

DEPARTMENT OF THE NAVY – NAVFAC SOUTHWEST
Naval Facilities Engineering Command
1220 Pacific Highway, San Diego, California 92132-5190



DRAFT

WORK PLAN

SITE CHARACTERIZATION FOR PETROLEUM CONTAMINATION AT THE BUILDING 500 FORMER UST SITE (UST 500, ALSO KNOWN AS UST 000008) NAVAL WEAPONS STATION SEAL BEACH, CALIFORNIA

December 20, 2012

Contract No.: N62473-10-D-4009
Task Order No.: 0068
Document Control No.: RBAE-4009-0068-0009

Prepared by:

BRADY

3710 Ruffin Road
San Diego, California 92123

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ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
bgs	below ground surface
CA	California
CPT	cone penetrometer test
CSM	conceptual site model
CUPA	Certified Unified Program Agency
DQO	data quality objective
°F	degrees Fahrenheit
LIF	laser induced fluorescence
NAVWPNSTA	Naval Weapons Station
NAVFAC SW	Naval Facilities Engineering Command Southwest
QC	quality control
SAP	Sampling and Analysis Plan
SIM	Selective Ion Monitoring
SCAPS	Site Characterization and Analysis Penetrometer System
SSHP	Site Specific Health and Safety Plan
TPH-diesel	total petroleum hydrocarbons quantified as diesel
TPH-gasoline	total petroleum hydrocarbons quantified as gasoline
UST	underground storage tank

1.0 INTRODUCTION

This Work Plan describes a planned site investigation to delineate the extent of non-aqueous phase fuel and/or contaminated soil associated with a diesel fuel release from a former underground storage tank (UST) at Building 500 on Naval Weapons Station (NAVWPNSTA) Seal Beach, California (CA). This document was prepared by Richard Brady & Associates (Brady) on behalf of Naval Facility Engineering Command Southwest (NAVFAC SW) under subcontract to Shaw Environmental and Infrastructure in accordance with Task Order 0068 issued under contract N62473-10-D-4009.

1.1 Scope of Work

The scope of work is designed to meet the objectives of the investigation of the former UST at Building 500 (UST 500). The objective of this investigation is to delineate the extent of diesel in soil and to make recommendations for future work based the magnitude of the release. Additionally, this investigation is designed to collect data to assess the exposure pathways to human health and the environment, and update the conceptual site model (CSM) for the Site. The investigation will be performed using the Navy's Site Characterization and Analysis Penetrometer System (SCAPS) direct push technology.

The scope of work for this investigation includes the following:

- Hand auguring all subsurface investigation locations to 5 feet below ground surface (bgs) for utility clearance.
- Screening the release area for diesel fuel using direct-push, real-time laser-induced fluorescence (LIF) and simultaneously collecting cone penetrometer test (CPT) data for soil classification.
- Delineating the extents of the non-aqueous phase fuel and/or contaminated soil, using the real-time LIF screening to dynamically guide step-out locations.
- Confirming the LIF screening results by collection and analysis of three soil samples.
- Analysis of the soil samples by a fixed base laboratory for the following parameters:

Analyte	Method
TPH-gasoline	EPA 8015B
TPH-diesel	EPA 8015B
Volatile Organic Compounds	EPA 8260B
Polynuclear Aromatic Hydrocarbons	EPA 8270 SIM

1.2 Report Organization

This Work Plan describes the site background and environmental setting, previous investigations, and the proposed technical approach.

The Sampling and Analysis Plan (SAP) is provided as Appendix A. The SAP provides a rationale for field sampling activities, and describes and establishes consistent field sampling procedures. The SAP establishes data gathering, handling, and documentation methods that are precise, accurate, representative, complete, and comparable to meet quality control (QC) requirements and data quality objectives (DQOs) for this project.

A site-specific Accident Prevention Plan (APP) and Specific Safety and Health Plan (SSHP) are prepared under separate cover. The SSHP contains health and safety procedures required by Title 29 Code of Federal Regulations 1910.120 to address worker protection against contamination and physical hazards, and to specify site specific air monitoring, accident reporting, and emergency procedures.

Upon completion of the field investigation and on the receipt of all analytical data, Draft and Final Site Characterization reports shall be provided detailing the findings and recommendations for the site.

1.3 Regulatory Status

The Department of the Navy is the lead agency on this project, and the lead regulatory agency is the California Regional Water Quality Control Board, Santa Ana Region.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Site Location and Description

NAVWPNSTA Seal Beach is located in the northwest corner of Orange County, CA, in the City of Seal Beach; which is approximately 20 miles south of Los Angeles (Figure 1). Nearby communities include the Cities of Huntington Beach, Westminster, Los Alamitos, and Garden Grove. Comprised of 5,256 acres, NAVWPNSTA Seal Beach is a Navy weapons and munitions loading, storage, and maintenance facility. NAVWPNSTA Seal Beach has been operated by the Navy and its contractors since its inception in 1944.

Former UST 500 is within a truck holding yard in the southeastern region of NAVWPNSTA Seal Beach (Figures 2 and 3). The former UST is located in a paved area adjacent to an electrical transformer pad.

2.2 Site History/Previous Investigation

The UST was discovered in November 2009 during site renovation of the holding yard at Building 500. Based on personnel knowledge, the UST was used for supplying diesel fuel to an emergency generator, and was abandoned in the 1950s.

An initial subsurface investigation revealed the UST was a 1,200-gallon single-walled steel tank, and contained approximately 1,000 gallons of diesel fuel. Under direction of the County of Orange Health Care Agency, Environmental Health Division (a Certified Unified Program Agency [CUPA] implementing the UST Program), the remaining fuel was removed, the UST interior was triple rinsed, and soil samples were collected for analysis. A backhoe was used to pothole and collect three soil samples adjacent to the bottom of the UST. Because the UST was situated adjacent to the transformer pad, near underground utilities, and in a remote area that may not pose any environmental health risks to the public or any beneficial uses of water, the UST was allowed to be filled in-place with cement grout. Some of the sampling excavation surrounding the UST was also filled with cement grout (NAVFAC SW, Personal Communication).

