel 37) through the installation of driven well points. The well points will be used to measure the extent of free product by direct measurement and by

sampling of free product and groundwater for chemical fingerprinting. The installation of the DVE system may be modified according to the results of the pre-installation investigation. The system performance will be evaluated using the data collected during the initial sampling.

Piezometers will be installed to refine the extent of free product at each site. Sampling conducted to date provides evidence to infer the distribution of free product at each site, but refinement of the extraction trench design requires the detailed definition of the current free product distribution. Approximately 30 temporary direct-push well piezometer points (piezometers) will be installed using GeoProbe™ drive sampler (or equivalent) to depths of up to 10 feet. The well points will be constructed of slotted stainless or carbon steel (2 inches) or PVC pipe (1 inch), with screen installed across and into the water table. Preliminary estimates are for installation of screens between 1 and 5 feet bgs for the stainless steel and between 2 and 10 feet for the PVC.

#### **4.2.1 Piezometer Placement Strategy**

Drive points will determine the current extent of the free product prior to the installation of the horizontal extraction trenches. Approximately 15 locations are proposed for Parcel 37 and Site 7 (30 total). The drive points will be installed in stages in step-out fashion. The first stage drive points will target the areas at the center of each suspected free product area. The placement of the second and third stage drive points will be directed by the result of the preceding drive point stage. The basic strategy will be to “step-out” where free product is observed, and to “step-in” if free product is not observed. The first stage piezometer points at each location will be allowed to equilibrate for 24 hours (if possible), and free product measurements will be taken prior to stepping out to the second and third stage drive points. The placement strategy will be reviewed and field changes will be documented at the completion of each drive stage.

Drive points at Parcel 37 will focus on the areas of high petroleum concentrations as detected by SCAPS investigation at the center of the former fuel distribution islands and at the northeast corner of Hangar 20. Site 7 drive points will be concentrated in the area surrounding the fuel distribution island and the former tank locations.

The vertical placement of piezometer screens will be directed by examination of lithologic data collected during previous investigations and lithologic data from four proposed Geoprobe type soil cores (per site) that will be collected at select locations within the area of impact. Using direct-push technology, continuous soil cores will be collected from grade to a depth of approximately 5 feet below the water table. The soil cores will be examined in the field by an IT geologist and the lithology logged. Additionally the soil cores will be field screened by

performing a "shake test" to determine if a significant mass of separate phase hydrocarbons is present. A "shake test" will be performed on each one-foot section of core. The test will involve placing a portion of soil from each one-foot core section into a glass jar partially filled with water, covering the jar with a lid, rigorously shaking the jar, allowing the jar to sit undisturbed, and then making visual observations about the presence or lack of a sheen or separate phase hydrocarbons.

#### **4.2.2 Piezometer Installation and Construction**

The drive piezometers will be constructed using 1-inch PVC (10 slot), a solid upper section, and a threaded screw cap. A nonlocking threaded cap or an expandable locking end-cap will form the surface completion for the GeoProbe™. The piezometer will be screened across the water table with blank casing extending from the surface to approximately 3 feet bgs. The actual depth of the surface casing bgs will be determined by soil characteristics and water table depth. The screen shall be placed to provide maximum open screen area above and below the static water table in order to span fluctuations in the potentiometric surface. The maximum depth of the screen interval is expected to be 10 feet bgs.

#### **4.2.3 Product Measurement and Sampling**

Once installed, the piezometers will be capped and allowed to equilibrate a minimum of 24 hours prior to sampling and free product measurement. These measurements will be made with a 5/8-inch-diameter interface probe and visually confirmed using a disposable bailer. Sampling of free product (or contaminated groundwater) will be accomplished with a bailer.

A sample of free product will be collected from Site 7 and Parcel 37 (one from each site). Hydrocarbon fingerprinting will include the analysis of typical constituents included in U.S. Environmental Protection Agency (EPA) Method 8015 (Modified) for quantification as gasoline, as diesel, and as motor oil, and the determination of distinct indicator compounds as specified by the fingerprinting laboratory. At the two locations that are sampled for free product, grab samples of groundwater will be collected from the drive piezometers and will be analyzed for volatiles using EPA Method 8260.

### **4.3 Piezometer Drilling Methods and Procedures**

All borehole locations will be cleared for possible underground utility interference prior to drilling. Due diligence will be exercised by reviewing existing utility drawings and conducting geophysical surveys as necessary. IT will notify USA at least 48 hours prior to initiation of drilling activities to mark utility locations. The drive points may be relocated to avoid any surface or subsurface structures or former pipeline trench backfill that may cause channeling.

All drive piezometers will be drilled using a truck-mounted drill or GeoProbe™ rig equipped with sufficient vertical drive power to drive points to a minimum of 10 ft bgs. Equipment will be inspected to ensure good operating condition. The drill rig will be free from leaks of fuel, hydraulic fluid, or oil. As an additional precaution during drilling and well development, plastic sheeting will be laid down around the working locations to contain potential spills and leaks. With the exception of potable water, no other fluids will be introduced during drilling. Grease and oil will not be allowed on any drilling rods or equipment. If necessary, Teflon™ tape or vegetable oil will be allowed on threads or joints of drill pipe or rods and its use will be documented in the field log.

A temporary decontamination pad will be constructed at the site. All drilling equipment, including the drill rig, rods, casing, bits, samplers, and tools will be decontaminated prior to use on site and prior to leaving the site.

The piezometers will be driven using a hollow conductor drive casing with a sacrificial tip. The conductor drive casing will be driven to total depth with the piezometer assembly nested inside the conductor pipe. The conductor will subsequently be removed, leaving the sacrificial drive tip and the piezometer in place. The open annulus of the driven hole will be backfilled with bentonite or suitable seal material to prevent connection of the borehole annulus with the open atmosphere. The drive piezometer will be constructed to prevent the introduction of annular sealing material into the screened interval.

The distribution of free product at each site will ultimately determine the extraction trench configuration. Figures 11 and 12 illustrate the preliminary layout of collection trenches at Site 7 and Parcel 37, respectively. The pilot test systems for each site will consist of three horizontal collection trenches with vertical DVE accumulation sumps placed at the core of any delineated free-product plume.

#### **4.4 Tidal Influence Survey**

Historical data indicate that there is no tidal influence at Site 7 (Tetra Tech EMI, 1997). In order to ascertain whether there is any influence at Parcel 37, IT will install pressure transducers equipped with loggers in up to three site piezometers for a period of 1 to 2 weeks to monitor water levels at the site. The pressure transducers will be calibrated so that data is recorded as feet of water so that if any tidal influence is observed, the magnitude of fluctuations due to tidal influence can be determined.

#### **4.5 Collection Trench Installation**

As described above, the configuration of the trench system will be determined by the distribution of free product at the site. In general, the collection trench system will consist of parallel trenches excavated to approximately 3 feet bgs. Within the trenches, horizontal collection pipes will be comprised of 4-inch-diameter, 0.02-inch slotted PVC well screen in line with vertical DVE accumulation sumps, as presented in Figure 13, "DVE Accumulation Sump for Non-Tidal Use." The horizontal piping will be placed so that the low intake area of the horizontal collection screen is located at or just above the mean high tide elevation, as determined by on a review of water level data from the piezometers and the results of the tidal influence study. The width of the trench may need to be expanded if soil conditions warrant in order to achieve the desired depth. Excavated soil will be temporarily stockpiled on plastic sheeting adjacent to the trenches for later use as backfill.

Once the trench has been excavated to the desired depth, the horizontal piping and vertical accumulation sumps will be assembled within the trench. As described above, the piping will be placed at the depth so that the low intake area of the horizontal collection screen is located at or just above the mean high tide elevation and centered horizontally within the trench. After installation of the piping, the excavated soil will be used to backfill the trench to grade. A 20-foot wide plastic liner will be installed at the top of the backfilled trench and sealed around the vertical accumulation sump riser pipes. Once the each of the excavation trenches has been completed an area-wide liner will be installed at each site and covered with imported sand to permit vehicle traffic. The liners will be used to reduce the short-circuiting of air flow from the ground surface. If, based on pilot test results, the liners are not sufficient to prevent such short-circuiting, alternative methods, including covering the area with asphalt, will be considered.

#### **4.6 System Construction**

After setting up the work areas, the pilot test equipment will be assembled in an approximately 50-foot by 50-foot level staging area. Piping and hoses will be connected from the collection trenches to the blower skid unit, within the vapor-phase treatment system, and within the liquid-phase treatment system. Temporary aboveground electrical lines will supply power to the unit and all equipment will be grounded.

#### **4.7 Pre-Operational Checkout**

Upon completion of the installation, pre-operational checkout and testing will be conducted.

Pre-operational testing will involve:

- Turning on the blower momentarily a few times to check for correctness of motor rotation and piping connection (i.e., blower inlet and outlet are properly connected)
- Inspecting any vacuum or pressure leak in the extraction system
- Inspecting electrical power and control wiring connections between equipment and control panels
- Resetting or readjusting all pressure and vacuum gauges to zero readings as needed

#### **4.8 Baseline Field Measurement**

Prior to actual field testing, several baseline measurements will be conducted in each piezometer.

These measurements include the following:

- Depth to free product and free product thickness using an oil/water interface level probe
- Depth to groundwater

After the depth to groundwater and free product is measured, the two-inch extraction tube will be placed inside the test DVE collection trench-accumulation sumps 6 inches below the liquid surface. This will be the initial position of the inner extraction tube for the first vacuum testing. Field instruments requiring calibration will be calibrated prior to their uses each day. Calibration and operating procedures will be in accordance with IT's standard operating procedures (SOPs) as well as manufacturers' recommendations where appropriate. All baseline measurement readings will be recorded on field data sheets.

#### **4.9 Dual Vacuum Extraction Testing**

Dual vacuum extraction testing will be the main activity of the pilot test. The test program will consist of two parts: a maximum vacuum test and a step vacuum test. The maximum vacuum test will be conducted first, followed by the step vacuum test at 25, 50, 75, and 100 percent of the maximum vacuum, unless the maximum is less than 4-inch Hg vacuum, in which case step testing would be conducted at 35 percent and 70 percent.

In addition to running at different vacuum levels, positioning of extraction tubes will be tested. This testing will consist of orienting each of the tubes at one position 6 inches below and 1-to-2 feet above the product/water surface inside the sumps. The positions will be measured

from the bottom of the V-notch tube or slots of the floating tube to the water or free product surface. The test depths may be adjusted based on the actual site conditions encountered.

#### **4.10 Evaluation of Dual Vacuum Extraction System Test Results**

Dual vacuum extraction pilot test results will be evaluated for applicability of the DVE technology to the site conditions. Subsequently, the data will be used for developing design parameters for the full-scale system. The analytical results and their interpretation and implications for full-scale design will be presented in a pilot test report. The pilot test report is described in Section 6.0.

#### **4.11 Anticipated Full-Scale Construction, Operation, and Closure**

Upon completion of the pilot test and full-scale design and construction, any resultant remediation systems installed for Site 7 and Parcel 37 will be operated for a period of 3 months for purposes of removing any remaining free product. Confirmation of adequate cleanup will be demonstrated by monthly monitoring for free product reduction over the 3-month operating period. Long-term monitoring has not been assumed following full-scale operation.

Preparation of a closure report documenting successful removal of free product petroleum hydrocarbon will take place during a 6-week period following the 3-month full-scale operation. Upon regulatory concurrence, the horizontal wells and piezometers will be removed, and the site will be restored during the process of demobilization that follows.

## **5.0 Demobilization and Waste Handling**

---

Upon completion of the pilot test, all non-expendable equipment and material in contact with site contaminants, such as skid units, tanks, hoses, and pipes, will be decontaminated in the equipment decontamination area. The following probable waste streams will be generated during this pilot test:

- Contaminated personal protective equipment (PPE)
- Soil from piezometer and collection trench cuttings
- Piezometer development water
- Extracted TPH-contaminated vapor
- Extracted TPH-contaminated groundwater
- Extracted free product
- Spent particulate filters
- Accumulated sludge in oil/water separator and tanks
- Spent carbon

### **5.1 Preliminary Information**

Waste management milestones and preliminary probable characterization is presented in the following sections. The preliminary waste information is summarized in Table 4, "Preliminary Waste Information."

### **5.2 Procurement**

The Transportation and Disposal (T&D) Coordinator will establish preliminary waste quantities, characterizations, transportation methods, and disposal methods. The T&D Coordinator will then prepare and submit purchase requisitions, including written T&D subcontractor scopes of work and recommended bidders lists (Federal Acquisition Regulations [FAR] 13.101 through 13.106-3).

The IT T&D Coordinator will technically evaluate all T&D subcontractor submittals and recommend selection of the most responsive, qualified, and cost-effective permitted T&D subcontractors (FAR 13.106-2).

Possible disposal and recycle facilities include but are not limited to the following:

- Altamont Landfill & Recycling Facility, Livermore, California (for Class II landfill)
- Chemical Waste Management, Kettleman City, California (for Class I landfill)

- ECDC Environmental, East Carbon, Utah (for out-of-state non-Resource Conservation and Recovery Act [RCRA])
- Forward Landfill, Manteca, California (for Class II landfill)
- Romic Environmental Technologies, East Palo Alto, California (for redistillation or fuels blending)
- Safety Kleen (Lokern), Buttonwillow, California (for Class I landfill)
- Seaport Environmental, Redwood City, California (for wastewater treatment followed by discharge)
- TPS Technologies, Richmond, California (for thermal desorption)

### **5.3 Waste Accumulation and Storage**

To the extent possible, IT will store containerized waste in liquid storage tanks, roll-off bins, and drums. For bulk waste, IT will construct containment areas for temporary wastes storage (22 CCR 66262.34[a]). Containment areas for containerized-waste liquids and for containerized-waste solids will consist of a high-density polyethylene (HDPE) underlain-liner that has a two-foot berm around its perimeter (22 CCR 66264 Subpart I, 22 CCR 66265 Subpart I). Waste will not accumulate on site in excess of 90 days (40 CFR 262.34[a], 22 CCR 66262.34[a]).

IT will assign unique ID numbers to waste containers and affix waste labels to waste containers and posts adjacent to stockpiles upon the first day of accumulation (22 CCR 66262.34[a][2], 22 CCR 66262.34[a][3], 40 CFR 264 Subpart I, 40 CFR 265 Subpart I). Each waste label will display the waste generator's name, the waste generator's address, the first date of accumulation, the waste ID number, and the characterization of the waste.

IT will prepare a waste inventory spreadsheet that will include each waste description, unique container type and ID number, quantity, accumulation method, and first date of accumulation (e.g., Sludge, Bin #DB9999, 15 cubic yards (cy), Bulk, 7/15/99). IT will update the waste inventory spreadsheet weekly.

### **5.4 Sampling and Analyses**

An IT Field Technician will obtain statistically representative samples of each waste in accordance with the procedures provided in EPA Publication SW-846 (40 CFR Appendices I through III to Part 261, "Representative Sampling Methods"). The Project Chemist or Field Technician will write an associated waste description of each sample (as presented in Table 4) in the description section of each waste sample's chain-of-custody (COC) document.

The Project Chemist or Field Technician will ship waste samples in accordance with the International Air Transport Association (IATA) Dangerous Goods Regulations, 41st Edition, effective January 1, 2000. The subcontracted laboratory will analyze each waste sample. The laboratory or the Field Technician will provide photocopies of the analytical results of each waste to the T&D Coordinator at least ten calendar days prior to scheduled off-site waste shipment. A summary of sampling and analysis of all anticipated waste streams treated on site or treated and disposed of off site is presented in Table 5, "Sampling and Analysis Summary."

### **5.5 Waste Characterization**

The T&D Coordinator will review the analytical results of each waste and determine the applicability of the Department of Toxic Substances Control (DTSC) California Hazardous Waste Control Law (HWCL) Regulations (22 CCR 66261), EPA RCRA Regulations (40 CFR 261), and DOT Hazardous Materials Transportation Act (HMTA) Regulations (40 CFR 173). In the event that the regulations become effective, these regulations will retroactively apply to the initial date of accumulation (22 CCR 66262.34[a][2]).

In the event that a waste's analytical results warrant changes to the waste's preliminary characterization, IT will modify this plan and the T&D subcontractors' purchase orders.

### **5.6 Waste Profiling**

The T&D Coordinator will first determine if the Navy possesses any preexisting waste profile documents on file with the T&D subcontractors specifically for the Site 7 or Parcel 37 facility wastes. In the event that the T&D subcontractors possess preexisting waste profiles, the T&D Coordinator will forward the waste's analytical results to the T&D subcontractors and update (amend) the pre-existing waste profiles. In the event that the T&D subcontractors do not have pre-existing waste profiles, the T&D Coordinator will prepare new waste profile documents. The necessary profile documents are presented in Table 4.

The T&D Coordinator will submit the amended and/or new waste profile documents to the Navy, the waste generator, for review and generator "wet-ink" signature certification. After obtaining generator "wet-ink" signature certifications, the T&D Coordinator will submit the waste profile documents to the T&D subcontractors.

The T&D subcontractors will review the waste profile documents to ensure compliance with T&D technologies, procedures, logistics, and permits. Upon waste acceptance approval, the T&D subcontractors will provide to the T&D Coordinator one written waste acceptance letter for each waste.

After receipt of the waste acceptance letters, IT will schedule off-site transportation for wastes requiring off-site disposal.

## **5.7 Shipment Preparation**

IT will first obtain all T&D subcontractors' requirements and restrictions written for waste quantity, schedule, package and cargo securement, equipment, and personnel. For example, each vehicle will restrict a waste shipment's net-cargo weight (e.g., 80,000-pound gross-weight maximum). If shipping waste drums, IT or the T&D subcontractors will secure all waste container shipments using standard 2- by 4-inch wooden beam triangulated blocking-bracing practices. IT or the T&D subcontractors will secure all dump truck or roll-off bin truck shipments using standard HDPE-lining practices and standard leveling-tarping-cording practices. IT will ensure that all waste cargoes are protected from weather and vandalism.

IT will provide and affix all DOT-required labels and placards to waste containers and/or T&D subcontractor vehicles (22 CCR 66262.31 through 66262.33; 49 CFR 172.300 through 172.450). These labels and placards are described in Table 4.

## **5.8 Manifesting**

The IT T&D Coordinator will prepare waste manifest packages (22 CCR 66262.20 through 66262.23; 22 CCR Appendix to Part 66262; 49 CFR 172.200 through 172.205) using IT Corporation's ManageIT™ software. Uniform hazardous waste manifests will describe hazardous wastes, and nonhazardous waste manifests will describe nonhazardous wastes.

The T&D Coordinator will submit the manifest packages to the waste generator for review and generator "wet-ink" custody-signature certification (22 CCR 66262.30[a][1]). After obtaining generator "wet-ink" custody-signature certifications, the T&D Coordinator will submit the manifest packages to the representatives of the first transporter for transporter "wet-ink" custody-signature (22 CCR 66262.30[a][2]). The T&D Coordinator will remove two original copies of each manifest package (22 CCR 66262.40[a]) and make two photocopies of each manifest package. The T&D Coordinator will provide one of the original copies to the waste generator, submit one of the original copies to California DTSC, and keep one of the photocopies for inclusion in the IT Final Report.

Each transporter will obtain a "wet-ink" custody-signature from a representative of the subsequent transporter. The final transporter will obtain a "wet-ink" custody-signature from a representative of the disposal/recycle facility.

The disposal/recycle facility will submit original copies of fully-executed “wet-ink” custody-signed manifests and certificates of disposal (CDs) to the waste generator (22 CCR 66262.40 Y through 66262.43) and submit photocopies of fully-executed manifests and CDs to the T&D Coordinator for inclusion in the IT final report. Manifest will be completed in conformance with regulations found in 40 CFR 263, 22 CCR 66263, and 49 CFR 171 for proper shipping name, HW classification, ID number, and packaging group. The IT T&D coordinators are fully trained per HM 181/126f to identify hazardous wastes and properly complete the necessary shipping documents to transport and dispose of hazardous wastes.

## **6.0 Dual Vacuum Extraction Pilot Test Report and Closure Report**

---

Pilot test findings will be summarized in a test report. The test report will include a brief description of field activities, a summary of chemical data, data reduction and analysis, discussion and interpretation of results, conclusions and full-scale design basis criteria. Following full-scale design, construction, and a 3-month operating period, all free product will be assumed to be removed. With concurrence of regulatory authorities, closure activities will be documented in a closure report. Demobilization of equipment and personnel will follow, as described in Section 5.0.

## 7.0 References

---

AN West, 1996, *Naval Air Station, Alameda, California, Removal of Fuel Lines and Underground Storage Tanks (Design Drawings)*, April 22.

California Code of Regulations, Department of Toxic Substances Control Hazardous Waste Management Regulations, 22 CCR 66260 through 66268.

California Code of Regulations, State Water Resources Control Board Hazardous Waste Management Regulations, 23 CCR 2520 through 2533.

Canonie, 1990, *RI/FS Work Plan, NAS Alameda, Alameda, California, Volumes 1 through 8, prepared for NAVY-WEST-DIV*, February.

Code of Federal Regulations, Resource Conservation and Recovery Act and Comprehensive Environmental Response and Liability Act Regulations, 40 CFR 260 through 268, 273, 279, 300.

Code of Federal Regulations, Department of Transportation, 49 CFR 170 through 178.

ERM-West, 1987, *Site Investigation, NAS Naval Exchange Gas Station, Alameda, California*, March 31.

Hazardous Materials Publishing Co., Inc., 1998/1999, *Hazardous Materials, Substances and Wastes Compliance Guide*.

IT Corporation, 1999, *Closure Report, Removal of Underground Storage Tanks, Building 373 - Fuel Loading Station, Alameda Point, Alameda, California*, May.

International Air Transport Association, 2000, *Dangerous Goods Regulations*, January 2000, 41<sup>st</sup> Edition.

PRC and James M. Montgomery (PRC and JMM), 1992, *Data Summary Report RI/FS Phases 2B and 3, prepared for Department of Navy, Western Division Naval Facilities Engineering Command, San Bruno, California*.

Rogers, J.D. and Figuers, S.H., 1991, *Engineering Geologic Site Characterization of the Greater Oakland-Alameda Area, Alameda and San Francisco Counties, California*, December 30.

Tetra Tech EM Inc., 1999a, *Fuel Line Removal and Closed-in-Place Fuel Line Summary Assessment Report*, May.

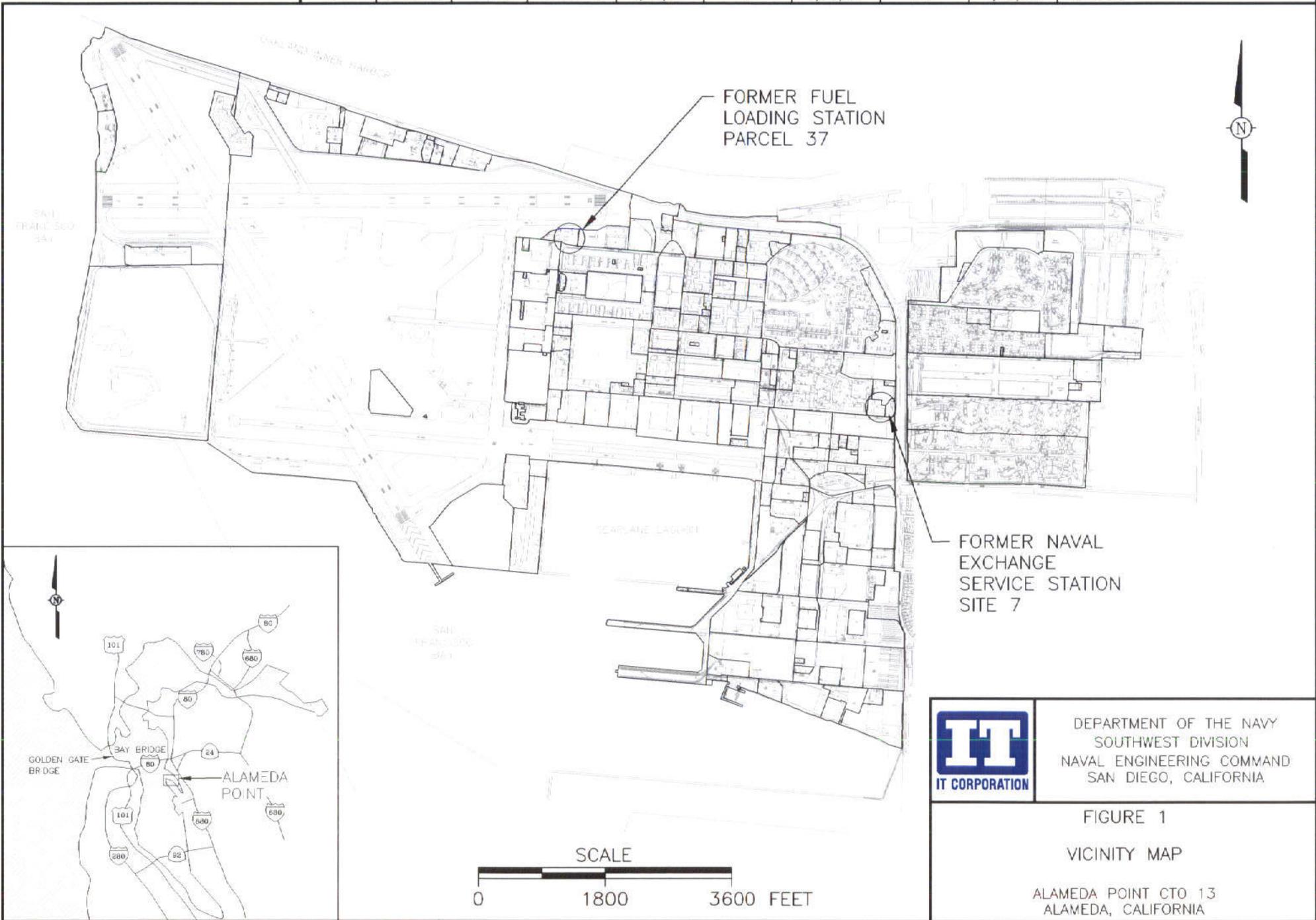
Tetra Tech EM Inc., 1999b, *OU-1 Remedial Investigation Report*, Alameda Point, Alameda, California, March 23.

Tetra Tech EM Inc., 1997, "Tidal Influence Study Letter Report," Alameda Point, Alameda, California, June.

U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, October 1998, *Management of Remediation Waste Under RCRA*.

## FIGURES

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	AL99BASE	CONC	B. Jensen	7/30/01	NH	7/30/01	DLS	7/30/01	807181-A7



DRAWING NUMBER 807181-B4

APPROVED BY DLS 7/30/01

CHECKED BY NH 7/30/01

DRAWN BY R. LANGSTON 2-28-01

OFFICE CONC

X-REF

IMAGE



TAXIWAY NO. 3

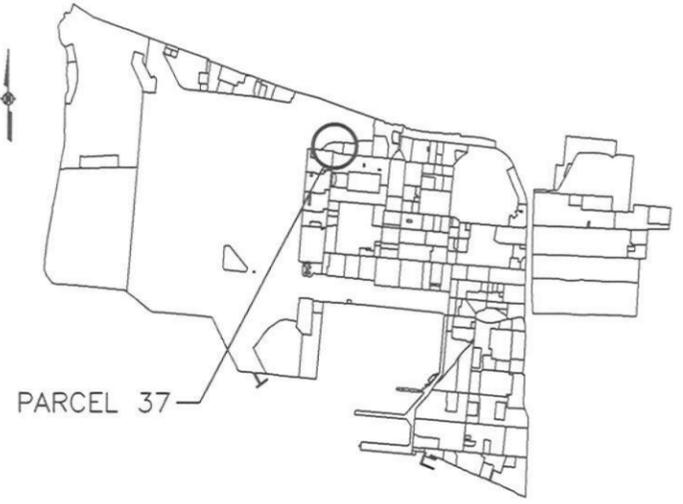
LIMITS OF FORMER EXCAVATION

4" TRANSITE DRAIN (GROUTED)

6" LAMP HOLE (GROUTED)

GRATE-COVERED SURFACE DRAIN (GROUTED)

12" R.C. DEBRIS LINE (GROUTED)



PARCEL 37

LEGEND

- LIMITS OF FORMER EXCAVATION
- - - FORMER JET FUEL PIPELINE
- COMM — COMMUNICATION LINES
- E — ELECTRICAL LINES
- STM — STEAM LINES
- G — GAS LINES
- FUEL LINES
- SW — SANITARY SEWER LINE
- SS — STORM SEWER LINE
- W — WATER
- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- C.I. - CAST IRON
- RC - REINFORCED CONCRETE
- - IRRIGATION
- ⊕ - HYDRANT

SCALE

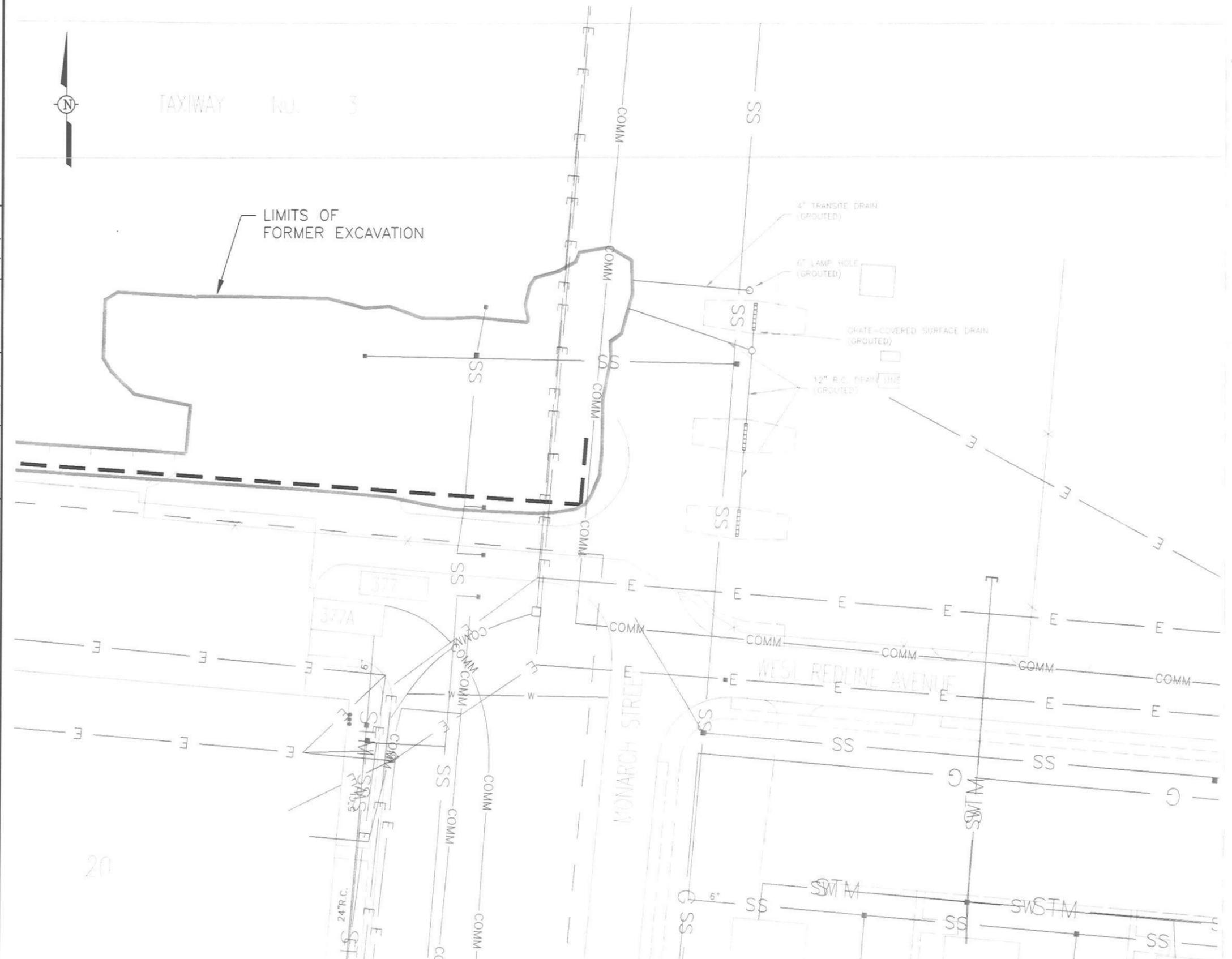


DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION NAVAL  
ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 2

SITE MAP

FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA



NOTE:  
WELL AND UTILITY LOCATIONS ARE APPROXIMATE.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	6/11/01	NH	NH	RC	ISSUED FOR REVIEW

DRAWING NUMBER 807181-B5

APPROVED BY DLS 7/30/01

CHECKED BY NH 7/30/01

DRAWN BY R. LANGSTON 2/28/01

OFFICE CONC. X-REF

LEGEND

- FLUORESCENCE <10,000 COUNTS
- POL FLUORESCENCE >10,000 COUNTS
- POL FLUORESCENCE >100,000 COUNTS
- POL FLUORESCENCE >200,000 COUNTS
- POTENTIAL POL FLUORESCENCE
- POL FLUORESCENCE ISOCONTOUR >100,000 COUNTS
- CROSS SECTION A-A' SECTION LINE
- LIMITS OF FORMER EXCAVATION
- FORMER JET FUEL PIPELINE
- COMM COMMUNICATION LINES
- E ELECTRICAL LINES
- STM STEAM LINES
- G GAS LINES
- FUEL LINES
- SW SANITARY SEWER LINE
- SS STORM SEWER LINE
- W WATER
- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- C.I. - CAST IRON
- RC - REINFORCED CONCRETE
- ◆ - HYDRANT
- - IRRIGATION



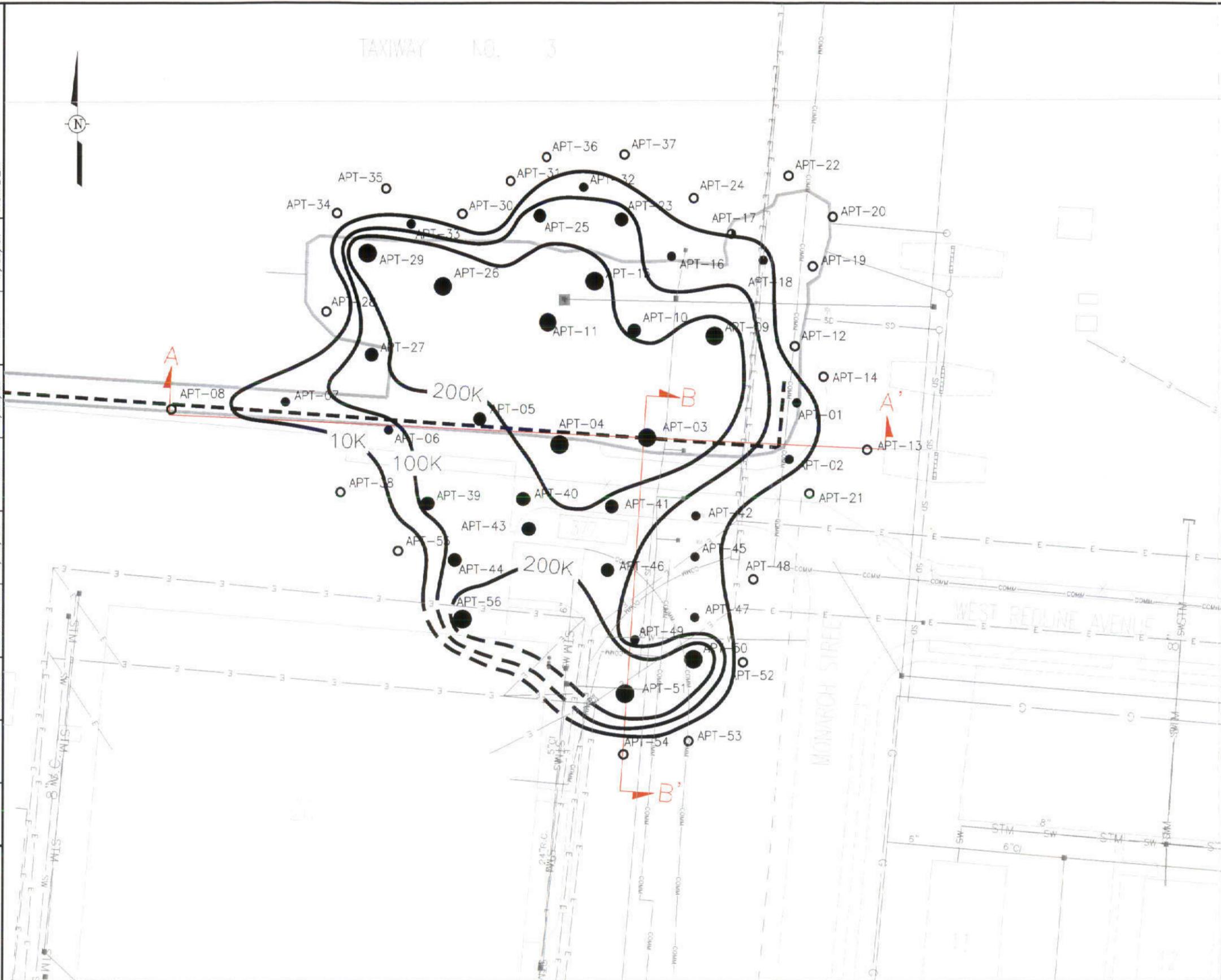
DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 3  
FUEL HYDROCARBON DISTRIBUTION MAP  
SCAPS DATA ISOCONTOURS  
FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA

NOTES:

SCAPS DATA FROM NAVY PUBLIC WORKS CENTER,  
CODE 980. FIGURE 2, SHIELDS 10/31/98 PMTERMINAL.DWG.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	6/11/01	NH	NH	RC	ISSUED FOR REVIEW



DRAWING NUMBER  
807181-B22

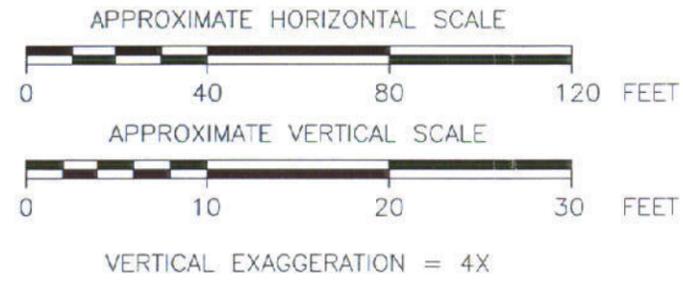
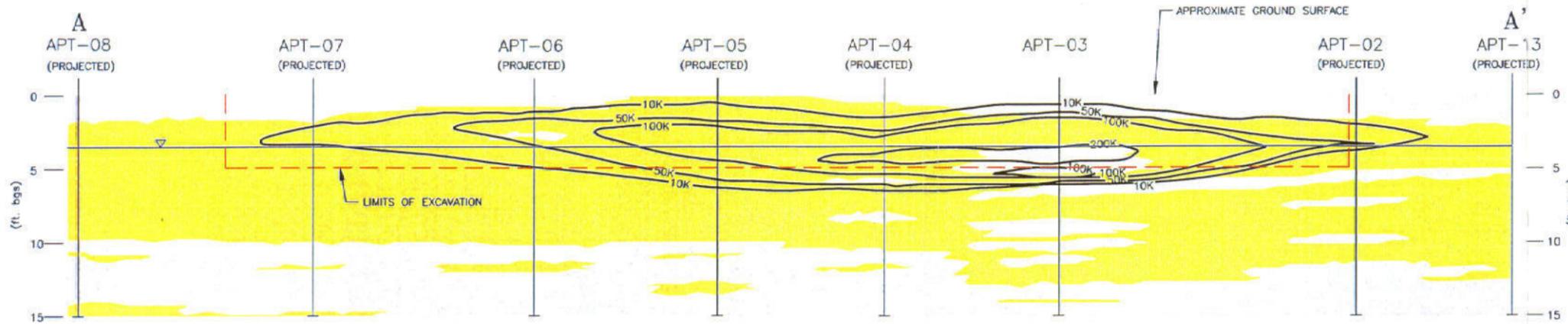
APPROVED BY

CHECKED BY

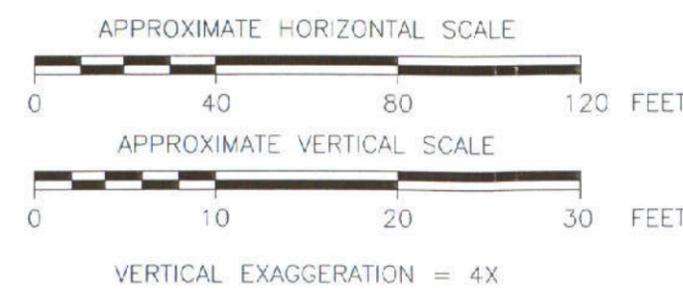
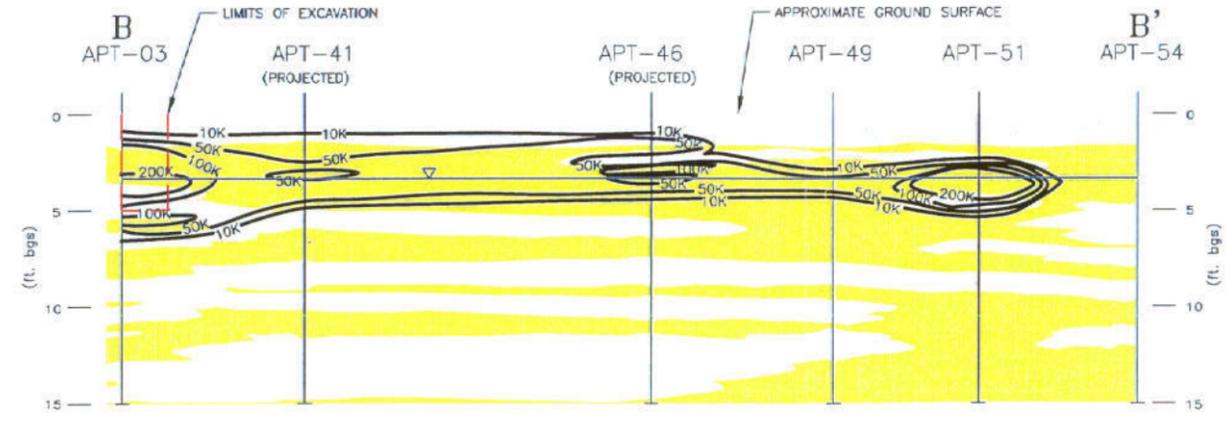
DRAWN BY  
B. Jensen 2/28/01

OFFICE CONC

X-REF SIZE



- LEGEND
- COARSE GRAIN SOILS [sw, sp, sm]
  - FINE GRAIN SOILS [ml, cl]
  - LIMITS OF EXCAVATION
  - APPROXIMATE WATER TABLE (1998)
  - POL FLUORESCENCE ISOCONTOUR >200,000 COUNTS
  - APT-07 (PROJECTED) CPT/LIF LOCATION