The laboratory reported the following results from the analysis of the three soil samples:

Sample SB-01-2	
Napthalene	0.0037 mg/kg
All other analytes were non-detect.	
Sample SB-02-8	
All analytes were non-detect	
Sample SB-03-8	
TPH quantified as gasoline	270 mg/kg
TPH quantified as diesel	7000 mg/kg
1,2,4-Trimethylbenzene	3.5 mg/kg
1,3,5-Trimethylbenzene	0.82 mg/kg
2-butanone	1.9 mg/kg Q
4-Isopropyltoluene	0.44 mg/kg
Isopropylbenzene	0.10 mg/kg
naphthalene	5.6 mg/kg Q
n-butylbenzene	0.48 mg/kg
n-propylbenzene	0.22 mg/kg
sec-butylbenzene	0.23 mg/kg
m,p-xylenes	0.66 mg/kg
o-xylene	0.24 mg/kg
All other analytes were non-detect.	
Q = One or more quality control criteria did not meet specifications.	

The laboratory report is provided in Appendix B. No third party validation was performed on the laboratory data.

2.3 Environmental Setting

The following sections describe the regional setting, land use, climate, geologic, and hydrologic settings at the site.

2.3.1 Regional Setting and Topography

NAVWPNSTA Seal Beach is located within the city boundaries of Seal Beach, CA, located in the northwestern region of Orange County, CA. Seal Beach is bordered to the west and north by the cities of Long Beach and Los Alamitos. The city is bordered to the east by Westminster and to the south by Huntington Beach, CA. The Seal Beach National Wildlife Refuge is located in the southwest region of the base which is bordered by Anaheim Bay leading to the Pacific Ocean.

The topography in the region is generally flat ranging from near sea level to approximately 15 feet above mean sea level, as part of the Sunset Gap topographical area.

2.3.2 Land Use

Since NAVWPNSTA Seal Beach was first commissioned in 1944, the facility has been used for weapons and munitions loading, storage, and maintenance. Prior to 1962 it was known as the Naval Ammunition and Net Depot and was used to service anti-submarine nets used to protect fleet bases and anchorages around the world. NAVWPNSTA Seal Beach has evolved into the Navy's primary West Coast ordnance storage, loading and maintenance facility. All current facility operations are industrial, and the Navy's proposed future use for the entire facility will remain industrial, with controlled access restricted to authorized badged personnel.

2.3.3 Climate

The Seal Beach area is characterized by a Mediterranean climate, with warm to hot, dry summers and cool, wet winters. Based on Anaheim, CA climate data, temperatures range from an average yearly high of 78 degrees Fahrenheit (°F) to an average low of 56 °F, with an average annual rainfall of 13.57 inches (TWC, 2012).

2.3.4 Geology

Regionally, the Los Angeles Basin is a thick sedimentary sequence of Pliocene and Quaternary age alluvial sediments eroded from the mountains that surround the area. Deposition of these variably weathered sediments that form the broad synclinal depression of the basin was influenced by sea level changes and encroachment that occurred across the depositional time frame (USGS, 2009). These sedimentary rocks lie on a pre-Tertiary, metamorphic and crystalline basement (Geological Survey, 1956).

The present topography in the area of the site was created by the geologically-recent and ongoing activity of the Newport Inglewood Structural Zone. This tectonic movement has formed the topographic low that incorporates the UST 500 Site within the Sunset gap and the flanking subtle elevation changes of the Bolsa Chica Mesa southeast of the site and Landing Hill to the northwest (Department of Water Resources [DWR], 1968).

Within the Sunset Gap area, the near surface geology at the study area is expected to consist of Holocene age sediments characterized as silt, sand, gravel and clay deposited in a floodplain/lagoonal environment. Underlying the recent deposits are the shallow marine, littoral, and continental Pleistocene sediments consisting of interfingering beds of sand, gravel, silt, and clay (Geological Survey, 1956).

2.3.5 Hydrogeology

NAVWPNSTA Seal Beach is located within the East Coastal Plain Hydrologic Subarea of the Lower Santa Ana River Hydrologic Area, which has designated existing or potential municipal, agricultural, and industrial beneficial uses for groundwater (RWQCB, 2008).

According to the 1956 Geological Survey Water Supply Paper, there are at least three distinct bodies of groundwater in the Long Beach-Santa Ana area. The shallowest is the semiperched body of water which occurs in the Holocene sediments, commonly less than 50 feet below land surface. The semiperched is essentially an unconfined fresh water body and is a minor groundwater producer of generally poorer quality than water from the deeper aquifer. Beneath the semiperched shallow aquifer and within primarily the Pleistocene sediments that underlie the Holocene deposition is the principal body of naturally fresh groundwater. This extensive, main fresh water body has its base 800 to 2,600 feet below sea level along the crest of the Newport-Inglewood zone, but extends to depths as great as 8,000 feet beneath the central part of Downey Plain. Connate, saline water underlies the main fresh water body in older Tertiary age rocks (Geological Survey, 1956).

The general groundwater gradient for the freshwater aquifers in the area is seaward (southwesterly). Historically however, variations in pumping and artificial recharge have affected groundwater gradient (DWR, 1968).

3.0 TECHNICAL APPROACH

A summary of the technical approach for this investigation is presented in this section. A detailed description of the sampling program and an expanded description of the supporting DQOs are presented in the attached SAP (Appendix A). The data collected during this investigation will be used to determine if further action is needed.

Based upon the Problem Definition (SAP Worksheet #10, Appendix A) and DQOs (SAP Worksheet #11, Appendix A), the following section summarizes the technical approach proposed for the investigation.

An array of LIF screening locations shown on Figure 3 will be cleared for underground utilities by a geophysical survey subcontractor. Each location to be investigated will also be manually hand-augured to a depth of five feet bgs to confirm the absence of underground utilities.

The LIF locations are chosen to allow efficient step outs from the former UST 500, delineating the non-aqueous phase fuel and/or contaminated soil in a dynamic manner guided by real-time LIF screening data. The level of effort planned for the field investigation is two days duration.

The investigation will proceed by using the SCAPS to push the LIF probe at the locations nearest to former UST 500. The depth is expected to yield continuous LIF and CPT data to a depth of approximately 10 below water table. Following each LIF screening push, the real time LIF data will be evaluated to determine if the fuel in soil has been delineated or if another step-out push is needed. Screening level delineation will be completed when the LIF screening data does not show elevated fluorescence intensity that infers the presence of fuel. The LIF probe will be pushed to a minimum depth of 25 feet bgs at each location.

After the extent of fuel has been delineated by the LIF, soil sampling, analysis, and validation will be conducted to confirm the screening level LIF results and to provide quantitative data. The SCAPS will be used to collect soil samples using a direct push sampling tool. One soil sample will be taken at the location and depth of the highest screening LIF detection. A second soil sample will be collected from a depth interval of background fluorescence directly above sample with the highest fluorescence. A third soil sample will be proposed from an area where background fluorescence is measured through the entire push interval, from a depth corresponding to the highest fuel fluorescence at an adjacent push location. The three soil samples will be analyzed for total petroleum hydrocarbons quantified as gasoline and diesel (EPA Method 8015M), volatile organic compounds (EPA Method 8260B), and polynuclear aromatic hydrocarbons (EPA Method 8270C SIM). Third party data validation will be done on the soil sample data.

If there are no elevated LIF readings at any of the screening locations, SCAPS will install a temporary piezometer to determine the depth to groundwater so that LIF confirmation

soil samples can be located in the capillary fringe on the presumed downgradient (southwesterly) side adjacent to UST. These samples will target a potential fuel smear zone with concentrations lower than the LIF detection threshold.

Horizontal coordinates of the sample locations will be measured by SCAPS personnel using differentially corrected global positioning system with sub-foot horizontal accuracy. Elevations of locations will not be surveyed.

Disposal of the investigative derived waste will be coordinated by Brady following approval by the NAVWPNSTA Seal Beach and the disposal facility. All investigative-derived waste will be disposed of in accordance with Federal, State, and local laws and regulations.

At the conclusion of the field investigation, a Site Characterization Report including recommendations will be produced in Draft and Final iterations. Project data and reports will be uploaded to GeoTracker.

4.0 PROPOSED SCHEDULE

The following schedule is planned for the execution of proposed site assessment activities at the Former UST Site 500:

- December, 2012 – Submittal of Draft Work Plan for review.
- January, 2013 – Agency comments received on Draft Work Plan.
- February, 2013 – Submittal of Final Work Plan.
- February, 2013 – Commencement of field investigation.
- April, 2013 – Receipt of validated laboratory data.
- August, 2013 – Submittal of Draft Site Characterization Report for review.
- October, 2013 – Agency comments received on Draft Site Characterization Report.
- December, 2013 – Submittal of Final Site Characterization Report.

5.0 REFERENCES

Geological Survey, 1956. Water Supply Paper 1109, Ground-water Geology of the Coastal Zone Long Beach-Santa Ana Area, California.

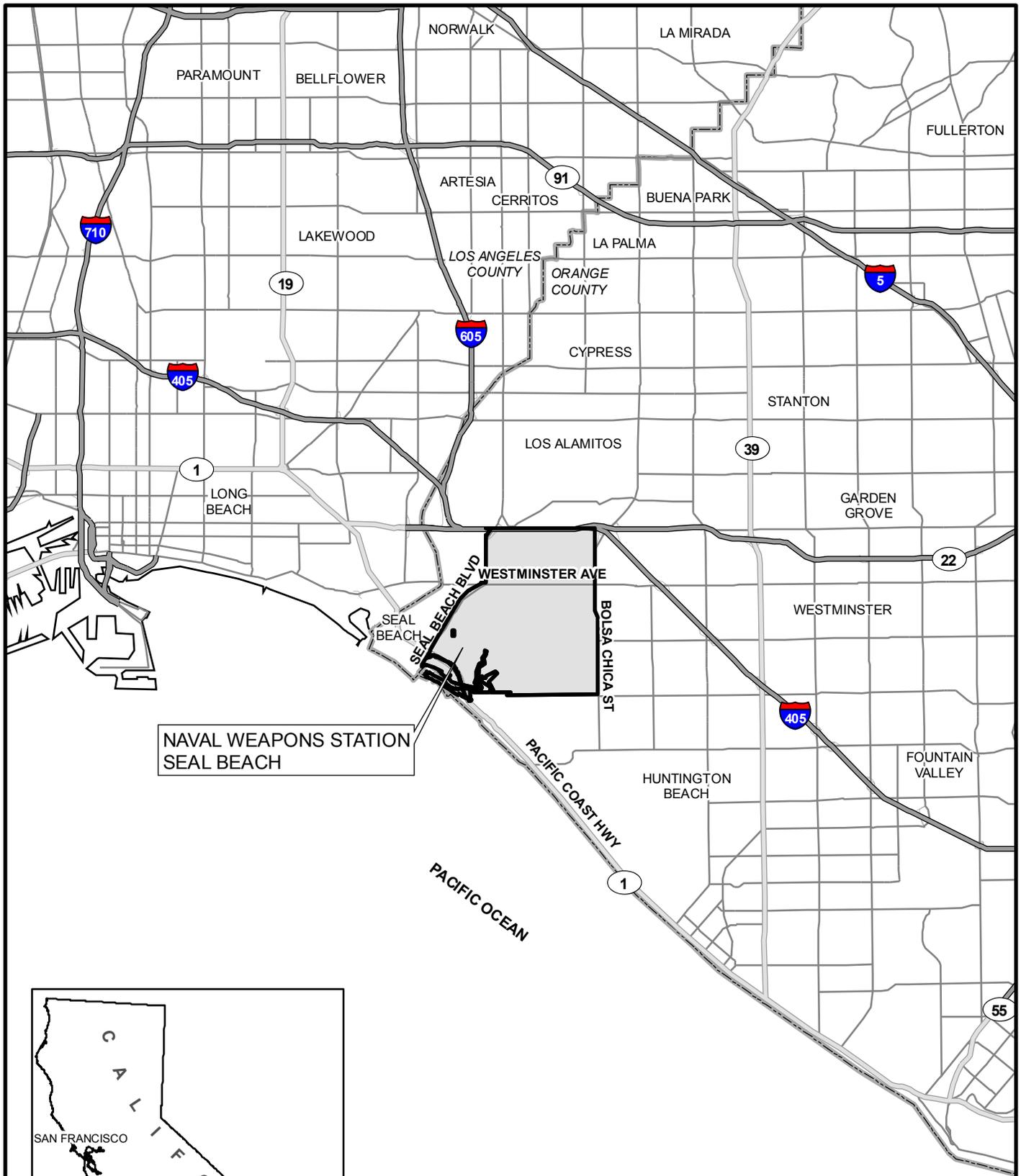
State of California Department of Water Resources (DWR), 1968. Bulletin No. 63-2 Sea-Water Intrusion: Bolsa-Sunset Area Orange County. Jan.