REV	DATE	BY	CHK'D	APRVD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 4  
CROSS SECTION A-A' & B-B'  
SCHEMATIC FUEL HYDROCARBON  
DISTRIBUTION AND STRATIGRAPHY PARCEL 37

807181-B9  
DRAWING NUMBER

7/30/01  
APPROVED BY  
DLS

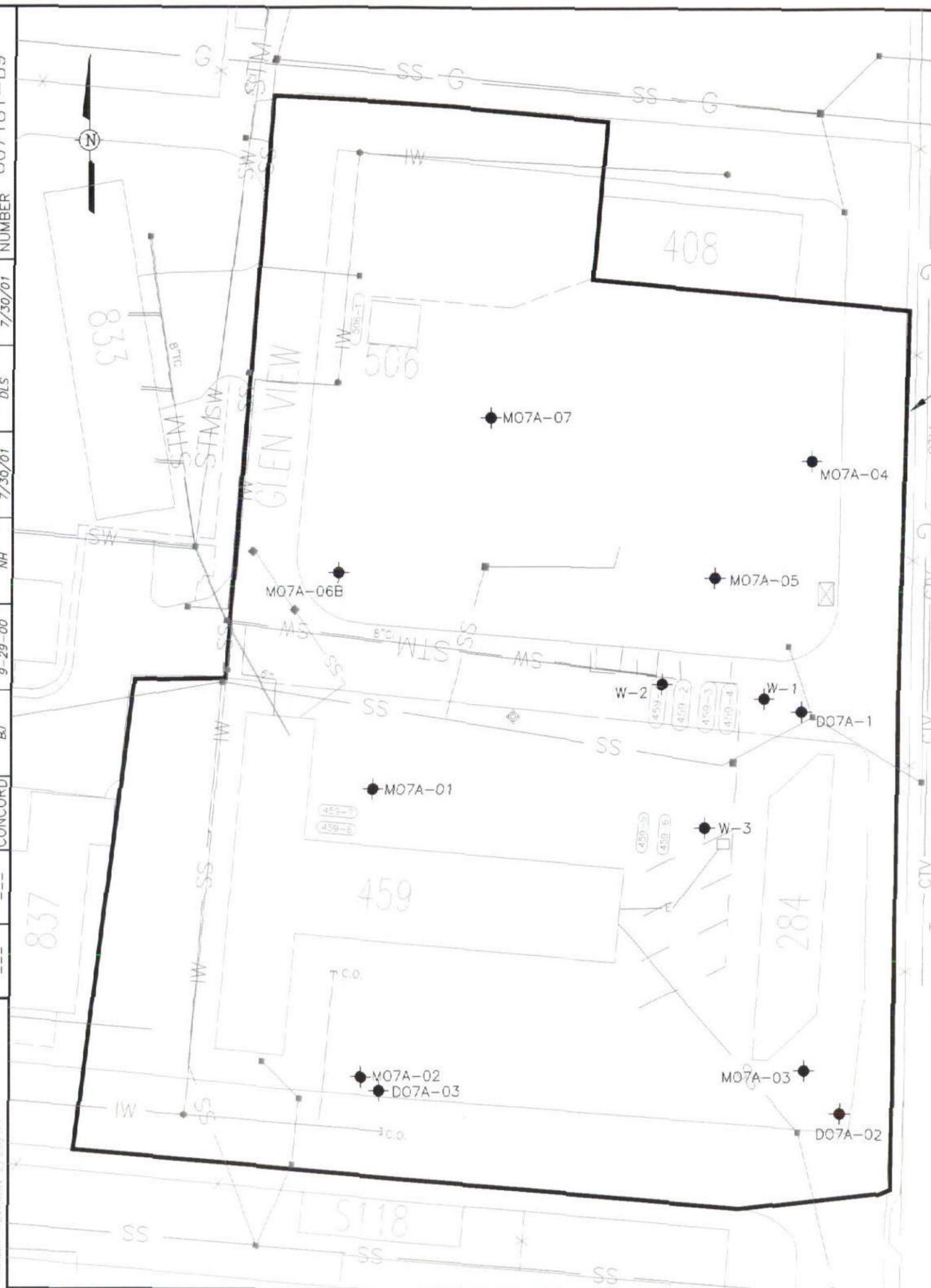
7/30/01  
CHECKED BY  
NH

9-29-00  
DRAWN BY  
BL

CONCORD  
OFFICE

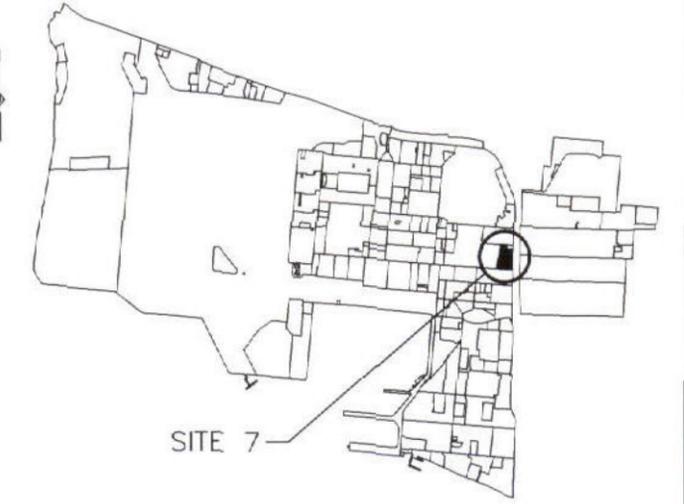
837  
X-REF

2/26/00  
REVISION



SITE 7 BOUNDARY

MAIN STREET

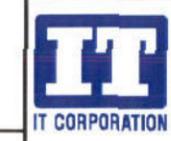
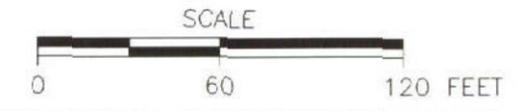


SITE 7

LEGEND

- MONITORING WELL
- E — ELECTRICAL LINES
- STM — STEAM LINES
- G — GAS LINES
- — FUEL LINES
- SW — SANITARY SEWER LINE
- SS — STORM SEWER LINE
- IW — INDUSTRIAL WASTE LINE
- T — TELEPHONE LINE
- CTV — CABLE TV LINE
- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- (459-1) FORMER UST (REMOVED)
- CI — CAST IRON
- RC — REINFORCED CONCRETE
- ◆ — HYDRANT
- ⊠ — TRANSFORMER

NOTE: WELL AND UTILITY LOCATIONS ARE APPROXIMATE.

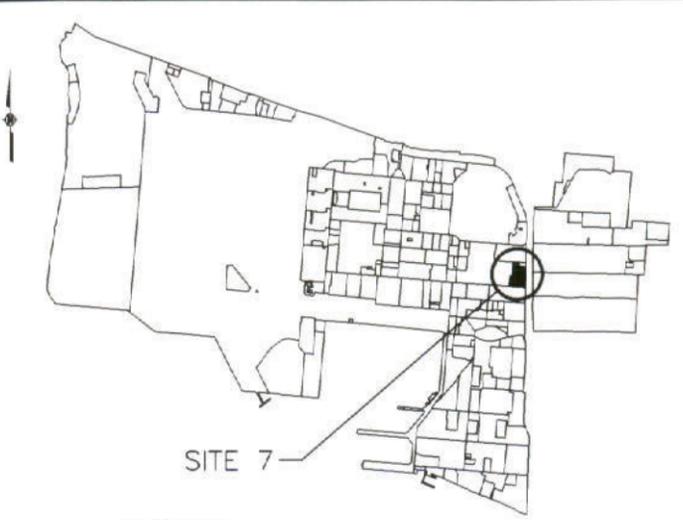


DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 5  
SITE MAP  
SITE 7  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

REV	DATE	BY	CHK'D	APP'VD	DESCRIPTION
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

IMAGE X-REF ---  
 OFFICE CONCORD  
 DRAWN BY BU 2/28/01  
 CHECKED BY NH 7/30/01  
 APPROVED BY DLS 7/30/01  
 DRAWING NUMBER 807181-B16



**LEGEND**

- MONITORING WELL
- - - 100 - - - ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) 100 µg/L AS TPH
- GROUNDWATER FLOW DIRECTION
- A — A' — CROSS SECTION A-A' SECTION LINE
- E — ELECTRICAL LINES
- STM — STEAM LINES
- G — GAS LINES
- — FUEL LINES
- SW — SANITARY SEWER LINE
- SS — STORM SEWER LINE
- IW — INDUSTRIAL WASTE LINE
- T — TELEPHONE LINE
- CTV — CABLE TV LINE
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- (459-1) FORMER UST (REMOVED)
- C.I. — CAST IRON
- RC — REINFORCED CONCRETE
- ⊕ — HYDRANT
- ⊗ — TRANSFORMER

SCALE  
 0 60 120 FEET

- NOTES:**
1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.
  2. GROUNDWATER FLOW DIRECTIONS BASED ON APRIL 1998 WATER ELEVATION DATA.
  3. ISOCONCENTRATION CONTOURS BASED ON AVERAGE VALUES FOR SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996.

REFERENCE: TETRA TECH CORP., TOTAL PETROLEUM HYDROCARBONS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE  
 XREF: SAS-SW, SSS-SW, IND-SW, OLD-FUEL, FUEL-ALL

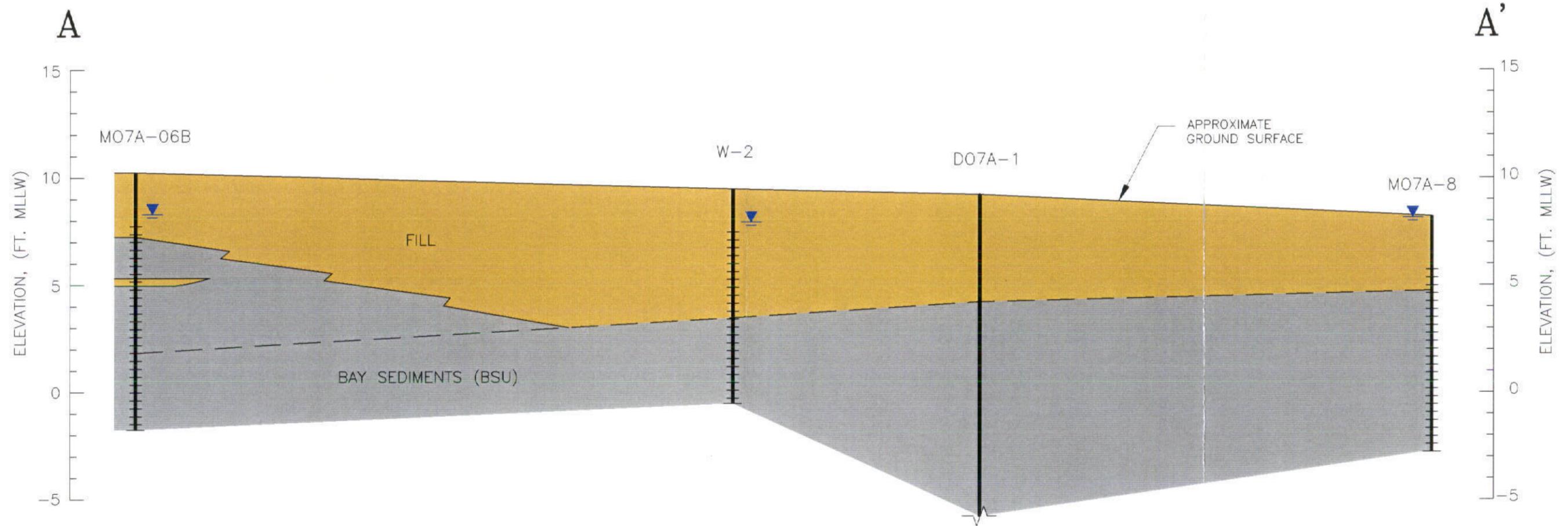
REV	DATE	BY	CHK'D	APPROVE	DESCRIPTION
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

**IT CORPORATION**

DEPARTMENT OF THE NAVY  
 SOUTHWEST DIVISION  
 NAVAL ENGINEERING COMMAND  
 SAN DIEGO, CALIFORNIA

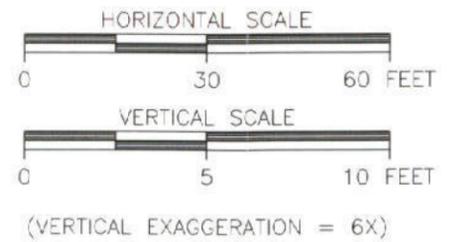
**FIGURE 6**  
**FUEL HYDROCARBON DISTRIBUTION MAP**  
**SITE 7**  
 ALAMEDA POINT CTO-13  
 ALAMEDA, CALIFORNIA

IMAGE ---  
 X-REF ---  
 OFFICE CONC  
 DRAWN BY RB 2/28/01  
 CHECKED BY NH 7/30/01  
 APPROVED BY DLS 7/30/01  
 DRAWING NUMBER 807181-B14



NOTE:  
 ACTUAL BORING DEPTH IS 69 FT BGS.  
 WELL SCREENED FROM 58 TO 68 FT BGS.

- APPROXIMATE GROUND WATER ELEVATION 4/98 (FT MLLW)
- INFERRED CONTACT
- COARSE GRAIN MATERIALS (SP, GM)
- FINE GRAIN MATERIALS (CL, ML)
- WELL LOCATION
- SCREEN INTERVAL

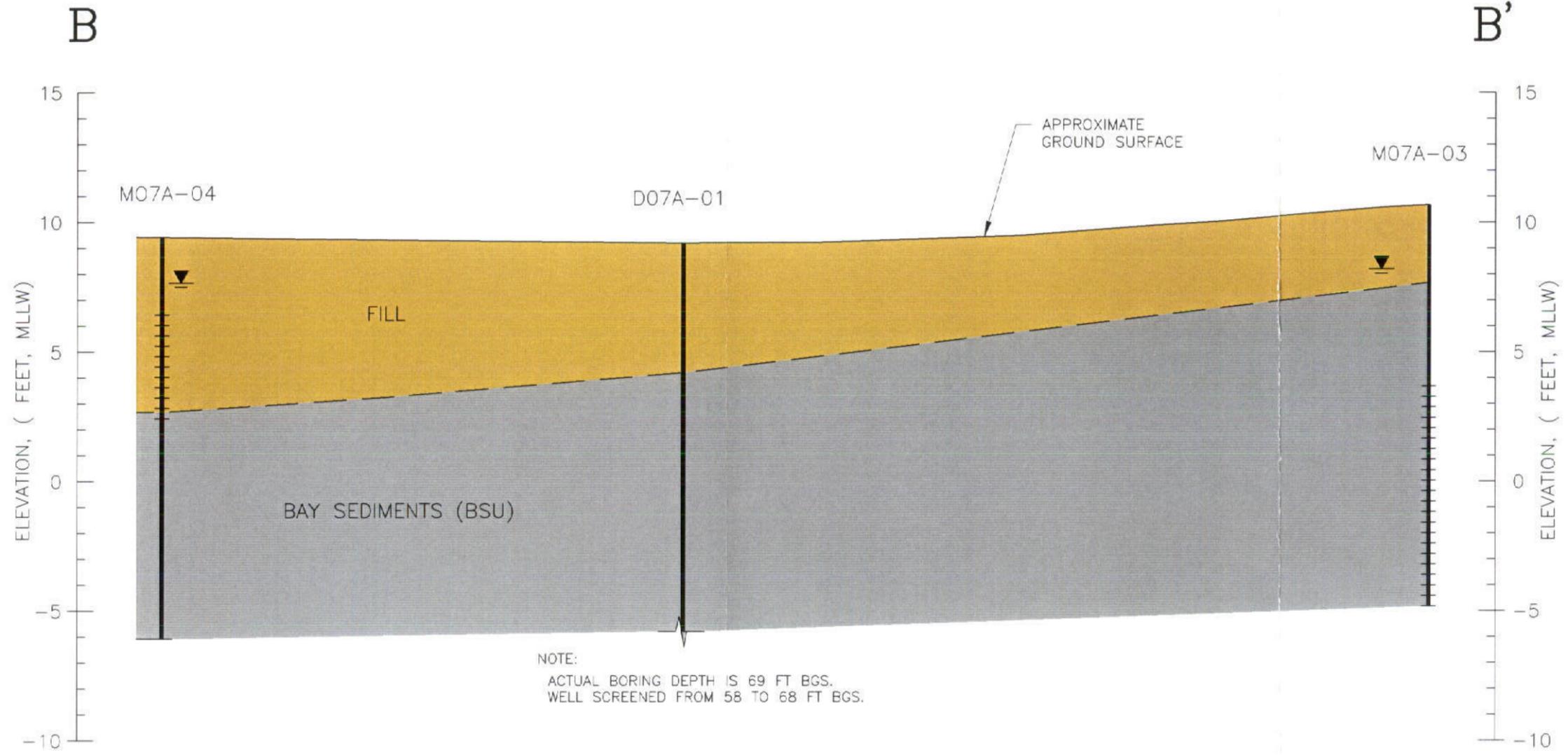


REV	DATE	BY	CHK'D	APP'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

DEPARTMENT OF THE NAVY  
 SOUTHWEST DIVISION  
 NAVAL ENGINEERING COMMAND  
 SAN DIEGO, CALIFORNIA

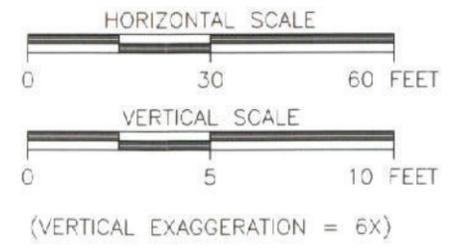
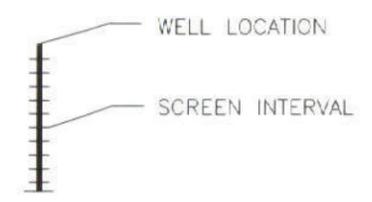
FIGURE 7  
 CROSS SECTION A-A'  
 SITE 7  
 ALAMEDA POINT, CTO-13  
 ALAMEDA, CALIFORNIA

IMAGE X-REF OFFICE CONC DRAWN BY RB 9-29-00 CHECKED BY NH 7/30/01 APPROVED BY DLS 7/30/01 DRAWING NUMBER 807181-B15



NOTE:  
ACTUAL BORING DEPTH IS 69 FT BGS.  
WELL SCREENED FROM 58 TO 68 FT BGS.

- APPROXIMATE GROUNDWATER ELEVATION  
4/98 (FT MLLW)
- INFERRED CONTACT
- COARSE GRAIN MATERIALS (SW, SP, SM, SC)
- FINE GRAIN MATERIALS (CL, ML)



REV	DATE	BY	CHK'D	APPROV'D	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

**FIGURE 8**  
CROSS SECTION B-B'  
SITE 7  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

DRAWING NUMBER 807181-B13

APPROVED BY DLS 7/30/01

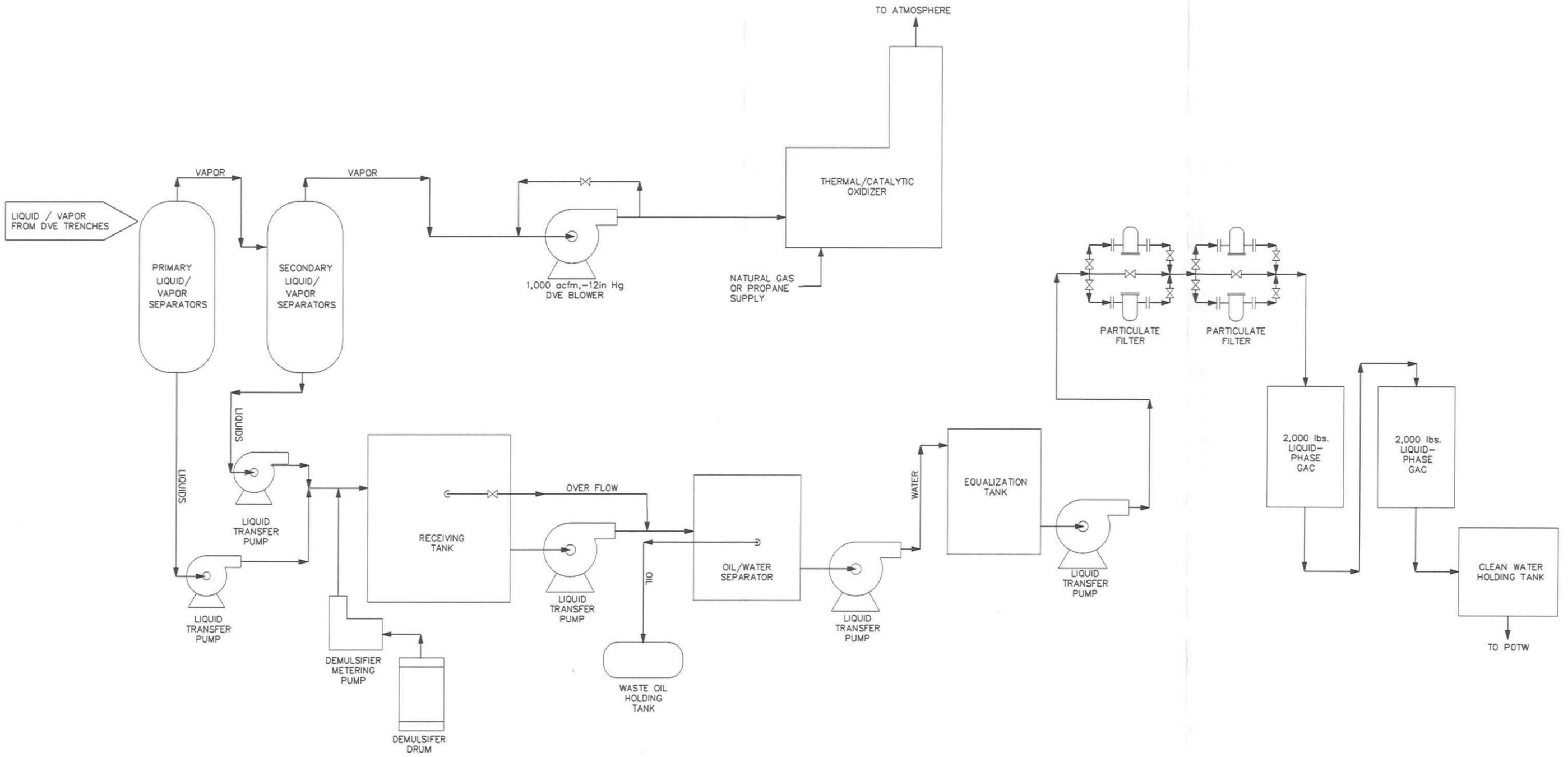
CHECKED BY NH 7/30/01

DRAWN BY BJ 3/28/01

OFFICE CONC

X-REF ---

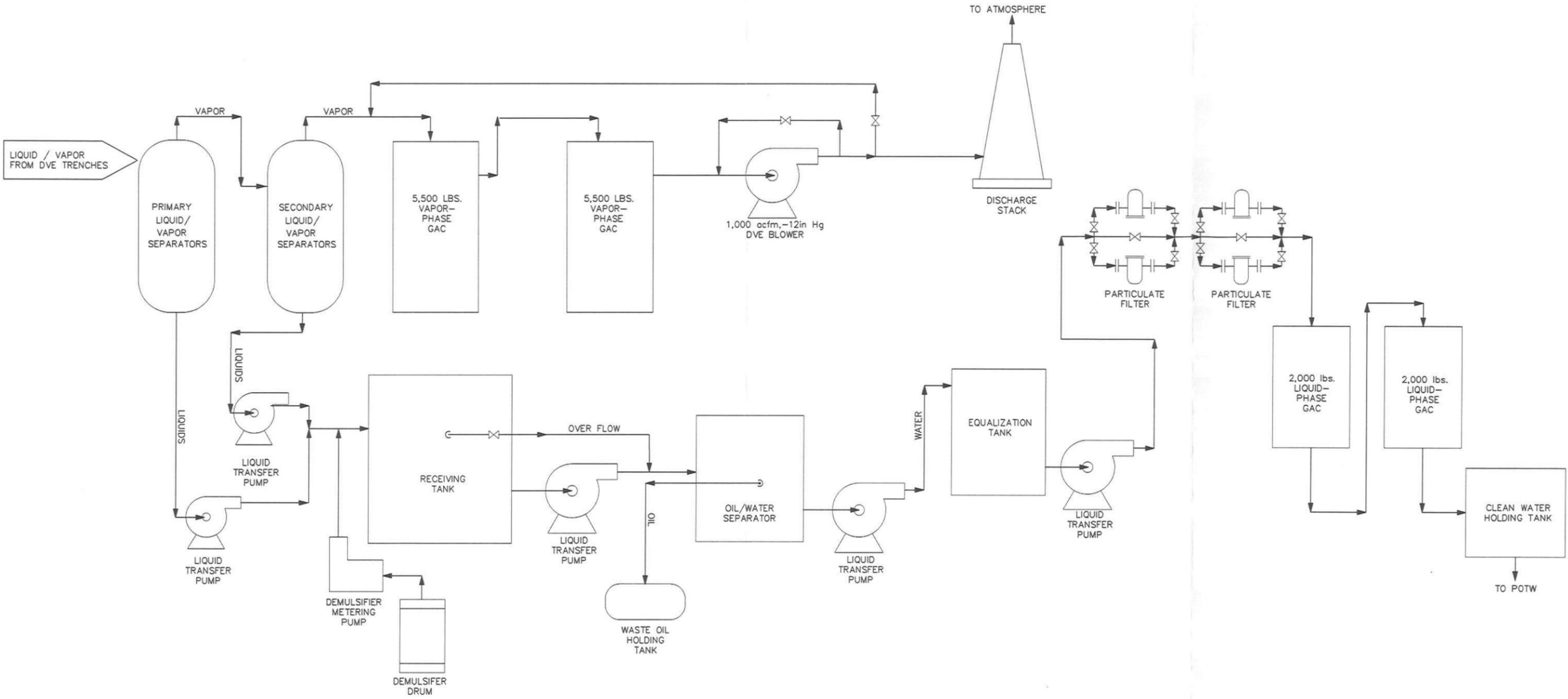
IMAGE ---



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 9  
PROCESS FLOW DIAGRAM  
SITE 7  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA

REV	DATE	BY	CHK'D	APR'D	DESCRIPTION / ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

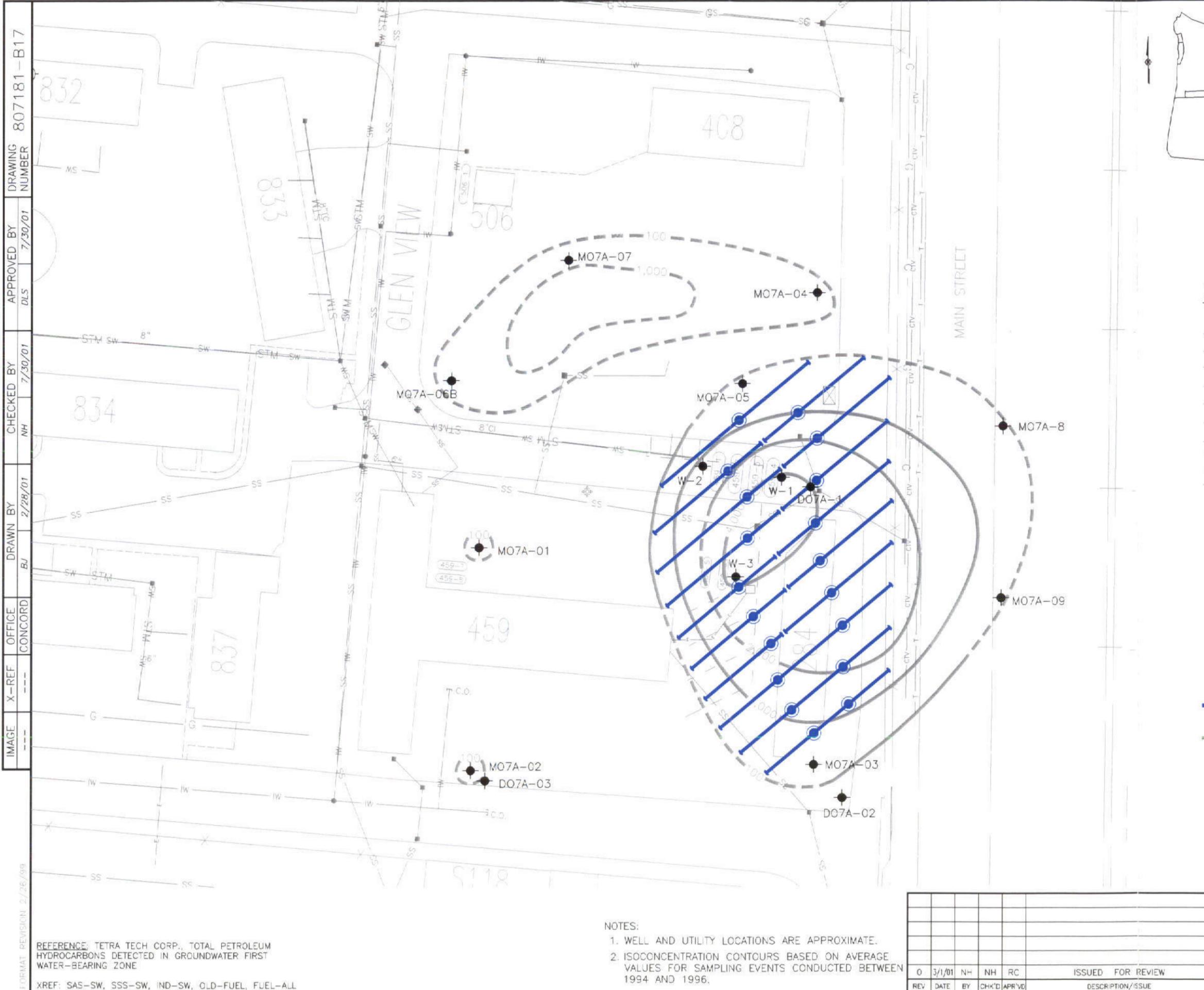


REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION / ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

**IT CORPORATION**

DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 10  
PROCESS FLOW DIAGRAM  
FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA



- LEGEND**
- MONITORING WELL
  - E — ELECTRICAL LINES
  - STM — STEAM LINES
  - G — GAS LINES
  - — FUEL LINES
  - SW — SANITARY SEWER LINE
  - SS — STORM SEWER LINE
  - IW — INDUSTRIAL WASTE LINE
  - T — TELEPHONE LINE
  - CTV — CABLE TV LINE
  - X — FENCE
  - SANITARY SEWER MANHOLE
  - STORM SEWER MANHOLE
  - CATCH BASIN
  - INDUSTRIAL WASTE MANHOLE
  - (459-T) FORMER UST (REMOVED)
  - C.I. — CAST IRON
  - RC — REINFORCED CONCRETE
  - DVE ACCUMULATION SUMP
  - ⊕ — HYDRANT
  - ⊠ — TRANSFORMER
  - DVE COLLECTION TRENCH
  - ISOCONCENTRATION CONTOUR (Dashed Where Inferred) 100ug/L as TPH



**NOTES:**

1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.
2. ISOCONCENTRATION CONTOURS BASED ON AVERAGE VALUES FOR SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

**IT CORPORATION**

DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

**FIGURE 11**  
**PROPOSED COLLECTION TRENCH LAYOUT**  
**SITE 7**  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

DRAWING NUMBER 807181-B17  
 APPROVED BY DLS 7/30/01  
 CHECKED BY NH 7/30/01  
 DRAWN BY BJ 2/28/01  
 OFFICE CONCORD  
 X-REF ---  
 IMAGE ---  
 FORMAT REVISION 2/26/99

REFERENCE: TETRA TECH CORP., TOTAL PETROLEUM HYDROCARBONS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE  
 XREF: SAS-SW, SSS-SW, IND-SW, OLD-FUEL, FUEL-ALL

DRAWING NUMBER 807181-B6

APPROVED BY DLS 7/30/01

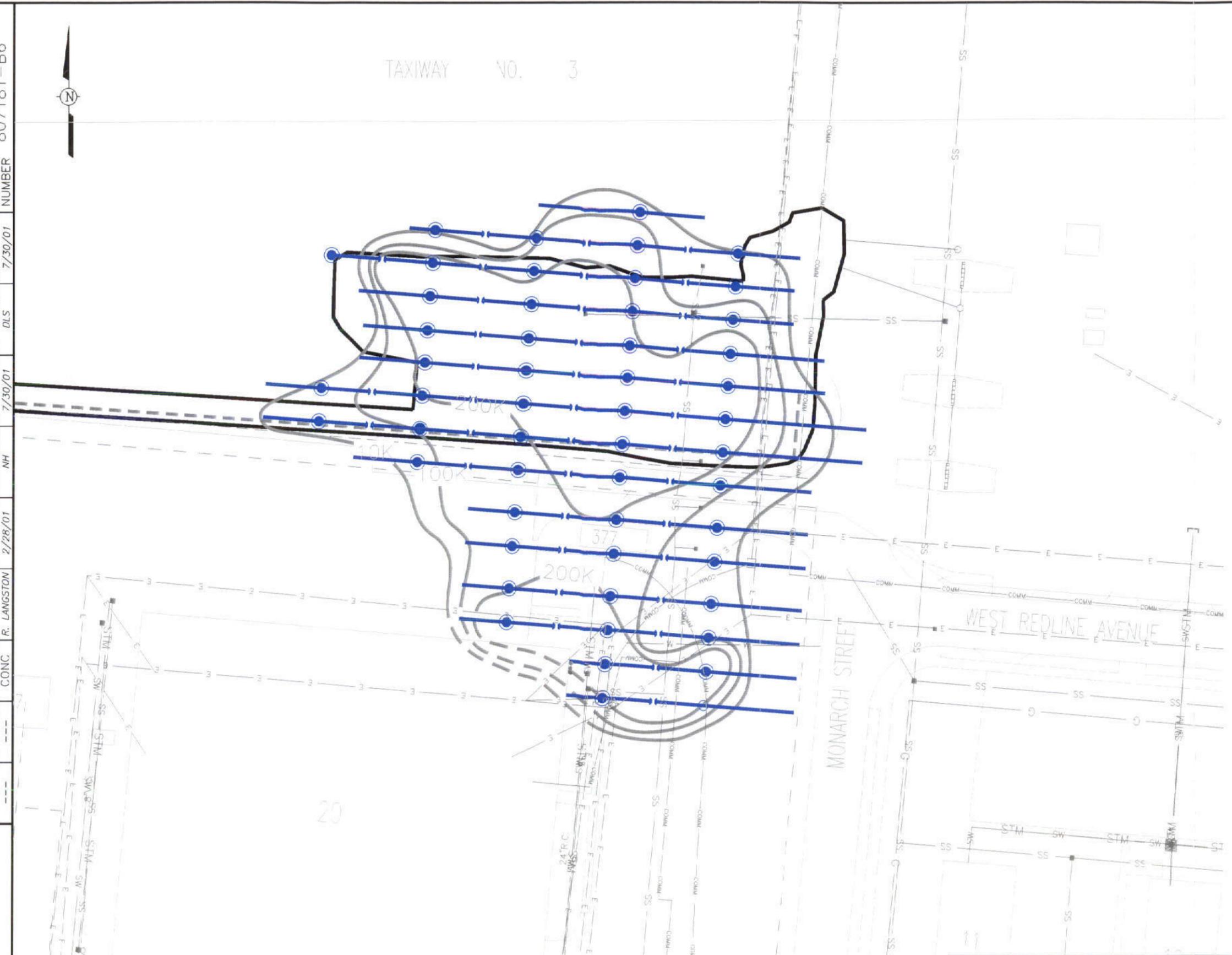
CHECKED BY NH 7/30/01

DRAWN BY R. LANGSTON 2/28/01

OFFICE CONC. ---



TAXIWAY NO. 3



LEGEND

- DVE ACCUMULATION SUMP
- DVE COLLECTION TRENCH
- POL FLUORESCENCE ISOCONTOURS >200,000 COUNTS
- LIMITS OF FORMER EXCAVATION
- FORMER JET FUEL PIPELINE
- COMMUNICATION LINES
- ELECTRICAL LINES
- STEAM LINES
- GAS LINES
- FUEL LINES
- SANITARY SEWER LINE
- STORM SEWER LINE
- WATER
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- C.I. - CAST IRON
- RC - REINFORCED CONCRETE
- HYDRANT
- IRRIGATION



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

NOTE:

1. SCAPS DATA FROM NAVY PUBLIC WORKS CENTER, CODE 980. FIGURE 2, SHIELDS 10/31/98 PMTERMINAL.DWG.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	6/11/01	NH	NH	RC	ISSUED FOR REVIEW

FIGURE 12  
PROPOSED  
COLLECTION TRENCH LAYOUT  
FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA

DRAWING NUMBER 807181-A9

APPROVED BY 7/30/01  
DLS

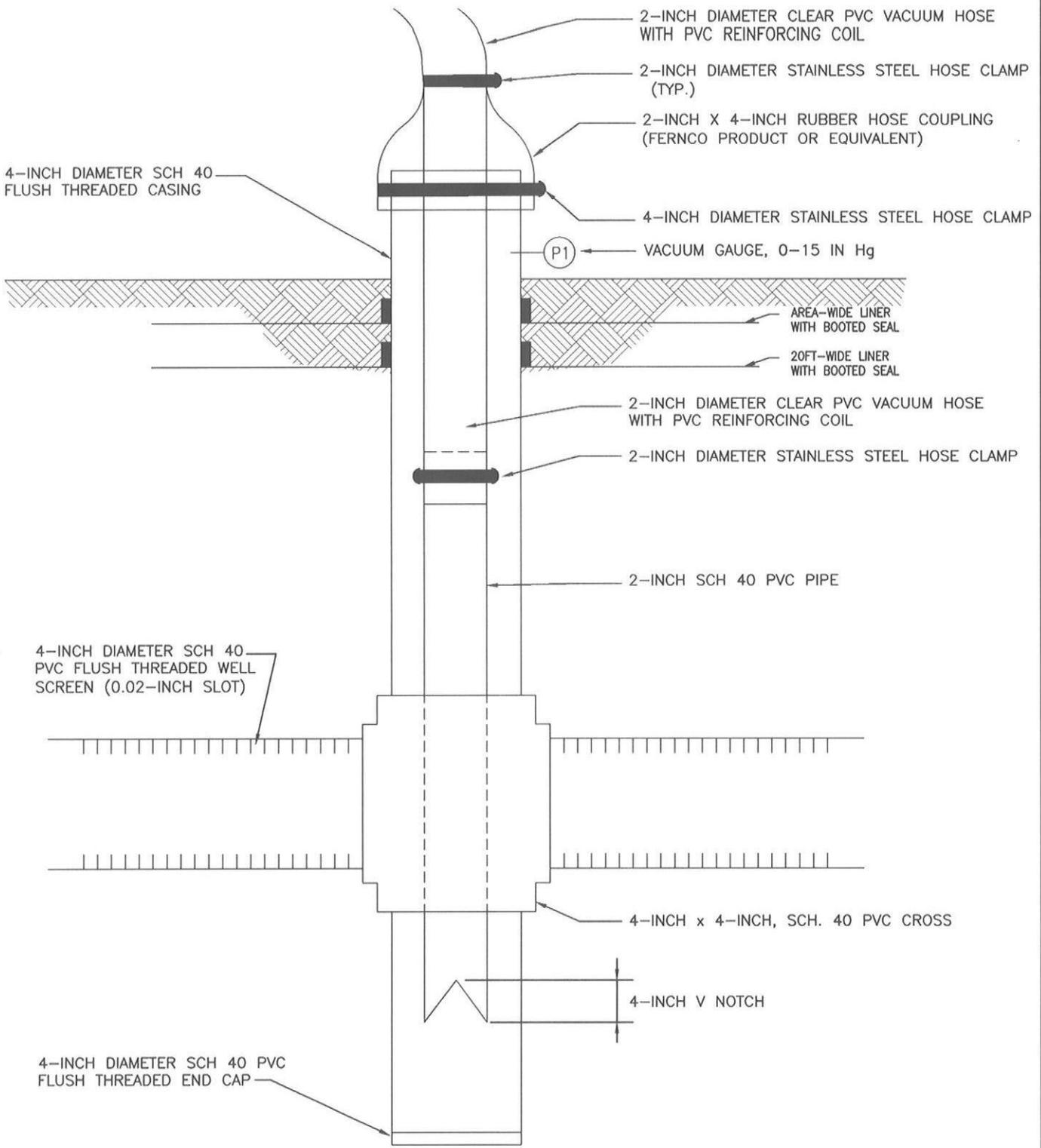
CHECKED BY 7/30/01  
NH

DRAWN BY 9-29-00  
BU

OFFICE  
Concord

X-REF  
---

IMAGE  
---



NOT TO SCALE



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 13

DVE ACCUMULATION SUMP  
FOR NON-TIDAL USE  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

REV	DATE	BY	CHK'D	APPR'D	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

DRAWING NUMBER 807181-B18

APPROVED BY DLS 7/30/01

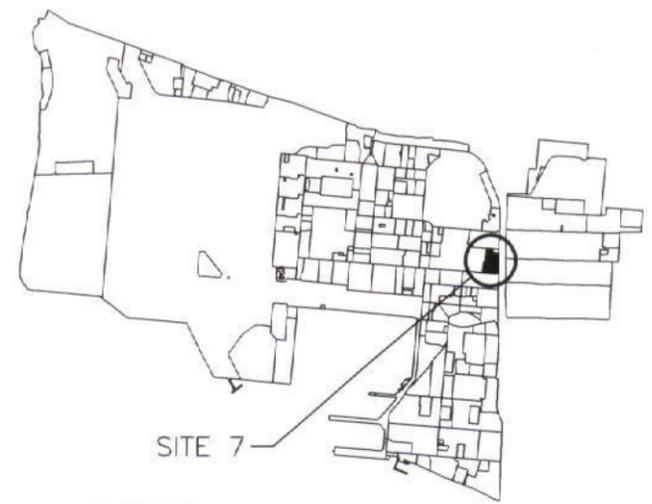
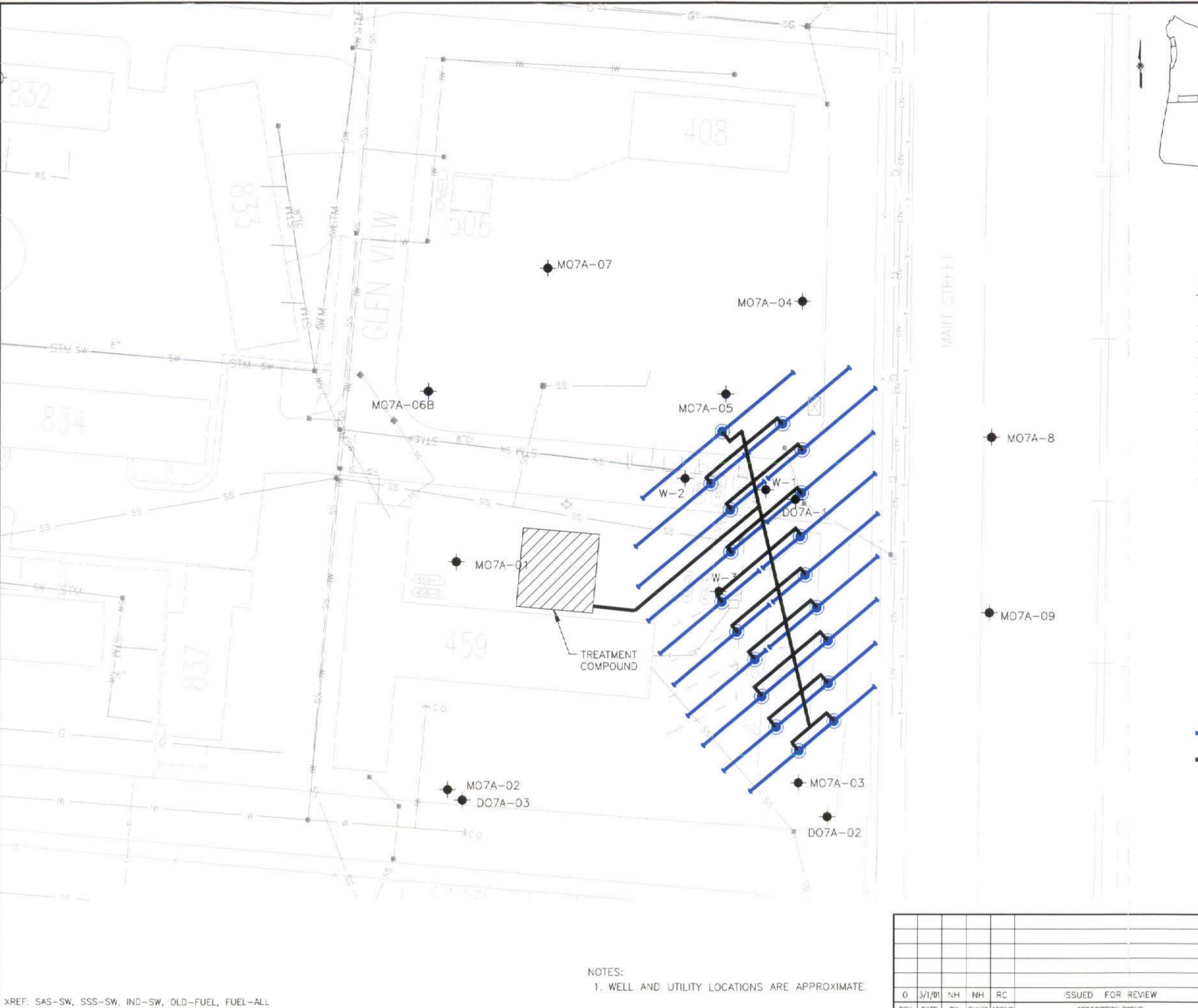
CHECKED BY NH 7/30/01

DRAWN BY BU 2/28/01

OFFICE CONCORD

X-REF ---

IMAGE ---



**LEGEND**

- MONITORING WELL
- E — ELECTRICAL LINES
- STM — STEAM LINES
- G — GAS LINES
- — FUEL LINES
- SW — SANITARY SEWER LINE
- SS — STORM SEWER LINE
- IW — INDUSTRIAL WASTE LINE
- T — TELEPHONE LINE
- CTV — CABLE TV LINE
- — FENCE
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- (with blue border) FORMER UST (REMOVED)
- C.I. — CAST IRON
- RC — REINFORCED CONCRETE
- (with blue border) DVE ACCUMULATION SUMP
- ◇ — HYDRANT
- ⊠ — TRANSFORMER
- (blue arrow) DVE COLLECTION TRENCH
- (black) ABOVE GROUND COLLECTION HEADER PIPING

SCALE  
0 60 120 FEET

NOTES:  
1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.