The Weather Channel (TWC), Monthly Weather Averages for Anaheim, CA, accessed May 2012: <http://www.weather.com/weather/wxclimatology/monthly/USCA0027>

USGS, 2009. Ground-Water Quality Data in the Coastal Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program. March.

Figures

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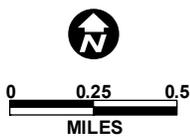


NAVAL WEAPONS STATION
SEAL BEACH



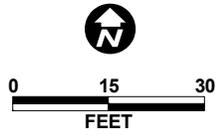
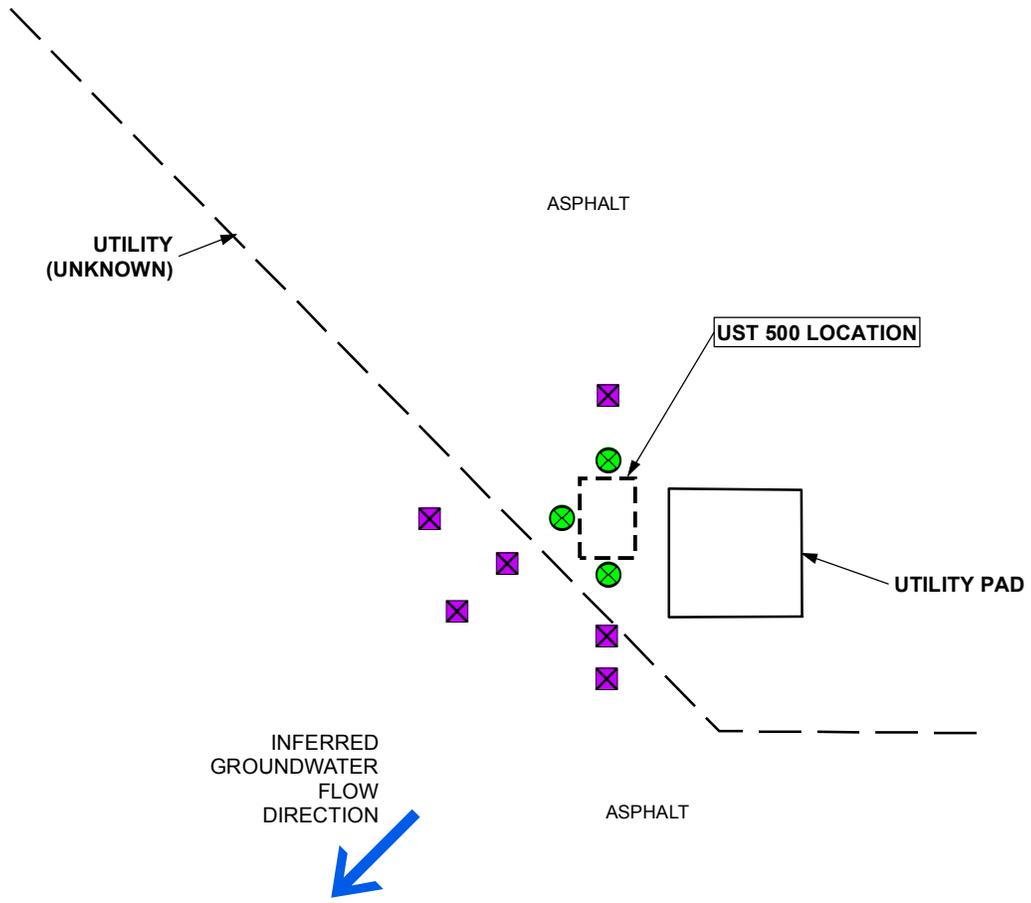
FACILITY LOCATION MAP	
NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA	
BRADY	DATE: July 31, 2012 FILE: LocMap _120731
FIGURE 1	

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<p>UST 500 SITE LOCATION MAP</p>	
<p>NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA</p>	
<p>BRADY</p>	<p>DATE: Jan 4, 2013 FILE: SiteLocMap_120710</p>
<p>FIGURE 2</p>	

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LEGEND

-  PROPOSED INITIAL LIF LOCATION
-  PROPOSED STEP-OUT LIF LOCATION

NOTES

LIF = LASER INDUCED FLUORESCENCE

UST 500 SITE PLAN AND PROPOSED LIF LOCATIONS	
NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA	
BRADY	DATE: Jan 8, 2013 FILE: PropLoc_130108
FIGURE: 3	

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Appendix A

Sampling and Analysis Plan

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1.0 SAP WORKSHEET #1 – TITLE AND APPROVAL PAGE

**DRAFT
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)**

December 2012

**SITE CHARACTERIZATION FOR PETROLEUM CONTAMINATION
AT THE BUILDING 500 FORMER UST SITE (UST 500/UST 000008) AT
NAVAL WEAPONS STATION
SEAL BEACH, CALIFORNIA**

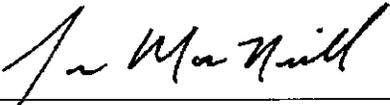
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Naval Facilities Engineering Command Southwest
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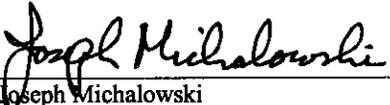
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Review Signature:


Date 12/03/12
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BRADY Quality Assurance Manager

Approval Signature:


Date December 6, 2012
Joseph Michalowski
NAVFAC SW Acting QA Officer

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1.1 Executive Summary

This Work Plan describes a planned site investigation to delineate the extent of non-aqueous phase fuel and/or contaminated soil associated with a diesel fuel release from a former underground storage tank (UST) at Building 500 (UST 500, also known as UST 000008) on Naval Weapons Station (NAVWPNSTA) Seal Beach, California. This document was prepared by Richard Brady & Associates (BRADY) on behalf of Naval Facility Engineering Command Southwest (NAVFAC SW) under subcontract to Shaw Environmental and Infrastructure in accordance with Task Order 0068 issued under contract N62473-10-D-4009.

The Department of the Navy is the lead agency on this project, and the lead regulatory agency is the California Regional Water Quality Control Board, Santa Ana Region.

The objective of this investigation is to delineate the extent of diesel in soil and to make recommendations for future work based the magnitude of the release. Additionally, this investigation is designed to collect data to assess the exposure pathways to human health and the environment, and update the conceptual site model (CSM) for the Site. The investigation will be performed using the Navy's Site Characterization and Analysis Penetrometer System (SCAPS) direct push technology.

To develop a current CSM, SCAPS will collect screening data for petroleum fuel in the release area by using direct-push, real-time laser-induced fluorescence (LIF) while simultaneously collecting cone penetrometer test (CPT) data for soil classification. The extents of the non-aqueous phase fuel and/or contaminated soil will be delineated using the real-time LIF screening to dynamically guide step-out locations. Three soil samples will be collected to confirm the LIF screening results. The soil samples will be analyzed by a fixed-base laboratory for the following parameters:

Analyte	Method
TPH-gasoline	EPA 8015B
TPH-diesel	EPA 8015B
Volatile Organic Compounds	EPA 8260B
Polynuclear Aromatic Hydrocarbons	EPA 8270 SIM

The overall quality of tasks performed for this investigation will be assured by conformance to protocols established for sample collection, analytical procedures, and data management. This Sampling and Analysis Plan (SAP) provides details of the quality assurance/quality control protocols that will be implemented throughout the investigation.

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Figure 2	UST 500 Site Location Map
Figure 3	UST 500 Site Plan and Proposed LIF Locations

ATTACHMENTS

Attachment 1	Form Examples
Attachment 2	Standard Operating Procedures
Attachment 3	Analytical Standard Operating Procedures

ACRONYMS/ ABBREVIATIONS

bgs	below ground surface
BRADY	Richard Brady & Associates
°C	degrees Celsius
CA	Corrective Action
CAS	Chemical Abstracts Service
CCC	criteria continuing concentration
CCV	continuous calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	Chain of Custody
COD	chemical oxygen demand
CLP	contract laboratory program
CPR	cardiopulmonary resuscitation
CPT	cone penetrometer test
CSM	conceptual site model
CUPA	Certified Unified Program Agencies
DCC	daily calibration check
DCN	document control number
DI	de-ionized
DIPE	Diisopropyl Ether
DL	detection limit
DoD	Department of Defense
DON	Department of Navy
DQI	Data Quality Indicator
DQO	Data Quality Objective
ELAP	Environmental Laboratory Accreditation Program
EMIMD	Electromagnetic Induction Metal Detector
EMPCL	Electromagnetic Pipe and Cable Locator
EPA	Environmental Protection Agency
ETBE	Ethyl Tert-Butyl Ether
EWI	Environmental Work Instruction
FCN	Field Change Notice
ft	feet
g	grams
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GPR	ground penetrating radar
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCl	hydrochloric acid
HPLC	high-performance liquid chromatography

H&S	health and safety
HSO	Health and Safety Officer
ICAL	initial calibration
ICV	initial calibration verification
ID	identification
IR	Installation Restoration
LCS	laboratory control spike
LDC	Laboratory Data Consultants
LIF	laser induced fluorescence
LOD	limit of detection
LOQ	limit of quantitation
LQAP	Laboratory Quality Assurance Program
MCL	Maximum Contaminant Level
MDL	method detection limit
ME	marginal exceedance
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
NA	not applicable
NAVFAC SW	Naval Facilities Engineering Command Southwest
NAVWPNSTA	Naval Weapons Station
NEDD	Navy Electronic Data Deliverable
NFESC	Naval Facilities Engineering Service Center
NIRIS	Naval Installation Restoration Information Solution
OCHCA	Orange County Health Care Agency
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCE	Tetrachloroethene
PG	Professional Geologist
pH	potential of hydrogen
PM	Program Manager
PT	proficiency testing (previously known as performance evaluation sample)
PVC	polyvinyl chloride
QA	Quality Assurance
QAO	Quality Assurance Officer
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	quantitation limit
RPD	relative percent difference

RPM	Remedial Project Manager
%RSD	percent relative standard deviation
RSD	relative standard deviation
RSL	Regional Screening Level
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCAPS	Site Characterization and Analysis Penetrometer System
SOP	standard operating procedure
SPCC	system performance check compound
SSHP	Site Specific Health and Safety Plan
SWQCB	Santa Ana Water Quality Control Board
TBD	to be determined
TCE	Trichloroethene
TPH-d	total petroleum hydrocarbon quantified as diesel
TPH-g	total petroleum hydrocarbons quantified as gasoline
TSA	technical systems audit
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic analytes
VOC	volatile organic compounds
WP	work plan

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2.0 SAP WORKSHEET #2 – SAP IDENTIFYING INFORMATION

Site Name/Number: Building 500 Former UST Site (UST 500, also known as UST 000008), Naval Weapons Station (NAVWPNSTA) Seal Beach, California

Operable Unit: N/A

Contractor Name: Richard Brady & Associates (BRADY)

Contract Number: N62473-10-D-4009

Contract Title: ENVIRONMENTAL SERVICES (Containerized Solid Waste, Site Assessment & Remediation, Industrial Waste/Oily Waste Management)

Work Assignment Number (optional): Task Order No. 0068

Document Control Number: 4009-0068-0008

2.1 Reference Documents

This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) [U.S. Environmental Protection Agency (U.S. EPA) 2005] and EPA Guidance for QAPP, EPA QA/G-5, QAMS (U.S. EPA 2002), and with:

Department of Defense (DoD) Environmental Data Quality Workgroup (EDQW). 2000. *Best Practices for Data Quality Oversight of Environmental Sampling and Testing Activities*. November.