XREF: SAS-SW, SSS-SW, IND-SW, OLD-FUEL, FUEL-ALL

**IT CORPORATION**  
DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 14  
PROPOSED PIPING NETWORK LAYOUT  
SITE 7  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

REV	DATE	BY	CHK'D	APP'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

TAX WAY NO. 3

LEGEND

- ⊗ ISOLATION VALVE
- DVE ACCUMULATION SUMP
- DVE COLLECTION TRENCH
- ABOVEGROUND COLLECTION HEADER PIPING



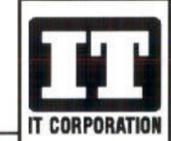
DRAWING NUMBER 807181-B7

APPROVED BY DLS 7/30/01

CHECKED BY NH 7/30/01

DRAWN BY B. Jensen 2/28/01

OFFICE CONC  
X-REF. SITE



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

FIGURE 15  
PROPOSED  
PIPING NETWORK LAYOUT  
FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA

## TABLES

**Table 1  
Project Schedule**

<b>Activity</b>	<b>Parcel 37</b>	<b>Site 7</b>
<b>A. Preconstruction Activities</b>	<b>Weeks 1-23</b>	<b>Weeks 1-23</b>
• Engineering	Weeks 1-4	Weeks 1-4
– Well Design	Weeks 1-3	Weeks 1-3
– Collection Piping	Weeks 2-3	Weeks 2-3
– Process Equipment	Weeks 3-4	Weeks 3-4
• Work Plan Preparation	Weeks 4-8	Weeks 4-8
– Sampling and Analysis Plan	Weeks 6-8	Weeks 6-8
– Health and Safety Plan	Weeks 6-8	Weeks 6-8
– Quality Assurance Plan	Weeks 6-8	Weeks 6-8
• Work Plan Revision/Approval	Weeks 8-14	Weeks 8-14
• Permitting	Weeks 14-22	Weeks 14-22
– Utility Clearance	Weeks 14-18	Weeks 14-18
– Construction Permits	Weeks 14-20	Weeks 14-20
– Drilling	Weeks 14-20	Weeks 14-20
– Air Quality	Weeks 14-22	Weeks 14-22
– Water Quality	Weeks 14-22	Weeks 14-22
• Navy Notice to Proceed	Weeks 22-23	Weeks 22-23
<b>B. Procurement</b>	<b>Weeks 23-28</b>	<b>Weeks 23-28</b>
• Site Preparation	Weeks 23-25	Weeks 23-25
• Laboratory Services	Weeks 23-25	Weeks 23-25
• Drilling	Weeks 23-27	Weeks 23-27
• Process Equipment	Weeks 23-24	Weeks 23-33
• Electrical/Controls	Weeks 25-28	Weeks 25-28
• Civil/Structural	Weeks 25-28	Weeks 25-28
• Waste Handling	Weeks 25-26	Weeks 25-26
<b>C. Field Activities (Construction/Testing/Operations)</b>	<b>Weeks 26-93</b>	<b>Weeks 26-93</b>
• Kick-off Meeting	Week 26	Week 26
• Contaminant Delineation (Phase I)	Weeks 26-37	Weeks 26-37
– Mobilization	Week 26	Week 26
– Utility Clearance/Survey	Weeks 26-28	Weeks 26-28

**Table 1 (continued)**  
**Project Schedule**

Activity	Parcel 37	Site 7
<b>C. Field Activities (Construction/Testing/Operations) (Continued)</b>		
– Drill/Install/Develop Piezometers	Weeks 27-29	Weeks 29-31
– Piezometer Sampling/Analysis	Weeks 31-33	Weeks 33-35
– Letter Report of Containment Distribution	Weeks 34-37	Weeks 36-37
• DVE Pilot Test (Phase II)	Weeks 37-58	Weeks 38-59
– Mobilization	Week 37	Week 38
– Install Horizontal Wells (Collection Trenches— Include Liners for Capping) (3)	Weeks 37-38	Weeks 38-39
– Waste Handling (Excavated Materials)	Weeks 39-41	Weeks 39-41
– Install Collection A/G Pipelines	Week 39	Week 40
– Install Process Equipment Foundation	Weeks 38-42	Weeks 38-42
– Install Process Equipment	Weeks 43-45	Weeks 44-46
– Install Process Equipment Building	Weeks 45-46	Weeks 45-47
– Install Electrical/Controls System	Weeks 45-47	Weeks 46-48
– DVE Start-up and Check-out	Week 48	Week 49
– Conduct DVE Pilot Test	Weeks 48-52	Weeks 49-53
– Prepare and Submit Pilot Test Report	Weeks 53-56	Weeks 53-56
– Pilot Report Review/Approval for Full Scale	Weeks 57-58	Weeks 58-59
• Full-Scale Design/Construction/Operations (Phase III)	Weeks 58-77	Weeks 58-78
– Additional Engineering/Survey	Weeks 58-60	Weeks 58-60
– Mobilization	Week 60	Week 60
– Install/Develop Additional Piezometers	Week 61	Week 62
– Install Horizontal Wells (Trenches) (Include Liners for Cap)	Weeks 61-64	Weeks 62-65
– Routine Operations (3 months operations)	Weeks 65-77	Weeks 66-78
– Confirmation of Cleanup (Monthly Sampling)	Weeks 69, 73, 77	Weeks 70, 74, 78
• Closure (Phase IV)	Weeks 78-93	Weeks 78-93
– Prepare Closure Report (without Long-Term Monitoring)	Weeks 78-84	Weeks 78-84
– Approval from Regulators	Weeks 84-88	Weeks 84-88
– Plug and Abandon Wells	Weeks 88-89	Weeks 89-90
– Restore Site	Weeks 90-92	Weeks 90-92
– Demobilization	Week 93	Week 93

**Table 2**  
**Major Equipment for Dual Vacuum Extraction Field Pilot Test, Site 7**

<b>Equipment</b>	<b>Capacity/Size</b>	<b>Physical Description/Operating Characteristics</b>
Vacuum Blower	1,000 cfm at 12 inches Hg (maximum)	75 HP positive displacement type, equipped with inlet particulate filter, outlet silencer, explosion proof motor with motor control and protection devices (such as high motor temperature shutdown); used for dual phase extraction
Primary & Secondary Liquid/Vapor Separators	250 gallons with an approximately 150 gallon liquid holding capacity	Carbon steel; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in the vessel; used for liquid and vapor separation
Thermal Oxidation Unit	1,000 cfm	Catalytic ready thermal oxidation system; oxidize the soil vapor using propane as a supplemental fuel; used for vapor stream abatement
Liquid Transfer Pumps	40 gpm	3 HP, centrifugal type, at maximum discharge pressure of 50 psig
Demulsifier Pump	Adjustable flow rate < 1 gpm	Electrical or water turbine powered
Receiving Tank	500 gallons	Carbon steel type; closed top; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in the tank; used to allow the free-phase hydrocarbons and emulsions to coalesce and separate from the air- and water-phase by gravity
Oil/Water Separator	300 gallons	50 gpm capacity; capable of removing 15 microns or greater in diameter oil droplets; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in vessel; used for free product and water separation
Product Holding Tank	500 gallons	Carbon steel type; 500 gallon minimum capacity; entire system shutdown at high liquid level in the tank; used to hold recovered free product pending disposal
Equalization Tank	300 gallons	Carbon steel type; closed top; operated at high and low level for water pumpout; entire system shutdown at high-high liquid level in the tank; used to capture any free-phase hydrocarbons not removed by the oil/water separator
Particulate Filters	50 gpm (total)	Vessels are pressure rated (150 psi max.); 160 gpm capacity; bag type filters; units operated in parallel; used to remove particulates 10 microns or greater in diameter
Liquid-Phase Granular Activated Carbon (GAC) Units	50 gpm (total)	50 gpm capacity; vessels are pressure rated (75 psig max.); containing approximately 2,000 pounds of activated carbon; units operated in parallel; used for abatement of extracted water
Clean Water Holding Tank	6,900 gallons	Polyethylene type; 6,900 gallon holding capacity; closed top; entire system shutdown at high liquid level in tank; used to hold treated (clean) water pending disposal

*cfm denotes cubic feet per minute.*

*gpm denotes gallon(s) per minute.*

*Hg denotes mercury.*

*HP denotes horsepower.*

*psig denotes pound(s) per square inch gauge.*

**Table 3**  
**Major Equipment for Dual Vacuum Extraction Field Pilot Test, Parcel 37**

<b>Equipment</b>	<b>Capacity/Size</b>	<b>Physical Description/Operating Characteristics</b>
Vacuum Blower	1,000 cfm at 12 inches Hg (maximum)	75 HP positive displacement type, equipped with inlet particulate filter, outlet silencer, explosion proof motor with motor control and protection devices (such as high motor temperature shutdown); used for dual phase extraction
Primary & Secondary Liquid/Vapor Separators	250 gallons with an approximately 150 gallon liquid holding capacity	Carbon steel; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in the vessel; used for liquid and vapor separation
Vapor-Phase Granular Activated Carbon (GAC) Units	1,000 cfm	Vessels are vacuum rated; containing approximately 5,000 pounds of activated carbon; units operated in parallel; used for abatement of recovered vapor stream
Liquid Transfer Pumps	40 gpm	3 HP, centrifugal type, at maximum discharge pressure of 50 psig
Demulsifier Pump	Adjustable flow rate < 1 gpm	Electrical or water turbine powered
Receiving Tank	500 gallons	Carbon steel type; closed top; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in the tank; used to allow the free-phase hydrocarbons and emulsions to coalesce and separate from the air- and water-phase by gravity
Oil/Water Separator	300 gallons	50 gpm capacity; capable of removing 15 microns or greater in diameter oil droplets; operated at high and low level for liquid pumpout; entire system shutdown at high-high liquid level in vessel; used for free product and water separation
Product Holding Tank	500 gallons	Carbon steel type; 500 gallon minimum capacity; entire system shutdown at high liquid level in the tank; used to hold recovered free product pending disposal
Equalization Tank	300 gallons	Carbon steel type; closed top; operated at high and low level for water pumpout; entire system shutdown at high-high liquid level in the tank; used to capture any free-phase hydrocarbons not removed by the oil/water separator
Particulate Filters	50 gpm (total)	Vessels are pressure rated (150 psi max.); 160 gpm capacity; bag type filters; units operated in parallel; used to remove particulates 10 microns or greater in diameter
Liquid-Phase Granular Activated Carbon (GAC) Units	50 gpm (total)	50 gpm capacity; vessels are pressure rated (75 psig max.); containing approximately 2,000 pounds of activated carbon; units operated in parallel; used for abatement of extracted water
Clean Water Holding Tank	6,900 gallons	Polyethylene type; 6,900 gallon holding capacity; closed top; entire system shutdown at high liquid level in tank; used to hold treated (clean) water pending disposal

*cfm denotes cubic feet per minute  
gpm denotes gallon(s) per minute  
Hg denotes mercury  
HP denotes horsepower  
psig denotes pound(s) per square inch gauge*

**Table 4  
Preliminary Waste Information<sup>1</sup>**

Waste Description	Accumulation Methods <sup>2</sup>	Preliminary Characterizations <sup>3</sup>	Profiles & Manifests <sup>4</sup>	Labels & Placards <sup>5</sup>	Transportation Methods	Disposal/Recycle Methods
Soil from piezometer and collection trench cuttings	Sift-proof, HDPE-lined roll-off bin containers	Nonhazardous waste solid, not DOT regulated; or California non-RCRA-hazardous waste; DOT Class 9, UN3077, HAZMAT (most probable); or RCRA-hazardous waste; DOT Class 3, UN1863, HAZMAT	Profile package; and Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous waste labels; California hazardous waste labels; and Class 9, UN3077 labels and placards (most probable); or Class 3, UN1863 labels and placards	Sift-proof roll-off bin on van truck	Direct California Class II landfill (if nonhazardous) Direct California Class I landfill (if not RCRA-regulated); or Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Rinse water and extracted waste water <sup>6</sup>	Liquid storage tanks; or UN1A2 open-head drums	Not regulated by EPA or DTSC; Not regulated by DOT (most probable)	Profile package and nonhazardous waste certification; and Nonhazardous waste manifest package	Nonhazardous waste labels	Vacuum tanker truck Stake bed or van truck (if packaged in drums)	Redistillation followed by carbon desorption and nonhazardous California Class II disposal
Petroleum product (not anticipated but included here for completeness)	Liquid storage tank or UN1A2 open-head drums	Non-RCRA-hazardous waste; not regulated by DOT RCRA-hazardous waste; DOT Class 3, UN1993 Nonhazardous waste liquid	Profile package; and California hazardous waste manifest and LDR package Nonhazardous waste manifest	California hazardous waste label Class 3, UN1863 labels and placards Nonhazardous waste labels	Vacuum tanker truck Stake bed or van truck (if packaged in drums)	Fuels blending
Spent carbon	UN1A2 open-head drum	California non-RCRA-hazardous waste; not regulated by DOT	Profile package California hazardous waste manifest and LDR package	California hazardous waste label	Stake bed or van truck	Regeneration
PPE (do not co-mingle with soil)	UN13H super-sacks; or UN1A2 open-head drums	Nonhazardous waste solid California non-RCRA hazardous waste; Not regulated by DOT	Profile package Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous labels California hazardous waste labels	Stake bed or van truck (if nonpumpable and packaged in drums)	Direct California Class I landfill (if not RCRA-regulated) Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Spent Particulate Bag Filters	UN1A2 open-head drums	Nonhazardous waste solid	Profile package	Nonhazardous labels	Stake bed or van truck (if nonpumpable and packaged in drums)	Direct California Class II landfill (if nonhazardous)

- 1 Information presented in Table 4 was prepared based on information provided in the Sampling and Analysis Plan.
- 2 Written accumulation procedures are presented in Section 5.3.
- 3 Written characterization procedures are presented in Section 5.5.
- 4 Written profiling and manifesting procedures are presented in Sections 5.6 and 5.8, respectively.
- 5 Written shipment preparation procedures are presented in Section 5.7.
- 6 Wastewater may be disposed of at the on-site treatment plant.
- 7 DOT denotes Department of Transportation.
- 8 DTSC denotes Department of Toxic Substance Control.
- 9 EPA denotes U.S. Environmental Protection Agency.
- 10 HAZMAT denotes hazardous materials.
- 11 HDPE denotes high-density polyethylene.
- 12 LDR denotes land disposal restriction.
- 13 RCRA denotes Resource Conservation and Recovery Act.
- 14 UN denotes United Nations.

**Table 5**  
**Sampling and Analysis Summary—Site 7 and Parcel 37**

Sample Matrix	Number of Samples (per Site)	Number of QC Samples (Per Site)	Analytical Method Measurement	Description
<b>Phase 1: Contaminant Delineation</b>				
Groundwater	1	One trip blank	VOCs (EPA 5030/8260B)	Sample from piezometer with free product.
Free Product	1	None	TPH fingerprint (EPA 8015B) Viscosity, density, and specific gravity (ASTM D445)	Sample from piezometer
Water—Rinsate and development	1	None	TPH full range (EPA 8015B) Metals (EPA 6010B/7000)	One composite sample for TPH and metals analysis. One discrete sample for VOCs analysis.
	1		VOCs (EPA 8260B)	
<b>Phase 2: DVE Pilot Test</b>				
Vapor—Influent —Stack	Up to 15	None	TVPH (EPA TO-3)	Only one sample analyzed for VOCs
	1		VOCs (EPA TO-14)	
Groundwater —Influent	4	None	TPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Only one sample analyzed for VOCs and metals
	1			
Groundwater —Effluent	4	Three (3) trip blanks, analyzed only if TPH or VOCs are detected in the effluent.	TPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Only one sample analyzed for metals
	1			
Free Product —Recovered	1	None	TPH (EPA 8015B) Metals (EPA 6010B/7000) Flash Point (EPA 1010) TOX (EPA 9020B)	Sample from waste oil holding tank
Soil—Cuttings	2	None	TPH (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	Discrete grab samples for VOCs analysis. Composite samples for all other analyses.
	2			
<b>Phase 3: Full-Scale Construction, Operations, and Closure</b>				
Vapor—Influent —Stack	8	None	TVPH (EPA TO-3)	Only one sample analyzed for VOCs.
	1		VOCs (EPA TO-14)	
Groundwater —Influent	6	None	TPH (EPA 8015B) VOCs (EPA 8260B)	Only one sample analyzed for VOCs.
	1			

**Table 5 (continued)**  
**Sampling and Analysis Summary—Site 7 and Parcel 37**

Sample Matrix	Number of Samples (per Site)	Number of QC Samples (Per Site)	Analytical Method Measurement	Description
<b>Phase 3: Full-Scale Construction, Operations, and Closure (Continued)</b>				
Groundwater —Effluent	6	Six (6) trip blanks, only analyzed if TPH or VOCs are detected in the effluent.	TPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Only one sample analyzed for metals.
	1			
Spent GAC —Vapor Phase	1	None	TPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1)	One composite sample
Spent GAC —Liquid Phase	1	None	TPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1)	One composite sample
Sludge (OWS, LV/S, Tank Bottoms)	1	None	TPH (EPA 8015B) Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	One discrete grab sample for VOCs analysis. One composite sample for all other analyses.
	1			
Free Product —Recovered	1	None	TPH (EPA 8015B) Metals (EPA 6010B/7000) Flash Point (EPA 1010) TOX (EPA 9020B)	
Soil—Cuttings	4	None	TPH (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	Discrete grab samples for VOCs analysis. Composite samples for all other analyses.
	4			

**Table 5 (continued)**  
**Sampling and Analysis Summary—Site 7 and Parcel 37**

Sample Matrix	Number of Samples (per Site)	Number of QC Samples (Per Site)	Analytical Method Measurement	Description
<b>Phase 4: Demobilization</b>				
Water —Decontamination and Rinsate	1	None	TPH (EPA 8015B) Metals (EPA 6010B/7000) VOCs (EPA 8260B)	One composite sample for TPH and metals analysis. One discrete sample for VOCs analysis.
Sludge (OWS, LV/S, Tank Bottoms)	1	None	TPH (EPA 8015B) Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	One discrete grab sample for VOCs analysis. One composite sample for all other analyses.

**FINAL**  
**PROJECT QUALITY CONTROL PLAN**  
**FUEL REMEDIATION MEASURES**  
**IR SITE 7 AND PARCEL 37**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

**Environmental Remedial Action**  
**Contract Number N62474-98-D-2076**  
**Contract Task Order 0013**

**Document Control Number 1538**  
**Revision 1**

**August 1, 2001**

Submitted to:

Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
Environmental Division  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_

Date: \_\_\_\_\_

Controlled

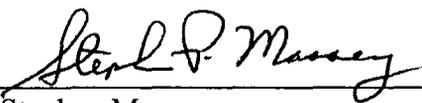
Uncontrolled

**FINAL  
PROJECT QUALITY CONTROL PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

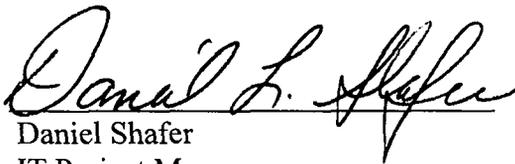
**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Approved by:   
Stephen Massey  
IT Program Quality Control Manager

Date: August 1, 2001

Approved by:   
Daniel Shafer  
IT Project Manager

Date: August 1, 2001

## **Table of Contents**

---

List of Appendices .....	i
Acronyms and Abbreviations .....	ii
1.0 Introduction .....	1-1
2.0 Quality Control Program Plan .....	2-1
3.0 Procedures .....	3-1
3.1 Standard Quality Procedures .....	3-1
3.2 Standard Operating Procedures .....	3-1
4.0 References .....	4-1

## **List of Appendices**

---

Appendix A	Project QC Manager Letter of Designation
Appendix B	Alternate Project QC Manager Letter of Designation
Appendix C	Definable Features of Work Matrix
Appendix D	Testing Plan and Log
Appendix E	Submittal Register
Appendix F	Quality Control Organization Chart

## **Acronyms and Abbreviations**

---

IT	IT Corporation
PQCP	Project Quality Control Plan
QC	Quality Control
QCPP	Quality Control Program Plan
SOP	Standard Operating Procedures
SQP	Standard Quality Procedures

## **1.0 Introduction**

---

This Project Quality Control Plan (PQCP) has been prepared to describe the quality control (QC) actions that IT Corporation (IT) will implement during the Free Product Removal at IR Site 7 and Parcel 37.

This PQCP will be used in conjunction with the Quality Control Program Plan (QCPP) that IT has prepared for work under Environmental Remedial Action Contract No. N62474-98-D-2076 (IT, 2000a), and with IT Standard Quality Procedures (SQP)/Standard Operating Procedures (SOP) (IT,2000b), as applicable. Section 2.0 of this PQCP describes the portions of the QCPP that are applicable to this project and any site-specific modifications to the QCPP that are required. Section 3.0 of this PQCP lists the IT SQPs and SOPs that are applicable. Appendices A through F present the following supporting documentation for the site-specific QC activities that IT will perform throughout the execution of this project:

- Appendix A – Project QC Manager Letter of Designation
- Appendix B – Alternate Project QC Manager Letter of Designation
- Appendix C – Definable Features of Work Matrix
- Appendix D – Testing Plan and Log
- Appendix E – Submittal Register
- Appendix F – Quality Control Organization Chart

## 2.0 Quality Control Program Plan

---

The following portions of the QCPP are applicable to the work conducted under this project, with modifications as noted:

- Management Policy Statement: applicable in its entirety
- Section 1.0—Introduction: applicable in its entirety
- Section 2.0—Organization and Responsibilities: applicable with the following modifications:
  - Add to Section 2.0: The QC organization for this CTO will be as shown in Appendix F, Quality Control Organization Chart.
- Section 3.0—Quality Control Management: applicable in its entirety
- Section 5.0—Instructions, Procedures, and Drawings: applicable in its entirety
- Section 6.0—Document Control: applicable in its entirety
- Section 7.0—Procurement: applicable in its entirety
- Section 8.0—Chemical Data Quality: applicable in its entirety
- Section 9.0—Field Sampling: applicable as described in the Sampling and Analysis Plan
- Section 10.0—Laboratory Analysis: applicable as described in the Sampling and Analysis Plan
- Section 11.0—Report Preparation: applicable in its entirety
- Section 12.0—Review of Work Activities: applicable in its entirety
- Section 13.0—Inspections: applicable in its entirety
- Section 14.0—Calibration and Maintenance of Measuring and Test Equipment: applicable in its entirety
- Section 15.0—Test Control: applicable in its entirety
- Section 16.0—Nonconformance Control and Corrective Actions: applicable in its entirety
- Section 17.0—Change Control: not applicable. Refer to the working draft project management guidelines.
- Section 18.0—Audits and Surveillance: applicable with the following modification: Subsections 18.1 through 18.8 do not apply
- Section 19.0—Records Management: applicable in its entirety

## **3.0 Procedures**

---

### **3.1 Standard Quality Procedures**

The following IT SQPs have been determined to be applicable to this project:

- SQP 1.1—Contractor Quality Control Program
- SQP 3.2—Indoctrination and Training
- SQP 4.1—Document Control
- SQP 4.2—Records Management
- SQP 5.1—Preparation, Revision, and Approval of Plans and Procedures
- SQP 6.1—Preparation, Review, and Approval of Procurement Documents
- SQP 7.1—Quality Inspections and Inspection Records
- SQP 7.2—Receipt Inspection
- SQP 8.2—Calibration and Maintenance of Measuring and Test Equipment
- SQP 9.1—Control of Tests
- SQP 10.1—Nonconformance Control
- SQP 10.2—Corrective Action
- SQP 10.3—Stop Work Order
- SQP 12.1—Quality Audits
- SQP 12.3—Quality Surveillances
- SQP 13.1—Coordination of Subcontracted Analytical Laboratories

### **3.2 Standard Operating Procedures**

The following IT SOPs have been determined to be applicable to this project:

- SOP 1.1—Chain of Custody
- SOP 2.1—Sample Handling, Packaging, and Shipping
- SOP 3.1—Surface and Shallow Subsurface Soil Sampling
- SOP 5.1—Water Level Measurements in Monitoring Wells
- SOP 5.2—Nonaqueous Phase Liquid Measurements in Monitoring Wells
- SOP 6.1—Sampling Equipment and Well Material Decontamination
- SOP 6.2—Drilling and Heavy Equipment Decontamination
- SOP 7.1—Surface and Subsurface Geophysics
- SOP 8.1—Monitoring Well Installation
- SOP 8.3—Borehole and Well Abandonment
- SOP 9.1—Groundwater Sampling
- SOP 10.2—Cone Penetration Testing and Hydropunch Groundwater Sampling
- SOP 12.1—Soil Stockpiling
- SOP 17.1—Sample Labeling

- SOP 17.2—Sample Numbering
- SOP 18.1—Field QC Sampling
- SOP 19.1—On-Site Sample Storage
- SOP 23.1—Land Surveying

## 4.0 References

---

IT Corporation, 2000a, *Quality Control Program Plan for Environmental Remedial Actions*, Contract No. N62474-98-D-2076, Revision 0, August.

IT Corporation, 2000b, *IT Standard Quality Procedures and Standard Operating Procedures Manual*, Revision 2, August.

**APPENDIX A**  
**PROJECT QC MANAGER LETTER OF DESIGNATION**

FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
CONTRACT TASK ORDER 0013

PROJECT QC MANAGER  
LETTER OF DESIGNATION

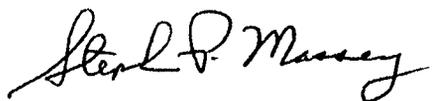
AUGUST 1, 2001

Mr. Charles Holman,

This letter will serve to assign you as the IT Corporation (IT) Project Quality Control (QC) Manager for the above captioned contract task order. In the event that you are not able to perform the Project QC Manager's duties, Mr. Eric Watabayashi or Ms. Robyn Matsumoto will serve as your Alternate Project QC Manager. In the role of Project QC Manager, you have the responsibilities and authorities designated in section 2.1.3 of the Quality Control Program Plan (QCPP). Additionally, you are granted stop work authority and will exercise this authority consistent with the QCPP, section 16.4 and Standard Quality Procedure (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified in the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. In this capacity you will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,  
IT CORPORATION



Stephen Massey  
Program QC Manager

**APPENDIX B**  
**ALTERNATE PROJECT QC MANAGER LETTER OF DESIGNATION**

FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
CONTRACT TASK ORDER 0013

ALTERNATE PROJECT QC MANAGER  
LETTER OF DESIGNATION

AUGUST 1, 2001

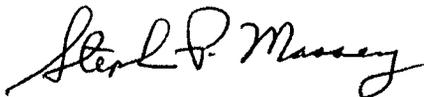
Mr. Eric Watabayashi,

This letter will serve to assign you as the IT Corporation (IT) Alternate Project Quality Control (QC) Manager for the above captioned contract task order. In the event that the designated Project QC Manager, Mr. Charles Holman, is unable to perform the Project QC Manager's duties, you will serve in that capacity. In this role, you will have the responsibilities and authorities designated in section 2.1.3 of the Quality Control Program Plan (QCPP).

Additionally, you will have stop work authority and will exercise this authority consistent with the QCPP, section 16.4 and Standard Quality Procedure (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified on the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. You will be authorized to act as an alternate for 14 consecutive working days or 30 non-consecutive working days at a maximum. You will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,  
IT CORPORATION



Stephen Massey  
Program QC Manager

FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
CONTRACT TASK ORDER 0013

ALTERNATE PROJECT QC MANAGER  
LETTER OF DESIGNATION

AUGUST 1, 2001

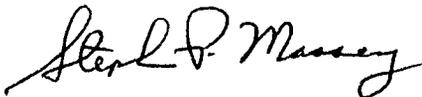
Ms. Robyn Matsumoto,

This letter will serve to assign you as the IT Corporation (IT) Alternate Project Quality Control (QC) Manager for the above captioned contract task order. In the event that the designated Project QC Manager, Mr. Charles Holman, is unable to perform the Project QC Manager's duties, you will serve in that capacity. In this role, you will have the responsibilities and authorities designated in section 2.1.3 of the Quality Control Program Plan (QCPP).

Additionally, you will have stop work authority and will exercise this authority consistent with the QCPP, section 16.4 and Standard Quality Procedure (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified on the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. You will be authorized to act as an alternate for 14 consecutive working days or 30 non-consecutive working days at a maximum. You will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,  
IT CORPORATION



Stephen Massey  
Program QC Manager

**APPENDIX C**  
**DEFINABLE FEATURES OF WORK MATRIX**

**PROJECT QUALITY CONTROL PLAN**  
**Fuel Remediation Measures, Site 7 and Parcel 37**  
**Alameda Point, Alameda CA**  
**Contract Task Order No. 0013**

**DEFINABLE FEATURES OF WORK MATRIX**

Specification Section	Paragraph No.	Feature of Work	Prep		Initial		Follow up	Remarks
			Req.	Date	Req.	Date	Req.	
Work Plan	4.1	Utility Location and Site Surveying	X		X		X	
Work Plan	4.2	Free Product Delineation	X		X		X	
Work Plan	4.3	Piezometer Installation and Monitoring	X		X		X	
Work Plan	4.4, 4.5, 4.6, 4.7	DVE Pilot System Construction and Operation	X		X		X	
Work Plan	4.8	DVE System Construction	X		X		X	
Work Plan	5.0	Waste Management	X		X		X	

*DVE denotes Dual Vapor Extraction*

**APPENDIX D  
TESTING PLAN AND LOG**

## TESTING PLAN AND LOG

Contract No. N62474-98-D-2076 Contract Task Order No. 0013		Fuel Remediation Measures, Site 7 and Parcel 37 Alameda Point, Alameda CA Contract Task Order No. 0013					CONTRACTOR IT Corporation				
SPECIFICATION SECTION AND PARAGRAPH NUMBER	TEST PROCEDURE	TEST NAME	ACCREDITED/ APPROVED LAB		SAMPLED BY	LOCATION OF TEST		FREQUENCY Of TEST	DATE COMPLETE	DATE FORWARDED TO CONTR. OFF	REMARKS
			YES	NO		ON SITE	OFF SITE				
**											

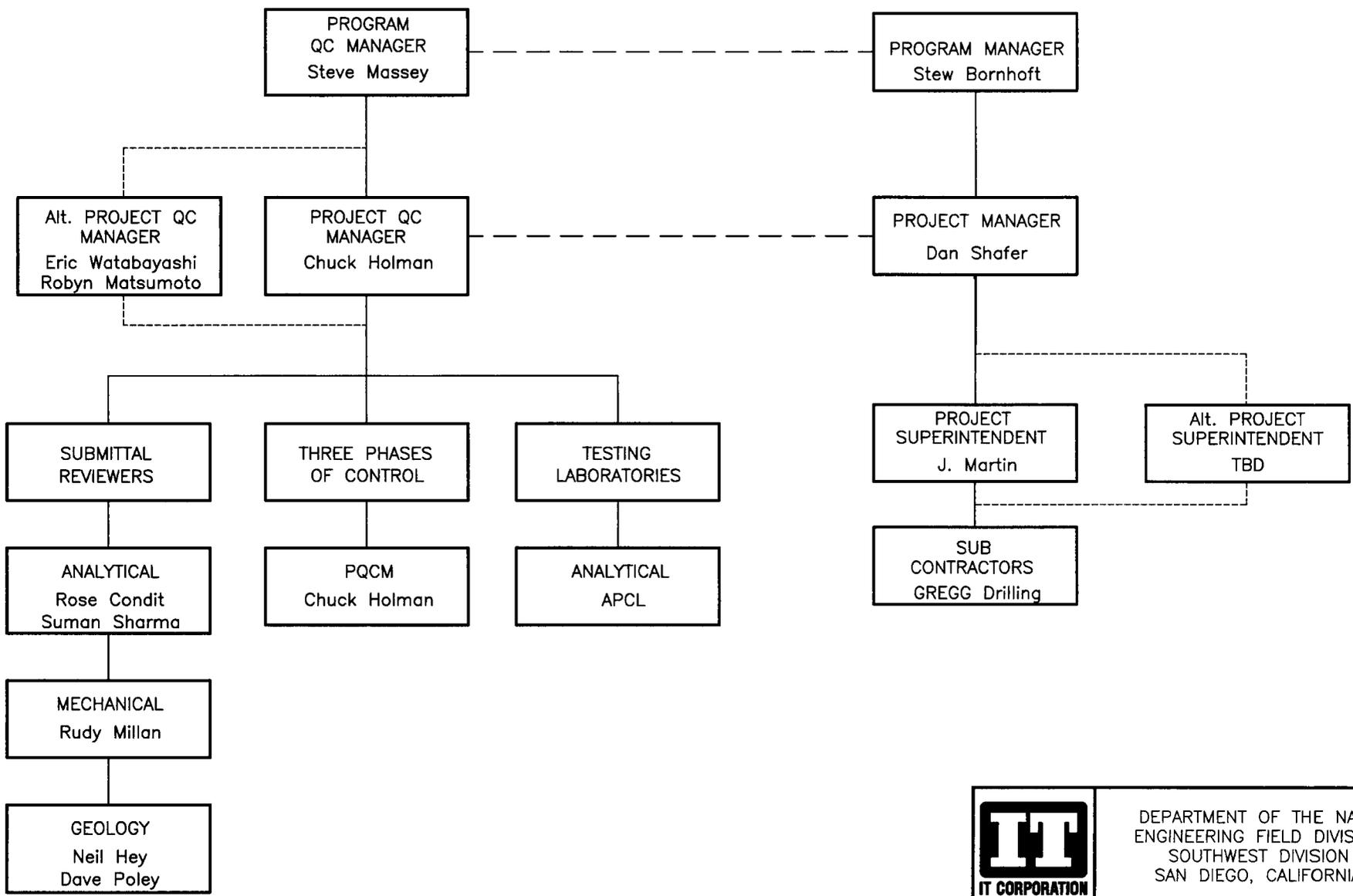
*\*\* No testing activities have been identified for field activities under this CTO*

**APPENDIX E  
SUBMITTAL REGISTER**



**APPENDIX F**  
**QUALITY CONTROL ORGANIZATION CHART**

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	Concord	SJZ	7/30/01	EW	7/30/01	DLS	7/30/01	807181-A21



 <b>ITT CORPORATION</b>	DEPARTMENT OF THE NAVY ENGINEERING FIELD DIVISION SOUTHWEST DIVISION SAN DIEGO, CALIFORNIA
	QUALITY CONTROL ORGANIZATION CHART FUEL REMEDIATION MEASURES SITE 7 AND PARCEL 37 CTO 13 ALAMEDA POINT ALAMEDA, CALIFORNIA

**FINAL  
SAMPLING AND ANALYSIS PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
Environmental Division  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_ Date: \_\_\_\_\_

Controlled

Uncontrolled

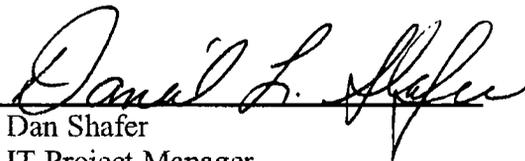
**FINAL  
SAMPLING AND ANALYSIS PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

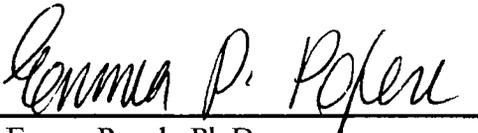
Approved by:

  
Dan Shafer  
IT Project Manager

Date:

August 1, 2001

Approved by:

  
Emma Popek, Ph.D.  
IT Program Chemist

Date:

8-1-01

N00236.000189  
ALAMEDA POINT  
SSIC NO. 5090.3

FINAL  
SAMPLING AND ANALYSIS PLAN ADDENDUM #2  
SUPPLEMENTAL CORRECTIVE ACTION  
CORRECTIVE ACTION AREA 6, PARCEL 37

DATED 06 MARCH 2007

IS FILED AS ADMINISTRATIVE RECORD NO.  
**N00236.002729**

# **Master Table of Contents**

---

## **Introduction**

**Part I           Field Sampling Plan**

**Part II           Quality Assurance Project Plan**

## 1.0 Introduction

---

IT Corporation (IT) has prepared this Sampling and Analysis Plan (SAP) to address requirements for sampling and analysis in support of constructing and operating a Dual Vacuum Extraction (DVE) system at Site 7 and Parcel 37, located on Alameda Point, Alameda, California. The objective of the work, performed under the Contract Task Order (CTO), is to remove residual free product from the groundwater surface beneath Site 7 and Parcel 37.

This work will be conducted under CTO No. 0013 of Naval Facilities Engineering Command Engineering Field Activity (EFA) Environmental Remedial Action Contract No. N62474-98-D-2076.

This SAP consists of two parts: Part I, Field Sampling Plan (FSP) and Part II, Quality Assurance Project Plan (QAPP). The FSP guides all field data collection work by defining in detail the field sampling activities that the IT team will perform and the data gathering methods that the team will use. The FSP addresses the following issues:

- Frequency of sample collection and the sampling locations
- Number and purpose of samples to be collected
- Number and type of field quality control (QC) samples
- Equipment decontamination procedures
- Disposal procedures for contaminated materials
- Analytical methods to be used
- Chain-of-custody (COC) procedures and field documentation
- Sample preservation, packaging, and shipment procedures

The QAPP defines the data quality objectives (DQOs), QC and quality assurance (QA) activities, and procedures that the IT team, including subcontract laboratories, will follow to achieve project data quality goals. The quality-related issues are detailed in the following QAPP elements:

- Project management
- Measurement/data acquisition
- Assessment/oversight
- Data validation and usability

This SAP complies with the requirements of the following documents:

- U.S. Environmental Protection Agency, 2000, *Guidance for Data Quality Objectives Process*, EPA QA/G-4.
- U.S. Environmental Protection Agency, November 1999, *Requirements for Quality Assurance Project Plans*, EPA QA/R-5.
- Naval Facilities Engineering Command, September 1999, *Navy Installation Restoration Chemical Data Quality Manual (IR CDQM)*.
- U.S. Navy Southwest Division Naval Facilities Engineering Command, Southwest Division, October 1999, *Environmental Work Instruction 4EN.2*.
- IT Corporation, August 2000, *Quality Control Program Plan for Environmental Remedial Actions Contract No. N62474-98-D-2076*.

This SAP is a controlled document distributed by IT to all members of the project team. It is required reading for all staff participating in the data collection and it will be in the possession of the field teams and of the laboratories performing analytical work.