_____. 2010. *Quality Systems Manual for Environmental Laboratories*, Version 4.2. October.

Department of the Navy (DoN). 2006. *Environmental Restoration Program Manual (NERP)*. August.

_____. 2009. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual, Rev. 1*. NAVSEA T0300-AZ-PRO-010. August.

Naval Facilities Engineering Command (NAVFAC). 1999. *Navy Installation Restoration Chemical Data Quality Manual*. September.

Navy Facilities Engineering Command Southwest (NAVFAC SW). 2001. *Environmental Work Instruction No. 1 (3EN2.1). Chemical Data Validation*. November.

_____. 2005. *Environmental Work Instruction No. 6 (EVR.6). Environmental Data Management and Required Electronic Delivery Standards*. April.

_____. 2007. *Environmental Work Instruction No. 4 (EVR.4). Implementing and Maintaining the Comprehensive Response, Compensation and*

Liability Act (CERCLA) Administrative Record (AR) and Compendium at NAVFAC Southwest. May.

_____. 2008. *Environmental Work Instruction No. 9 (EV3.9). Working Draft Standard Text for Applicable or Relevant and Appropriate Requirements (ARARs).* September.

_____. 2010. *Environmental Work Instruction No. 3 (EV3.3). Selecting an Environmental Laboratory That Meets Environmental Restoration Program Requirements.* August.

_____. 2011. *Environmental Work Instruction No. 2 (EV3.2). Review, Approval, Revision and Amendment of Sampling and Analysis Plans (SAPs).* January.

Naval Facilities Engineering Service Center (NFESC). 1999. *Navy Installation Restoration (IR) Chemical Data Quality Manual (CDQM).* September.

U.S. Environmental Protection Agency (EPA). 1994. *Guidance for the Data Quality Objectives (DQO) Process*, EPA QA/G-4, Final, September.

_____. 2000. *Guidance for the DQOs Process.* Office of Environmental Information, EPA/600/R-96/055. EPA QC/G-4. August.

_____. 2002. *Guidance for Quality Assurance Project Plans*, EPA QA/G-5. December.

_____. 2005. *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)*, EPA-505-B-04-900A. March.

_____. 2006. *Guidance on Systematic Planning Using the DQO Process.* EPA QA/G-4. Office of Environmental Information EPA/240/B-06/001. February.

_____. 2007. *Test Methods for Evaluation of Solid Wastes*, SW-846, Update IV.

_____. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, June.

_____. 2010. *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*, EPA 540-R-10-011. January.

2.2 Regulatory Program

The Navy is investigating the Building 500 former UST site under the Installation Restoration (IR) Program in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan.

2.3 Type of SAP

This SAP is a Project-Specific SAP.

2.4 Scoping Sessions

Scoping Session	Date
<u>Project Kickoff Meeting</u>	<u>July 16, 2012</u>

2.5 Relevant SAP

List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
<u>Not Applicable</u>	<u>Not Applicable</u>

2.6 Project Stakeholders

- Department of Navy (DON)
- California Regional Water Quality Control Board (RWQCB), Santa Ana Region

2.7 Lead organization

As lead agency, Naval Facilities Engineering Command Southwest (NAVFAC SW) will be responsible for ensuring the collection of representative media samples, accurate analysis of samples, verification and independent third-party validation of data, and archival and reporting of data in accordance with this SAP (see Worksheet #7 for detailed list of data users).

2.8 Omitted SAP Elements

SAP elements or required information that has been omitted because they are either not applicable to this project or are provided elsewhere, are listed below:

No special training is required for this SAP (Worksheet #8).

2.9 Not Applicable SAP Worksheets

SAP elements and required information that are not applicable to the project are noted below. Further explanation is provided on the previous page and in the appropriate SAP worksheet(s).

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
<i>Documentation</i>		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
<i>Project Organization</i>		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	Worksheet #2, Subsection 2.8
<i>Project Planning/ Problem Definition</i>		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table	
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		
<i>Sampling Tasks</i>		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/ SOP Requirements Table Sample Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field QC Sample Summary Table	
21	Project Sampling SOP References Table Sampling SOPs	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
<i>Analytical Tasks</i>		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	

Table Continues

TABLE 2.9 CONTINUED

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
<i>Sample Collection</i>		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example COC Form and Seal	
<i>QC Samples</i>		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
<i>Data Management Tasks</i>		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and CA Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

Acronyms:

CA	Corrective Action
COC	Chain of Custody
SOP	Standard Operating Procedure
QA	Quality Assurance
QC	Quality Control

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3.0 SAP WORKSHEET #3 – DISTRIBUTION LIST

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Ms. Brenda Reese	Project RPM	NAVFAC SW	619.532.4209	brenda.reese@navy.mil 1220 Pacific Highway Bldg. 128, Mail Room San Diego, CA 92132 Attn: Code JE30.BR
Mr. Paul Nguyen	Activity Point of Contact	NAVFAC SW	562.626.7655	paul.d.nguyen@navy.mil 800 Seal Beach Boulevard, Building 230 Seal Beach, CA 90740 Attn: Code N45W
Mr. Rod Soule	Navy Technical Representative	NAVFAC SW	619.532.3176	roderick.soule@navy.mil 1220 Pacific Highway Bldg. 128, Mail Room San Diego, CA 92132 Attn: Code WRRE18
Mr. Joseph Michalowski	Acting Quality Assurance Officer	NAVFAC SW	619.532.4125	joseph.michalowski@navy.mil 1220 Pacific Highway Bldg. 128, Mail Room San Diego, CA 92132 Attn: Code EV3
Ms. Diane Silva	Administrative Records	NAVFAC SW	619.532.3676	diane.silva@navy.mil 1220 Pacific Highway Bldg. 128, Mail Room San Diego, CA 92132 ATTN.: Code EVR.DS FISC Bldg. 1, 3rd Floor

Table Continues

SAP WORKSHEET #3 - DISTRIBUTION LIST – CONTINUED

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Mr. John Broderick	Agency Representative	RWQCB	951.782.4494	jbroderick@waterboards.ca.gov 3737 Main St., Suite 500 Riverside, CA 92501-3348
Mr. Richard Wong	Prime Contractor Project Manager	Shaw	619.446.4543	richard.wong@shawgrp.com 1230 Columbia Street, Suite 1200 San Diego, CA 92101-8517
Mr. Fred Essig	Project Manager	BRADY	619.571.2389	fessig@rbrady.net 3710 Ruffin Road San Diego, CA 92123
Mr. Tim Shields	Program Manager	BRADY	619.571.4176	tshields@rbrady.net 3710 Ruffin Road San Diego, CA 92123
Mr. Jesse MacNeill	Quality Assurance Manager	BRADY	858.634.4549	jmacneill@rbrady.net 3710 Ruffin Road San Diego, CA 92123

Acronyms:

BRADY	Richard Brady & Associates
NAVFAC SW	Naval Facilities Engineering Command Southwest
RWQCB	Regional Water Quality Control Board

4.0 SAP WORKSHEET #4 – PROJECT PERSONNEL SIGN-OFF SHEET

The Project Personnel Sign-Off Sheet documents that all key project personnel performing work have read this site-specific SAP and will carry out the tasks as described. The project manager, health and safety officer, field team lead and senior technical manager are responsible for communicating the requirements of the applicable portions of the SAP to all field personnel. To ensure that on-site field personnel have read and understood the SAP, the supervisory personnel will meet with each and review the SAP as part of the readiness review conducted prior to field work. If only portions of the SAP are required, then personnel will note which sections were reviewed on the sign-off sheet. The completed sign-off sheet will be included in the field copy of the SAP and in the project file.

Name	Organization/Title/Role	Telephone Number	Signature/E-mail receipt	SAP Section Reviewed	Date SAP Read
Fred Essig	BRADY / Project Manager	619.571.2389		All Worksheets	
Jason Williams	BRADY / Site Health and Safety Officer	619.571.2358		All Worksheets	
Tim Shields	BRADY / Program Manager	619.571.4176		All Worksheets	
Molly Nguyen	EMAX Laboratories, Inc. / Project Manager	310.618.8889		Worksheets 12, 15, 19, 20, 22, 23, 24, 25, 26, 27, 28, 30, 34, 35	
Linda Rauto	Lab Data Consultants / Operations Manager	760.634.0437		Worksheets 12, 15, 20, 22, 23, 24, 25, 28, 30, 34, 35, 36	

Acronyms:

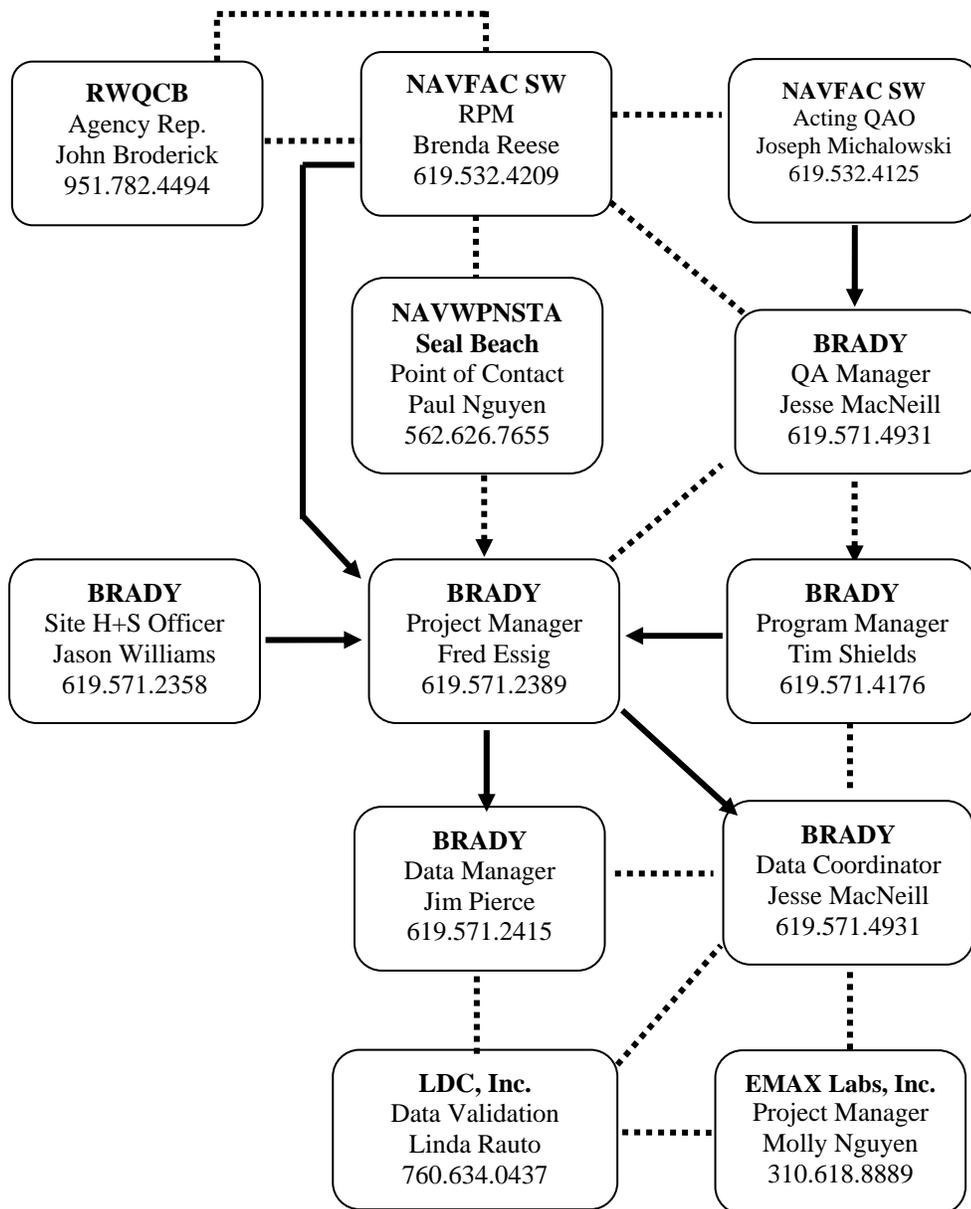
BRADY Richard Brady & Associates

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5.0 SAP WORKSHEET #5 – PROJECT ORGANIZATIONAL CHART

Lines of Authority —————

Lines of Communication



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6.0 SAP WORKSHEET #6 – COMMUNICATION PATHWAYS