**FINAL  
FIELD SAMPLING PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
Environmental Division  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_ Date: \_\_\_\_\_

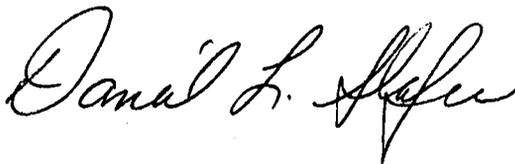
Controlled       Uncontrolled

FINAL  
FIELD SAMPLING PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA

Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013

Document Control Number 1538  
Revision 1

August 1, 2001



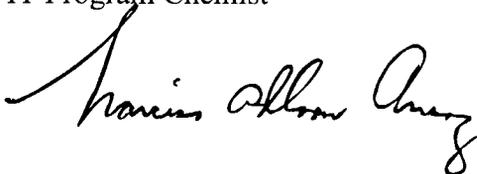
Approved by: \_\_\_\_\_  
Dan Shafer  
IT Project Manager

Date: August 1, 2001



Approved by: \_\_\_\_\_  
Emma Popek, Ph.D.  
IT Program Chemist

Date: August 1, 2001



Approved by: \_\_\_\_\_  
Nars Ancog  
US Navy Quality Assurance Officer

Date: 01 AUG 01

# Table of Contents

---

Table of Contents.....	i
List of Figures.....	ii
List of Tables.....	ii
Acronyms and Abbreviations.....	iii
1.0 Introduction.....	1-1
1.1 Project Purpose and Scope .....	1-1
1.2 Sampling Objectives .....	1-3
2.0 Site History and Background .....	2-1
3.0 Site Map .....	3-1
4.0 Sampling Strategy .....	4-1
4.1 Groundwater Characterization .....	4-1
4.2 Vapor Sampling .....	4-2
4.3 DVE Process Water Sampling .....	4-3
4.3.1 Treated Water Permit Requirements .....	4-3
4.3.2 Operational Sampling .....	4-4
4.4 Waste Streams Sampling.....	4-5
4.4.1 Personal Protective Equipment.....	4-5
4.4.2 Sludge.....	4-6
4.4.3 Soil Cuttings from Piezometer Installations.....	4-6
4.4.4 Wastewater .....	4-6
4.4.5 Recovered Free-Phase Product.....	4-7
4.4.6 Spent GAC.....	4-7
4.5 Sampling Summary.....	4-7
5.0 Analytical Requirements and Quality Control .....	5-1
5.1 Analytical Methods.....	5-1
5.2 Sample Containers, Preservatives, and Holding Times .....	5-2
5.3 Field Quality Control Samples.....	5-2
5.3.1 Trip Blanks.....	5-2
5.3.2 Temperature Blanks.....	5-3
5.4 Laboratory Quality Control Samples .....	5-3
6.0 Field Methods and Sampling Procedures.....	6-1
6.1 Groundwater Sampling Procedures .....	6-1
6.2 Wastewater Sampling Procedure.....	6-2
6.3 Waste Soil Sampling Procedure .....	6-3
6.4 Vapor Sampling Procedure .....	6-3
6.5 DVE Process Water Sampling .....	6-4
6.6 Free Product Sampling .....	6-4
6.7 Photoionization Detector Operation .....	6-5
6.8 Decontamination Procedure.....	6-5
6.9 Sample Numbering .....	6-6
6.10 Sample Labeling .....	6-6
6.11 Sample Packaging and Shipment.....	6-7

**Table of Contents (continued)**

---

6.12 Field Documentation ..... 6-8  
    6.12.1 Chain-of-Custody ..... 6-8  
    6.12.2 Field Logbooks..... 6-8  
    6.12.3 Document Corrections ..... 6-9  
7.0 References ..... 7-1

**List of Figures**

---

- Figure 1 Vicinity Map  
Figure 2 Proposed Collection Trench Layout—Site 7  
Figure 3 Proposed Collection Trench Layout—Former Loading Station, Parcel 37

**List of Tables**

---

- Table 1 Summary of Field Sampling and Analysis at Site 7  
Table 2 Summary of Field Sampling and Analysis Parcel 37  
Table 3 Sample Containers, Preservatives, and Holding Times

## Acronyms and Abbreviations

---

ASTM	American Society for Testing and Materials
°C	degrees Celsius
BAAQMD	Bay Area Air Quality Management District
BERM	Bureau of Environmental Regulation and Management
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
CAM	California Assessment Manual
COC	chain-of-custody
COD	chemical oxygen demand
CTO	Contract Task Order
DOT	Department of Transportation
DQO	data quality objectives
DVE	dual vacuum extraction
EBMUD	East Bay Municipal Utility District
EFA—West	Engineering Field Activity—West
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
FWS	fuel water separator
GAC	granular activated carbon
HCl	hydrochloric acid
HDPE	high-density polyethylene
HEM	Hexane Extractable Material
HNO <sub>3</sub>	nitric acid
IT	IT Corporation
mL	milliliter
mL/min	milliliter(s) per minute
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl tert-butyl ether
NADEP	Naval Aviation Depot
NPDES	National Pollution Discharge Elimination System
O&G	oil and grease
PCB	polychlorinated biphenyls
PID	photoionization detector
POTW	publicly-owned treatment works
PPE	personal protective equipment
ppmv	parts per million by volume
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	quality control
SAP	Sampling and Analysis Plan
SGT	Silica Gel treated
SHSP	Site Health and Safety Plan
SM	Standard Method
SOP	standard operating procedures
SOW	scope of work

## **Acronyms and Abbreviations (continued)**

---

SVOC	semivolatile organic compound
TEPH	Total Extractable Petroleum Hydrocarbons
T&D	transportation and disposal
TSS	total suspended solids
TO	toxic organic
TOX	total organic halides
TPH	total petroleum hydrocarbon
TtEMI	Tetra Tech EM, Inc.
TVPH	total volatile petroleum hydrocarbons
VOC	volatile organic compound

## **1.0 Introduction**

---

IT Corporation (IT) has prepared this Field Sampling Plan (FSP) to address requirements for sampling and analysis in support of the corrective action at Site 7 and Parcel 37, located on Alameda Point, Alameda, California. The goal of this project is to remove free product from the groundwater surface beneath the sites to the extent technically and economically practical.

This work will be conducted under Contract Task Order (CTO) 0013 of Naval Facilities Engineering Command Engineering Field Activity – West (EFA-West) Environmental Remedial Action Contract No. N62474-98-D-2076.

This FSP has been prepared as Part I of the Sampling and Analysis Plan (SAP) for the jet fuel corrective action at Site 7 and Parcel 37. The project data quality objectives (DQOs) are presented in the Quality Assurance Project Plan (QAPP), which constitutes Part II of the SAP.

### **1.1 Project Purpose and Scope**

Subsurface soil and groundwater at Site 7 contains gasoline and, at Parcel 37, jet propulsion fuel No. 5 (JP-5) in free product, dissolved and adsorbed phases. The purpose of this project is to remove free-phase product from the groundwater surface beneath Site 7 and Parcel 37. Dual Vacuum Extraction (DVE) has been proposed as an appropriate cost-effective technology for free-phase product recovery at this site. By constructing a limited-scale (pilot-scale) system and conducting a pilot test, IT will be able to verify DVE effectiveness, as well as establish optimal operating conditions for the full-scale systems. At the conclusion of the pilot test, the systems will be operated in the pilot-scale mode until the full-scale design has been completed and implemented.

All project activities have been divided according to their purpose into four phases as described below.

#### **Phase 1 – Contaminant Delineation**

To delineate the lateral extent of free product, approximately 30 temporary direct-push well piezometer points (piezometers) will be installed to depths of up to 10 feet. Drive points will determine the current extent of the free product prior to the installation of the horizontal extraction trenches. Approximately 15 locations are proposed for Site 7 and Parcel 37 each (30 total). The drive points will be installed in stages in step-out fashion. Decisions on the locations of the piezometers will be made in the field and are not identified in this plan.

Once the free product plume has been delineated, a baseline groundwater sampling event will be performed to confirm the contaminants of concern, to evaluate the free-phase and dissolved-phase product type and distribution, to optimize the treatment system design, and to aid in wastewater discharge permitting.

### ***Phase 2 – DVE Pilot Test***

A pilot-scale DVE system will be constructed at each site and pilot-tested for approximately one month; the system startup period will take one week. During pilot-scale operation, data will be collected and evaluated to design the full-scale systems.

### ***Phase 3 – Full Scale Construction, Operation and Closure***

Following approval of full-scale design documents, the systems will be expanded from the pilot-scale systems to include additional extraction wells. The full scale systems will be operated for three months.

### ***Phase 4 – Demobilization***

After a three months period of full scale operation, the systems will be dismantled, the wells will be abandoned and the sites will be restored to their original condition. All project-generated waste streams will be characterized and disposed of.

This FSP addresses the requirements for sampling and analysis during all four phases of project work. The primary objectives of the fieldwork described in this set of project plans are as follows:

- To determine the depths and types of geologic strata and construction materials present at the site in which the free product is present
- To delineate the lateral and vertical extent of free product
- To install piezometers and extraction wells
- To conduct a pilot test to verify the effectiveness of DVE
- To establish optimal operating conditions for the full-scale system
- To expand system from the pilot-scale to full-scale and operate system until removal of free phase product is completed

The scope of work (SOW) for this project consists of the following tasks:

- Install up to fifteen piezometers at the peripheries of the free product areas to aid in delineating the extent of free product (a total of thirty piezometers).

- Install optional step-out piezometers if the initial piezometers show the presence of free product; collect chemical data to document the dissolved phase concentrations of hydrocarbons at the outer limits of the free product areas at each site.
- Install pilot-scale DVE systems and conduct a pilot tests at each site.
- Design, install, and operate full-scale DVE systems at each site.
- Dispose of waste, such as soil cuttings, purge water from well installations, recovered free product, and spent granular activated carbon (GAC) at each site.
- Sample water treatment influent to determine recovery and GAC loading rates at each site.
- Sample vapor treatment system influent and effluent at each site for compliance with Bay Area Air Quality Management District (BAAQMD) permit requirements.
- Sample water treatment system influent and effluent at each site for compliance with Publicly Owned Treatment Works (POTW) wastewater discharge permit requirements.

The purpose of this FSP is to provide field sampling procedures and data gathering methods that will be used during the piezometer installations, the DVE system pilot-scale and full-scale operations, and waste disposal at Site 7 and Parcel 37. Field personnel will use this FSP as a reference during sampling activities.

## **1.2 Sampling Objectives**

The FSP has the following objectives:

- Provide a rationale for field sampling activities
- Describe the sampling strategy and design
- Describe and establish consistent field sampling procedures
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities

Various matrices will be sampled and analyzed to achieve the project objectives, such as soil, vapor, free product, and water. Analytical data collected under the provisions of this FSP at each site will be used for the following purposes:

- Provide a baseline characterization of the free-phase and dissolved-phase product and subsurface materials.
- Optimize the DVE system design.

- Establish operating parameters for a full-scale DVE system.
- Verify compliance with BAAQMD discharge permit requirements.
- Verify compliance with POTW discharge permit requirements.
- Estimate the volume and mass of free product removed from the subsurface in the vapor-phase and liquid-phase.
- Determine GAC loading rates.
- Dispose of derived waste.

## 2.0 Site History and Background

---

A detailed discussion of site locations, history, and previous investigations is presented in Section 2.0 of the Work Plan. An area location map is presented in Figure 1, "Vicinity Map." The DVE system wellfield layouts are presented in Figure 2, "Proposed Collection Trench Layout—Site 7" and Figure 3, "Proposed Collection Trench Layout—Parcel 37."

Site 7 consists of the former Alameda Point service station (Building 459) and the surrounding area, including an unpaved vacant lot to the north. The former service station, located at the corner of Main Street and West Tower Avenue, operated from 1966 to 1997. It included an auto repair shop, a small convenience store, and eight underground storage tanks (USTs).

Two USTs, located west of the pump islands, were abandoned in place due to leakage, date unknown. Underground piping associated with these two USTs were removed up to the edge of the excavation and capped. In 1987 an investigation was initiated at Site 7 and soil sample results identified petroleum hydrocarbon impact in all borings. Accumulated free product was identified near the two abandoned USTs west of the pump islands. In January 1995, two additional USTs and associated piping were removed. In February 1995, another UST was removed along with associated vent and product line piping from the northern area of Site 7. In November 1998, the remaining USTs, associated fuel lines, and pumps were removed.

Potential sources of contamination identified at Site 7 include USTs, fuel lines associated with the USTs, and pump islands. Other potential contamination sources include the industrial, sanitary, and storm sewer lines located around Site 7. Remedial investigations conducted at Site 7 included a soil gas survey in 1991 and soil, groundwater, and sediment sampling during Cone Penetrometer tests completed to investigate site lithology in the follow-up investigation. Contaminants of concern for Site 7 include gasoline, benzene, toluene, ethyl benzene, xylenes (BTEX), and possibly methyl tert-butyl ether (MTBE).

Parcel 37, also known as the fuel loading station, was previously used as a filling station for trucks used to service aircraft on base. In December 1998, one waste oil UST, one fuel drain vault, an oil interceptor pit, and an aboveground water separator system were removed. Work was also performed in the fuel loading station immediately south of the former USTs, and a roughly 300-foot diameter fuel plume centered around the southwest quadrant of the fuel loading station was identified during a Site Characterization and Analysis Penetrometer System (SCAPS) survey. A portion of this fuel hydrocarbon contamination was removed in January 1999, when

approximately 5,000 cubic yards of fuel hydrocarbon contaminated sandy soil was excavated from the fuel loading station area.

The SCAPS data for Parcel 37 reveal the presence of JP-5 in the form of free product and as a dissolved phase in the shallow groundwater at the site.

### **3.0 Site Map**

---

The maps showing the site locations and the proposed locations for piping layouts are presented in Figures 1, 2, and 3.

## **4.0 Sampling Strategy**

---

The project DQOs and sampling design are presented in Section 3.1 of the QAPP. This FSP section discusses the sampling and analysis strategy for product, water, air, and waste samples required to meet the project DQO. Procedures for sample collection and handling are discussed in Sections 5.0 and 6.0.

The Standard Operating Procedures (SOPs) referenced in these sections are part of IT Standard Quality Procedures and Standard Operating Procedures Manual (IT, 2000).

### **4.1 Groundwater Characterization**

This section addresses the requirements for baseline groundwater sampling that will be conducted during Phase 1, Contaminant Delineation. Prior to the pilot-scale system start-up, baseline sampling will be conducted to confirm the contaminants of concern, to evaluate the free-phase and dissolved-phase product type and distribution, and to optimize the treatment system design.

Prior to the baseline sampling event, IT field personnel will monitor all the piezometers and wells for water level and free-phase product using an oil/water interface probe. Visual confirmation for the presence and thickness of free-phase product will be performed using a disposable bailer. These measurements will be used to establish groundwater flow directions, hydraulic gradients, and the free-phase product distributions. This information will be used in determining the locations for sampling the groundwater.

The baseline event includes collecting one groundwater sample and one free-phase product sample per site for laboratory analysis. The free product and groundwater samples will allow the laboratory to determine the chemical and physical characteristics of free product and to estimate the highest possible concentration of dissolved contaminants in groundwater.

The groundwater samples from both sites will be analyzed for volatile organic compounds (VOCs), including MTBE and other oxygenated additives, by EPA Method 8260B. The free-phase product samples will be collected to establish the product type and properties. These product samples will be collected from piezometers and analyzed for the following parameters:

- TPH fingerprint by EPA Method 8015B
- Viscosity, density, and specific gravity by American Society for Testing and Materials (ASTM) D445

## 4.2 Vapor Sampling

Vapor sampling will be performed during both the pilot-scale and full-scale operations of the DVE system. The samples will be collected to provide data to aid in optimizing the DVE system design and operating parameters, to calculate the mass recovered in the vapor phase, and to verify compliance with the BAAQMD air discharge permit.

During the pilot-scale and full-scale operations, the extracted vapors will be treated through a thermal/catalytic oxidizer at Site 7 and Parcel 37, and a GAC adsorption system will be used to treat vapor, after which it will be discharged to the atmosphere. The DVE systems will require BAAQMD permits for vapor discharge, and these permits will be obtained before the start of the system operations. A typical BAAQMD permit for this type of system requires that the treatment influent be sampled and analyzed for specified organic constituents during the startup, and the effluent be monitored with a portable photoionization detector (PID) for the presence of organic vapors. A typical permit requires that during routine operations, both influent and effluent vapor streams of each GAC vessel be monitored daily with a PID for organic vapor presence and discharge permit compliance.

Daily vapor sampling will occur during the DVE system startup, pilot vacuum tests, and routine operations. The samples for laboratory analysis will be collected into passivated SUMMA™ canisters and the samples for field PID analysis will be collected into Tedlar™ bags. Pending review of the BAAQMD discharge permit, the treatment influent and effluent vapor streams will be sampled at each site and monitored at the following frequencies:

- **Pilot Test**

The influent vapor stream to the thermal or catalytic oxidizer and to the GAC vessel train will be sampled during a maximum vacuum test and each of the three planned step vacuum tests (25, 50 and 75 percent of the maximum vacuum). In addition, the effect of the extraction tubes positioning (6 inches below and 1-to-2 feet above the product/water surface inside the sumps) on the influent vapor stream may be tested by collecting additional vapor samples. Therefore, up to 12 influent samples per site may be analyzed for total volatile petroleum hydrocarbons (TVPH) by EPA Method TO-3. One sample per site will be collected from the stack and will be analyzed for VOCs by EPA Method TO-14A.

In conjunction with the testing and sampling, both the influent and effluent vapor streams of each GAC vessel will be monitored daily with a PID.

- **First Month of Operation**

One influent vapor sample to the thermal or catalytic oxidizer and to the GAC will be collected weekly over the remaining three weeks of the pilot test, and analyzed for TVPH by EPA Method TO-3. Both influent and effluent vapor streams of each

GAC vessel will be monitored daily for compliance with the BAAQMD discharge permit with a PID. However, upon BAAMQD review of actual measurements taken at the site during operations, the PID monitoring schedule may be changed based on the decline in organic emissions and/or demonstrated breakthrough rates of the GAC vessels.

- **Second Month**

One influent sample will be collected every two weeks and analyzed for TVPH by EPA Method TO-3. Two additional samples may be analyzed during the first week of the full scale operation. Both the influent and effluent vapor streams of each GAC vessel will be monitored with a PID daily or at the BAAQMD-approved monitoring schedule.

- **Third Month and Thereafter**

Influent vapor samples will be collected once a month and analyzed for TVPH by EPA Method TO-3. One stack sample will be analyzed for VOCs by EPA Method TO-14A. Both the influent and effluent vapor streams of each GAC vessel will be monitored with a PID daily or at the BAAQMD-approved monitoring schedule.

### **4.3 DVE Process Water Sampling**

DVE process water sampling will be performed during the pilot-scale and full-scale operations of the DVE system. The samples will be collected to provide data to aid in optimizing the system design and operating parameters, to calculate the mass of the dissolved-phase product recovered, and to verify compliance with the POTW wastewater discharge permit.

#### **4.3.1 Treated Water Permit Requirements**

During the pilot-scale and full-scale operations, extracted water at each site will be treated through a GAC absorption system. Prior to start of the DVE system operation, IT intends to obtain a wastewater discharge permit allowing the treated water effluent to be directly discharged to the local POTW. A typical POTW permit for this type of system requires that both the influent and effluent streams of the water treatment system be sampled twice during the startup week, biweekly during the first month, and monthly for the remaining period of operations. A typical analytical suite required for a POTW discharge permit consists of the following parameters:

- TPH as gasoline by EPA Method 8015B
- TPH as diesel and motor oil by EPA Method 8015B
- VOCs by EPA Method 8260B
- Semivolatile Organic Compounds (SVOCs) by EPA Method 8270C

- Total metals: arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, and zinc, by EPA Method(s) 200 Series
- Chemical oxygen demand (COD) by Standard Methods (SM) 5220D
- Total suspended solids (TSS) by EPA Method 160.2
- Total oil and grease (O&G) by EPA Method 1664 Hexane Extractable Material (HEM)
- Hydrocarbon O&G by EPA Method 1664 Hexane Extractable Material Silica Gel Treated (HEM-SGT)
- Total and amenable cyanide by EPA Methods 335.1 and 335.2
- Phenolics by EPA Method 420.1
- Pesticides and polychlorinated biphenyls (PCBs) by EPA Methods 8081A/8082
- pH by EPA Method 150.1
- Temperature (field test)

Pending review of the POTW discharge permit and startup sample results, the sampling frequency and analytical parameters may be increased or decreased.

#### **4.3.2 Operational Sampling**

In addition to the POTW discharge permit sampling requirements, the DVE process water streams will be sampled to aid in evaluating and optimizing the operations of the water treatment process. Influent and effluent water will be analyzed for the TPH and VOC concentrations to operational purposes. Metals indicated in the POTW permit will be determined in the influent water for the purpose of establishing the background metal concentrations. Effluent water will be analyzed for at a minimum for TPH, VOCs and metals for compliance with permit requirements. (Other analysis may be implemented as discussed in Section 4.2.1). Influent samples will be collected from a sampling port between the oil-water separator and the thermal or catalytic oxidizer and the GAC vessel train in each of the DVE systems. Effluent samples will be collected from a sampling port located at the outlet of the thermal or catalytic oxidizer and the liquid GAC vessel train of each of the DVE system.

During the pilot test period, four influent and four effluent samples (two pairs during the first week, one pair at the end of the second week, and one pair at the end of the month) will be collected per site and analyzed at a minimum for the following parameters:

- Site 7: TPH as gasoline by EPA Method 8015B

- Parcel 37: Total Extractable Petroleum Hydrocarbons (TEPH) by EPA Method 8015B
- Site 7 and Parcel 37: VOCs by EPA Method 8260B (only one influent sample analyzed for VOCs and all effluent samples)
- Site 7 and Parcel 37: Metals by EPA Methods 6010B/7000 (only one influent and one effluent sample analyzed for metals)

The metal analytes will be collected according to the POTW permit requirements. During full-scale operations of the DVE, six influent samples and six effluent samples (two pairs during the first week, one at the end of the second week, and monthly thereafter) will be collected per site and analyzed for the following parameters:

- Site 7: TPH as gasoline by EPA Method 8015B
- Parcel 37: TEPH by EPA Method 8015B
- Site 7 and Parcel 37: VOCs by EPA Method 8260B (only one influent sample analyzed for VOCs and all effluent samples)
- Site 7 and Parcel 37: Metals by EPA Methods 6010B/7000 (only one effluent sample analyzed for metals; no influent analysis)

#### **4.4 Waste Streams Sampling**

The project waste streams will consist of the following:

- Personal protective equipment
- Sludge
- Soil cuttings from piezometer installations
- Wastewater from well development
- Recovered free-phase product
- Spent GAC

##### **4.4.1 Personal Protective Equipment**

PPE will be used during the work and will be treated as disposable refuse. No samples will be required.

#### **4.4.2 Sludge**

Sludge will accumulate in the oil-water separator and tank bottoms of the DVE systems. One sludge sample will be collected from each site during full-scale operations and analyzed for the following disposal characterization parameters:

- TEPH by EPA Method 8015B
- California Assessment Manual Metals (CAM 17) by EPA Methods 6010B/7000
- VOCs by EPA Method 8260B
- Reactivity, corrosivity, and ignitability by SW-846 7.3, 9045, and 7.1, respectively

Discrete grab samples of sludge will be collected for VOC analysis and four-point composite sludge samples will be collected for all other analyses.

#### **4.4.3 Soil Cuttings from Piezometer Installations**

Soil cuttings will be stored in DOT-approved 55-gallon drums or roll-off bins. The soil cuttings from piezometer installations will be combined into one waste stream for each site. Two soil samples per site, representing the stream, will be collected during the pilot test and four soil samples per site will be collected during full-scale operations and analyzed for the following parameters to determine the disposal options:

- TEPH full range by EPA Method 8015B
- CAM17 metals by EPA Methods 6010B/7000
- VOCs by EPA Method 5035/8260B
- Reactivity, corrosivity, and ignitability by SW-846 7.3, 9045, and 7.1, respectively

Discrete grab samples will be collected for VOC analysis and four-point composite soil samples will be collected for all other analyses.

#### **4.4.4 Wastewater**

All wastewater generated during well development and equipment decontamination will be combined and stored in Department of Transportation (DOT) approved 55-gallon drums or poly-tanks. Within 90 days of the accumulation start date, the water will be treated by the DVE system and discharged to the local POTW. Should the DVE system not be operable to treat the water within 90 days of the accumulation start date, the waste water will be shipped off site for proper disposal. One water sample representing the wastewater will be collected per site and analyzed at a minimum for the following parameters to determine the disposal options:

- TEPH by EPA Method 8015B
- VOCs by EPA Method 8260B

- CAM17 metals by EPA Methods 6010B/7000

Further analysis may be required according to disposal facility.

#### **4.4.5 Recovered Free-Phase Product**

Free-phase product will be recovered from the subsurface during the pilot- and full-scale DVE system operations. It is planned to dispose of the recovered product by recycling at a permitted facility. One sample of the product stream will be collected per site during pilot test and one during full-scale operations and characterized per the selected recycling facility requirements. A typical analytical suite for petroleum products intended for recycling is as follows:

- TPH as gasoline by EPA Method 8015B
- TEPH by EPA Method 8015B
- Metals by EPA Method 6010B/7000
- Flash point by EPA Method 1010
- Total organic halides (TOX) by EPA Method 9020B

Pending review of the characterization requirements of the selected recycling facility, parameters may be added or removed from the analytical suite as required.

#### **4.4.6 Spent GAC**

Spent aqueous-phase type and vapor-phase type GAC will be produced during operations of the DVE system. The spent GAC will be recycled through reactivation at a permitted facility. The recycling facility will require a one-time composite sample of each GAC type be collected per site and analyzed for waste profiling. One GAC sample from each site will be analyzed for the following parameters:

- TPH as gasoline by EPA Method 8015B
- TEPH by EPA Method 8015B
- CAM 17 metals by EPA Methods 6010B/7000
- VOCs by EPA Method 8260B
- Reactivity, corrosivity, and ignitability by SW-846 7.3, 9045, and 7.1, respectively

### **4.5 Sampling Summary**

Table 1 presents a summary of sampling and analysis to be conducted at Site 7 over the course of project activities. Table 2 presents a summary of sampling and analysis to be conducted at Parcel 37 over the course of project activities.

## 5.0 Analytical Requirements and Quality Control

---

This section describes analytical methods, container and preservative requirements, and field and laboratory quality control (QC) samples.

### 5.1 Analytical Methods

The following analytical methods will be used to obtain the data for this project:

- ***EPA Test Methods for Evaluating Solid Waste, SW-846, Update III, 1996 (EPA, 1996)***
  - TPH as gasoline by EPA Method 8015B
  - TEPH by EPA Method 8015B
  - TPH fingerprinting by EPA Method 8015B
  - VOCs by EPA Method 8260B
  - Closed system purge and trap by EPA Method 5035
  - Metals by EPA Method 6010B/7000 series
  - TOX by EPA Method 9020B
  - Reactivity by SW-846 7.3
  - Corrosivity by SW-846 9045
  - Ignitability by SW-846 7.1
  - Flash point by EPA Method 1010
  - Additional methods may be as follows: semivolatile organic compounds (SVOCs) by EPA Method 8270C and pesticides/polychlorinated biphenyls (PCBs) by EPA Method 8081A/8082
- ***EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, 1999 (EPA, 1999)***
  - VOCs in air by EPA Method TO-14A
  - TVPH in air by modified EPA Method TO-3
- ***American Society for Testing and Materials, 2000 (ASTM, 2000)***
  - Viscosity, density, and specific gravity by ASTM D445

The following methods may be also used if required by the POTW:

- ***American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 1998 (APHA, 1998)***
  - Chemical oxygen demand (COD) by SM 5220D
  
- ***EPA Methods for Chemical Analysis of Water and Waste, 1983 (EPA, 1983)***
  - pH by EPA Method 150.1
  - Total oil and grease (O&G) by EPA Method 1664 HEM
  - Hydrocarbon O&G by EPA Method 1664 HEM-SGT
  - TSS by EPA Method 160.2
  - Total and amenable cyanide by EPA Methods 335.1 and 335.2
  - Phenolics by EPA Method 420.1
  - Metals by 200 series

Detailed information on methods, calibration criteria, project-required reporting limits, and QC acceptance criteria are presented in the QAPP.

## **5.2 Sample Containers, Preservatives, and Holding Times**

Sample containers for water will be certified precleaned according to EPA protocols. Table 3, “Sample Containers, Preservatives, and Holding Times,” lists the sample container, preservative, and holding time requirements for water, soil, product and vapor samples.

## **5.3 Field Quality Control Samples**

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples for this project will include trip blanks for water samples and temperature blanks.

### **5.3.1 Trip Blanks**

Each cooler containing water samples for VOC analysis will contain a trip blank. Trip blanks are 40 milliliter (mL) volatile organic analysis vials of organic-free water, which are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine if samples have been contaminated with VOCs during transportation or sample collection. One trip blank is needed for each day of sampling of groundwater for VOC analysis. Trip blanks will not be used with wastewater, product, or soil samples.

### **5.3.2 Temperature Blanks**

Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The laboratory will record the temperature of the temperature blank immediately upon receipt of the samples.

### **5.4 Laboratory Quality Control Samples**

The laboratory will analyze a matrix spike and matrix spike duplicate (MS/MSD) for every 20 project samples. For the laboratory to prepare a project-specific MS/MSD, field personnel will collect triple the sample volumes for water samples. Field personnel will designate one sample of groundwater for MS/MSD analysis on the chain-of-custody (COC) form. Waste and vapor samples will not be submitted as MS/MSD samples.

## 6.0 *Field Methods and Sampling Procedures*

---

This section describes field methods and sampling procedures, including water, vapor, and soil sampling; decontamination; sample handling; and documentation procedures.

The descriptions provided in this section summarize the important points of the IT SOPs included in the *IT Standard Quality Procedures and Standard Operating Procedures Manual*, August 2000. The manual will be kept on file at the job site for the field personnel's reference. Copies of the SOPs will be made available to the overseeing regulatory agency upon written request to the Navy Remedial Project Manager.

### 6.1 *Groundwater Sampling Procedures*

Groundwater will be sampled at one location per site in accordance with the procedures described in IT SOP 9.1. A summary of the low-flow sampling procedure is presented in this section.

The piezometers will be purged before sampling using peristaltic pumps and the low-flow micro-purging technique. After the piezometer has been installed and developed by the drilling subcontractor, each well will be micro-purged (300 to 500 milliliter/minute [mL/min]) using the following procedures:

1. Don appropriate personal protective equipment (PPE), following the Site Health and Safety Plan (SHSP) guidance.
2. Confirm the piezometer identification. Preferentially collect samples from wells with the lowest expected contaminant concentrations to the highest expected concentrations to minimize the potential for cross-contamination.
3. Calibrate field instruments in accordance with the manufacturers' directions. Record all calibration documentation in the field logbook or on the groundwater sampling log.
4. Measure the depth to water at each well using an electronic water level indicator probe. Record the water level measurement to the nearest 0.01 of a foot on the groundwater sampling log. Decontaminate the water level indicator before each measurement according to the procedure in Section 6.8.
5. **Carefully lower the intake to the pump into the well with as little disturbance to the groundwater as possible.** Place the intake to the pump at the middle of the screen interval. The pump speed will be set so that the water column in the well does not drop more than 0.2 feet below the initial water level reading.

6. Purge the piezometer at a flow rate of 300 to 500 mL/min. Monitor water quality parameters (turbidity, pH, temperature, conductivity, and dissolved oxygen) every 3 to 5 minutes during purging, using in-line monitoring equipment to increase the reading stability. Record the water quality parameters on the "Groundwater Sampling Log." If the water quality parameters are stable for three consecutive readings, collect samples for chemical analysis. Stabilization is achieved if successive readings are within  $\pm 0.1$  pH units,  $\pm 1$  degree Celsius ( $^{\circ}\text{C}$ ) for temperature,  $\pm 3$  percent for conductivity,  $\pm 10$  percent for dissolved oxygen. **Since these wells are not equipped with permanent sampling pumps, turbidity measurements will be collected but will not be used as a stabilization parameter.** If the water quality parameters have not stabilized, continue purging until stabilization occurs or three calculated well volumes have been purged.
7. Reduce the pump flow to a rate of less than 300 mL/min, and collect samples.
8. Fill the appropriate sample containers, shown in Table 3, from the pump discharge line.
9. Label, package, and prepare the samples for shipment to the laboratory in accordance with Section 6.10 and the IT SOPs 2.1, 17.1, and 17.2. Transfer the samples to cold storage immediately after collection.

## **6.2 Wastewater Sampling Procedure**

Wastewater samples from on-site storage tanks will be collected using a disposable bailer. Samples will be collected using the following procedure:

1. Obtain an unused disposable bailer for each sample event.
2. Put on a new, clean, and chemical-resistant pair of disposable gloves.
3. Tie the bailer to a nylon cord.
4. Lower the bailer into the containment area. Allow sufficient time for the bailer to fill with water.
5. Retrieve the bailer and fill appropriate bottle(s) for analyses being requested.
6. Cap the bottle(s) and wipe any moisture from the outside of the bottle(s).
7. Place a sample label, completed with the information described in Section 6.10, on the bottle.
8. Place the bottle in a resealable bag.
9. Package and prepare the samples for shipment to the laboratory in accordance with the IT SOPs 2.1, 17.1, and 17.2. Transfer the samples to cold storage immediately after collection.

### **6.3 Waste Soil Sampling Procedure**

Soil samples from the drums or roll-off bins will be collected with a slide-hammer or disposable sampling scoops. The following steps summarize the sampling procedures to be performed:

1. Obtain brass sleeves or 8-ounce glass jars.
2. Put on a new, clean, and chemical-resistant pair of disposable gloves.
3. Fill the sample sleeve or glass jar with soil.
4. Cover both ends of sleeves with the Teflon™ sheets and the plastic caps. Place a sample label, completed with the information described in Section 6.10, on the sleeve or jar.
5. Collect samples for VOCs following IT SOP 3.5 using EnCore™ sampling device.
6. Place a sample label, completed with the information described in Section 6.10, on the bottle.
7. Place the sample container in a resealable bag.
8. Package and prepare the samples for shipment to the laboratory in accordance with the IT SOPs 2.1, 17.1, and 17.2. Transfer the samples to cold storage immediately after collection.

### **6.4 Vapor Sampling Procedure**

Vapor samples will be collected from the influent of the vapor phase carbon treatment system. The following procedure will be used to collect the vapor samples into SUMMA™ canisters:

1. Connect a SUMMA™ canister to the sampling port using an air-tight fitting.
2. Open the ball-valve on the sample tap, then open the canister valve. A slight hissing sound immediately after opening the valve of the canister indicates that vapor is filling the canister.
3. Allow one to two minutes for sample collection to complete.
4. Close the canister valve, and disconnect the canister from the sampling port.
5. Label the canister with the appropriate sample identification (as described in Section 6.10). Use a tie-on tag instead of the adhesive label.
6. Pack the canister and ship to the subcontract laboratory for analysis.

Sampling into Tedlar™ bags will be conducted with a sampling pump from the same sample ports where samples in SUMMA™ canisters were collected.

## **6.5 DVE Process Water Sampling**

Water samples will be collected from the influent and effluent of the aqueous phase GAC treatment system. The following steps summarize the sampling procedures to be performed:

1. Don the appropriate PPE following the Site Health and Safety Plan (SHSP) guidance.
2. Calibrate field instruments in accordance with the manufacturers' directions. Record all calibration documentation in the field logbook.
3. Preferentially sample the effluent stream with expected little or no contaminants first, then sample the influent stream with expected contaminants.
4. Confirm the sample port location and identification.
5. Carefully open the sample port until the water flows at a rate with little or no observable agitation (i.e. air bubbles, etc.). Monitor the water quality parameters (turbidity, pH, temperature, conductivity, and dissolved oxygen). Record the water quality parameters on a sampling log form. Take at least three water quality parameter measurements prior to collecting a sample.
6. Fill the appropriate sample containers, shown in Table 3, directly from the sample port.
7. Label, package, and prepare the samples for shipment to the laboratory in accordance with Section 6.10 and the IT SOPs 2.1, 17.1, and 17.2. Transfer the samples to cold storage immediately after collection.

## **6.6 Free Product Sampling**

Free product samples will be collected from both an extraction well and the recovered product holding vessel. The sample from the extraction well will be analyzed for the baseline characterization. The sample from the holding vessel will be analyzed for profiling. The free product samples will be collected with a disposable-type bailer or thief-type sampler and placed directly into a sample container. The samples will be labeled according to Section 6.10, and packaged and prepared for shipment to the laboratory in accordance with the IT SOPs 2.1, 17.1, and 17.2.

## **6.7 Photoionization Detector Operation**

A portable PID will be used to screen soil for evidence of petroleum hydrocarbon contamination. The PID measures the presence of volatile ionizable contaminants in vapor. The PID will be operated and calibrated daily according to the manufacturer's specifications. The procedure for PID operation is summarized below:

1. Turn on instrument according to the manufacturer's directions and allow the lamp to stabilize.
2. Establish "zero" for the PID calibration using atmospheric air.
3. Verify the instrument is in calibration by reading a known concentration (usually 50 to 100 parts per million by volume [ppmv] of iso-butylene in air). If the instrument reading is more than 25 percent from the true value, recalibrate the PID following manufacturer's directions.
4. Attach sampling pump inlet to the vapor sampling port of the GAC treatment system. Fill Tedlar™ bag with vapor from sample pump discharge.
5. Once filled, remove Tedlar™ bag from pump and attach to inlet of PID meter.
6. Collect the reading from the instrument and record it in the field logbook.

## **6.8 Decontamination Procedure**

Decontamination of nondisposable sampling equipment that comes in contact with samples (such as sleeve rings and the split-spoon sampling device) will be performed according to IT SOP 6.1 to prevent the introduction of extraneous material into samples and to prevent cross-contamination between sampling events. A summary of the procedure is presented below. All sampling equipment will be decontaminated by steam cleaning or by washing with a nonphosphate detergent such as Liquinox™ or equivalent. Decontamination water will be collected in 55-gallon DOT-approved drums or a poly-tank and subsequently treated by the DVE system.

The following procedures will be used for decontamination of nondisposable sampling equipment:

1. Rinse with potable water. Change the water frequently. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed.
2. Wash with the nonphosphate detergent and water solution. Dilute the nonphosphate detergent as directed by the manufacturer. This step will remove remaining contamination from the equipment.

3. Rinse with potable water. Change the water frequently. This step will rinse the detergent solution away from the equipment.
4. Rinse with de-ionized water. This step will rinse any detergent solution and potable water residues. Rinsing will be accomplished by applying the de-ionized water from a stainless steel Hudson-type sprayer or Nalgene™ squeeze bottle while holding equipment over a five-gallon bucket.

Decontamination of drilling and heavy equipment will be accomplished via hot water pressure washing according to IT SOP 6.2.

## **6.9 Sample Numbering**

All samples submitted to the analytical laboratory will be uniquely numbered according to IT SOP 17.2 in the following format:

**13-X-Y-ZZZ**

Where, “X” is the system identifier, such as 7 and 37; “Y” is the type of sample (*e.g.*, S for soil, W for wastewater, P for product and V for vapor); and “ZZZ” is a sequential sample number for this project. Groundwater samples will be labeled using the well ID. The sample number will be recorded in the field logbook at the time of sample collection. A complete description of the sample and sampling circumstances will be recorded in the Field Log and Field Activity Daily Log, and referenced to the unique sample identification number.

## **6.10 Sample Labeling**

Sample labels will be filled out with indelible ink and affixed to each sample container. Each sample label will be covered with clear tape according to IT SOP 17.1. Sample containers will be placed in resealable plastic bags to protect the sample from moisture during transportation to the laboratory. Each sample container will be labeled with the following, at minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Project number (*i.e.*, 807181)
- Sampler's initials
- Analyses to be performed
- Preservation (if any)
- Location (*i.e.*, Alameda Point)

## **6.11 Sample Packaging and Shipment**

Samples will be shipped to the analytical laboratory by land delivery services according to DOT regulations. The International Air Transportation Association regulations will be adhered to when shipping samples by air courier services. Transportation methods will be selected to ensure that the samples arrive at the laboratory in time to allow testing according to established holding times and project schedules. No samples will be accepted by the receiving laboratory without a properly prepared COC record and properly labeled and sealed shipping container(s).

Packaging of sample containers will be based on the level of protection a sample will require during handling, shipping, and storage. Protection may vary according to sample type, sample media, suspected amount of hazardous substances, required testing, and handling and storage conditions. Proper packaging will be based on the following considerations:

1. Type and composition of inner packing (*e.g.*, plastic bags, metal cans, absorbent packing material, and ice for preservation)
2. Type and composition of overpacks (*e.g.*, metal or plastic coolers, cardboard box, rock core box, and undisturbed tube rack)
3. Method of overpack sealing (*e.g.*, strapping tape, custody seals)
4. Marking and labeling of overpacks (*e.g.*, laboratory address, any appropriate DOT Hazard Class Labels, and handling instructions)

Upon collection, samples will be handled according to IT SOP 2.1. Immediately after sample collection, sample labels will be affixed to each sample container. Each sample label will be covered with clear tape. Containers with samples will be placed in a resealable plastic bag to keep the sample container and the label dry. SUMMA™ canisters will be shipped in coolers without ice.

Because there is no evidentiary intent in the project objectives, custody seals will not be affixed to each sample container; two custody seals placed on the cooler with samples will be sufficient for the purpose of this project. All glass sample containers will be protected with bubble wrap. A temperature blank will be placed in every cooler with samples.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Ice, double bagged in resealing bags, will be added to the cooler in sufficient quantity to keep the samples cooled to 4±2 degrees Celsius (°C) for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, the COC form will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the COC form will include the airbill number in the “transfers accepted by” column, and will be sealed in a resealable bag. The COC form will then be taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape, and two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill will be retained for documentation.

## **6.12 Field Documentation**

At a minimum, sampling information will be recorded on a COC form and in the Field Activity Daily Log. All entries will be legible and recorded in ink. Sampling locations documented in the Field Activity Daily Log will include:

- Depth of sample soil samples
- Well identification number
- Influent/effluent

### **6.12.1 Chain-of-Custody**

The COC form will be completed according to the requirements of IT SOP 1.1, and as described in Section 5.0 of the QAPP.

### **6.12.2 Field Logbooks**

A permanently bound field logbook with consecutively numbered pages will be assigned to this project. All entries will be recorded in indelible ink. Corrections will be made following the procedure described in Section 6.6.3. At the end of each workday, the logbook pages will be signed by the responsible sampler and any unused portions of a logbook page will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used.

At a minimum, the logbook will contain the following information:

- Project name and location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from the FSP
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

### **6.12.3 Document Corrections**

Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing by the person performing the correction, and dating the correction. The original item, although erroneous, will remain legible beneath the cross-out. The new information will be written above the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

## 7.0 References

---

American Public Health Association, 1998, *Standard Methods for the Examination of Water and Wastewater*.

American Society for Testing and Materials, 2000, Annual Book of Standards

IT Corporation, August 2000, *Quality Control Program Plan for Environmental Remedial Actions Contract No. N62474-98-D-2076*.

IT Corporation, August 2000, *IT Standard Quality Procedures and Standard Operating Procedures Manual*.

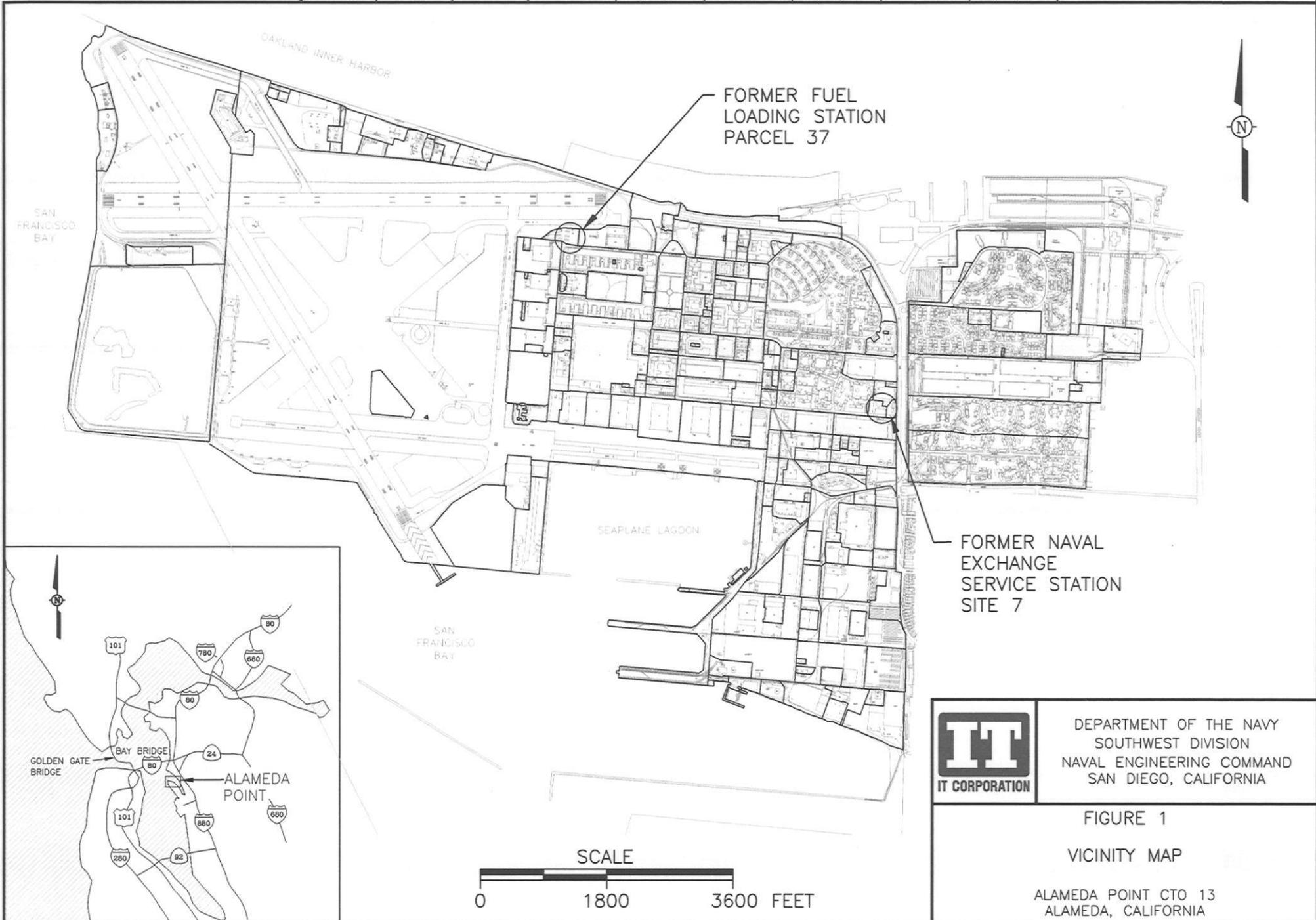
U.S. Environmental Protection Agency, September 1996, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846*, Update III.

U.S. Environmental Protection Agency, 1999, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition.

U.S. Environmental Protection Agency, March 1983, *Methods for Chemical Analysis of Water and Wastes*, Second Edition.

## FIGURES

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	AL99BASE	CONC	B. Jensen	7/30/01	NH	7/30/01	DLS	7/30/01	807181-A7



DRAWING NUMBER 807181-B27

APPROVED BY DLS 7/30/01

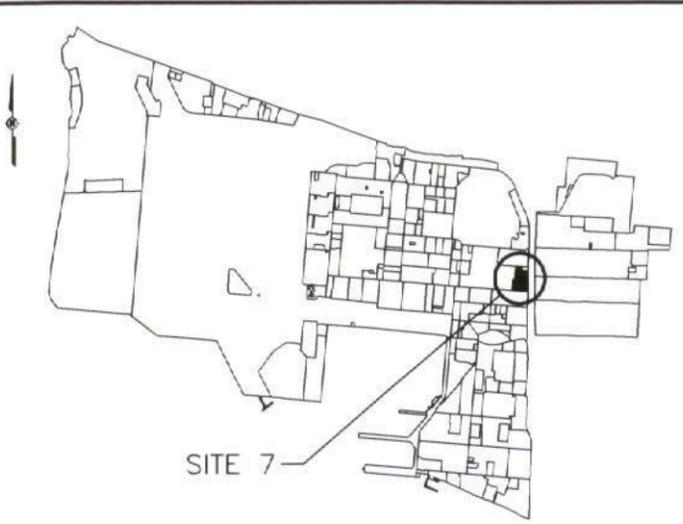
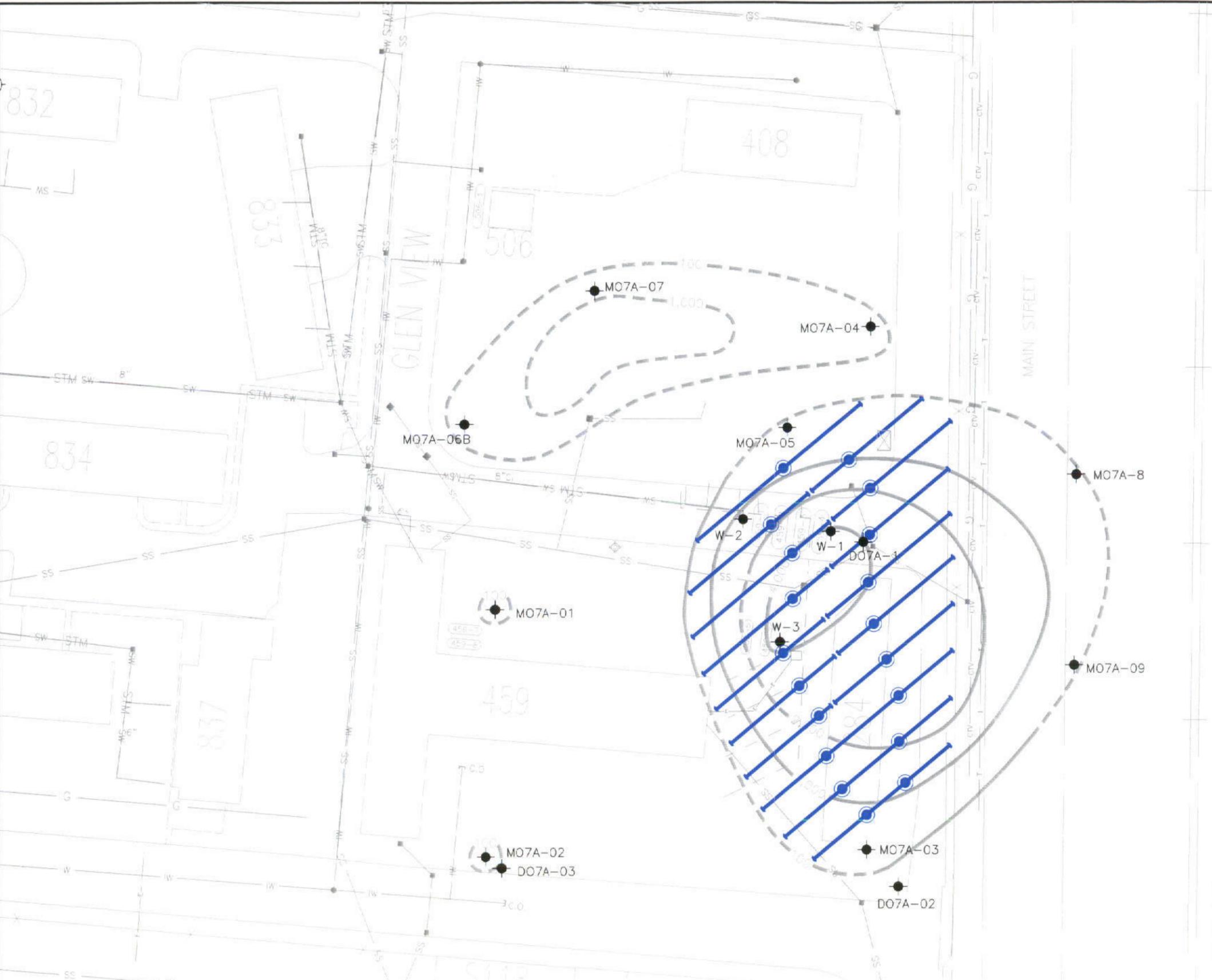
CHECKED BY NH 7/30/01

DRAWN BY BJ 6/06/01

OFFICE CONCORD

X-REF

FORMAT REVISION 2/26/99



- LEGEND**
- MONITORING WELL
  - ELECTRICAL LINES
  - STM STEAM LINES
  - G GAS LINES
  - FUEL LINES
  - SW SANITARY SEWER LINE
  - SS STORM SEWER LINE
  - IW INDUSTRIAL WASTE LINE
  - T TELEPHONE LINE
  - CTV CABLE TV LINE
  - FENCE
  - SANITARY SEWER MANHOLE
  - STORM SEWER MANHOLE
  - CATCH BASIN
  - INDUSTRIAL WASTE MANHOLE
  - FORMER UST (REMOVED)
  - C.I. — CAST IRON
  - RC — REINFORCED CONCRETE
  - DVE ACCUMULATION SUMP
  - ◆ — HYDRANT
  - ⊠ — TRANSFORMER
  - DVE COLLECTION TRENCH
  - - - ISOCONCENTRATION CONTOUR (Dashed Where Inferred) 100ug/L as TPH



**IT CORPORATION**

DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

FIGURE 2  
PROPOSED COLLECTION TRENCH LAYOUT  
SITE 7  
ALAMEDA POINT CTO-13  
ALAMEDA, CALIFORNIA

NOTES:  
1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.  
2. ISOCONCENTRATION CONTOURS BASED ON AVERAGE VALUES FOR SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996.

REFERENCE: TETRA TECH CORP., TOTAL PETROLEUM HYDROCARBONS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE  
XREF: SAS-SW, SSS-SW, IND-SW, OLD-FUEL, FUEL-ALL

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

DRAWING NUMBER 807181-B28

APPROVED BY DLS 7/30/01

CHECKED BY NH 7/30/01

DRAWN BY R. LANGSTON 6/06/01

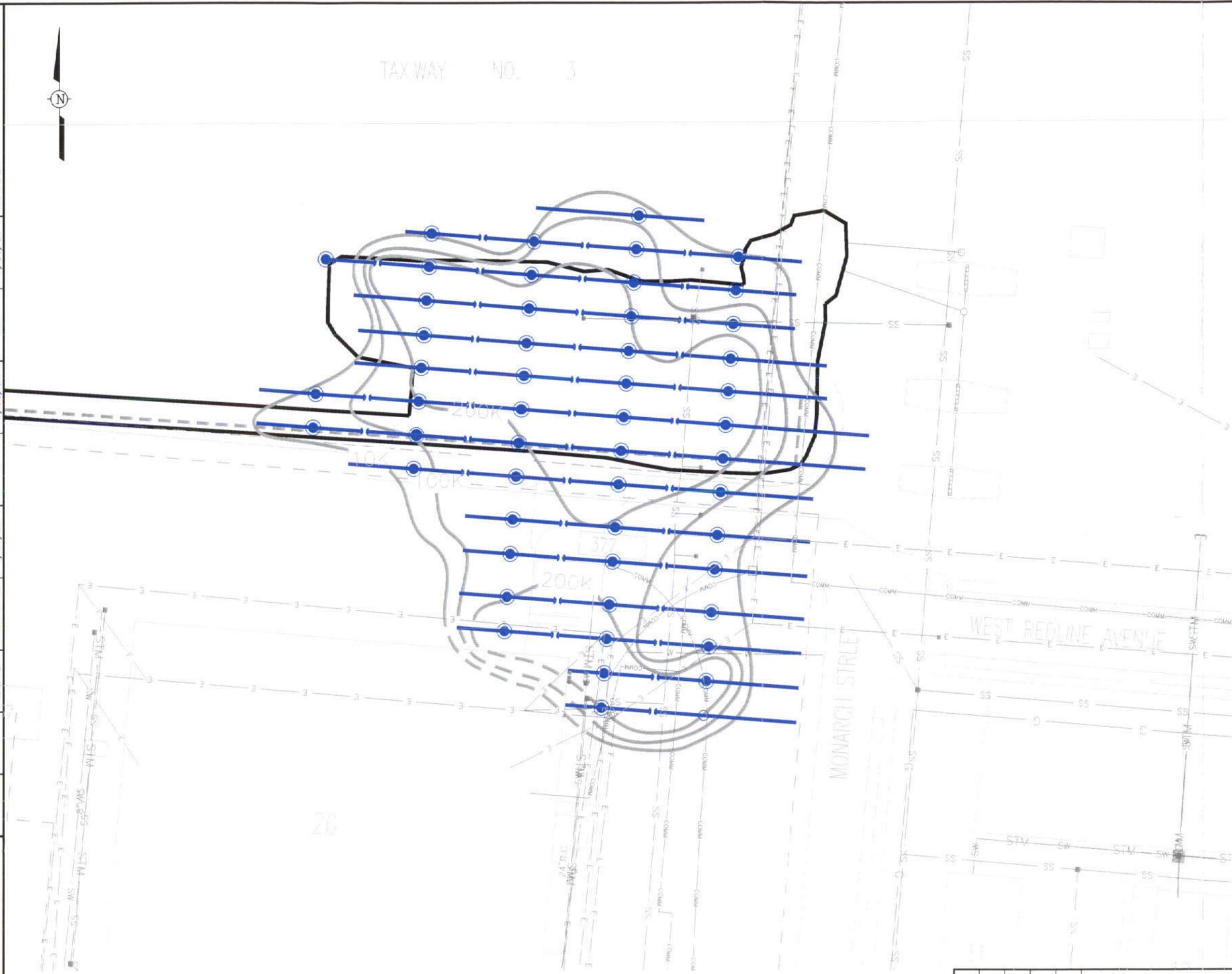
OFFICE CONC

X-REF

IMAGE



TAXWAY NO. 3



LEGEND

- DVE ACCUMULATION SUMP
- DVE COLLECTION TRENCH
- POL FLUORESCENCE ISOCONTOURS >200,000 COUNTS
- LIMITS OF EXCAVATION
- FORMER JET FUEL PIPELINE
- COMMUNICATION LINES
- ELECTRICAL LINES
- STEAM LINES
- GAS LINES
- FUEL LINES
- SANITARY SEWER LINE
- STORM SEWER LINE
- WATER
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- CATCH BASIN
- INDUSTRIAL WASTE MANHOLE
- CAST IRON
- REINFORCED CONCRETE
- HYDRANT
- IRRIGATION



DEPARTMENT OF THE NAVY  
SOUTHWEST DIVISION  
NAVAL ENGINEERING COMMAND  
SAN DIEGO, CALIFORNIA

NOTE:

1. SCAPS DATA FROM NAVY PUBLIC WORKS CENTER, CODE 980. FIGURE 2, SHIELDS 10/31/98 PMTERMINAL.DWG.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/1/01	NH	NH	RC	ISSUED FOR REVIEW

FIGURE 3  
PROPOSED  
COLLECTION TRENCH LAYOUT  
FORMER FUEL LOADING STATION PARCEL 37  
ALAMEDA POINT CTO 13  
ALAMEDA, CALIFORNIA

## TABLES

**Table 1**  
**Summary of Field Sampling and Analysis at Site 7**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
<b>Groundwater Characterization</b>				
Groundwater (Baseline)	1	One trip blank One MS/MSD sample	VOCs (EPA 8260B)	Sample from piezometer with free product.
Product (Baseline)	1	None	TPH fingerprint (EPA 8015B) Viscosity, Density, Specific Gravity (ASTM D445)	Sample from piezometer with free product.
<b>DVE Vapor Sampling - Pilot Test</b>				
Vapor (Pilot test)	12 Influent	None	TVPH (EPA TO-3)	One influent sample collected at maximum vacuum, 25, 50, and 75 percent vacuum tests; additional samples from positioning the extraction tubes at different depths.  One effluent will be collected at the stack.
	1 Effluent	None	VOCs (EPA TO-14A)	
	Daily		PID monitoring of the influent and the effluent.	
Vapor (First month of operation)	3 Influent	None	TVPH (EPA TO-3)	One influent sample collected weekly.
	Daily		PID monitoring of the influent and the effluent.	
<b>DVE Vapor Sampling - Full Scale Operation</b>				
Vapor (Second month of operation)	Up to 4 Influent	None	TVPH (EPA TO-3)	One influent sample collected every two weeks; two additional samples may be collected during the first week.
	Daily		PID monitoring of the influent and the effluent.	
Vapor (Third month and thereafter)	2 Influent	None	TVPH (EPA TO-3)	One influent sample collected monthly.  One effluent will be collected at the stack.
	1 Effluent		VOCs (EPA TO-14A)	
	Daily		PID monitoring of the influent and the effluent.	
<b>DVE Process Water Sampling – Pilot Test and First Month</b>				
Water	4 Influent 4 Effluent	4 trip blanks, analyzed only if TPH or VOCs are detected in the effluent	TPH as gasoline (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Two pairs during the first week; one pair during the second week; one pair at the end of the month.  Only one influent will be analyzed for VOCs.  Only one influent and one effluent will be analyzed for metals.

**Table 1, Continued**  
**Summary of Field Sampling and Analysis at Site 7**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
<b>DVE Process Water Sampling – Full Scale Operation</b>				
Water	6 Influent 6 Effluent	6 trip blanks, analyzed only if TPH or VOCs are detected in the effluent	TPH as gasoline (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Two pairs during the first week; one pair during the second week; one pair monthly thereafter.  Only one influent will be analyzed for VOCs.  Only one effluent will be analyzed for metals (no influent).
<b>Waste Profile</b>				
Process-generated sludge	2	None	TEPH (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity, corrosivity, and ignitability (SW-846 7.3, 9045, and 7.1)	Discrete grab sample for VOCs. Four point composite samples for all other analyses.
Soil cuttings	6	None	TEPH (EPA 8015B) VOCs (EPA 5035/8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity, corrosivity, and ignitability (SW-846 7.3, 9045, and 7.1)	Discrete grab sample for VOCs. Four-point composite samples for all other analyses.
Wastewater	1	None	TEPH (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000 Series) TPH as gasoline (EPA 8015B) SVOC (EPA 8270C) COD (SM 5220D) TSS (EPA 160.2) O&G (EPA 1664) Hydrocarbon O&G (EPA 1664) Total and amenable cyanide (EPA 335.1; 335.2) Phenolics (EPA 420.1) Pesticides/PCBs (EPA 8081A/8082) pH (EPA 150.1) Temperature (field test)	One sample will represent a waste stream.
Recovered free product	Up to 2	None	TPH as gasoline (EPA 8015B) TEPH (EPA 8015B) Metals (EPA 6010B/7000) Flash point (EPA 1010) TOX (EPA 9020B)	One sample during the pilot test and one sample during full scale operation.

**Table 1, Continued**  
**Summary of Field Sampling and Analysis at Site 7**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
Spent granular activated carbon	1	None	TPH as gasoline (EPA 8015B) TEPH (EPA 8015B) Metals (EPA 6010B/7000) Flash point (EPA 1010) TOX (EPA 9020B)	One four-point composite sample.

Notes:

ASTM denotes American Society for Testing and Materials.  
 API denotes American Petroleum Institute.  
 COD denotes chemical oxygen demand.  
 EPA denotes U.S. Environmental Protection Agency.  
 MS/MSD denotes matrix spike/matrix spike duplicate.  
 O & G denotes oil and grease.  
 PCBs denotes polychlorinated biphenyls.  
 SM denotes Standard Methods.

SVOC denotes semivolatile organic compounds.  
 TO denotes toxic organics.  
 TOX denotes total organic halides.  
 TPH denotes total petroleum hydrocarbons.  
 TSS denotes total dissolved solids.  
 TVPH denotes total volatile petroleum hydrocarbons.  
 VOCs denotes volatile organic compounds.

**Table 2**  
**Summary of Field Sampling and Analysis Parcel 37**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
<b>Groundwater Characterization</b>				
Groundwater (Baseline)	1	One trip blank One MS/MSD sample	VOCs (EPA 8260B)	Sample from piezometer with free product.
Product (Baseline)	1	None	TPH fingerprint (EPA 8015B) Viscosity, Density, Specific Gravity (ASTM D445)	Sample from piezometer with free product.
<b>DVE Vapor Sampling - Pilot Test</b>				
Vapor (Pilot test)	12 Influent	None	TVPH (EPA TO-3)	One influent sample collected at maximum vacuum, 25, 50, and 75 percent vacuum tests; additional samples from positioning the extraction tubes at different depths.  One effluent will be collected at the stack.
	1 Effluent	None	VOCs (EPA TO-14A)	
	Daily		PID monitoring of the influent and the effluent.	
Vapor (First month of operation)	3 Influent	None	TVPH (EPA TO-3)	One influent sample collected weekly.
	Daily		PID monitoring of the influent and the effluent.	
<b>DVE Vapor Sampling - Full Scale Operation</b>				
Vapor (Second month of operation)	Up to 4 Influent	None	TVPH (EPA TO-3)	One influent sample collected every two weeks; two additional samples may be collected during the first week.
	Daily		PID monitoring of the influent and the effluent.	
Vapor (Third month and thereafter)	2 Influent	None	TVPH (EPA TO-3)	One influent sample collected monthly.  One effluent will be collected at the stack.
	1 Effluent		VOCs (EPA TO-14A)	
	Daily		PID monitoring of the influent and the effluent.	
<b>DVE Process Water Sampling - Pilot Test and First Month</b>				
Water	4 Influent 4 Effluent	4 trip blanks, analyzed only if TPH or VOCs are detected in the effluent	TEPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Two pairs during the first week; one pair during the second week; one pair at the end of the month  Only one influent will be analyzed for VOCs  Only one influent and one effluent will be analyzed for metals

**Table 2, Continued**  
**Summary of Field Sampling and Analysis Parcel 37**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
<b>DVE Process Water Sampling – Full Scale Operation</b>				
Water	6 Influent 6 Effluent	6 trip blanks, analyzed only if TPH or VOCs are detected in the effluent	TEPH (EPA 8015B) VOCs (EPA 8260B) Metals (EPA 6010B/7000)	Two pairs during the first week; one pair during the second week; one pair monthly thereafter  Only one influent will be analyzed for VOCs  Only one effluent will be analyzed for metals (no influent)
<b>Waste Profile</b>				
Process-generated sludge	2	None	TEPH (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity, corrosivity, and ignitability (SW-846 7.3, 9045, and 7.1)	Discrete grab sample for VOCs. Four point composite samples for all other analyses.
Soil cuttings	6	None	TEPH (EPA 8015B) VOCs (EPA 5035/8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity, corrosivity, and ignitability (SW-846 7.3, 9045, and 7.1)	Discrete grab sample for VOCs. Four-point composite samples for all other analyses.
Wastewater	1	None	TEPH (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000 Series) TPH as gasoline (EPA 8015B) SVOC (EPA 8270C) COD (SM 5220D) TSS (EPA 160.2) O&G (EPA 1664) Hydrocarbon O&G (EPA 1664) Total and amenable cyanide (EPA 335.1; 335.2) Phenolics (EPA 420.1) Pesticides/PCBs (EPA 8081A/8082) pH (EPA 150.1) Temperature (field test)	One sample will represent a waste stream.
Recovered free product	Up to 2	None	TPH as gasoline (EPA 8015B) TEPH (EPA 8015B) Metals (EPA 6010B/7000) Flash point (EPA 1010) TOX (EPA 9020B)	One sample during the pilot test and one sample during full scale operation.

**Table 2, Continued**  
**Summary of Field Sampling and Analysis Parcel 37**

Matrix	Number of Field Samples	Number of QC Samples (per Site)	Analysis	Description
Spent granular activated carbon	1	None	TPH as gasoline (EPA 8015B) TEPH (EPA 8015B) Metals (EPA 6010B/7000) Flash point (EPA 1010) TOX (EPA 9020B)	One four-point composite sample.

**Notes:**

ASTM denotes American Society for Testing and Materials.  
 API denotes American Petroleum Institute.  
 COD denotes chemical oxygen demand.  
 EPA denotes U.S. Environmental Protection Agency.  
 MS/MSD denotes matrix spike/matrix spike duplicate.  
 O & G denotes oil and grease.  
 PCBs denotes polychlorinated biphenyls.  
 SM denotes Standard Methods.

SVOC denotes semivolatile organic compounds.  
 TO denotes toxic organics.  
 TOX denotes total organic halides.  
 TPH denotes total petroleum hydrocarbons.  
 TSS denotes total dissolved solids.  
 TVPH denotes total volatile petroleum hydrocarbons.  
 VOCs denotes volatile organic compounds.

**Table 3**  
**Sample Containers, Preservatives, and Holding Times**

Analytes	Method	Container*	Preservative	Holding Time
<b>Water</b>				
TPH as gasoline	EPA 8015B	Three 40-mL vials, Teflon™-lined septum	HCl to pH<2 Cool at 4±2°C	14 days
TEPH	EPA 8015B	Two 1-liter amber bottles, Teflon™-lined lid	Cool at 4±2°C	7 days before extraction, 40 days after extraction
VOCs	EPA 8260B	Three 40-mL vials, Teflon™-lined septum	HCl to pH<2 Cool at 4±2°C	14 days
SVOCs	EPA 8270C	Two 1-liter amber bottles, Teflon™-lined lid	Cool at 4±2°C	7 days before extraction, 40 days after extraction
Pesticides/PCBs	EPA 8081A/8082	Two 1-liter amber bottles, Teflon™-lined lid	Cool at 4±2°C	7 days before extraction, 40 days after extraction
Chemical oxygen demand	SM 5220D	250 mL HDPE	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2°C	28 days
Total oil and grease	EPA 1664	1-liter amber bottle, Teflon™-lined lid	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2°C	28 days
Hydrocarbon oil and grease	EPA 1664	1-liter amber bottle, Teflon™-lined lid	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2°C	28 days
Total suspended solids	EPA 160.2	250 mL HDPE	Cool at 4±2°C	7 days
Phenols	EPA 420.1	1-liter amber bottle	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2°C	28 days
Cyanide	EPA 335.1 and 335.2	1 liter HDPE	NaOH to pH>12 0.6 gram Ascorbic Acid	14 days
Metals	EPA 6010B/7000	500 mL HDPE	HNO <sub>3</sub> to pH<2	180 days for all metals except mercury 28 days for mercury
<b>Vapor</b>				
TVPH and VOCs	EPA TO-3 EPA TO-14A	One 6-Liter Passivated Summa Canister	None	14 days
<b>Product</b>				
TPH fingerprint	EPA 8015B	Three 40-mL vials, Teflon™-lined septum	Cool at 4±2°C	Not specified
TEPH	EPA 8015B			
TPH as gasoline	EPA 8015B			
Metals	EPA 6010B/7000			
Flash point	EPA 1010			
TOX	EPA 9020B			
Viscosity, density, and specific gravity	ASTM D445	½ liter	Cool at 4±2°C	Not specified

**Table 3, Continued**  
**Sample Containers, Preservatives, and Holding Times**

Analytes	Method	Container <sup>(a)</sup>	Preservative	Holding Time
<b>Soil</b>				
TEPH	EPA 8015B	Brass sleeve or 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	14 days
VOCs	EPA 5035/8260B	3 EnCore devices	Cool at 4±2°C	48 hours unpreserved 14 days preserved
CAM17 Metals	EPA 6010B/7000	One brass sleeve or one 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	180 days for all metals except mercury 28 days for mercury
Reactivity; corrosivity; ignitability	EPA SW-846 7.3, EPA 9045; EPA SW-846 7.1			As soon as possible
<b>Sludge</b>				
TEPH	EPA 8015B	Brass sleeve or 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	14 days
VOCs	EPA 8260B			
CAM17 Metals	EPA 6010B/7000	One brass sleeve or one 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	180 days for all metals except mercury 28 days for mercury
Reactivity; corrosivity; ignitability	EPA SW-846 7.3, EPA 9045; EPA SW-846 7.1			As soon as possible
<b>Spent granular activated carbon</b>				
TPH as gasoline	EPA 8015B	Brass sleeve or 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	14 days
TEPH	EPA 8015B			
VOCs	EPA 8260B			
CAM17 Metals	EPA 6010B/7000	One brass sleeve or one 8-oz. glass jar with a Teflon™-lined lid	Cool at 4±2°C	180 days for all metals except mercury 28 days for mercury
Flashpoint	EPA 1010			As soon as possible
TOX	EPA 9020B			14 days

**Notes:**

\*Additional sample containers will be provided for matrix spike/matrix spike duplicate analyses.  
 ASTM denotes American Society for Testing and Materials.  
 API denotes American Petroleum Institute.  
 °C denotes degrees Celsius.  
 CAM denotes California Assessment Metal.  
 COD denotes chemical oxygen demand.  
 EPA denotes U.S. Environmental Protection Agency.  
 HCl denotes hydrochloric acid.

HDPE denotes high density polyethylene.  
 HNO<sub>3</sub> denotes nitric acid.  
 mL denotes milliliter.  
 PCBs denotes polychlorinated biphenyls.  
 SVOCs denotes semivolatiles organic compounds.  
 TO denotes toxic organic.  
 TOX denotes total organic halides.  
 TVPH denotes total volatile petroleum hydrocarbons.  
 VOCs denotes volatile organic compounds.

**FINAL  
QUALITY ASSURANCE PROJECT PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
Environmental Division  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_ Date: \_\_\_\_\_



Controlled



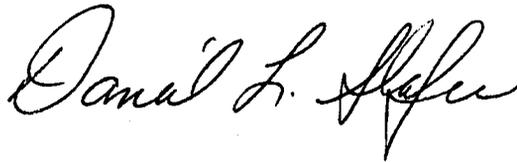
Uncontrolled

FINAL  
QUALITY ASSURANCE PROJECT PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA

Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013

Document Control Number 1538  
Revision 1

August 1, 2001



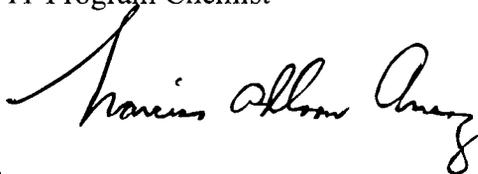
Approved by: \_\_\_\_\_  
Dan Shafer  
IT Project Manager

Date: August 1, 2001



Approved by: \_\_\_\_\_  
Emma Popek, Ph.D.  
IT Program Chemist

Date: August 1, 2001



Approved by: \_\_\_\_\_  
Nars Ancog  
US Navy Quality Assurance Officer

Date: 01 AUG 01

# Table of Contents

---

List of Figures.....	iii
List of Tables.....	iii
Acronyms and Abbreviations.....	iv
1.0 Introduction.....	1-1
1.1 Objective.....	1-3
1.2 Background.....	1-3
2.0 Project Organization.....	2-1
3.0 Quality Assurance Objectives.....	3-1
3.1 Data Quality Objectives.....	3-1
3.1.1 Stating the Problem.....	3-1
3.1.2 Identifying the Decisions.....	3-2
3.1.3 Identifying Inputs to the Decisions.....	3-3
3.1.4 Defining the Boundaries.....	3-4
3.1.5 Developing a Decision Rule.....	3-5
3.1.6 Specifying Limits on Decision Error.....	3-6
3.1.7 Optimizing the Design for Obtaining Data.....	3-7
3.2 Analytical Data Quality Objectives.....	3-7
3.2.1 Laboratory Quality Control Checks.....	3-7
3.2.2 Laboratory Control Samples.....	3-8
3.2.3 Laboratory Duplicates.....	3-8
3.2.4 Matrix Spikes.....	3-8
3.2.5 Surrogate Standards.....	3-8
3.2.6 Internal Standards.....	3-9
3.2.7 Method Blanks.....	3-9
3.2.8 Instrument Blanks.....	3-9
3.3 Data Quality Indicators.....	3-9
3.3.1 Post-Digestion Spikes and the Method of Standard Addition.....	3-9
3.3.2 Precision.....	3-10
3.3.3 Accuracy.....	3-11
3.3.4 Representativeness.....	3-12
3.3.5 Comparability.....	3-12
3.3.6 Completeness.....	3-12
3.4 Analytical Method Requirements.....	3-13
3.5 Project-Required Reporting Limits.....	3-14
4.0 Sample Collection.....	4-1
4.1 Sample Locations.....	4-1
4.2 Sample Collection.....	4-1
4.3 Sample Containers, Preservatives, and Holding Times.....	4-1
4.4 Sample Packaging and Shipment.....	4-1

## Table of Contents (continued)

---

5.0	Sample Custody and Documentation .....	5-1
5.1	Chain of Custody .....	5-1
5.2	Analysis Request .....	5-1
5.3	Field Sample Custody .....	5-2
5.4	Field Documentation .....	5-3
6.0	Analytical Quality Control Procedures .....	6-1
6.1	Laboratory Qualifications .....	6-1
6.2	Laboratory Quality Assurance and Quality Control Program.....	6-1
6.2.1	Calibration.....	6-2
6.2.2	Preventive Maintenance .....	6-3
6.2.3	Training .....	6-3
6.2.4	Supplies and Consumables .....	6-4
6.2.5	Software Quality Assurance.....	6-4
6.2.5.1	Software Validation.....	6-4
6.2.5.2	Software Security .....	6-5
6.2.5.3	Manual Integration.....	6-5
6.3	Laboratory Corrective Action.....	6-5
6.3.1	Batch Corrective Action .....	6-6
6.3.2	Method Blank.....	6-8
6.3.3	Laboratory Control Sample .....	6-8
6.3.4	Matrix Spike and Matrix Spike Duplicate.....	6-9
6.3.5	Individual Sample Corrective Action .....	6-9
7.0	Data Management.....	7-1
7.1	Data Reduction, Verification, and Reporting .....	7-1
7.1.1	Data Reduction .....	7-1
7.1.2	Laboratory Data Verification and Review.....	7-1
7.1.3	Data Reporting.....	7-3
7.1.4	Electronic Deliverables .....	7-4
7.2	Data Validation.....	7-4
7.3	Data Review.....	7-5
7.4	Data Quality Assessment Report.....	7-5
8.0	Quality Assurance Oversight.....	8-1
8.1	Laboratory Assessment and Oversight.....	8-1
8.1.1	Naval Facilities Engineering Service Center Laboratory Audits .....	8-1
8.1.2	Technical Systems Audits.....	8-1
8.1.3	Performance Evaluation Audits.....	8-2
8.1.4	Magnetic Tape Audits .....	8-3
8.1.5	Performance Evaluation Sample Programs .....	8-3
8.2	Field Audits .....	8-3
8.3	Quality Assurance Project Plan Revision or Amendment.....	8-4
9.0	References.....	9-1

## List of Figures

---

Figure 1	Project Organization Chart
Figure 2	Chain-of-Custody Record
Figure 3	Custody Seal

## List of Tables

---

Table 1	Project Personnel and Chemical Data Collection Responsibilities
Table 2	Reporting Limits EPA Method 8015B (Nonhalogenated Organics Using GC/FID)
Table 3	Reporting Limits EPA Method 8260B (Volatile Organic Compounds)
Table 4	Reporting Limits Metal Analyses
Table 5	Reporting Limits, Inorganic / Miscellaneous Analyses
Table 6	Reporting Limits EPA TO-14A and EPA Method TO-3 (Volatile Organic Compounds)
Table 7	Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for Chromatography Methods Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III
Table 8	Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for EPA Methods 8260B and 8270C Methods Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III
Table 9	Summary of QC Requirements and Corrective Action for Inorganic Analyses
Table 10	Summary of Calibration Requirements, Quality Control Procedures and Corrective Action for EPA Method 6010B Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III
Table 11	Summary of Calibration Requirements, Quality Control Procedures and Corrective Action for EPA Method 7000A Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III
Table 12	Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for EPA Method TO-14A
Table 13	Reporting Units
Table 14	Gas Chromatography/Matrix Spike Data Deliverables Package Requirements
Table 15	GC or High Performance Liquid Chromatography (HPLC) Data Deliverables Package Requirements
Table 16	Metals Data Deliverables Package Requirements
Table 17	Inorganic Data Deliverables Package Requirements
Table 18	Data Qualifiers

## Acronyms and Abbreviations

---

°C	degrees Celsius
µg/kg	microgram per kilogram
µg/L	microgram per liter
APHA	American Public Health Association
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
BFB	Bromofluorobenzene
CCC	calibration check compounds
CCV	continuing calibration verification
CF	calibration factor
COC	chain-of-custody
COD	chemical oxygen demand
CRDL	Contract Required Detection Limit
CTO	Contract Task Order
DDT	Dichlorodiphenyltrichloroethane
DFTPP	Decafluorotriphenylphosphine
DHS	California Department of Health Services
DQAR	Data Quality Assessment Report
DQOs	data quality objectives
DVE	Dual Vacuum Extraction
EDD	electronic data deliverable
EFA	Engineering Field Activity
EFA-West	Engineering Field Activity – West
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GAC	granular activated carbon
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
GLP	Good Laboratory Practices
GPC	gel permeation chromatography
HPLC	high performance liquid chromatography
IC	initial calibration
ICP	inductively coupled plasma
ICS	interference check solution
ICV	initial calibration verification
IDL	instrument detection limit
IDW	investigation-derived waste
IR CDQM	Installation Restoration Chemical Data Quality Manual
IT	IT Corporation
ITEMS	IT Environmental Management Systems

## Acronyms and Abbreviations (continued)

---

JP-5	Jet Propellant – 5
LCD	laboratory control duplicates
LCS	laboratory control samples
MDLs	Method Detection Limits
MEK	methyl ethyl ketone
MS	matrix spikes
MSA	Method of Standard Addition
MSD	matrix spikes duplicates
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCR	Nonconformance Report
NEDTS	Navy Electronic Data Transfer System
NFESC	Naval Facilities Engineering Services Center
NIST	National Institute for Standards and Testing
O&G	oil and grease
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCBs	polychlorinated biphenyls
PID	photoionization detector
ppbv	parts per billion-volume
POTW	Publicly Owned Treatment Plant
PQL	practical quantitation limit
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RF	Response Factor
RL	reporting limit
RPD	relative percent difference
RSD	Relative Standard Deviation
ROI	radius of vacuum influence
SAP	Sampling and Analysis Plan
SD	sample duplicate
SDG	sample delivery group
SM	Standard Methods
SOPs	Standard Operating Procedures
SPCC	System Performance Check Compounds
SVOCs	semivolatile organic compounds
SW	solid waste
SWDIV	Southwest Division
TICs	tentatively identified compounds
TO	toxic organics

## **Acronyms and Abbreviations (continued)**

---

TPH	total petroleum hydrocarbons
TSS	total suspended solids
TtEMI	Tetra Tech Environmental Management, Inc.
TVPH	total volatile petroleum hydrocarbon(s)
VOC	volatile organic compound

## 1.0 Introduction

---

IT Corporation (IT) has prepared this Quality Assurance Project Plan (QAPP) to address requirements for sampling and analysis in support of a corrective actions at Site 7 and Parcel 37, located on Alameda Point, Alameda, California. The goal of this project is to remove jet propulsion fuel No. 5 (JP-5) free phase product from the subsurface at the sites to the extent technically and economically practical. The extent of free phase product on the surface of the groundwater table beneath the sites will be delineated during the investigation portion of this project. Following the spatial delineation of the free phase product, the data will be evaluated from an engineering standpoint, and if appropriate, a Dual Vacuum Extraction (DVE) pilot test will be conducted to verify effectiveness of the technology at these sites. The results of the pilot test will be used to determine the effectiveness of DVE at these locations, and to provide parameters for the design and construction of the full-scale DVE system. At the conclusion of the pilot tests, the systems will be operated in the pilot scale mode until the full-scale designs have been completed and implemented.

This work will be conducted under Contract Task Order (CTO) No. 0013 of Naval Facilities Engineering Command Engineering Field Activity – West (EFA-West) Environmental Remedial Action Contract No. N62474-98-D-2076.

This QAPP is based on the requirements of the following documents:

- Naval Facilities Engineering Command Navy Installation Restoration Chemical Data Quality Manual (IR CDQM), (Naval Facilities Engineering Service Center [NFESC], 1999)
- *Guidance for the Data Quality Objectives Process, EPA QA/G-4* (EPA, 2000)
- *EPA Guidance for Quality Assurance Project Plans, EPA QA/R-5* (EPA, 1999a)
- IT Corporation, August 2000, *Quality Control Program Plan for Environmental Remedial Actions Contract No. N62474-98-D-2076*
- U.S. Navy Southwest Division (SWDIV), October 1999, *Environmental Work Instruction 4EN.1 – Chemical Data Validation*, (SWDIV, 1999a)
- U.S. Navy SWDIV, *Environmental Work Instruction 4EN.2 – Review, Approval, Revision, and Amendment of Field Sampling Plans (FSP) and Quality Assurance Project Plans (QAPP)*, (SWDIV, 1999b).

- U.S. Navy Southwest Division (SWDIV), *Environmental Work Instruction 4EN.3 – Laboratory Quality Assurance Program*, (SWDIV, 1999c).

This QAPP and the preceding document, Field Sampling Plan (FSP) constitute the Sampling and Analysis Plan (SAP). The FSP has the following objectives:

- Describe the sampling strategy and design
- Describe and establish consistent field sampling procedures
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities

Quality control requirements associated with the sampling activities are presented in the FSP and will not be repeated here.

In accordance with the U.S. Environmental Protection Agency (EPA), the QAPP elements are categorized into four groups that have been addressed in the SAP as follows:

- *Group A. Project Management*
  - Title and Approval Sheet
  - Table of Contents
  - Project/Task Organization – QAPP Section 2.0
  - Data Quality Objectives – QAPP Section 3.0
  - Documentation and Records – FSP Section 6.6, QAPP Section 5.0
- *Group B. Measurement/Data Acquisition*
  - Sampling Methods Requirements – FSP Sections 5.0 and 6.0
  - Sample Handling and Custody Requirements – FSP Section 6.0 and QAPP Section 5.0
  - Analytical Method Requirements – QAPP Sections 3.2.7 and 3.2.8
  - Quality control requirements – QAPP Sections 3.2 and 6.2
  - Instrument/Equipment Testing, Inspection and Maintenance Requirements – QAPP Section 6.2.2
  - Instrument Calibration and Frequency – QAPP Section 6.2.1
  - Acceptance Requirements for Supplies and Consumables – QAPP Section 6.2.4

- *Group C. Assessment/Oversight*
  - Assessments and Response Actions – QAPP Section 6.3 and 8.0
  - Reports to Management – QAPP Section 8.0
  
- *Group D. Data Validation and Usability*
  - Data Review, Validation and Verification Requirements – QAPP Section 7.1
  - Validation and Verification Methods – QAPP Section 7.3
  - Reconciliation with User Requirements – QAPP Section 7.4

## **1.1 Objective**

This QAPP has been prepared to ensure that the data collected over the course of the project are of known quality to meet their intended use, and that all components of data acquisition are thoroughly documented, verifiable and defensible. This document describes the project data quality objectives (DQOs) and based on these DQOs derives appropriate quality assurance (QA) objectives and quality control (QC) requirements to ensure that the acquired data are valid and usable. The QAPP outlines the criteria for data quality in terms of precision, accuracy, representativeness, comparability, and completeness, often referred to as the PARCC parameters.

## **1.2 Background**

This information is provided in Section 2.0 of the FSP.

## 2.0 Project Organization

---

The project organization consists of representatives from the Navy providing technical direction and QA oversight, and the IT Team. The project organization, which is shown in Figure 1, “Project Organization Chart,” consists of the following members:

- Remedial Project Manager, Southwest Division
- U.S. Navy QA Officer (QAO)
- Project Manager, IT
- Program QC Manager, IT
- Program Chemist, IT
- Program Health and Safety Manager, IT
- Site Health and Safety Officer, IT
- Technical Manager, IT
- Superintendent/Construction Manager, IT
- Project QC Manager, IT
- Project Engineer, IT
- Project Chemist, IT
- Field Technician, IT

The responsibilities of the team members associated with data acquisition activities are presented in Table 1, “Project Personnel and Chemical Data Collection Responsibilities.”

## 3.0 Quality Assurance Objectives

---

DQOs are qualitative and quantitative statements that clarify the project objectives, specify the most appropriate type of data for the project decisions, determine the most appropriate conditions from which to collect data, and specify tolerable limits on decision errors. DQOs are based on the end uses of the data and are determined through a seven-step process as described in QA/G-4 (EPA, 2000).

In addition to the project objectives, the DQOs specify data collection boundaries and limitations, the most appropriate type of data to collect, and the level of decision error that will be acceptable for the decision.

### 3.1 Data Quality Objectives

The DQO process is a series of planning steps based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision-making are appropriate for the intended application. The DQO process, as defined by EPA, consists of seven steps that are designed to provide a systematic approach to resolving issues that pertain to the site investigation and remediation (EPA, 2000). This section of the QAPP describes the outcome of the seven-step DQO process for data collection activities under the scope of work for this project.

#### 3.1.1 Stating the Problem

**Step 1: Summarize the problem that requires environmental data acquisition and identify the resources available to resolve the problem.** As a result of past activities at Alameda Point, JP-5 has leaked into the subsurface of Parcel 37, and gasoline has leaked into the subsurface of Site 7. The extent of free phase product is unknown at this time and probably varies across the sites. Under this corrective action, the Navy has contracted IT to design, build and operate DVE systems for free-phase product removal. The effectiveness of free-product removal using DVE is to be determined through pilot testing.

This plan describes the pilot-scale DVE systems to be installed and provides preliminary plans for operating full-scale systems. Optimal operating conditions for the full-scale systems will be determined during the pilot tests. Remediation of soil and groundwater is not within the scope of work for this CTO.

### 3.1.2 Identifying the Decisions

#### **Step 2. Identify the decision that requires acquisition of environmental data. Identify the intended use of the data.**

The decision that requires environmental data acquisition is to optimize the removal of free phase product from the subsurface at Site 7 and Parcel 37, while balancing the technical practicality and effectiveness of DVE, from technology, engineering, and cost standpoints. Samples of groundwater, vapor, soil, and recovered product will be collected and analyzed as described in the FSP. The data acquired over the course of the project activities will be used to answer the following questions:

1. What are the hydrogeologic conditions and chemical speciation in the groundwater at the sites?
  - What are depths to groundwater beneath the sites?
  - What are the depth and thickness of the free product layers present at the sites?
  - What are the concentrations of the dissolved phase products and their constituents in groundwater?
  - What areas contain recoverable free product?
2. Are the DVE systems operating at maximum capacity?
  - What is the maximum rate of free phase product recovery that can be cost effectively attained under different vacuum and system operating conditions during the initial testing and pilot phase operations of the DVE systems?
3. Is the DVE technique effective at removing product at Site 7 and Parcel 37?
  - Is free product being drawn into the extraction wells?
  - Does the application of DVE yield an adequate radius of vacuum influence (ROI) for capture of the product plumes and cost-effective full-scale implementation?
4. Are the vapor discharges from the DVE system effluent and the treated water discharged to the sanitary sewer compliant with applicable permits?
  - Are the Bay Area Air Quality Management District (BAAQMD) discharge permit requirements for vapor emissions being met?
  - Are the Publicly Owned Treatment Plant (POTW) discharge permit requirements being met?

5. What are the disposal options for waste?
  - Do the investigation-derived waste (IDW) and the waste streams generated during the pilot test and full-scale operations meet selective criteria for cost effective disposal?
  - Can recovered product be recycled?

***The intended use of the data is as follows:***

- Characterize the baseline conditions with respect to dissolved and free phase contaminants in groundwater
- Support the final evaluation of remedy selection prior to full-scale implementation
- Support the installation and operation of the DVE system; optimize the system operation parameters
- Support ongoing evaluation of system effectiveness and operational efficiency
- Ensure compliance with air and water discharge permit requirements
- Characterize waste streams for disposal

### ***3.1.3 Identifying Inputs to the Decisions***

***Step 3. Identify the information needed to support the decisions and specify the inputs requiring environmental measurements.*** The input data to the decisions regarding the performance of the DVE pilot-scale remediation are the analytical results of the chemicals of concern in the system influent and effluent vapor and water streams. Results of analysis of samples representing waste streams and air emissions will support decisions related to waste disposal and permit compliance. The following data and measurements will be obtained to support the project decisions:

1. What are the baseline conditions in the pilot-scale DVE system well field areas in terms of geology, hydrogeology and the product distribution?
  - Well logging data, lithologic descriptions of subsurface materials
  - The depth to groundwater measurements
  - Groundwater flow directions (calculated)
  - Product thickness, depth, and extent measurements
  - Concentrations of dissolved phase product in groundwater as determined using EPA Method 8015B analysis for total petroleum hydrocarbons (TPH)

2. Is the DVE system operating at its maximum capacity?
  - Concentrations of total volatile petroleum hydrocarbons (TVPH) in influent vapor as determined using EPA Method TO-3
  - Measured volume of product in the recovery tanks
  - Calculated rates of overall product recovery (product, liquid phase, and vapor phase)
  - Hydrocarbon concentrations in influent and effluent water samples
3. Is DVE technique effective at removing product from groundwater at Site 7 and Parcel 37?
  - Hydrocarbon concentrations in the influent and effluent vapor and water streams of the DVE system.
  - Measured volumes of recovered product
  - Calculated rates of overall product recovery and associated operational cost per gallon of recovered product
  - Vacuum measured in piezometers
  - Free product thickness measurements in piezometers
4. Are the vapor discharges from the DVE system effluent and the treated water discharged to the sanitary sewer compliant with applicable permits?
  - Total concentrations of volatile organic compounds (VOCs) in the vapor discharge stream as determined with a field portable photoionization detector (PID). The BAAQMD may also require periodic laboratory analyses as a condition of issuing a permit to construct and operate the system.
  - Concentrations of chemical parameters included in the POTW batch discharge permit within the treated effluent water
5. What are the disposal options for waste?
  - Concentrations of chemical constituents in soil cuttings and wastewater samples
  - Concentrations of organic compounds, metals and the flash point of the recovered product

### **3.1.4 Defining the Boundaries**

**Step 4. Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision.** Previous investigations indicated the presence of

gasoline and BTEX in the subsurface of Site 7 and JP-5 in the subsurface of Parcel 37, (IT 1999). It is anticipated that the free phase product exists within the pore space of the soils at the capillary fringe of the groundwater table. Annual fluctuations of the groundwater table elevation may have caused a “smearing effect” of the free phase product where-by some of the free phase product is distributed within the soil voids beneath the high stand of the groundwater table. Low groundwater stands during the summer and fall months, and high groundwater stands during the winter and spring months, cause this “smearing effect” in areas where free phase product are floating atop the groundwater table. This corrective action specifically targets removal of free phase product at the groundwater table interface. In as much as the full-scale system is scheduled to be operational during the late summer and fall months of the year (low groundwater stand), it is anticipated that the system will be able to target the “smeared” areas of the soil column in an efficient manner.

It is anticipated that the pilot-scale remediations will be implemented within the spatial boundaries shown in Figures 2 and 3 of the FSP. The DVE pilot system will operate for approximately one month; the startup period is anticipated to take one week. The full-scale system is scheduled to be operated for up to three months, or until product recovery has reached an asymptotic, insignificant, or cost prohibitive recovery rate.

### **3.1.5 Developing a Decision Rule**

**Step 5. Develop a logical “if...then” statement that defines the conditions that would cause the decision-maker to choose among alternative actions.** Decisions related to optimization of the performance of the DVE systems will be made based on obtained process and chemical data. Decisions regarding discharge compliance will be made based on comparisons of effluent vapor and water concentrations to the BAAQMD and POTW discharge permits. Decisions related to the selection of the disposal options for the IDW will be made upon review of the chemical analyses and by comparing them to the disposal facility acceptance requirements.

- If the effluent vapor concentrations exceed the requirements of the BAAQMD permit, then the DVE system operational parameters will be re-evaluated, or the vapor GAC vessel will be changed, or other operational changes will be implemented based on the decisions of the project engineer.
- If a decrease in the influent vapor concentrations is observed, then the vacuum settings of the DVE will be re-evaluated to improve vapor recovery.
- If the initial operation of the pilot-scale system yields a lower volume of extracted free phase product than was anticipated (based on projected removal rates), then the

system operating parameters will be adjusted to maximize the rate of free phase product removal.

- If the concentrations of hydrocarbons and their constituents at one of the effluent water sampling points indicate that breakthrough has occurred, the granular activated carbon (GAC) bed associated with that sampling port will be changed.
- If the systems have induced an overall reduction in the thickness and volume of free phase product, and the removal rate is deemed cost effective through sound engineering judgement, then the DVE remediation technology has been successful at these sites.
- If the rates of free phase product removal approach an insignificant volume or an asymptotic value (or a cost prohibitive value), then the system performance will be reviewed with the stakeholders and the operations reduced or ceased as deemed appropriate.
- If contaminant concentrations in wastewater are greater than the POTW discharge criteria, then the water will be treated through liquid GAC and will be re-sampled prior to discharge. In the event that the wastewater again does not meet the discharge requirements, it will be disposed of off site at an appropriate disposal facility. Should this be the persistent case (involving significant volumes of wastewater), the entire treatment train will be reviewed and modified as appropriate.
- If contaminant concentrations in wastewater meet the POTW batch discharge criteria, then the water will be disposed of into the sanitary sewer.
- If soil waste are deemed hazardous, then the waste will be transported for disposal at an off-site hazardous waste disposal facility.
- If soil and water waste streams are deemed non-hazardous, then the soil will be disposed of at a non-hazardous waste disposal facility and the aqueous waste will be discharged to the sanitary sewer.
- If recovered product meets the recycling facility acceptance standards, then it will be recycled. If not, another disposal option will be identified and implemented.

### **3.1.6 Specifying Limits on Decision Error**

**Step 6. Specify the decision-maker's acceptable limits on decision errors, which are used to establish appropriate performance goals for limiting uncertainty in environmental data.** This step does not apply because sampling will not be based on probabilistic designs. The number of samples to be collected are based on existing experience with similar projects and the applicable regulatory guidance (for example, the frequency of wastewater sampling or of vapor monitoring). The sampling strategy was also influenced by cost considerations. To limit uncertainty in obtained environmental data, criteria for the PARCC parameters and reporting

limits for the contaminants of concern have been developed. The data that meet these criteria will be of definitive quality and of less uncertainty than the estimated data that do not meet the criteria.

### **3.1.7 Optimizing the Design for Obtaining Data**

**Step 7. Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy project DQOs.** The system will target the areas where maximum product removal can be expected. Vapor samples will be used to verify compliance with BAAQMD requirements. Groundwater sampling will provide additional characterization for future project decisions. The optimized sampling design is presented in Section 4.0 of the FSP.

## **3.2 Analytical Data Quality Objectives**

A laboratory with appropriate capabilities and accreditation will produce analytical data required for the project using EPA methods of analysis. Analytical DQOs will be assessed through application of the PARCC parameters. Laboratory QC checks that allow deriving the PARCC parameters and the applicable QC criteria are defined in this section. Because precise and accurate information may be expressed in several ways, only the definitions for these indicators that are provided in this section will be used for data quality assessment. This section also provides information on the analytical methods to be used and the project-required reporting limits for the target analytes.

### **3.2.1 Laboratory Quality Control Checks**

The recovery of known additions is a part of laboratory analytical protocols. The use of additives at known concentrations allows detecting matrix interferences and estimating the impact of these interferences when present. It also allows evaluating the efficiency of extraction procedures and overall accuracy of analysis. Laboratory internal QC checks will include:

- Laboratory control samples (LCS)
- Laboratory control duplicates (LCD)
- Matrix spikes (MS)
- Matrix spikes duplicates (MSD)
- Laboratory duplicates
- Surrogate standards
- Internal standards
- Method and instrument blanks
- Post-digestion spikes

### **3.2.2 Laboratory Control Samples**

Laboratory control samples are matrix equivalent QC check samples (analyte-free water, laboratory sand, or sodium sulfate) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for LCS/LCD preparation is of a source different from the stock that was used to prepare calibration standards.

### **3.2.3 Laboratory Duplicates**

For laboratory sample duplicate (SD) analyses, a sample is prepared and analyzed twice. Laboratory sample duplicates are prepared and analyzed with each batch of samples for most inorganic analyses.

### **3.2.4 Matrix Spikes**

Matrix spikes are QC check samples that measure matrix-specific method performance. A matrix spike sample is prepared by adding a known quantity of target analytes to a sample before sample digestion or extraction. In general, for organic compound and metal analyses, a MS/MSD pair is prepared and analyzed with each preparation batch or for every 20 field samples. The frequency of MS/MSD analysis depends on the project DQOs. For inorganic compound analysis, a single MS and a laboratory sample duplicate are often prepared and analyzed with each batch. The LCS results, together with matrix spike results, allow verifying the presence of matrix effects.

### **3.2.5 Surrogate Standards**

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements; the compounds:

- Are not the target analytes
- Do not interfere with the determination of target analytes
- Are not naturally occurring, yet chemically similar to the target analytes
- Are compounds exhibiting similar response to target analytes

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, re-extraction and re-analysis may be performed.

### **3.2.6 Internal Standards**

Some organic compound analyses include the addition, quantitation, and recovery calculation of internal standards. Internal standards are usually synthetic compounds, which are similar in chemical behavior to the target analytes. They are added to sample extracts at the time of instrument analysis and are used to quantitate results through internal standards calibration procedure. Internal standard recoveries are used to correct for injection and detector variability. Gas chromatography/mass spectrometry (GC/MS) must use internal standards and have acceptability limits for internal standard areas. Use of internal standard quantitation for gas chromatography (GC) methods is optional.

### **3.2.7 Method Blanks**

A method blank is used to monitor the laboratory preparation and analysis systems for interferences and contamination from glassware, reagents, sample manipulations, and the general laboratory environment. A method blank is carried through the entire sample preparation process and is included with each batch of samples. Some methods of inorganic analysis do not have a distinctive preparation step. For these tests the instrument blank, which contains all reagents used with samples, is considered to be the method blank.

### **3.2.8 Instrument Blanks**

An instrument blank is used to monitor the cleanliness of the instrument portion of a sample analysis process. Instrument blanks are usually just the solvent or acid solution of the standard used to calibrate the instrument. During metals analyses one instrument blank is usually analyzed for every ten samples. For GC and GC/MS analyses, instrument blanks are analyzed on an as-needed basis for troubleshooting and chromatography column carryover determination purposes.

## **3.3 Data Quality Indicators**

This section defines the data quality indicators and their use for assessment of data quality.

### **3.3.1 Post-Digestion Spikes and the Method of Standard Addition**

A post-digestion spike is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the Method of Standard Addition (MSA) will be used to quantitate the sample result. The MSA technique compensates

for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to two to three aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

### 3.3.2 Precision

Precision measures the reproducibility of measurements under a given set of conditions. The following equation illustrates the method for calculating relative percent difference (RPD) to assess a method's precision:

$$\text{Precision as RPD} = \frac{2 \times (\text{Result} - \text{Duplicate Result})}{\text{Result} + \text{Duplicate Result}} \times 100\%$$

The laboratory uses MS/MSD pairs to assess the precision of analytical procedures, with one MS/MSD pair analyzed for every batch of up to 20 samples. According to the Navy requirements, analytical laboratories perform MS/MSD on the Navy project samples. This helps determine whether matrix interferences may be present.

The laboratory uses LCS/LCD pairs when MSs are not practical due to the nature of sample or analytical method used, and they are prepared and analyzed with each batch of samples instead of MS/MSD. LCS/LCD may also be prepared in place of MS/MSD in the case that a sufficient sample volume was not obtained in the field to perform the MS/MSD analysis. For inorganic analyses, analytical precision is usually calculated based on the sample and sample duplicate results.

The analytical laboratory will have statistically based acceptability limits for RPDs established for each method of analysis and sample matrix. The laboratory will review the QC samples to ensure that internal QC data lies within the limits of acceptability. Any suspect trends will be investigated and corrective actions taken. The analytical precision acceptability limits for this project will be as follows:

- Soil:** 20% for metals and 30% for all other analyses
- Water:** 20% for all analyses
- Vapor:** 50 % for all analyses

Field precision of sampling procedures is usually evaluated by collecting and analyzing “blind” field duplicate samples (field QC samples) at a rate of one for every ten samples. This project does not have a sufficient number of samples to be collected for site characterization purpose as most of the samples will be collected for operation monitoring. As stated in the FSP, field duplicates will not be collected over the course of this project because they are not justifiable under the project DQOs.

### 3.3.3 Accuracy

Accuracy measures the bias of an analytical system by comparing the difference of a measurement with a reference value. The percent recovery of an analyte, which has been added to the environmental samples at a known concentration before extraction and analysis, provides a quantitation tool for analytical accuracy. The spiking solutions used for accuracy determinations are not used for instrument calibrations.

The following equation illustrates how accuracy is evaluated:

$$\text{Accuracy as percent recovery} = \frac{\text{Spiked Sample Result} - \text{Sample Result}}{\text{Sample True Value}} \times 100\%$$

Percent recoveries for MS, MSD, and LCS that are analyzed for every batch of up to 20 samples serve as a measure of analytical accuracy. Surrogate standards are added to all samples, blanks, MS, MSD, and LCS analyzed for organic contaminants to evaluate accuracy of the method and help to determine matrix interferences.

As a general rule, the recovery of most compounds spiked into samples is expected to fall within a range of 70 to 130 percent. This range represents the EPA advisory acceptability limits for MS, MSD, and LCS for all organic analysis methods. The surrogate standard advisory acceptability limits are also 70 to 130 percent for all organic analyses with the exception of GC/MS methods, where these limits are specified in the methods for each matrix. Laboratories may use the advisory limits until the in-house statistically based control limits are developed for each method of organic analysis and sample matrix. EPA SW-846 mandates the recovery acceptance limits for metal analysis at 75 to 125 percent.

Control limits are defined as the mean recovery, plus or minus three standard deviations, of the 20 data points, with the warning limits set as the mean plus or minus two standard deviations. The laboratory will review the QC samples and surrogate standard recoveries for each analysis to

ensure that internal QC data lie within the limits of acceptability. The laboratory will investigate any suspect trends and take appropriate corrective actions.

### **3.3.4 Representativeness**

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to approved SAP and field Standard Operating Procedures (SOPs). Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged nonrepresentative and may form a basis for rejecting the data.

Data generated by the laboratory must be representative of the laboratory database of accuracy and precision measurements for analytes in different matrices. Laboratory procedures for sample preparation will ensure that aliquots used for analysis are representative of the whole sample. Aliquots to be analyzed for volatile parameters will be removed before the laboratory composites/homogenizes the samples, to avoid losing volatile compounds during mixing.

### **3.3.5 Comparability**

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

### **3.3.6 Completeness**

Completeness is a measure of whether all the data necessary to meet the project have been collected. For the data to be considered complete, they must meet all acceptance criteria including accuracy and precision and other criteria specified for an analytical method. The data

will be reviewed and /or validated to keep invalid data from being processed through data collection.

Completeness is evaluated using the following equation:

$$\text{Completeness} = \frac{\text{Acceptable Results}}{\text{Total Results}} \times 100\%$$

The goal for completeness for all QC parameters, except holding times, will be 90 percent. The goal for holding times will be 100 percent. If these goals are not achieved, the sources of nonconformances will be evaluated to determine whether resampling and re-analysis is necessary.

### **3.4 Analytical Method Requirements**

The following analytical methods will be used to obtain the data for this project:

- ***EPA Test Methods for Evaluating Solid Waste, SW-846, Update III, 1996 (EPA, 1996)***
  - TPH as gasoline by EPA Method 8015B
  - Total extractable petroleum hydrocarbons (TEPH) by EPA Method 8015B
  - TPH fingerprinting by EPA Method 8015B
  - VOCs by EPA Method 8260B
  - Closed system purge and trap by EPA Method 5035
  - Metals by EPA Method 6010B/7000 series
  - TOX by EPA Method 9020B
  - Reactivity by SW-846 7.3
  - Corrosivity by SW-846 9045
  - Ignitability by SW-846 7.1
  - Flash point by EPA Method 1010
  - Additional methods may be as follows: semivolatile organic compounds (SVOCs) by EPA Method 8270C and pesticides/polychlorinated biphenyls (PCBs) by EPA Method 8081A/8082

- ***EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, 1999 (EPA, 1999)***
  - VOCs in air by EPA Method TO-14A
  - TVPH in air by modified EPA Method TO-3
- ***American Society for Testing and Materials, 2000 (ASTM, 2000)***
  - Viscosity, density, and specific gravity by ASTM D445

The following methods may be also used if required by the POTW:

- ***American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 1998 (APHA, 1998)***
  - Chemical oxygen demand (COD) by SM 5220D
- ***EPA Methods for Chemical Analysis of Water and Waste, 1983 (EPA, 1983)***
  - pH by EPA Method 150.1
  - Total oil and grease (O&G) by EPA Method 1664 HEM
  - Hydrocarbon O&G by EPA Method 1664 HEM-SGT
  - Total suspended solids (TSS) by EPA Method 160.2
  - Total and amenable cyanide by EPA Methods 335.1 and 335.2
  - Phenolics by EPA Method 420.1
  - Metals by 200 series

Laboratories will conduct these analyses according to the requirements of the method and the laboratory SOPs.

### **3.5 Project-Required Reporting Limits**

The laboratory will determine the Method Detection Limits (MDLs) for each method, instrument, analyte, and matrix by using the procedure described in 40 CFR Part 136 Appendix B. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

An MDL study involves preparation/digestion and analysis of seven replicates of a given matrix spiked with target analytes at concentrations 2-5 times greater than the estimated MDL. The MDLs for metals in soil will be derived from the MDLs for metals in water. At a minimum, the laboratory will conduct annual MDL studies.

Reporting limits for the project are presented in Tables 2 through 6. These limits may be elevated for individual samples if matrix interferences are encountered.

## **4.0 Sample Collection**

---

### **4.1 Sample Locations**

Sample locations and the number of samples to be collected are described in Section 4.0 of the FSP, and are not repeated here.

### **4.2 Sample Collection**

Sample collection procedures are described in Section 6.0 of the FSP, and are not repeated here.

### **4.3 Sample Containers, Preservatives, and Holding Times**

Sample containers, preservatives, and holding times are described in Section 5.0 of the FSP, and are not repeated here.

### **4.4 Sample Packaging and Shipment**

Sample packaging and shipping requirements are presented in Section 6.11 of the FSP and are not repeated here.

## **5.0 Sample Custody and Documentation**

---

This section describes sample custody and field documentation procedures that IT will follow at the project site.

### **5.1 Chain of Custody**

An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible, i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the chain-of-custody (COC) record. A sample is considered to be in custody if it is:

- In actual possession or in view of the person who collected the samples
- Locked in a secure area
- Placed in an area restricted to authorized personnel
- Placed in a container and secured with an official seal, such that the sample cannot be reached without breaking the seal

Figure 2, “Chain-of-Custody Form,” presents a copy of the COC record that will be used for the Site 7 and Parcel 37 projects. The COC record lists each sample and the individuals performing the sample collection, shipment, and receipt. The sample chain of custody procedures will be implemented according to IT SOP 1.1. Figure 3, “Custody Seal,” presents an example of a custody seal that will seal a cooler with samples during transportation to the laboratory.

On project sites, samples will be stored in locked refrigerators at 2 to 6 degrees Celsius (°C). Sample custody will be the responsibility of the Project Chemist or an on-site designee from the time of sample collection until the samples are accepted by the courier service for delivery to the laboratory. Thereafter, the laboratory performing the analysis will maintain custody.

### **5.2 Analysis Request**

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses.

The COC records will be completed, signed, and distributed as follows:

- One copy retained by the sample coordinator for inclusion in the project files
- The original sent to the analytical laboratory with the sample shipment

After the laboratory receives the samples, the sample custodian will inventory each shipment before signing for it, and note on the original COC record any discrepancy in the number of samples, temperature of the cooler, or broken samples. The Project Chemist will be notified immediately of any problems identified with shipped samples. The Project Chemist will, in turn, notify the Project QC Manager, and together they will determine the appropriate course of action. The Project Chemist will also notify the Project Manager if the project budget and schedule may be impacted.

The laboratory will initiate an internal chain of custody that will track the sample within the various areas of the laboratory. The relinquishing signature of the sample custodian and the custody acceptance signature of the laboratory personnel transfer custody of the sample. This procedure is followed each time a sample changes hands. The laboratory will archive the samples and maintain their custody as required by the contract or until further notification from the Project Chemist at which time the samples will either be returned to the project for disposal or disposed of by the laboratory.

### **5.3 Field Sample Custody**

The COC record will be the controlling document to ensure that sample custody is maintained. The COC record will be initiated in the field by sampling personnel upon collecting a sample. Each individual who has the sample(s) in his/her possession will sign the COC. Each time the sample custody is transferred, the former custodian will sign the COC in the "Relinquished by" line, and the new custodian will sign the COC in the "Received by" line. The date, time, and the name of the project or company affiliation will accompany each signature.

The waybill number or courier name will be recorded on the COC when a commercial carrier is used. The shipping container will be secured with two custody seals, thereby allowing custody to be maintained by the shipping personnel until receipt by the laboratory.

If the laboratory sample custodian judges sample custody to be invalid (e.g., custody seals have been broken), the laboratory will initiate a Nonconformance Report (NCR). The Project Chemist will be immediately notified. The Project Chemist will, in turn, notify the Project Manager and the Project QC Manager. The Project Manager will make a decision, in consultation with the client, as to the fate of the sample(s) in question on a case-by-case basis. The sample(s) will

either be processed “as-is” with custody failure noted along with the analytical data, or rejected with re-sampling scheduled, if necessary. The nonconformance associated with the samples will be noted on the appropriate certificate or analysis or case history.

#### **5.4 Field Documentation**

Field documentation procedures are described in Section 6 of the FSP.

## **6.0 Analytical Quality Control Procedures**

---

This section describes analytical QC procedures, including laboratory qualifications and QA program, and QC procedures associated with analytical methods.

### **6.1 Laboratory Qualifications**

The analytical laboratories selected to analyze samples for this project will be certified by the California Department of Health Services (DHS) through the Environmental Laboratory Accreditation Program (ELAP) for all the analytical methods required for the project. In addition, the laboratory will successfully complete Naval Facilities Engineering Service Center (NFESC) Laboratory Evaluation Program before sampling activities and maintain that status throughout the project.

Laboratories selected for the project must be capable of providing the required turnaround times, project QC, and data deliverables required by this QAPP and the FSP.

### **6.2 Laboratory Quality Assurance and Quality Control Program**

Quality assurance is a set of operating principles that, if strictly followed during sample collection and analysis, will produce defensible data of known quality. Included in quality assurance are quality control and quality assessments. Quality control is a set of measures within a sample analysis methodology to ensure that the process is in control. Quality assessment consists of procedures for determining the quality of laboratory measurements by use of data from internal and external quality control measures.

A properly designed and executed QC program will result in a measurement system operating in a state of statistical control, which means that errors have been reduced to acceptable levels. An effective QA program includes the following elements:

- Certification of operator competence
- Internal QC checks, such as recovery of known additions through use of surrogate standards, matrix spikes, and laboratory control samples
- Analysis of externally supplied standards
- Analysis of reagent blanks
- Calibration with standards using internal or external standard procedures
- Calibration verification with second source standard
- Analysis of duplicates
- Maintenance of control charts

Strict adherence to Good Laboratory Practices (GLP) and consistent use of SOPs are also essential for a successful QC program. The laboratory will have the current revisions of the SOPs readily available for all staff. At a minimum, SOPs will be written for the following procedures and methods: sample receipt, control, and disposal; sample preparation and extraction; sample analysis; result calculation; database management; health and safety; and corrective action.

The analytical laboratory will have written SOPs defining the instrument operation and maintenance, tuning, calibration, method detection limit determination, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. The SOPs will be available to the analysts in the laboratory. Any method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories will have prior approval of the IT Project Chemist.

### **6.2.1 Calibration**

All instruments will be calibrated and the calibration acceptance criteria met before samples are analyzed. Calibration standards will be prepared with National Institute for Standards and Testing (NIST)-traceable standards and analyzed according to methods requirements. Initial calibration acceptance criteria documented in the laboratory SOPs will meet those of applicable guidance documents. The initial calibration will meet one of the following requirements:

- The lowest concentration of the calibration standard is less than or equal to the practical quantitation limit (PQL) based on the final volume of extract or sample.
- For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level) as defined by the DQOs.

Before samples are analyzed, initial calibration will be verified with a second source standard prepared at the mid-point of the calibration curve. Initial calibration verification will meet the acceptance criteria which are expressed in the laboratory SOPs.

Daily calibration verification will be conducted at the method-prescribed frequencies and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.

Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard and therefore be traceable to the standard preparation records.

Calibration requirements and acceptance criteria for organic and inorganic analysis are summarized in Tables 7 through 12.

### **6.2.2 Preventive Maintenance**

The primary objective of a preventive maintenance program is to help ensure the timely and effective completion of a measurement effort by minimizing the down time of crucial analytical equipment due to expected or unexpected component failure. In implementing this program, efforts are focused in three primary areas: maintenance responsibilities, maintenance schedules, and adequate inventory of critical spare parts and equipment.

Maintenance responsibilities for laboratory equipment are assigned to the respective laboratory managers. The laboratory managers then establish maintenance procedures and schedules for each major equipment item. These are contained in the maintenance logbooks assigned to each instrument.

The effectiveness of any maintenance program depends to a large extent on adherence to specific routine maintenance for each major equipment item. Other maintenance activities may also be identified as requiring attention on an as-needed basis. Manufacturers' recommendations and/or sample throughput provide the basis for the established maintenance schedules, and manufacturers' service contracts provide primary maintenance for many major instruments (e.g., GC/MS instruments, atomic absorption spectrometers, analytical balances, etc.). Maintenance activities for each instrument are documented in a maintenance log.

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment down time. This inventory emphasizes those parts (and supplies) that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

The respective laboratory managers are responsible for maintaining an adequate inventory of necessary spare parts and ensuring that sufficient equipment is on hand to continue analyses in the event that an instrument encounters problems. In addition to backup instrumentation, a supply of spare parts such as gas chromatography columns, fittings, septa; atomic absorption lamps, mirrors, diaphragms; graphite furnace tubes; and other ancillary equipment is maintained.

### **6.2.3 Training**

The laboratory will have an established policy and procedure on training and documenting of the analyst's competency. Each staff member that performs sample preparation and analysis will demonstrate their proficiency through preparation and analysis of four LCSs as described in

SW-846. An analyst will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain all training records on file.

#### **6.2.4 Supplies and Consumables**

The laboratory will inspect supplies and consumables before their use in analysis. The materials specifications in the analytical methods will be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents will be monitored by analysis of method blanks. An inventory and storage system for materials and supplies will ensure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

#### **6.2.5 Software Quality Assurance**

The generation, compilation, and reporting of electronic data are critical components of laboratory operations. To produce defensible data of known quality, the laboratory will develop a software QA plan or an SOP that describes activities related to data generation, reduction, and transfer with modern tools of data acquisition, as well as the policies and procedures for procurement, modification, and use of computer software.

##### **6.2.5.1 Software Validation**

The laboratory will have procedures in place to ensure that all software for data reduction, reporting, and transfer adequately and correctly perform all intended functions and do not perform any unintended functions.

The laboratory will verify, validate, and document the proper functioning of the software immediately after any new data acquisition and/or management systems have been installed at the laboratory. The baseline verification and validation may include the following actions:

- Comparison of the computer printouts with reduced data and the raw data
- Manual calculations to confirm correctness of all computer calculations
- Comparison of analytical report to the electronic deliverable files

Baseline software validation will be documented in laboratory QA files. Continuing software verification will take place during sample analysis. To eliminate data entry errors during analytical sequence set-up, as part of data package review, the correctness of results will be checked by one manual calculation per QC batch during data review. This verification will be documented in the QA/QC checklist for each data file.

### **6.2.5.2 Software Security**

Only authorized and trained laboratory personnel will have access to the operating and data management software. Each analyst will be trained in software use for operating different functional areas of the software systems and have a password that allows access to these areas.

### **6.2.5.3 Manual Integration**

Manual integration is sometimes necessary for proper compound quantitation in cases of overlapping or tailing peaks and sloping baselines. When justified, manual integration can be conducted for standards, samples, and QC check samples.

Manual integration may include valley-to-valley baselines, vertical peak separation, or slope integration. The type of manual integration is a judgement call of an analyst experienced in GC.

If a need for manual integration arises, the analysts performing analysis will select a proper approach based on their professional judgement. Manual integration will then be conducted and documented in the data file. Once an approach has been selected, it will be consistently used for the similarly affected peaks.

Manual integration documentation will include a copy of a computer-integrated chromatogram, a copy of a manually integrated chromatogram, a brief justification description, and the name of the person who performed the manual integration. The Laboratory Manager will review and approve all manual integrations performed by analysts.

## **6.3 Laboratory Corrective Action**

Corrective action takes place when a circumstance arises that has a negative impact on the quality of the analytical data generated during sample analysis. For corrective action to be initiated, awareness of a problem must exist. In most instances, the individuals performing laboratory analyses are in the best position to recognize problems that will affect data quality. Keen awareness on their part can frequently detect minor instrument changes, drifts, or malfunctions which can then be corrected, thus preventing a major breakdown of the quality control system in place. If major problems arise, they are in the best position to recommend the proper corrective action and initiate it immediately, thus minimizing data loss. Therefore, the laboratory personnel will have a prime responsibility for recognizing a nonconformance and the need for implementing and documenting the corrective action.

If a situation arises requiring corrective action, the following closed-loop corrective action process will be used:

1. Define the problem
2. Assign responsibility for investigating the problem
3. Investigate and determine the cause of the problem
4. Determine corrective action course to eliminate the problem
5. Assign responsibility for implementing the corrective action
6. Determine the effectiveness of the corrective action and implement the correction
7. Verify that the corrective action has eliminated the problem
8. If not completely successful, return to step 1

The personnel identifying or originating a nonconformance will document it to include the following items:

- Identify the individual(s) discovering or originating the nonconformance
- Describe the nonconformance
- Obtain required approval signatures
- Identify method(s) for corrective action or describe the variance granted
- Prepare a schedule for completing corrective action

All affected project samples will be listed on the Nonconformance/Corrective Action Report. The laboratory Project Manager will notify the IT Project Chemist of any laboratory nonconformance affecting the samples. Nonconformance/Corrective Action Reports will be submitted to IT as part of data packages. Corrective action procedures for different types of analyses are presented in Tables 7 through 12.

### **6.3.1 Batch Corrective Action**

Analytical laboratory processes are batch processes, and the batch is a basic unit for the frequency of some quality control elements. A batch is a group of samples of similar matrix that behave similarly relative to the procedures being employed. The following three types of batches can be identified at the analytical laboratory:

- Preparation batch
- Instrument batch
- Sample delivery group (SDG)

A preparation batch is a group of up to 20 field samples that are prepared (e.g., extracted or digested) simultaneously or sequentially without interruption. Samples in each batch are of similar matrix (e.g., soil, sludge, liquid waste, water), are treated in a similar manner, and are

processed with the same lots of reagents. For organic compound analyses each batch will contain a method blank, an LCS, and an MS/MSD pair. For inorganic compound analyses, each batch will contain a method blank, an LCS, an MS, and an SD. These QC check samples are not counted into the maximum batch size of 20.

An instrument batch is a group of samples that are analyzed within the same analytical run sequence. If the continuous operation of an instrument is interrupted (shut down for maintenance, etc.), a new instrument batch must be started. The instrument batch includes an instrument blank, calibration check standards, extracts/digestates of the field samples, and QC check samples. The number of samples in the analytical batch is not limited, but the frequency of the calibration check standard and instrument blank analysis is mandated in each particular method.

For VOC analyses by GC or GC/MS, the preparation and instrument batch are the same, since the sample preparation (purge and trap) is performed as part of the instrument analysis. For these analyses, a batch is defined as a group of up to 20 field samples that are sequentially loaded on the instrument and analyzed as a single analytical run sequence. Laboratory QC check samples (method blank, an LCS, an MS/MSD pair) will be analyzed as part of the batch in addition to 20 field samples, as well as the calibration standard per method requirements.

For CLP analyses, an SDG is defined as a group of 20 or fewer samples within a project that are received over a period of 14 days or less. An SDG is primarily a reporting format and is not limited to sample receipt groups, preparation batches, or analytical batches.

Method quality control acceptance criteria determine whether a method is performing within acceptable limits of precision and accuracy. There is a method component and a "matrix" component to this determination. The method component measures the performance of the laboratory analytical processes during the sample analyses. The matrix component measures the method performance on a specific matrix. Some quality control elements uniquely measure the laboratory component of method performance, but all QC elements measuring the matrix component contain the method component.

Method blanks and laboratory control samples uniquely measure the method performance. Matrix spikes, matrix spike duplicates, laboratory sample duplicates, surrogate standards, and post-digestion spikes measure the matrix component of method performance.

### **6.3.2 Method Blank**

The method blank measures laboratory-introduced contamination for the sample batch and batch corrective action is initiated when contamination is found. It may include re-analysis of the blank, re-analysis of the samples, re-preparation and re-analysis of the blank, QC, and samples, and assessment of the impact of the contamination on batch sample data. Although it is a goal to have no detected target analytes in the method blanks, analytes may be periodically detected in blanks due to the nature of the analysis or the reporting limit for the analyte. For example, methylene chloride, acetone, and 2-butanone (MEK) may sometimes be found in blanks for VOC analysis, and, the phthalate esters may sometimes be found in the blanks for SVOC analyses.

A method blank will be considered acceptable if the following conditions are met:

- Target analytes are present at concentrations less than one half of the PQLs.
- Target analytes are present at concentrations less than 5 percent of the regulatory limits for these analytes.
- Target analytes are present at concentrations less than 5 percent of the sample results for these analytes.

If the method blank results do not meet these acceptance criteria, the laboratory will initiate corrective action.

The first step of corrective action is to assess the effect on the samples. For example, if an analyte is found only in the blank but not in any of the associated samples or if the target analyte in the blank is less than 1/20 the value in the sample, no corrective action is necessary.

If corrective action is required, the method blank and any samples containing the same contaminant will be re-analyzed. If the contamination remains, the contaminated samples of the batch would be re-extracted and re-analyzed with a new method blank and QC check samples.

### **6.3.3 Laboratory Control Sample**

An LCS must meet the accuracy acceptance criteria for target analytes for the batch to be considered acceptable. If the target analytes are outside of the acceptance limits, corrective action will be initiated. Corrective action will include re-extraction and re-analysis of the whole batch, including method blank, samples, and QC check samples.

If matrix spikes are not conducted, an LCS/LCD pair will be analyzed with each batch of samples. If the LCS/LCD are outside method acceptance criteria for accuracy and precision, the

whole batch will be re-extracted and re-analyzed, including method blank, samples, and QC check samples.

#### **6.3.4 Matrix Spike and Matrix Spike Duplicate**

An MS/MSD pair is included with each batch of samples for organic compound analyses and MS and laboratory sample duplicate are included with each batch of samples for inorganic compound analysis. These QC check samples allow evaluating the accuracy and precision of analysis and the influence of matrix effects.

Matrix spike data evaluation is more complex than blank or LCS data evaluation since matrix spikes measure matrix effects in addition to sample preparation and analysis effects. Sample heterogeneity, lithological composition of soil, and presence of interfering chemical compounds often negatively affect accuracy and precision of analysis. If the native concentration of target analytes in the sample chosen for spiking is high relative to the spiking concentration, the differences in the native concentration between the unspiked sample and the spiked samples may contribute a significant error in the precision and accuracy. The accuracy and precision in this case are not representative of the true method and matrix performance.

If the accuracy of MS/MSD analysis is outside the acceptability limits for any target analyte, the LCS will be evaluated. If the LCS accuracy limits are met, the MS/MSD recovery problem will be identified as matrix effect and no further action will be required. If the LCS accuracy limits are not met, corrective action will be implemented and the affected samples and associated QC samples will be re-prepared and re-analyzed.

If the MS/MSD or sample/sample duplicate pair fail in precision due to observed matrix interferences, sample inhomogeneity or the nature of the contaminant, corrective action will not be required, and the laboratory will make an appropriate notation in the case narrative.

#### **6.3.5 Individual Sample Corrective Action**

In addition to batch corrective action, individual samples within a batch may also require corrective action. Re-extraction and re-analysis of individual samples will take place in the following situations:

- Surrogate standard recoveries are outside acceptability limits.
- Internal standard areas for GC/MS analyses are outside acceptability limits.

Errors have been made during sample preparation, and results of analysis are not conclusive.

## **7.0 Data Management**

---

This section describes the data management procedures for data review, verification, reporting and validation.

### **7.1 Data Reduction, Verification, and Reporting**

All analytical data generated by the laboratory in support of the Site 7 and Parcel 37 projects will be reviewed before reporting to ensure the validity of reported data. This internal laboratory data review process will consist of data reduction, three levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms or logbooks that will be signed and dated by the reviewer.

#### **7.1.1 Data Reduction**

Data reduction involves the mathematical or statistical calculations used by the laboratory to convert raw data to the reported data. Reduction of analytical data will be performed by the laboratory as specified in each of the appropriate analytical methods and laboratory SOPs. For each method, all raw data results will be recorded using method-specific forms or a standardized output from each of the various instruments.

All data calculations will be verified and initialed by personnel both generating and approving them. All raw and electronic data, notebook references, supporting documentation, and correspondence will be assembled, packaged, and stored for a minimum of 10 years for future use. All reports will be held client confidential. If the laboratory is unable to store project-related data for 10 years, then it is the responsibility of the laboratory to contact IT to make alternative arrangements.

#### **7.1.2 Laboratory Data Verification and Review**

The laboratory analyst who generates the analytical data will have the primary responsibility for the correctness and completeness of data. Each step of this verification and review process will involve the evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of known quality are generated consistently. All data generated and reduced will follow well-documented in-house protocols.

**Level 1. Technical (Peer) Data Review.** Analysts will review the quality of their work based on an established set of guidelines, including the QC criteria established in each method, in this QC Plan and as stated within the laboratory QA Manual. This review will, at a minimum, ensure that the following conditions have been met:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate SOPs have been followed.
- Calculations are verified.
- There are no data transposition errors.
- Analytical results are correct and complete.
- QC samples are within established control limits.
- Blanks and laboratory control samples are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.
- Documentation is complete, for example, any anomalies and holding times have been documented and forms have been completed.

**Level 2. Technical Data Review.** This review will be performed by a supervisor or data review specialist whose function is to provide an independent review of data packages. This review will also be conducted according to an established set of guidelines and will be structured to verify the following finding of Level 1 data review:

- All appropriate laboratory SOPs have been followed.
- Calibration data are scientifically sound, appropriate to the method, and completely documented.
- QC samples are within established guidelines.
- Qualitative identification of contaminants is correct.
- Manual integrations are justified and properly documented.
- Quantitative results and calculations are correct.
- Data are qualified correctly.
- Documentation is complete; for example, any anomalies and holding times have been documented and appropriate forms have been completed.

- Data are ready for incorporation into the final report.
- The data package is complete and is in compliance with contract requirements.

The Level 2 review will be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from at least 10 percent of the samples are checked back to the sample preparation and analytical bench sheets. If no problems are found with the data package, the review will be considered complete.

If any problems are found with the data package, an additional 10 percent of the sample results will be checked back to the sample preparatory and analytical bench sheets. This cycle will then be repeated until either no errors are found in the data set checked or until all data have been checked. All errors and corrections noted will be documented.

**Level 3. Administrative Quality Assurance Data Review.** The Laboratory QA Manager will review 10 percent of all data packages. This review should be similar to the review as provided in Level 2 except that it will provide a total overview of the data package to ensure its consistency and compliance with project requirements. All errors noted will be corrected and documented.

### **7.1.3 Data Reporting**

This section details the requirements for data reporting and data package formats that will be provided by the laboratory. All definitive soil results will be reported on a dry weight basis. Reporting units are presented in Table 13.

**Hard copy deliverables:** All relevant raw data and documentation, including (but not limited to) logbooks, data sheets, electronic files, final reports, etc., will be maintained by the laboratory for at least seven years. The laboratory will notify IT 30 days before disposal of any relevant laboratory records.

IT will maintain copies of all COC forms until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. The second copy of the report will be sent for third-party data validation.

Data packages will be prepared to meet the requirements for data package contents that are presented in Tables 14 through 17. Data packages for all vapor samples will require a standard laboratory package.

#### **7.1.4 Electronic Deliverables**

The electronic data deliverable (EDD) will be in ASCII format. The analytical laboratory will follow the requirements stated in the Laboratory Interface Document for the Analytical Laboratory Electronic Data Deliverable. At project closeout, IT will submit a Navy Electronic Data Transfer System (NEDTS)-compatible electronic file to the Navy.

The laboratory will certify that the EDD and the hard copy reports are identical. Both the EDD and the hard copy will present results to two or three significant figures. For inorganic results, two significant figures will be used for results that are less than 10, and three significant figures will be used for results that are greater than 10. For organic results, one significant figure will be used for results that are less than 10, and two significant figures will be used for results that are greater than 10. The EDD for each sample delivery group will be due at the same time as the hard copy, 14 days after the last sample of the sample delivery group has been delivered to the laboratory.

Field information (date and time collected, sample identification, etc.) will be entered directly into the main database from the COC form or uploaded from electronic files generated in the field.

Upon receipt by the IT Environmental Management System (ITEMS) Data Manager, electronic data will be uploaded into a temporary access database. The uploaded data will be printed and proofread relative to the hard copy submitted by the laboratory. The reader will also check for irregularities in analyte identities, concentrations, and units. The uploaded data will also be processed to compare the fields against a list of required values. If any errors are returned by the program, the file will be manually edited or regenerated by the laboratory. If no errors are returned, the data will be uploaded into the main database. The laboratory database will be merged with the field database, and reports will be generated from the merged database.

#### **7.2 Data Validation**

Data review will be performed according to the Navy requirements (SWDIV, 1999a). Validation by a third party will not be required for any of the samples collected for this project, as none of the data will be used for characterization or confirmation purposes. All groundwater, vapor and waste stream data will be reviewed by an IT Project Chemist. The review will be in accordance with the QC criteria specified in this document. Data will be flagged with data qualifiers shown in Table 18.

### **7.3 Data Review**

The Project Chemist will review the standard laboratory data packages for groundwater, waste characterization and vapor analysis data packages to establish that the holding times for extraction and analysis the calibration and internal QC check requirements have been met.

### **7.4 Data Quality Assessment Report**

Based on data validation and review, the Project Chemist will determine if the project DQOs have been met and will calculate data completeness. To reconcile the collected data with project DQOs and to establish and document data usability, the Project Chemist will prepare a Data Quality Assessment Report (DQAR). The DQAR will discuss the following topics:

- Implementation of sampling design and analysis according to the approved SAP (or sample completeness and representativeness)
- Proper frequency of field QC samples and the adequacy of field decontamination procedures
- Accuracy and precision of the data collected
- Data comparability, if appropriate
- Data usability for project decisions

The DQAR will be included in the Final Project Report.

## **8.0 Quality Assurance Oversight**

---

The QA oversight for this project will include system audits of field activities and of the laboratory subcontracted by the Navy to perform the analysis.

### **8.1 Laboratory Assessment and Oversight**

Systems and performance audits will be carried out by IT as independent assessments of sample collection and analysis procedures. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system.

Audit results are used to evaluate if the analytical laboratories are able to produce data that fulfill the objectives established for the program and identify any areas requiring corrective action.

#### **8.1.1 Naval Facilities Engineering Service Center Laboratory Audits**

The laboratories will successfully complete an NFESC laboratory audit. An NFESC audit conducted in the past for a different project is an acceptable qualification, provided it is still current.

#### **8.1.2 Technical Systems Audits**

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activity is being performed in compliance with the SAP specifications and that the collected data fulfill the project DQOs.

Laboratories performing under this program may be required to have a pre-qualification (or periodic) systems audit performed by IT, depending on the scope of services to be provided, past performance, or other factors indicating a need to evaluate quality in this manner. Subsequently, the laboratories will respond to and address any project or technical concerns resulting from the audits. A follow-up audit may be performed to verify resolution of findings and observations as well as review the corrective measures taken. Laboratories found deficient will not be used on a project until the deficiencies are corrected and the laboratory accepted. Laboratories previously qualified for the types of testing to be performed on the project will not require pre-qualification provided that pre-qualification has been within the past year and the work performed has been acceptable.

The laboratory systems audit results will be used to review laboratory operations and to ensure that any outstanding corrective actions have been addressed. A laboratory systems audit will include the following critical areas:

- Sample custody procedures
- Calibration procedures and documentation
- Completeness of data forms, notebooks, and other reporting requirements
- Data review procedures
- Storage, filing, and record keeping procedures
- QC procedures and documentation
- Operating conditions of facilities and equipment
- Documentation of training and maintenance activities
- Systems and operations overview
- Security of laboratory automated systems

After the audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit to the Project Manager and the laboratory an audit report including observations of the deficiencies and the necessary recommendations for corrective actions. Follow-up audits will be performed before completion of the project to ensure corrective actions have been taken.

### **8.1.3 Performance Evaluation Audits**

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific performance evaluation (PE) samples for analysis for each analytical method used in the project. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced will meet the project DQOs. If there is a concern about the laboratory performance, or per the Navy request, IT will administer performance evaluation samples for the target analytes.

Review of PE results include the following elements:

- Correct identification and quantitation of the PE sample analytes
- Accurate and complete reporting of the results
- Measurement system operation within established acceptance limits for accuracy

The concentrations reported for the PE samples will be compared with the known or expected concentrations spiked in the samples. The percent recovery will be calculated and the results assessed according to the acceptance limits, which are based on inter-laboratory studies. If the

accuracy criteria are not met, the cause of the discrepancy will be investigated and a second PE sample will be submitted. PE sample results review will be documented in a report to the Project Manager.

#### **8.1.4 Magnetic Tape Audits**

Magnetic tape audits involve the examination of the electronic media used in the analytical laboratory to acquire, report, and store data. These audits are used to assess the authenticity of the data generated and assess the implementation of good automated laboratory practices. IT may perform magnetic tape audits of the off-site laboratory when warranted by project PE samples results, or by other circumstances.

#### **8.1.5 Performance Evaluation Sample Programs**

The off-site laboratory will participate in the EPA PE Water Supply and Water Pollution Studies programs or equivalent programs for state certifications. Satisfactory performance in these PE programs also demonstrate proficiency in methods used to analyze project samples. The laboratory will document the corrective actions to unacceptable PE results to demonstrate resolution of the problems.

### **8.2 Field Audits**

The IT and SWDIV QA Officers may schedule audits of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The audit will also include observations of COC procedures, field documentation, instrument calibrations, and field measurements.

Field documents and COC forms will be reviewed to ensure that all entries are printed or written in indelible ink, dated, and signed.

Sampling operations will be reviewed and compared with the FSP, the QAPP, and other applicable SOPs. The auditor will verify that the proper sample containers are used, the preservatives are added or are already present in the container, and the documentation of the sampling operation is adequate.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, that the calibration is completed at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

Audit findings will be documented in a report to the IT Program QC Manager and the Project Manager. Corrective action will be implemented as needed.

### **8.3 Quality Assurance Project Plan Revision or Amendment**

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, the QAPP document will be revised or amended. The modification process will be based on EPA guidelines and direction from the Navy and QA Officer.

## 9.0 References

---

American Public Health Association (APHA), 1998, *Standard Methods for the Examination of Water and Wastewater*, 20<sup>th</sup> Edition.

American Society for Testing and Materials, 2000, *Annual Book of Standards*.

IT Corporation (IT) 1999, *Soil and Groundwater Characterization Report Building 397 Fuel Release*, Navy Aviation Depot, Naval Air Station Alameda, Alameda, California, June.

Naval Facilities Engineering Command Navy Installation Restoration Chemical Data Quality Manual (IR CDQM), Naval Facilities Engineering Service Center (NFESC), 1999.

Tetra Tech Environmental Management, Inc. (TtEMI).1999. Operable Unit 2 – Remedial Investigations Report, Draft, Alameda Point, Alameda, California. June 29.

U.S. Environmental Protection Agency, 1983, *Methods for Chemical Analysis of Water and Waste*.

U.S. Environmental Protection Agency, 1996, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846*, Update III. September.

U.S. Environmental Protection Agency, 1999a, *Guidance for Quality Assurance Project Plans, EPA QA/R-5*.

U.S. Environmental Protection Agency, 1999b, *Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

U.S. Environmental Protection Agency, 1999c, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. Second edition.

U.S. Environmental Protection Agency, 1999d, *Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

U.S. Environmental Protection Agency, 2000, *Guidance for the Data Quality Objectives Process EPA QA/G-4*.

## FIGURES





**INTERNATIONAL  
TECHNOLOGY  
CORPORATION**

**ANALYSIS REQUEST AND  
CHAIN OF CUSTODY RECORD \***

Reference Document No. 545664  
Page 1 of \_\_\_\_

Project Name/No. <sup>1</sup> \_\_\_\_\_ Samples Shipment Date <sup>7</sup> \_\_\_\_\_  
 Sample Team Members <sup>2</sup> \_\_\_\_\_ Lab Destination <sup>8</sup> \_\_\_\_\_  
 Profit Center No. <sup>3</sup> \_\_\_\_\_ Lab Contact <sup>9</sup> \_\_\_\_\_  
 Project Manager <sup>4</sup> \_\_\_\_\_ Project Contact/Phone <sup>12</sup> \_\_\_\_\_  
 Purchase Order No. <sup>6</sup> \_\_\_\_\_ Carrier/Waybill No. <sup>13</sup> \_\_\_\_\_  
 Required Report Date <sup>11</sup> \_\_\_\_\_

Bill to: <sup>5</sup> \_\_\_\_\_  
 Report to: <sup>10</sup> \_\_\_\_\_

**ONE CONTAINER PER LINE**

Sample <sup>14</sup> Number	Sample <sup>15</sup> Description/Type	Date/Time <sup>16</sup> Collected	Container <sup>17</sup> Type	Sample <sup>18</sup> Volume	Pre- <sup>19</sup> servative	Requested Testing <sup>20</sup> Program	Condition on <sup>21</sup> Receipt	Disposal <sup>22</sup> Record No.
							<b>FOR LAB USE ONLY</b>	
							<b>FOR LAB USE ONLY</b>	

Special Instructions: <sup>23</sup>

Possible Hazard Identification: <sup>24</sup>  
 Non-hazard  Flammable  Skin Irritant  Poison B  Unknown

Sample Disposal: <sup>25</sup>  
 Return to Client  Disposal by Lab  Archive \_\_\_\_\_ (mos.)

Turnaround Time Required: <sup>26</sup>  
 Normal  Rush

QC Level: <sup>27</sup>  
 I.  II.  III.  Project Specific (specify): \_\_\_\_\_

1. Relinquished by <sup>28</sup>  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

1. Received by <sup>28</sup>  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

2. Relinquished by  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

2. Received by  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

3. Relinquished by  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

3. Received by  
 (Signature/Affiliation) Date: \_\_\_\_\_ Time: \_\_\_\_\_

Comments: <sup>29</sup>

**FIGURE 2  
Chain-of-Custody Record**

White: To accompany samples

Yellow: Field copy

\*See back of form for special instructions

**Figure 3**  
**Custody Seal**

<p style="text-align: center;"><b>CUSTODY SEAL</b></p> <p style="text-align: center;">Date: _____</p> <p style="text-align: center;">Signature: _____</p>
---

**TABLES**  
**(Notes to Tables Follow Table 18)**

**Table 1**  
**Project Personnel and Chemical Data Collection Responsibilities**

Position	Responsibility
U.S. Navy QAO	<ul style="list-style-type: none"> <li>• Provides governmental oversight of the IT QA Program.</li> <li>• Provides quality-related directives through Contracting Officer's Technical Representative.</li> <li>• Provides technical and administrative oversight of IT surveillance audit activities.</li> <li>• Acts as point of contact for all matters concerning QA and the Navy's Laboratory QA Program.</li> <li>• Prepares governmental budget estimates for all QA functions included in IT contracts.</li> <li>• Coordinates training on matters pertaining to generation and maintenance of quality of data.</li> <li>• Authorized to suspend project execution if QA requirements are not adequately followed.</li> </ul>
Program Chemist	<ul style="list-style-type: none"> <li>• Reviews and approves the SAP.</li> <li>• Guides the selection of subcontract analytical laboratories.</li> <li>• Conducts field and laboratory audits.</li> <li>• Serves as a point of contact for the Navy.</li> <li>• Develops corrective action as required.</li> <li>• Serves as a technical advisor to the project.</li> </ul>
Project Chemist	<ul style="list-style-type: none"> <li>• Develops the project DQOs and prepares the SAP.</li> <li>• Selects qualified subcontract laboratories.</li> <li>• Implements chemical data QC procedures and performs auditing of field performance.</li> <li>• Reviews laboratory data before use.</li> <li>• Coordinates data validation of laboratory data.</li> <li>• Reviews data validation report.</li> <li>• Prepares the appropriate sections of the report summarizing the project activities.</li> </ul>
Field Technician	<ul style="list-style-type: none"> <li>• Performs all sampling in accordance with approved SAP.</li> <li>• Ensures that field QC samples are collected as specified in the FSP.</li> <li>• Completes field documentation.</li> <li>• Coordinates laboratory and field sampling activities.</li> <li>• Implements field corrective actions as required.</li> </ul>

**Table 2**  
**Reporting Limits**  
**EPA Method 8015B (Nonhalogenated Organics Using GC/FID)**

Compound Name	Soil, mg/kg	Water, mg/L
Total petroleum hydrocarbons as gasoline, carbon range C <sub>6</sub> to C <sub>12</sub>	1.0	0.1
Total petroleum hydrocarbons as diesel fuel, carbon range C <sub>12</sub> to C <sub>24</sub>	10	0.1
Total petroleum hydrocarbons as motor oil, carbon range C <sub>20</sub> to C <sub>36</sub>	100	0.5

**Table 3**  
**Reporting Limits**  
**EPA Method 8260B (Volatile Organic Compounds)**

Compound Name	Soil, µg/kg	Water, µg/L
Benzene	5.0	2.0
Bromobenzene	5.0	2.0
Bromochloromethane	5.0	2.0
Bromodichloromethane	5.0	2.0
Bromoform	10	2.0
Bromomethane	5.0	2.0
n-Butylbenzene	5.0	2.0
sec-Butylbenzene	5.0	2.0
tert-Butylbenzene	5.0	2.0
Carbon Tetrachloride	5.0	2.0
Chlorobenzene	5.0	2.0
Chloroethane	10	2.0
Chloroform	5.0	2.0
Chloromethane	10	2.0
2-Chlorotoluene	5.0	2.0
4-Chlorotoluene	5.0	2.0
Dibromochloromethane	5.0	2.0
Dibromochloropropane (DBCP)	5.0	2.0
Dibromomethane	5.0	2.0
Dichlorodifluoromethane	10	2.0
Dichloromethane (Methylene Chloride)	5.0	2.0
1,2-Dichlorobenzene	5.0	2.0
1,2-Dichloroethane	5.0	2.0
1,3-Dichlorobenzene	5.0	2.0
1,2-Dichloropropane	5.0	2.0
1,3-Dichloropropane	5.0	2.0
1,4-Dichlorobenzene	5.0	2.0
2,2-Dichloropropane	5.0	2.0
1,1-Dichloroethane	5.0	2.0
1,1-Dichloroethene	5.0	2.0
1,1-Dichloropropene	5.0	2.0
1,2-Dibromoethane (EDB)	5.0	2.0
trans 1,2-Dichloroethene	5.0	2.0

**Table 3 (Continued)**  
**Reporting Limits**  
**EPA Method 8260B (Volatile Organic Compounds)**

Compound Name	Soil, µg/kg	Water, µg/L
cis 1,2-Dichloroethene	5.0	2.0
Ethylbenzene	5.0	2.0
Hexachlorobutadiene	5.0	2.0
Isopropylbenzene	5.0	2.0
4-Isopropyltoluene	5.0	2.0
Methyl tert-butyl ether	5.0	2.0
Napthalene	5.0	2.0
n-Propylbenzene	5.0	2.0
Styrene	5.0	2.0
Toluene	5.0	2.0
Trichloroethene (TCE)	5.0	2.0
Trichlorofluoromethane	5.0	2.0
1,1,1,2-Tetrachloroethane	5.0	2.0
1,1,1-Trichloroethane	5.0	2.0
1,1,2,2-Tetrachloroethane	5.0	2.0
Tetrachloroethene (PCE)	5.0	2.0
1,1,2-Trichloroethane	5.0	2.0
1,2,3-Trichlorobenzene	5.0	2.0
1,2,3-Trichloropropane	5.0	2.0
1,3,5-Trimethylbenzene	5.0	2.0
1,2,4-Trichlorobenzene	5.0	2.0
1,2,4-Trimethylbenzene	5.0	2.0
m&p-Xylenes	5.0	2.0
o-Xylene	5.0	2.0
Vinyl Chloride	10	2.0

**Hazardous Substance List**

Acetone	100	100
Carbon Disulfide	100	100
2-Butanone (MEK)	100	100
4-Methyl-2-Pentanone (MIBK)	50	50
2-Hexanone	50	50

**Table 4**  
**Reporting Limits**  
**Metal Analyses**

<b>Metal</b>	<b>Soil, mg/kg</b>	<b>Water, µg/L</b>
<b>EPA Method 6010B (ICP)</b>		
Aluminum (Al)	50	200
Antimony (Sb)	10	50
Arsenic (As)	5.0	50
Barium (Ba)	10	100
Beryllium (Be)	0.2	2.0
Cadmium (Cd)	0.2	2.0
Calcium (Ca)	100	500
Chromium (Cr)	1.0	10
Cobalt (Co)	1.0	10
Copper (Cu)	1.0	10
Iron (Fe)	10	100
Lead (Pb)	1.0	5.0
Magnesium (Mg)	50	500
Manganese (Mn)	1.0	10
Molybdenum (Mo)	5.0	100
Nickel (Ni)	4.0	40
Potassium (K)	500	5000
Selenium (Se)	10	20
Silver (Ag)	1.0	5.0
Sodium (Na)	500	5000
Thallium (Tl)	1.0	10
Vanadium (V)	1.0	10
Zinc (Zn)	2.0	20
<b>EPA 7471A/7472 (Cold Vapor Technique)</b>		
Mercury (Hg)	0.2	0.02

**Table 4 (Continued)**  
**Reporting Limits**  
**Metal Analyses**

Metal	Soil, mg/kg	Water, µg/L
<b>EPA 7000A (Graphite Furnace Atomic Absorption)</b>		
	Method Reference	Water, µg/L
Arsenic (As)	7060A	1.0
Beryllium (Be)	7091	1.0
Cadmium (Cd)	7131A	1.0
Chromium (Cr)	7191	1.0
Copper (Cu)	7211	1.0
Lead (Pb)	7421	1.0
Nickel (Ni)	7521	1.0
Silver (Ag)	7761	1.0
Zinc (Zn)	7951	2.0

**Table 5**  
**Reporting Limits, Inorganic / Miscellaneous Analyses**

<b>Inorganic / Miscellaneous</b>		
	<b>Method Reference</b>	<b>Water, µg/L</b>
Cyanide (total)	9010B/9012A	50
Phenols	420.1 / 8041	50
Hydrocarbon Oil and Grease	SM 5220G	100
Total Recoverable Oil and Grease	413.1	100
Dissolved Sulfides (acid soluble only)	9030B	0.2

**Table 6**  
**Reporting Limits**  
**EPA TO-14A and EPA Method TO-3 (Volatile Organic Compounds)**

Compound name	Vapor, part per billion-volume
1,1,1-Trichloroethane	1
1,1,1,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
2-Butanone	5
2-Hexanone	5
4-Methyl-2-Pentanone	5
Acetone	5
Benzene	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon Tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	1
Chloromethane	1
Cis-1,2-Dichloroethene	1
Cis-1,3-Dichloropropene	1
Dibromochloromethane	1
Ethylbenzene	1
Methylene Chloride	1
Methyl-tert-butyl-ether	1
Styrene	1
Tetrachloroethene	1
Toluene	1
Trans-1,2-Dichloroethene	1
Trans-1,3-Dichloroethene	1
Trichloroethene	1
Vinyl Acetate	1
Vinyl chloride	1
Xylenes (Total)	1
Total volatile petroleum hydrocarbons	100

**Table 7**  
**Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for Chromatography Methods Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for target analytes	Initial calibration before sample analysis	Target analyte CF or RF RSD less than or equal to 20% <sup>1</sup> Mean CF or RF RSD less than or equal to 20% <sup>1</sup>	Correct problem, then repeat initial calibration.
Second-source calibration verification	Once per five-point initial calibration	Less than 20% difference for most target analytes, 25% for difficult compounds	Correct problem, then repeat initial calibration.
Daily calibration verification	Before sample analysis and every 10 samples or every 12 hours, as specified by the method	Less than 15% difference for all target analytes	Correct problem, then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method's requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria.
Retention time window study	Establish initially, verify during daily calibrations	Within $\pm 3$ standard deviations of each analyte retention time from the initial study	Correct problem, re-evaluate analyte identification.
8081A: DDT and Endrin breakdown check	Daily before analysis of samples and every 10 samples	Degradation $\leq 15\%$	Clean the system, repeat breakdown check.
Internal standards (optional)	Every sample, spiked sample, standard, and method blank	Laboratory established QC acceptance criteria	Correct problem, re-extract and re-analyze affected samples.
Method blank	One per analytical batch (VOCs) and one per preparation batch (SVOCs)	No analytes detected above the RL	Correct problem, then re-extract and re-analyze method blank and all samples processed with the contaminated blank.
MS/MSD	One MS/MSD pair conducted on Navy samples per each analytical/preparation batch	Advisory recovery limits: 70 to 130%	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per analytical/preparation batch	Advisory recovery limits: 70 to 130%	Correct problem, then re-extract and re-analyze the LCS and all associated batch samples.
Surrogate standards	Every sample, spiked sample, standard, and method blank	Advisory recovery limits: 70 to 130%	Correct problem, then re-extract and re-analyze all affected samples.
MDL study	Once per 12-month period	Detection limits established will be below the RLs	Correct problem, repeat the MDL study.

<sup>1</sup>If RSD for any analyte is > 20%, regression fit may be used for the calibration curve for that analyte. Acceptance criteria for first order regression is  $r^2 \geq 0.99$ .

**Table 8**  
**Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for EPA Methods 8260B and 8270C Methods Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for target analytes	Initial calibration before sample analysis	<p><u>8260B</u>: The minimum average SPCC RF for Chloromethane, 1,1-Dichloroethane, Bromoform is 0.1; for Chlorobenzene and 1,1,2,2-Tetrachloroethane is 0.30.</p> <p><u>8270C</u>: The minimum average SPCC RF is 0.050.</p> <p><u>8260B and 8270C</u>: RSD is less than or equal to 15% for target analytes, and is less than or equal to 30% for CCC<sup>1</sup>.</p>	Correct problem, then repeat initial calibration.
Second-source calibration verification	Once per five-point initial calibration	Less than 25% difference for all target analytes and CCCs	Correct problem, then repeat initial calibration.
Daily calibration verification	Before sample analysis and every 12 hours of analysis time	Less than 20% difference for all target analytes and CCCs	Correct problem, then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method's requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria.
Check of mass spectral ion intensities (tuning procedure) using BFB (8260B) and DFTPP (8270C)	Before initial calibration and calibration verification	Must meet the method's requirements before samples are analyzed	Retune instrument and verify the tune acceptability.
Internal Standards	During data acquisition of calibration standard, samples and QC check samples	Areas within -50% to +100% of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.
Method blank	One per analytical batch (8260B) and one per preparation batch (8270C)	No analytes detected above the RL	Correct problem, then re-extract and re-analyze method blank and all samples processed with the contaminated blank.
MS/MSD	One MS/MSD pair conducted on Navy samples per analytical/preparation batch	Advisory recovery limits: 70 to 130%	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD per analytical/preparation batch	Advisory recovery limits: 70 to 130%	Correct problem, then re-extract and re-analyze the LCS (LCS/LCD) and all associated batch samples.

**Table 8 (Continued)**  
**Summary of Calibration Requirements, Quality Control Procedures, and Corrective Action for EPA Methods 8260B and 8270C Methods Conducted per the Test Methods for Evaluating Solid Waste (SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Surrogate standards	Every sample, spiked sample, standard, and method blank	QC acceptance criteria per method's requirements (per Method 8260B Table 8 and Method 8270A Table 8 <sup>2</sup> )	Correct problem, then re-extract and re-analyze all affected samples.
MDL study	Once per 12-month period	Detection limits established will be below the RLs	Correct problem, repeat the MDL study.

<sup>1</sup> If RSD for any analyte is >15%, regression fit may be used for the calibration curve for that analyte. Acceptance criteria for first order regression is  $r^2 \geq 0.99$ .

<sup>2</sup> For Method 8270C use the surrogate standard acceptance criteria of Method 8270A, Revision 1, July 1992.

**Table 9****Summary of QC Requirements and Corrective Action for Inorganic Analyses**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial three-point calibration (IC) and a blank	Initial calibration before sample analysis	Correlation coefficient >0.99	Correct problem, repeat initial calibration
Second-source ICV, prepared at the calibration mid-point	Once per initial calibration	Per method's requirements or laboratory established criteria	Correct problem, repeat initial calibration
Continuing calibration verification (CCV), same source as IC	After every 10 samples and at the end of the sequence	Per method's requirements or laboratory established criteria	Correct problem, re-analyze previous 10 samples
Calibration blank	After IC, before CCV calibration, after every 10 samples, and at the end of the sequence	All target analytes not detected above the RL	Prepare and analyze the blank again, recalibrate the instrument.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once	QC acceptance criteria per method's requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria
MDL study (water only)	Once per 12 month period	MDL will be below the RL	Correct problem, repeat the MDL study
Method blank	One per preparation batch	No analytes detected above the RL	Correct problem, then prepare and analyze again the method blank and all samples processed with the contaminated blank
MS for all analytes	One MS conducted on Navy samples per each preparation batch	Advisory recovery limits 70-130%	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD and all associated batch samples.
SD or MS/MSD pair	One SD or MS/MSD pair conducted on Navy samples per each preparation batch	30% RPD for soil, 20% RPD for water Advisory recovery limits 70-130%	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD or SD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD or SD	One LCS or LCS/LCD pair per each preparation batch	30% RPD for soil, 20% RPD for water Advisory recovery limits 70 to 130%	Correct problem, re-prepare and re-analyze LCS/LCD and the affected batch

ICV = Initial Calibration Verification

RL = Reporting Limit

MDL = Method Detection Limit

**Table 10**  
**Summary of Calibration Requirements, Quality Control Procedures and Corrective Action**  
**for EPA Method 6010B Conducted per the Test Methods for Evaluating Solid Waste**  
**(SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial calibration (IC) per manufacturer's instructions with a minimum of one standard and a calibration blank	Initial calibration prior to sample analysis	Accepted if the initial calibration verification (ICV) passes	Correct problem, repeat initial calibration.
Second-source ICV, prepared at the calibration mid-point	Once per initial calibration	Less than 10% difference from IC for all target analytes	Correct problem, repeat initial calibration.
Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Less than 10% difference from IC for all target analytes; $\leq 5\%$ RSD for a minimum of two integrations	Correct problem, repeat initial calibration.
Calibration blank	After IC, before CCV calibration, after every 10 samples, and at the end of the sequence	All target analytes are within three times the IDLs	Prepare and analyze the blank again, recalibrate the instrument.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once	QC acceptance criteria per method's requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria.
IDL study	Once per 12-month period	IDLs will be below the MDLs	Correct problem, repeat the IDL study.
MDL study (water only)	Once per 12-month period	MDLs will be below the RLs	Correct problem, repeat the MDL study.
Method blank	One per digestion batch	No analytes detected above the RLs	Correct problem, then prepare and analyze again the method blank and all samples processed with the contaminated blank.
Interference check solution (ICS)	At the beginning of an analytical run	Within $\pm 20\%$ of expected value	Terminate analysis; correct problem; reanalyze ICS; reanalyze all affected samples.
MS/MSD for all analytes	One MS/MSD pair conducted on Navy samples per each preparation batch	QC acceptance criteria: 75 to 125% accuracy, 20% precision	Identify problem, reprepare and re-analyze the MS/MSD pair and all samples in the associated batch.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per each preparation batch	QC acceptance criteria: 75 to 125% accuracy, 20% precision	Terminate analysis, identify and correct the problem, prepare and analyze all affected samples and QC checks again.
Dilution test	Each new sample matrix	1:5 dilution must agree within $\pm 10\%$ of the original determination	Perform post digestion spike addition.

**Table 10 (Continued)**  
**Summary of Calibration Requirements, Quality Control Procedures and Corrective Action**  
**for EPA Method 6010B Conducted per the Test Methods for Evaluating Solid Waste**  
**(SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method of standard addition (MSA), single or multi-level	When interferences are suspected or and for new sample matrix	Linearity of a multi-level MSA	Correct problem, repeat MSA.
Post-digestion spike addition	When dilution test fails	Recovery within 75 to 125% of expected results	Correct problem, reanalyze post digestion spike addition.

**Table 11**  
**Summary of Calibration Requirements, Quality Control Procedures and Corrective Action**  
**for EPA Method 7000A Conducted per the Test Methods for Evaluating Solid Waste**  
**(SW-846), Update III**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial multi-point calibration (IC) with a minimum of three standards and a calibration blank	Initial calibration before sample analysis	Correlation coefficient >0.995; accepted if the initial calibration verification (ICV) passes	Correct problem, repeat initial calibration.
Second-source ICV, prepared at the calibration mid-point	Once per initial calibration (IC)	Less than 10% difference from IC for all target analytes	Correct problem, repeat initial calibration.
Continuing calibration verification (CCV), same source as IC	After every 10 samples and at the end of the sequence	Less than 20% difference from IC for all target analytes	Correct problem, re-analyze previous 10 samples.
Calibration Blank	After IC, before CCV calibration, after every 10 samples, and at the end of the sequence	All target analytes not detected above the PQLs	Prepare and analyze the blank again, recalibrate the instrument.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once	QC acceptance criteria per method's requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria.
MDL study (water only)	Once per 12 month period	MDLs will be below the PQLs	Correct problem, repeat the MDL study.
Method blank	One per digestion batch	No analytes detected above the PQLs	Correct problem, then prepare and analyze again the method blank and all samples processed with the contaminated blank.
MS/MSD for all analytes	One MS/MSD pair conducted on Navy samples per each preparation batch	QC acceptance criteria: 80 to 120% accuracy, 20% precision	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per each preparation batch	QC acceptance criteria: 80 to 120% accuracy, 20% precision	Correct problem, redigest and re-analyze LCS/LCD pair and the affected batch.
Dilution test	One sample per batch	1:5 dilution must agree within $\pm 10\%$ of the original determination	Perform post-digestion spike addition.
Post-digestion spike addition (recovery test)	When dilution test fails	Recovery within 85-115% of expected results	Conduct MSA test.
Method of standard addition (MSA), single or multi-level	When post-digestion spike addition fails	Linearity of a multi-level MSA	Correct problem, repeat MSA.

**Table 12**  
**Summary of Calibration Requirements, Quality Control Procedures, and Corrective**  
**Action for EPA Method TO-14A**

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for target analytes	Initial calibration before sample analysis	The minimum average SPCC RF is 0.30. RSD is less than or equal to 50% for target analytes, and is less than or equal to 30% for CCC	Correct problem, then repeat initial calibration.
Daily calibration verification	Before sample analysis and every 12 hours of analysis	Less than 50% difference for all target analytes and less than 25% for CCCs	Correct problem, then repeat initial calibration
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per Method 8260B requirements	Recalculate results; locate and fix the problem, if exists, rerun demonstration of those analytes that did not meet acceptance criteria.
Check of mass spectral ion intensities (tuning procedure) using BFB	Before initial calibration and calibration verification	Must meet the Method 8260B requirements before samples are analyzed	Retune instrument and verify the tune acceptability.
Internal standards	During data acquisition of calibration standard, samples and QC check samples	Areas within -50% to +100% of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions; mandatory re-analysis of samples analyzed while system was malfunctioning.
Method blank	One per analytical batch	No analytes detected above the RL	Correct problem, then re-extract and re-analyze method blank and all samples processed with the contaminated blank.
MS/MSD	One MS/MSD pair conducted on Navy samples per analytical/preparation batch	Advisory recovery limits: 70 to 130%	Identify problem. If not related to matrix interference, re-extract and re-analyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD per analytical/preparation batch	Advisory recovery limits: 70 to 130%	Correct problem, then re-extract and re-analyze the LCS (LCS/LCD) and all associated batch samples.
Surrogate standards	Every sample, spiked sample, standard, and method blank	QC acceptance criteria per laboratory requirements	Correct problem, then re-extract and re-analyze all affected samples.
MDL Study	Once per 12-month period	Detection limits established will be below the RLs	Correct problem, repeat the MDL study.

**Table 13**  
**Reporting Units**

Analytes	Soil Samples	Aqueous Samples	Air Samples
Organic parameters	µg/Kg	µg/L	ppbv
Inorganic parameters	mg/Kg	ug/L	
Total petroleum hydrocarbons (TPH)	mg/Kg	mg/L	ppbv

**Table 14**  
**Gas Chromatography/Matrix Spike Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report	
Organic Analysis by GC/MS	Case Narrative		X	X	X	
	Corrective Action Report(s)		X	X	X	
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X	
	Chain-of-Custody Form, Cooler Receipt Form		X	X	X	
	Sample log-in sheet	DC-1	X			
	Complete SDG file inventory sheet	DC-2-1	X			
	Data summary for each blank and sample (1)	I	X	X	X	
	Tentatively identified compounds (TICs) for each sample (ten peaks)	I,TIC	X	X		
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III (modified)	X	X	X	
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X	
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X	
	Instrument performance check (tuning) report	V	X	X		
	Initial calibration data (including acceptance limits)	VI	X	X		
	Continuing calibration data (including acceptance limits)	VII	X	X	(summary only)	
	Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	VIII	X	X		
	Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard			X		
	Instrument quantitation report			X		
	Raw and background subtracted mass spectra for each target analyte found			X		
	Mass spectra of TICs with library spectra of five best-fit matches			X		
	Sample preparation bench sheets			X	X	
	Gel permeation chromatography (GPC) clean-up logs			X		
	Method blank summary	IV		X		
	Standard preparation logs			X	X	
	Analysis run logs	VIII		X	X	
	Percent moisture			X	X	X
	pH			X (2)		

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limits, Method Detection Limit, dilution factor(s), results, comments, approval signature/date.

2) For water samples volatile analysis only.

**Table 15**  
**GC or High Performance Liquid Chromatography (HPLC) Data Deliverables Package**  
**Requirements**

GC/HPLC	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC or HPLC	Case Narrative		X	X	X
	Corrective Action Report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample (1)	I	X	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X
	Initial calibration data for each column (indicate which column was used for quantitation)	VI	X	X (summary only)	
	Continuing calibration data (indicate which column was used for quantitation) and calibration verification data	VII	X	X (summary only)	
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards		X	X (3)	
	Instrument quantitation report		X		
	Method blank summary	IV	X		
	Pesticide identification summary	X	X		
	Sample preparation bench sheets		X	X	
	GPC clean-up logs		X		
	Standard preparation logs		X	X	
	Analysis run logs	VIII	X	X	
Percent moisture		X	X	X	

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, dilution factor(s), comments, approval signature/date. Results from the primary and secondary columns/detector shall be reported.

3) For petroleum fuels or PCB analyses chromatograms for samples with compound detection only.

**Table 16  
Metals Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Metals Analysis	Case Narrative		X	X	X
	Corrective Action Report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample (1)	I-IN	X	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	V (Part 1)-IN	X	X	X
	Post-digestion spike recovery	V (Part 2)-IN	X	X	X
	Duplicate sample report	VI-IN	X	X	X
	Blank results	III-IN	X	X	X
	Initial and continuing calibration data	II (PART 1)-IN	X	X (summary only)	
	ICP interference check sample report	IV-IN	X	X	
	Standard addition results	VIII-IN	X	X	
	ICP serial dilution results	IX-IN	X		
	Preparation logs	XIII-IN	X	X	
	Analysis run logs	XIV-IN	X	X	
	Standard preparation logs		X	X	
	CRDL standard report	II (Part 2)-IN	X		
	Instrument detection limits	X-IN	X		
	ICP interelement correction factors	XI-IN	X	X	
	Data and instrument printouts		X		
Percent moisture		X	X	X	
pH			X (2)		

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, dilution factor(s), results, comments, approval signature/date.

2) For water samples only.

**Table 17**  
**Inorganic Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package	SW-846 Package	Standard Laboratory Report
Inorganic Chemistry	Case narrative		x	x	x
	Corrective action report(s)		x	x	x
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		x	x	x
	Chain-of-Custody Form, Cooler Receipt Form		x	x	x
	Sample log-in sheet	DC-1	x		
	Complete SDG file inventory sheet	DC-2-1	x		
	Data summary for each blank and sample (1)	I-IN	x	x	x
	Laboratory Control Sample/Laboratory Control Duplicate (LCS/LCD) report (concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	x	x	x
	Matrix Spike (MS) report (concentration spiked, percent recovered, percent recovery acceptance limits)	V(PART1)-IN	x	x	x
	Duplicate sample report	VI-IN	x	x	x
	Calibrations, initial and verification	II(PART1)-IN	x	X (summary only)	
	Copies of sample preparation logs	XIII	x	x	
	Copies of analysis run logs	XIV	x	x	
	Raw data and instrument printouts		x		
	Copies of standard preparation logs		x	x	
Percent moisture			x	x	x

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, analytical results, dilution factors, RLs, MDLs, comments, approval signature/date.

**Table 18  
Data Qualifiers**

Qualifier	Description
J	The analyte was positively identified, the quantitation is an estimation. The analyte was positively identified but the associated numerical value is an estimated value above the MDL and below the PQL.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the PQL.
R	The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.

**Notes to Tables**

$\mu\text{g}/\text{kg}$  denotes microgram per kilogram.

$\mu\text{g}/\text{L}$  denotes microgram per liter.

ASTM denotes American Society for Testing and Materials.

API denotes American Petroleum Institute.

BFB denotes Bromofluorobenzene.

CCC denotes Calibration Check Compounds.

CCV denotes continuing calibration verification.

CF denotes Calibration Factor.

COD denotes chemical oxygen demand.

CRDL denotes Contract Required Detection Limit

DDT denotes Dichlorodiphenyltrichloroethane.

DFTPP denotes Decafluorotriphenylphosphine.

EFA denotes Engineering Field Activity.

EPA denotes U.S. Environmental Protection Agency.

IC denotes initial calibration.

ICP denotes inductively coupled plasma.

ICS denotes interference check solution.

ICV denotes initial calibration verification.

IDL denotes instrument detection limit.

LCS/LCD denotes laboratory control sample/laboratory control duplicate.

MDL denotes method detection limit.

$\text{mg}/\text{kg}$  denotes milligram per kilogram.

$\text{mg}/\text{L}$  denotes milligram per liter.

MS/MSD denotes matrix spike/matrix spike duplicate.

MSA denotes method of standard addition.

O&G denotes oil and grease.

PCBs denotes polychlorinated biphenyls.

ppbv denotes parts per billion-volume.

QA denotes quality assurance.

QAO denotes Quality Assurance Officer.

QC denotes quality control.

RF denotes Response Factor.

RL denotes reporting limit.

RSD denotes Relative Standard Deviation.

SAP denotes Sampling and Analysis Plan.

SD denotes sample duplicate.

SDG denotes sample delivery group.

SM denotes Standard Methods.

SPCC denotes System Performance Check Compounds.

SVOC denotes semivolatile organic compounds.

TO denotes toxic organics.

TOX denotes total organic halides.

TPH denotes total petroleum hydrocarbons.

TSS denotes total dissolved solids.

TVPH denotes total volatile petroleum hydrocarbons.

VOCs denotes volatile organic compounds.

**FINAL  
SITE HEALTH AND SAFETY PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

Submitted to:

U.S. Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
1220 Pacific Highway  
San Diego, California 92132-5190

Submitted by:

IT Corporation  
4005 Port Chicago Highway  
Concord, California 94520-1120

Issued to: \_\_\_\_\_ Date: \_\_\_\_\_

Controlled       Uncontrolled

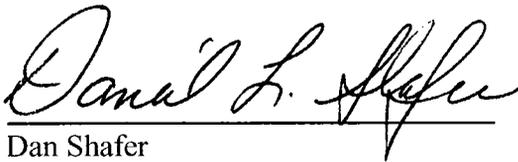
**FINAL  
SITE HEALTH AND SAFETY PLAN  
FUEL REMEDIATION MEASURES  
IR SITE 7 AND PARCEL 37  
ALAMEDA POINT  
ALAMEDA, CALIFORNIA**

**Environmental Remedial Action  
Contract Number N62474-98-D-2076  
Contract Task Order 0013**

**Document Control Number 1538  
Revision 1**

**August 1, 2001**

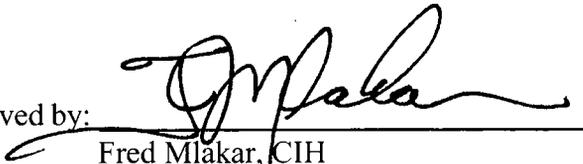
Approved by:



Dan Shafer  
IT Project Manager

Date: August 1, 2001

Approved by:



Fred Mlakar, CIH  
IT Program Certified Industrial Hygienist

Date: August 1, 2001

# Table of Contents

---

List of Tables.....	ii
List of Appendices.....	ii
Acronyms and Abbreviations .....	iii
Policy Statement.....	v
Objective.....	vi
Site Health and Safety Plan Acknowledgement.....	vii
1.0 Site Description and Scope of Work.....	1-1
1.1 Site Description.....	1-1
1.1.1 Fuel Remediation Measures at Site 7 and Parcel 37 .....	1-1
1.2 Scope of Work .....	1-2
1.2.1 Fuel Remediation Measures at Site 7 and Parcel 37 .....	1-2
2.0 Responsibilities .....	2-1
3.0 Project Hazard Analysis .....	3-1
3.1 Activity Hazard Analysis.....	3-1
3.2 Chemicals of Concern .....	3-1
3.2.1 Proposition 65 Warning and Notification and Material Safety Data Sheets.....	3-1
4.0 Buddy System .....	4-1
5.0 Personal Protective Equipment .....	5-1
5.1 Activity-Specific Levels of Protection .....	5-1
5.1.1 Site 7 and Parcel 37 .....	5-1
6.0 Site Control .....	6-1
6.1 Site Control .....	6-1
6.2 Hazard Briefing .....	6-1
6.3 Entry Log .....	6-1
7.0 Decontamination .....	7-1
7.1 Personnel Hygiene and Decontamination Facilities and Procedures.....	7-1
7.2 Equipment Decontamination Facilities and Procedures.....	7-1
8.0 Site Monitoring .....	8-1
8.1 Air Monitoring.....	8-1
8.1.1 Action Levels .....	8-1
8.1.2 Real Time Air Monitoring Frequency and Location .....	8-1
8.1.3 Fuel Remediation Measures at Site 7 and Parcel 37 .....	8-1
8.1.4 Integrated Personal Exposure Monitoring.....	8-1
8.2 Monitoring of Physical Hazards .....	8-1
9.0 Employee Training .....	9-1
9.1 Tailgate Safety Meetings .....	9-1
9.2 Hazardous Waste Training .....	9-1
9.3 Hazard Communication .....	9-1
9.4 Site-Specific Training.....	9-1
9.5 First Aid and Cardiopulmonary Resuscitation .....	9-2
10.0 Medical Surveillance Program.....	10-1
11.0 Emergency Response Plan and Contingency Procedures.....	11-1

## **Table of Contents (continued)**

---

11.1	Project Superintendent .....	11-1
11.2	Site Health and Safety Officer.....	11-1
11.3	List of Emergency Contacts and Notification .....	11-1
11.4	Fire Control .....	11-1
11.5	Site Evacuation Procedures.....	11-2
11.6	Spills or Leaks .....	11-2
11.7	Medical Emergency Response .....	11-3
11.8	Personal Exposure or Injury.....	11-3
11.9	List of Emergency Contacts and Notifications.....	11-4
12.0	References.....	12-1

## **List of Tables**

---

Table 1	Known Concentrations in Soil and Water at Site 7
Table 2	Known Concentrations in Soil and Water at Parcel 37
Table 3	Hazardous and Toxic Materials
Table 4	Exposure Guidelines for Identified Health-Significant Site Contaminants
Table 5	Activity-Specific Levels of Protection for Site 7 and Parcel 37
Table 6	Action Levels for PPE B, C, and D
Table 7	Real-Time Air Monitoring Frequency and Location

## **List of Appendices**

---

Appendix A	Activity Hazard Analyses
Appendix B	Site Map and Route to Nearest Hospital
Appendix C	Emergency Phone Numbers
Appendix D	Proposition 65 Notice and Material Safety Data Sheets
Appendix E	Health and Safety Checklist
Appendix F	Exclusion Zone Evacuation Map

## Acronyms and Abbreviations

---

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygiene
AHA	Activity Hazard Analysis
BP	boiling point (°F)
BZ	breathing zone
CESPD	Core of Engineers South Pacific Division
CHP	chemical hygiene plan
CIH	Certified Industrial Hygienist
CNS	central nervous system
COC	contaminants of concern
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
CTOs	contract task orders
dBA	decibels, A-scale
DO	delivery order
DVE	dual-vacuum extraction
EFDSW	Engineering Field Division Southwest
eV	electron volt
EZ	exclusion zone
FID	flame ionization detector
FISCO	Fleet and Industrial Supply Center, Oakland
FP	flash point (°F)
GFCI	ground fault circuit interrupters
HAZWOPER	Hazardous Waste Operations and Emergency Response
Hg	mercury
HCl	hydrochloric acid
IDLH	immediately dangerous to life and health
IIPP	Injury and Illness Prevention Plan
IP	ionization potential
IT	IT Corporation
IWTP	Industrial Waste Treatment Plan
JF	jet fuel
lb(s).	pound(s)
LEL	lower explosive limit
LMP	licensed medical practitioner
mg/kg	milligrams per kilogram
mg/m <sup>3</sup>	milligram(s) per cubic meter
mm	millimeter
MP	melting point (°F)
MSDS	material safety data sheet
MTBE	methyl tertiary butyl ether
MW	molecular weight
NAS	Naval Air Station

## **Acronyms and Abbreviations (continued)**

---

NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
PEL	permissible exposure limit
PHSP	Program Health and Safety Plan
PID	photo-ionization detector
PPE	personal protective equipment
ppm(s)	part(s) per million
PM	Project Manager
PS	Project Superintendent
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
REL	recommended exposure limit
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
Sol	solubility in water (relative)
STEL	short-term exposure limit
SZ	support zone
TCE	trichloroethylene
TLV	threshold limit value
TPH	total petroleum hydrocarbons
TWA	time weighted average
UEL	upper explosive limit (%)
UL	Underwriters Laboratories
UL/FM	Underwriters Laboratories/Factory Mutual Laboratories
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
VP	vapor pressure (mm Hg)

## ***Policy Statement***

---

It is the policy of IT Corporation (IT) to provide a safe and healthful work environment for all its employees. IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At IT, we believe every accident and every injury is preventable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Site Health and Safety Plan (SHSP), in conjunction with the Engineering Field Division Southwest (EFDSW)-Remedial Action Contract (RAC) II Program Health and Safety Plan (PHSP), describes the procedures that must be followed during project operations. Operational changes that could affect the health or safety of personnel, the community, or the environment will not be made without the prior approval of the IT Program Certified Industrial Hygienist (CIH). The provisions of this SHSP are mandatory for all IT personnel, IT project managers, IT subcontractor personnel, Navy personnel, and visitors on this project.

## Objective

---

The objective of this SHSP is to provide the guidelines for the contract task orders (CTOs) issued under contract with the Department of the Navy, EFDSW. The procedures and guidelines contained herein are based on the best information available at the time of the plan's preparation. This SHSP describes the specific health and safety requirements and procedures to be used while conducting field work.

This SHSP has been developed for each CTO, in combination with the PHSP and IT's *Health and Safety Policy and Procedures Manual*. These documents serve as the company's Injury and Illness Prevention Plan (IIPP) and Code of Safe Work Practices. Each of these documents is required to be on site and available for immediate reference. Collectively, they contain the essential elements of each project site's Health and Safety Program. Section 1.0 of this SHSP describes the specific project site and the scope of work.



## **1.0 Site Description and Scope of Work**

---

### **1.1 Site Description**

The former Naval Air Station (NAS) Alameda, now renamed Alameda Point, is located on the western end of Alameda Island, south of Oakland, primarily in Alameda County, California. Alameda Island is separated from Oakland by the Inner Harbor and Tidal Canal, which were constructed during the late 1800s and early 1900s. Prior to this time, Alameda was a peninsula surrounded by marsh and tidal areas. After construction of the Inner Harbor and Tidal Canal, fill was laid over the marsh, tidal areas, and open waters, primarily at the northern and western ends of the island. Alameda Point is constructed on this fill material. The source of much of the fill material is undocumented, although the use of dredge spoils from the nearby waterways is a likely source for much of the fill material.

#### **1.1.1 Fuel Remediation Measures at Site 7 and Parcel 37**

Site 7 consists of the former Alameda Point fuel station (Building 459) and the surrounding area including an unpaved vacant lot to the north. The former fuel station, located at the corner of Main Street and West Tower Avenue, operated from 1966 to 1997. It included an auto repair shop, a small convenience store, and eight underground storage tanks (USTs). Five 10,000-gallon USTs and one 8,000-gallon UST were used for storing and dispensing gasoline, and two 500-gallon USTs were used for holding waste oil. One of the 500-gallon USTs reportedly was used for storing solvents. One 10,000-gallon gasoline UST and one 8,000-gallon gasoline UST, located west of the pump islands, were abandoned in place due to leakage, date unknown. A petroleum hydrocarbon odor was detected at the site during the excavation, and signs of contamination were observed around the perimeter of the excavation. Underground piping associated with these two USTs were removed up to the edge of the excavation and capped.

Potential sources of contamination identified at Site 7 include USTs formerly holding gasoline, fuel lines associated with the USTs, and pump islands. Other potential contamination sources include the industrial, sanitary, and storm sewer lines located around Site 7.

Parcel 37, also known as the former fuel loading station, refers to the area to the south of Taxiway Number 3, north of West Redline Avenue, and the northern terminus of Monarch Street. The fuel loading station consisted of a fenced area that held two wooden sheds, three concrete fueling islands, three truck storage pads, and a concrete bermed area containing an aboveground water separator system in-line with the jet fuel (JF)-1 fuel lines. The site was

previously used as a filling station for trucks used to service aircraft on base. Areas where fuel was transferred into service trucks, and where these service trucks were parked when not in use, had surface drains or sumps to collect any fuel that could be recovered and the water discharged.

## **1.2 Scope of Work**

This section briefly describes the scope of work at Site 7 and Parcel 37.

### **1.2.1 Fuel Remediation Measures at Site 7 and Parcel 37**

The field activities to be performed include free product investigation and Dual Vacuum Extraction (DVE) field pilot tests at both project locations. Field activities to be implemented include the following:

- Site setup
- Piezometer installation and monitoring
- Free product measurement and sampling
- Collection trench installation
- Construction and checkout of aboveground extraction system
- Baseline field measurement
- DVE tests
- Waste handling and demobilization

An activity hazard analysis for each of the above activities has been developed and is summarized in Section 3.0 and detailed in Appendix A.

## **2.0 Responsibilities**

---

All persons are responsible for their own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to their supervisor and the Project Superintendent (PS). All persons on site are responsible for continuous adherence to health and safety procedures during the performance of any project work. In no case may work be performed in a manner that conflicts with the intent of, or the inherent safety precautions expressed in, this SHSP. After due warning, persons who violate procedures or work rules may be dismissed from the site, terminated, or have their contract revoked. Blatant disregard or repeated infractions of health and safety policies are grounds for disciplinary action up to and including dismissal and/or removal from the project.

All IT Corporation (IT) and subcontractor personnel are required to read and acknowledge their understanding of this SHSP. All project personnel are expected to abide by the requirements of this SHSP and to cooperate with project management and safety representatives to ensure a safe and healthful work site. Site personnel are required to immediately report any of the following to the PS:

- Accidents and injuries, no matter how minor
- Expected or uncontrolled release of chemical substances
- Any sign or symptoms of chemical exposure
- Any unsafe or malfunctioning equipment
- Any changes in site conditions that may affect the health and safety of project personnel

Appendix B contains a site map and route to the nearest hospital. Key project personnel are identified in Appendix C, "Emergency Phone Numbers," of this SHSP.

## **3.0 Project Hazard Analysis**

---

### **3.1 Activity Hazard Analysis**

The Activity Hazard Analysis (AHA) identifies potential safety, health, and environmental hazards and provides for protection of personnel, the community, and the environment. Activity Hazard Analyses for major tasks are included in Appendix A.

### **3.2 Chemicals of Concern**

Activities required during hazardous waste operation projects may result in the exposure of site workers and visitors to various contaminants of concern (COCs). Chemicals of concern for this project are presented in Tables 1 through 4.

#### **3.2.1 Proposition 65 Warning and Notification and Material Safety Data Sheets**

The State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) requires notification of all persons who may be exposed to substances that have been determined by the State of California to cause cancer, birth defects, or other reproductive harm. The contaminants that may be present on site that have been determined by the State to cause cancer or reproductive harm are listed in Appendix D of this SHSP, "Proposition 65 Notice and Material Safety Data Sheets."

Material Safety Data Sheets (MSDSs) are provided in Appendix D for all materials that may be used during the course of project operations.

## **4.0 Buddy System**

---

Project staffing during hazardous waste operations will meet the requirements and intent of the “buddy system,” which states that at least two persons are required to be at the work area or exclusion zone (EZ), when risk of worker contamination or serious injury may exist. Respiratory protection, when worn, will always require that the buddy system be observed (for air-purifying respirators as well as supplied-air respirators).

## **5.0 Personal Protective Equipment**

---

### **5.1 Activity-Specific Levels of Protection**

The required level of protection is specific to the activity being conducted. The initial levels of personal protective equipment (PPE) are identified in Table 5. A health and safety checklist is provided in Appendix E.

#### **5.1.1 Site 7 and Parcel 37**

The initial levels of PPE for Site 7 and Parcel 37 are Level D and modified Level D. See Table 5 for task-specific requirements.

As site activities progress, levels of PPE are subject to change or to modification. Upgrading of PPE can occur when action levels are exceeded or whenever the need arises to protect the safety and health of site personnel. Levels of PPE will not be downgraded without prior approval from the Program Certified Industrial Hygienist (CIH).

No work will be permitted in Level B without the authorization and concurrence of the Program CIH. No work will be permitted in Level A without the authorization and concurrence of the Program CIH and the Vice President of Health and Safety.

PPE level upgrades or downgrades are customarily communicated verbally between the Program CIH and the SHSO and are based on the results of air sampling data.

## **6.0 Site Control**

---

### **6.1 Site Control**

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and PPE are clearly specified prior to beginning operations. Each site will be set up separately taking into consideration, the working space, the type of contamination and the activities to be performed. This access control may require fences, barricades, traffic control devices, use of flaggers, caution tape, and other means to keep the site secure and to provide a visual barrier to help keep the curious or unaware public from entering the site. For sites where Modified Level D protection or higher is required, the work area will be divided into three work zones, an EZ, a contamination reduction zone (CRZ), and a support zone (SZ), based on the exposure to contaminated materials or anticipated hazards associated with the work.

All other site activities will only require a work area and support zone.

### **6.2 Hazard Briefing**

No person will be allowed on the site during site operations without first being given a site hazard briefing. In general, the briefing will consist of a review of this SHSP and the tailgate safety meeting. All persons on the site, including visitors, must sign the SHSP Acknowledgement Sheet (page viii of this SHSP) and the tailgate safety meeting form. The tailgate safety meetings will held daily before site activities begin.

### **6.3 Entry Log**

A site entry/exit log will be maintained with names of all personnel who enter the CRZ or the EZ.

## **7.0 Decontamination**

---

### **7.1 Personnel Hygiene and Decontamination Facilities and Procedures**

Requirements for personnel hygiene and decontamination for this project are detailed in the Program Health and Safety Plan.

### **7.2 Equipment Decontamination Facilities and Procedures**

Specific requirements for equipment decontamination facilities for this project are detailed in the Program Health and Safety Plan.

## **8.0 Site Monitoring**

---

### **8.1 Air Monitoring**

Personnel and ambient air monitoring is essential to ensure that all field personnel are adequately protected from airborne contaminants. The action levels specified in Table 6 have been established based on contaminants of concern, the potential route of entry, duration of exposure, and the permissible exposure levels established by the California Occupational Safety and Health Administration (Cal OSHA) as well as guidelines published by the American Conference of Governmental Industrial Hygiene (ACGIH) and National Institute for Occupational Safety and Health (NIOSH). These action levels will vary from project to project.

#### **8.1.1 Action Levels**

Specific action levels for various analytes using PPE Levels B, C, and D are identified in Table 6.

#### **8.1.2 Real Time Air Monitoring Frequency and Location**

Air monitoring requirements for nine project phases are listed in Table 7.

#### **8.1.3 Fuel Remediation Measures at Site 7 and Parcel 37**

Monitoring requirements for eight project activities at Site 7 and Parcel 37 are listed in Table 7.

#### **8.1.4 Integrated Personal Exposure Monitoring**

At this time, no integrated personal exposure monitoring will be conducted. Should site conditions change or real-time air monitoring results warrant, the Program CIH must be contacted.

### **8.2 Monitoring of Physical Hazards**

The monitoring of physical hazards such as noise, temperature, wind speed, and dust may be performed by the Site Health and Safety Officer (SHSO) under the direction of the Program CIH. The specific requirements for noise monitoring and evaluating heat and cold stress are discussed in detail in the PHSP as well as in the *IT Health and Safety Policies and Procedures Manual*.

## **9.0 Employee Training**

---

### **9.1 Tailgate Safety Meetings**

Before the project begins, all personnel will participate in an initial tailgate safety meeting. During the initial tailgate safety meeting, this SHSP will be discussed. The PS will ensure that the anticipated site hazards are summarized and explained to all personnel, and that those personnel are aware of the precautions they must take to minimize their exposure to the hazards. Tailgate safety meetings will be held at the start of each work shift. All new employees will attend a Site Health and Safety Orientation. Attendance records and meeting notes will be maintained with the project file.

### **9.2 Hazardous Waste Training**

All personnel entering the EZ or CRZ will have completed at least the training listed below (as required by 29 Code of Federal Regulations [CFR] 1910.120, or in California T8 California Code of Regulations [CCR]-5192). Job-specific training may also be required:

- 40 hours of training for all personnel
- Three days of field experience
- Current 8-hour refresher (within the last 12 months)
- 8-hour supervisory training (supervisors)
- Trenching/excavation competent person training
- Entry supervisor training for confined spaces
- Confined space entry training for workers

### **9.3 Hazard Communication**

All personnel performing field activities will receive basic hazard communication training. This training involves a review of the IT written hazard communication program (IT Health and Safety Procedure HS 060), MSDSs for chemicals used on site, container labeling, and chemical health hazards. MSDSs will be obtained for all materials purchased or brought on site that require an MSDS, and the MSDS will be kept on site with this SHSP.

### **9.4 Site-Specific Training**

Site-specific training will be accomplished through an initial review of this SHSP by the SHSO and through the daily tailgate safety meetings. Attendance for such training will be tracked by obtaining signatures of all attendees and will be documented in the project files.

## **9.5 First Aid and Cardiopulmonary Resuscitation**

At least two employees current and certified in first aid and cardiopulmonary resuscitation (CPR) will be assigned to the project, and at least one of these will be on the site whenever operations are ongoing. Where multiple work groups are dispersed throughout a project site, more than two employees will be current and certified in first aid and CPR. The extent of coverage will be determined relative to the number of employee groups. First aid trained personnel will also be trained in bloodborne pathogen hazards. IT requires refresher training in first aid and CPR for such individuals to maintain a current certificate. The SHSO will be current and certified in first aid and CPR training.

## **10.0 Medical Surveillance Program**

---

IT uses the services of Health Resources for medical surveillance requirements for all projects. All personnel working on site within the CRZ or EZ will have completed an occupational medical monitoring physical exam within the last 12 months. Such individuals will also have written clearance in their record to work on hazardous waste sites and to wear a respirator if required by the job.

## **11.0 Emergency Response Plan and Contingency Procedures**

---

Site personnel will be prepared to respond and act quickly in the event of an emergency. Emergency preparedness and response procedures will aid in protecting site workers and the surrounding environment. Preplanning measures will include employee training, fire and explosion prevention and protection, chemical spill and discharge prevention and protection, and safe work practices to avoid personal injury or exposure. These measures will be discussed in the daily tailgate safety meetings.

### **11.1 Project Superintendent**

At all times during scheduled work activities, a designated PS will be present on the site. This individual is responsible for implementing any emergency response or contingency procedures. Depending on the circumstances, and time permitting, the PS will review proposed response actions with the SHSO.

### **11.2 Site Health and Safety Officer**

The SHSO is responsible for implementing, communicating, and enforcing health and safety policies and procedures during the course of the project. The SHSO will also help evaluate health and safety concerns relative to environmental releases and emergency response actions. In the event of an injury, the Concord Health and Safety Administrator will be notified of the medical incident, which will be reported to Health Resources.

### **11.3 List of Emergency Contacts and Notification**

The PS and SHSO will be notified immediately in the event of an emergency. The PS will immediately evaluate the incident and, if necessary, notify the Alameda Fire Department. Telephone numbers for emergency contact personnel are listed in Appendix C.

### **11.4 Fire Control**

In the event of a fire or explosion, or imminent danger of fire or explosion, all activities will halt, and the Alameda Fire Department will be notified immediately. If it is safe to do so, site personnel may use fire-fighting equipment available on site to remove and isolate flammable or other hazardous materials, which may contribute to the fire.

The following measures will be implemented during site activities to minimize the risk of fire and/or explosion:

- Smoking will be prohibited on site except in designated smoking areas

- Good housekeeping procedures will be required on site
- Material storage methods will comply with manufacturers' recommendations
- Flammable liquids will be stored in approved containers only
- All storage, handling, or use of flammable and combustible materials will be conducted by trained personnel only
- Entry and exit pathways will be kept clear of debris or obstacles
- Work areas will be cleared of excess vegetation and obstructions
- Hot work permits will be required on site

### **11.5 Site Evacuation Procedures**

Prior to field activities, the Project Superintendent shall plan emergency egress routes and discuss them with all personnel who will be conducting field work. Initial planning includes establishing emergency warning signals and evacuation routes in case of an emergency. The site route map to the hospital is located in Appendix B. The initial evacuation muster points and EZs are shown on the Exclusion Zone and Muster Point Location Map in Appendix F. Usually these areas are located upwind of project areas. As work progresses, the HSO may alter these assembly areas depending on site and weather conditions. The site-specific evacuation procedures will be discussed in detail at the daily safety tailgate meeting.

The authority to order personnel to evacuate the work area rests with the PS and the SHSS. In the event that site evacuation is required, a continuous, uninterrupted air horn or vehicle horn (back up) will be sounded for approximately ten seconds. Personnel working in the exclusion zone will immediately make their way to the muster point for a head count.

The EZ, evacuation route, and emergency equipment locations have been included on a map and are located in Appendix F of this document. This map will be posted at each entrance to the exclusion zone. During an emergency, the evacuation routes noted on this map should be followed. If conditions such as wind direction or physical hazards do not allow access to the prescribed evacuation routes, personnel must evacuate by the safest route available.

### **11.6 Spills or Leaks**

IT will maintain the following equipment and materials in the CRZ for use during spill response activities:

- Absorbent pads
- Granular absorbent material

- Polyethylene sheeting
- 55-gallon drums
- Shovels and assorted hand tools

### **11.7 Medical Emergency Response**

In the event of severe physical or chemical injury, Alameda Fire Department personnel will be summoned for emergency medical treatment and ambulance service. The Alameda Fire Department emergency medical responders will be used to provide care to severely injured personnel. Once an initial assessment is made by the emergency medical technicians, the decision to use ground or air transportation for the victims will be made. Minor injuries will be treated on site by qualified first aid and CPR providers; if additional treatment beyond first aid is required, the injured personnel will be transported to the designated hospital. Transportation routes and maps will be placed in each site vehicle before on-site activities begin. Maps from the sites to applicable hospitals are included in Appendix B.

### **11.8 Personal Exposure or Injury**

In the event of personal exposure to contaminants, the following general guidelines will be adhered to:

- Contact/Absorption
  - Flush contaminants from the victim's skin using copious amounts of distilled or tap water, for at least 20 minutes.
  - Start flushing skin while removing contaminated clothing.
  - If irritation persists, repeat flushing.
  - Assess condition of the victim and arrange for transport to a medical center, if necessary.
  - Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.
- Inhalation
  - Move the victim **IMMEDIATELY** to an area where fresh air is available.
  - Decontaminate the victim, if necessary.
  - Administer artificial respiration, if necessary.
  - Assess condition of the victim and arrange for transport to a medical center, if necessary.
- Ingestion
  - Contact the local poison control center **IMMEDIATELY**.
  - Decontaminate the victim, if necessary.
  - Transport the victim to a medical facility, if necessary.

## **11.9 List of Emergency Contacts and Notifications**

The SSSH will immediately evaluate the incident and, if necessary, notify emergency support services. If not previously notified, the Project Manager (PM) and location contact will be advised of the situation. Telephone numbers for emergency personnel are listed in Appendix C. This list will be maintained with current contacts, and telephone lists will be kept along with other emergency phone numbers in each site vehicle.

The information provided to the notified person should include the nature of the incident and the exact location and suspected materials involved. Information that should be reported to the emergency operator regarding the incident includes the following:

- Name and telephone number of the individual reporting the incident
- Location and type of incident
- Nature of the incident (fire, explosion, spill, or release) and substances involved
- Number and nature of medical injuries
- Movement or direction of spill/vapor/smoke
- Response actions currently in progress
- Estimate of quantity of any released materials
- Status of incident
- Other pertinent information

## 12.0 References

---

IT, June 2000, *Program Health and Safety Plan for Environmental Remedial Actions*, Concord, California.

IT, 2001, *Work Plan, Fuel Remediation Measures, Site 7 & Parcel 37, Alameda Point, Alameda, California*, March.

IT, *Health and Safety Policy and Procedure Manual*, Concord, California

## TABLES

**Electronic Comments re: Chromium**

(Page: 10) Table 1

Check values with H&S

(Page: 12) Table 5

(check values with H&S)

**Table 1**  
**Known Concentrations in Soil and Water at Site 7**

Chemical	Concentration (mg/kg) Soil	Concentration (ppm) Water
Gasoline		N/A
MTBE		N/A
Benzene		N/A
Ethyl benzene		N/A
Toluene		N/A
Xylene		N/A

**Table 2**  
**Known Concentrations in Soil and Water at Parcel 37**

Chemical	Concentration (mg/kg) Soil	Concentration (ppm) Water
Jet fuel JP-5		N/A

**Table 3  
Hazardous and Toxic Materials**

Contaminant (Synonyms)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Arsenic	Variable	MW: Varies BP: Sublimes MP: Sublimes VP: 0 mm Hg Sol: Insoluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Strong oxidizing agents	Liver, kidneys, skin, lungs, lymphatic system	Dermatitis; ulceration of nasal system; respiratory system irritant; gastrointestinal disturbances; darkening of skin; peripheral nerve damage
Benzene	Colorless liquid with aromatic odor	MW: 78 BP: 176°F MP: 42°F VP: 75 mm Hg Sol: 0.18% FP: 12°F LEL: 1.3% UEL: 7.1% IP: 9.25 eV	Chlorine, bromine with iron; strong oxidizers	Blood, bone marrow, eyes, skin, respiratory system, CNS	Eye, nose, and respiratory system irritation; headache, nausea, dizziness; fatigue, anorexia; dermatitis; abdominal pain, bone marrow depression
PAHs	Yellow crystals	MW: N/A BP: 310°C MP: 179°C VP: N/A Sol: Insoluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Strong oxidizers	Respiratory system, skin, bladder, kidneys, (lung, kidney, and skin cancer)	Dermatitis, bronchitis; lung, kidney, and skin cancer
Beryllium	Hard, brittle, gray metal	MW: 9.01 BP: 2500°C MP: 1287°C VP: 0 mm Hg Sol: Complete FP: N/A LEL: N/A UEL: N/A IP: N/A	Sodium metal, aluminum, halogenated hydrocarbons	Lungs, skin, eyes, mucous membranes	Eye, skin, nose, and throat irritation, cough, difficulty breathing
Cadmium dust	Metal: silver-white, blue-tinged lustrous, odorless solid	MW: 112.4 BP: 1409°F MP: 610°F VP: 0 mm Hg Sol: Insoluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Strong oxidizers, elemental sulfur, selenium and tellurium	Respiratory system, kidneys, prostate, blood	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, anosmia, emphysema, proteinuria, mild anemia, carcinogen

**Table 3 (continued)  
Hazardous and Toxic Materials**

Contaminant (Synonyms)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Chromium	Metal, steel gray to blue white, hard, odorless solid	MW: 52 BP: 4788°F MP: 3452°F VP: 20 mm Hg Sol: Insoluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Strong oxidizers, alkalis	Eyes, skin, respiratory system	Eyes, skin and respiratory system irritation
Diesel fuel	Brown, slightly viscous liquid	MW: Varies BP: 340 to 675°F MP: Varies VP: Varies Sol: Insoluble FP: 125°F LEL: 0.6% UEL: 7.5% IP: Varies	Strong oxidizers	CNS, skin and mucous membrane	Headache, nausea, CNS, depression, anorexia, pulmonary edema, kidney and liver damage
Ethyl benzene	Colorless liquid with aromatic odor	MW: 106 BP: 277°F MP: -139°F VP: 10 mm Hg Sol: 0.01% FP: 55°F LEL: 1.0% UEL: 6.7% IP: 8.76 eV	Strong oxidizers	Eyes, skin, upper respiratory system, CNS	Eye and mucous membrane irritation; dermatitis; headache, narcosis, coma
Gasoline	Clear liquid, may be yellow to red in color, with strong kerosene-like odor	MW: Variable BP: 74 to 430°F MP: N/A VP: 400 mm Hg Sol: Insoluble FP: -40°F LEL: 1.1% UEL: 7.6% IP: Not established	Strong oxidizers	Skin, eyes, respiratory system, CNS	Eye, skin, and respiratory system irritation; headache, nausea, dizziness, coma, death; pulmonary edema, bronchitis
Methyl Tertiary Butyl Ether (MTBE)		MW: 92 BP: 231°F MP: -139°F VP: 22 mm Hg Sol: 0.05% FP: 40°F LEL: 1.3% UEL: 7.1% IP: 8.82 eV			

**Table 3 (continued)**  
**Hazardous and Toxic Materials**

Contaminant (Synonyms)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Toluene (Methyl benzene)	Colorless liquid with an aromatic odor like benzene	MW: 92 BP: 231°F MP: -139°F VP: 22 mm Hg Sol: 0.05% FP: 40°F LEL: 1.3% UEL: 7.1% IP: 8.82 eV	Strong oxidizers	Skin, liver, kidneys, CNS	Dermatitis; weakness, fatigue, dizziness; euphoria; dilated pupils, photophobia
Trichloroethylene (Trichloroethene, TCE)	Colorless liquid with a sweet chloroform-like odor	MW: 131 BP: 188°F MP: -123°F VP: 50 mm Hg Sol: 0.1% FP: None LEL: 11% UEL: 41% IP: 9.47 eV	Strong caustics; when acidic, reacts with aluminum; chemically active metals (barium, lithium, sodium, magnesium, titanium)	Skin, respiratory system, heart, liver, kidneys, skin, CNS	Eye irritation; dermatitis, headache, vertigo, blurred vision; nausea, vomiting, tremors; loss of feeling in extremities
Xylene	Colorless liquid with an aromatic odor	MW: 106 BP: 281 to 292°F MP: -12 to 55°F VP: 7-9 mm Hg Sol: 0.00003% FP: 81 to 90°F LEL: 1 to 1.1% UEL: 6 to 7% IP: 8.44 to 8.56 eV	Strong oxidizers	Eyes, skin, gastrointestinal tract, blood, liver, kidneys, CNS	Eye, nose, and throat irritation; dermatitis; corneal lesions; dizziness, poor equilibrium; anorexia, vomiting, abdominal pain

**Table 4  
Exposure Guidelines for Identified Health-Significant Site Contaminants**

Contaminant (Synonyms)	OSHA PEL		ACGIH TLV		NIOSH REL		IDLH
	8-HR TWA	15-MIN STEL	8-HR TWA	15-MIN STEL	8-HR TWA	15-MIN STEL	
Arsenic	0.01 mg/m <sup>3</sup>	—	0.01 mg/m <sup>3</sup>	—	—	0.002 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Benzene	1 ppm	5 ppm	10 ppm	—	0.1 ppm	1 ppm	500 mg/m <sup>3</sup>
Benzo(a)pyrene (PAH)	0.2 mg/m <sup>3</sup>	—	A-2	—	0.1 mg/m <sup>3</sup>	—	
Beryllium	0.002 mg/m <sup>3</sup>	0.005 mg/m <sup>3</sup> ceiling	A-2 0.002 mg/m <sup>3</sup>	—	—	0.005 mg/m <sup>3</sup>	4 mg/m <sup>3</sup>
Cadmium dust	0.005 mg/m <sup>3</sup>	—	0.01 mg/m <sup>3</sup> – elemental 0.002 mg/m <sup>3</sup> – compounds	—	Lowest feasible concentration	—	9 mg/m <sup>3</sup>
Chromium	0.5 mg/m <sup>3</sup>	—	0.5 ppm	—	.5 ppm	—	250mg/ m <sup>3</sup> (as Cr)
Diesel engine exhaust	—	—	—	—	Lowest feasible concentration	—	—
Ethyl benzene	100 ppm	125 ppm	100 ppm	125 ppm	100 ppm	125 ppm	2000 ppm
Gasoline engine exhaust	—	—	—	—	—	—	—
Methyl Tertiary Butyl Ether (MTBE)							
Toluene	100 ppm	150 ppm	50 ppm	—	100 ppm	150 ppm	2,000 ppm
Trichloroethylene (TCE)	25 ppm	200 ppm	50 ppm	100 ppm	25 ppm	2 ppm	1,000 ppm
Xylene	100 ppm	—	100 ppm	150 ppm	100 ppm	150 ppm	—

**Table 5**  
**Activity-Specific Levels of Protection for Site 7 and Parcel 37**

<b>Task</b>	<b>Activity</b>	<b>Initial Levels of PPE</b>
Site setup	All	Level D
Free product delineation, sampling and characterization	All	Modified Level D
Piezometer installation and monitoring	All	Modified Level D
Collection trench installation	All	Modified Level D
Construction and checkout of above-ground extraction system	All	Modified Level D
Baseline field measurement	All	Level D
Dual vacuum extraction tests	All	Modified Level D
Waste handling and demobilization	All	Modified Level D

**Table 6  
Action Levels for PPE B, C, and D**

Analyte	Action Level <sup>a</sup>	Required Action <sup>b</sup>
<b>LEVEL D PPE</b>		
Dust	> 0.5 mg/m <sup>3</sup> above background	Upgrade to Level C
Unknown VOCs	> 5 ppm above background	Detector tube for benzene; continue work if no benzene is detected
Benzene	> 1 ppm or ≤ 5 ppm	Upgrade to Level C
	> 5 ppm	Stop work; contact CIH <sup>c</sup>
O <sub>2</sub>	≥ 23.5% or ≤ 20%	Stop work; contact CIH <sup>c</sup>
LEL	10% of LEL	Stop work; determine cause <sup>c</sup>
<b>LEVEL C PPE</b>		
Dust	> 5.0 mg/m <sup>3</sup> above background	Stop work; initiate dust suppression
Unknown VOCs	> 50 ppm above background in BZ	Use a detector tube for benzene and TCE; continue work if no benzene is detected
Benzene	> 5 but ≤ 50 ppm	Upgrade to Level B, contact CIH <sup>c</sup>
O <sub>2</sub>	≥ 23.5% or ≤ 20%	Stop work; contact CIH <sup>c</sup>
LEL	10% of LEL	Stop work; determine cause <sup>c</sup>
<b>LEVEL B PPE (not to be used without CIH approval)</b>		
Unknown VOCs	100 ppm above background in BZ	Stop work; detector tube for benzene; contact CIH <sup>c</sup>
O <sub>2</sub>	≥ 23.5% or ≤ 20%	Stop work; contact CIH <sup>c</sup>
LEL	10% of LEL	Stop work; determine cause <sup>c</sup>

<sup>a</sup> Five excursions above the action level in any 15-minute period or a sustained reading in excess of the action levels for 5 minutes will trigger a response.

<sup>b</sup> Frequency of air monitoring may be adjusted by the CIH after sufficient characterization of site contaminants has been completed, tasks have been modified, or site controls have proven effective.

<sup>c</sup> Contact with the Program CIH must be made before work continues. The Program CIH may then initiate integrated air sampling along with additional engineering controls.

**No one is permitted to downgrade levels of PPE without authorization from the Program CIH.**

**Table 7**  
**Real-Time Air Monitoring Frequency and Location**

Work Activity	Instrument	Frequency <sup>a</sup>	Location
Activity 1 Mobilization/demobilization	PID	N/A	N/A
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	N/A	N/A
Activity 2 Utility clearance	PID	N/A	N/A
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	N/A	N/A
Activity 3 Direct-push sampling	PID	Periodically	BZ of employee/area
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	Periodically	BZ of employee/area
	Detector Tube (Benzene)	Periodically	BZ of employee
Activity 4 Decontamination	PID	N/A	N/A
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	Periodically	BZ of employee
Activity 5 Soil excavation	PID	Periodically	BZ of employee/area
	Miniram	Continuously	Area
	O <sub>2</sub> /LEL	Periodically	BZ of employee/area
	Detector Tube (Benzene)	Periodically	BZ of employee
Activity 6 Dewatering	PID	Periodically	BZ of employee/area
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	Periodically	BZ of employee/area
	Detector Tube (Benzene)	Periodically	BZ of employee
Activity 7 Site setup	PID	N/A	N/A
	Miniram	N/A	N/A
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	N/A	N/A
Activity 8 Free product delineation, sampling and characterization	PID	Periodically	Area/BZ of employee
	Miniram	Continuously	Area/BZ of employee
	O <sub>2</sub> /LEL	Periodically	Area/BZ of employee
	Detector Tube (Benzene)	Periodically	Area/BZ of employee
Activity 9 Piezometer installation and monitoring	PID	Periodically	Area/BZ of employee
	Miniram	Periodically	Area/BZ of employee
	O <sub>2</sub> /LEL	Periodically	Area/BZ of employee
	Detector Tube (Benzene)	Periodically	Area/BZ of employee
Activity 10 Collection trench installation	PID	Periodically	BZ of employee
	Miniram	Continuously	BZ of employee
	O <sub>2</sub> /LEL	Periodically	Area/BZ of employee
	Detector Tube (Benzene)	Periodically	BZ of employee

**Table 7 (Continued)**  
**Real-Time Air Monitoring Frequency and Location**

Work Activity	Instrument	Frequency <sup>a</sup>	Location
Activity 11 Construction and checkout of above-ground extraction system	PID	N/A	N/A
	Miniram	Continuously	Area/BZ of employee
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	N/A	N/A
Activity 12 Baseline field measurement	PID	Periodically	Area/BZ of employee
	Miniram	Continuously	Area/BZ of employee
	O <sub>2</sub> /LEL	Periodically	Area/BZ of employee
	Detector Tube (Benzene)	Periodically	Area/BZ of employee
Activity 13 Dual vacuum extraction tests	PID	Periodically	BZ of employee
	Miniram	Continuously	BZ of employee
	O <sub>2</sub> /LEL	N/A	N/A
	Detector Tube (Benzene)	Periodically	BZ of employee
Activity 14 Waste handling and demobilization	PID	Periodically	BZ of employee/area
	Miniram	Continuously	BZ of employee/area
	O <sub>2</sub> /LEL	Periodically	Area
	Detector Tube (Benzene)	Periodically	BZ of employee/area

**Table Notes:**

- ACGIH denotes American Conference of Governmental Industrial Hygiene
- BP denotes boiling point (°F)
- BZ denotes breathing zone.
- CNS denotes central nervous system
- eV denotes electron volt
- FP denotes flash point (°F)
- Hg denotes mercury
- IDLH denotes immediately dangerous to life or health.
- IP denotes ionization potential (electron volts: eV)
- JP-5 denotes jet petroleum-5
- LEL denotes lower explosive limit (%)
- mg/kg denotes milligrams per kilogram.
- mg/m<sup>3</sup> denotes milligrams per cubic meter.
- mm denotes millimeter
- MP denotes melting point (°F)
- MTBE denotes methyl tertiary butyl ether.
- MW denotes molecular weight
- NIOSH denotes National Institute for Occupational Safety and Health.
- OSHA PEL denotes Occupational Safety and Health Administration permissible exposure limit.
- PAH denotes polynuclear aromatic hydrocarbons.
- PID denotes photo-ionization detector.
- ppm denotes parts per million.
- REL denotes recommended exposure limit
- Sol denotes solubility in water (relative)
- STEL denotes short-term exposure limit
- TCE denotes trichloroethylene.
- TVL denotes threshold limit value
- TWA denotes time weighted average
- UEL denotes upper explosive limit (%)
- VP denotes vapor pressure (mm Hg)