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Point of Contact for DoN Quality Issues	NAVFAC SW Acting QAO	Joseph Michalowski	619.532.4125 joseph.michalowski@navy.mil	Acting QAO will review and approve this SAP and all amendments to this SAP, if applicable.
Project Management for DoN	NAVFAC SW RPM	Brenda Reese	619.532.4209 brenda.reese@navy.mil	RPM will ensure that the project scope of work requirements are fulfilled.
Project Management	BRADY Project Manager	Fred Essig	619.571.2389 fessig@rbrady.net	Brady PM will manage field and project personnel. She will document any deviation from the SAP, including minor changes, major changes, or significant changes, by notifying the BRADY QAM by phone and e-mail within 24 hours and will submit a FCN within 48 hours. All completed FCNs will be included as an appendix in the final report. Major or significant changes in the SAP would require an addendum or a revision of the SAP as described in the NAVFACSW Environmental Work Instruction # 2.
Field Audit	BRADY QAM	Jesse MacNeill	619.571.4931 jmacneill@rbrady.net	The BRADY QAM may conduct a field audit during project fieldwork. Audit results are maintained in BRADY's project and QA files. Any issues requiring CA will be documented and assigned an appropriate response period.
Reporting Laboratory Data Quality Issues	Laboratory Project Manager	Molly Nguyen	310.618.8889 mnguyen@emaxlabs.com	All QA/QC issues will be reported by the Laboratory Project Manager to the BRADY QAM in writing within 2 business days.
Notification of Non-Conformant Analytical Data	BRADY QAM	Jesse MacNeill	619.571.4931 jmacneill@rbrady.net	If significant problems are identified by the laboratory or the project team that impact the usability of the data (i.e. the data is rejected or the data quality objectives are not met), the program chemist or QAM will notify the NAVFACSW RPM and the NACFACSW acting QAO within 24 hours or the next business day.

Table Continues

SAP WORKSHEET #6 – COMMUNICATION PATHWAYS – CONTINUED

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Release of Analytical Data	BRADY QAM	Jesse MacNeill	619.571.4931 jmacneill@rbrady.net	Brady QAM will review data to verify that quality is met, as described in this SAP, prior to releasing the data.
Stop Work	BRADY QAM BRADY Project Manager BRADY HSO NAVFAC SW RPM NAVFAC SW Acting QAO	Jesse MacNeill Fred Essig Jason Williams Brenda Reese Joseph Michalowski	619.571.4931 jmacneill@rbrady.net 619.571.2389 fessig@rbrady.net 619.571.2358 jwilliams@rbrady.net 619.532.4209 brenda.reese@navy.mil 619.532.4125 joseph.michalowski@navy.mil	BRADY QAM, BRADY PM, BRADY HSO, NAVFAC SW RPM, or NAVFAC SW QAO may stop work in response to any serious quality- or safety-related issue if warranted. In this case, the issue and proposed CA will be documented with planned timing for implementation. The Stop Work Notice will be submitted to the NAVFAC SW QAO and RPM by e-mail within 24 hours.

Acronyms:

BRADY	Richard Brady & Associates	QA	Quality Assurance
CA	Corrective Action	QAM	Quality Assurance Manager
FCN	Field Change Notice	QAO	Quality Assurance Officer
HSO	Health and Safety Officer	RPM	Remedial Project Manager
NAVFAC SW	Naval Facilities Engineering Command Southwest	SAP	Sampling and Analysis Plan

7.0 SAP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS TABLE

Name	Title/Role	Organizational Affiliation	Responsibilities
Fred Essig	Project Manager	BRADY	Responsible for implementing all activities specified in the Delivery Order. Supervises preparation of the Work Plan and SAP by the Project Team. Responsible for ensuring BRADY's field team compliance with WP, SAP, SSHP and APP. Responsible for maintaining effective and timely communication between field team and BRADY management.
Jesse MacNeill	QAM	BRADY	Responsible for ensuring BRADY team's programmatic and project-specific compliance with quality assurance policies generally and this SAP specifically. Ensures SAP conforms to current NAVFAC SW and UFP-QAPP requirements. Ensures BRADY team maintains proper training, certification and experience to execute project-specified tasking. Responsible for BRADY's environmental quality, including oversight of environmental program to ensure compliance with Federal, State, and local regulatory requirements and with Department of Navy policy; development of project plans; coordination of laboratory and data validation services; review of project-specific requirements as outlined in SAP; and support to BRADY Project Managers.
Jim Pierce	Database Manager	BRADY	Responsible for developing, monitoring and maintaining the project database under guidance of the BRADY Project Manager and QAM. Ensures timely and accurate upload of project data to NEDD/NIRIS. Works with the QAM to resolve sample identification issues and geospatial data issues during fieldwork execution.
Jason Williams	Site Health & Safety Officer	BRADY	Responsible for implementing the Health and Safety Plan, determining appropriate site control measures, and identifying personal protection levels. Leads daily safety briefings for the Project Team, subcontractor personnel and site visitors.
Timothy Shields	Program Manager	BRADY	Responsible for assigning appropriately trained and qualified staffing resources to project and for providing technical direction and field oversight to BRADY staff during SAP development and in execution of fieldwork. Responsible for ensuring effective and timely communication between Project Team and NAVFAC customer(s) and NAVWPNSTA Seal Beach facility representatives.
Joseph Michalowski	Acting QAO	NAVFAC SW	The acting QAO provides government oversight of the quality assurance program, including review and approval of SAPs. The acting QAO has the authority to suspend affected projects or site activities if NAVFAC SW-approved quality requirements are not maintained.

Table Continues

SAP WORKSHEET # 7 - PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS TABLE – CONTINUED

Name	Title/Role	Organizational Affiliation	Responsibilities
Brenda Reese	Remedial Project Manager	NAVFAC SW	The RPM is the Navy manager directly responsible for project execution and coordination with base representatives, regulatory agencies, and the NAVFAC SW management team.
Molly Nguyen	Project Manger	EMAX Laboratories, Inc.	Responsible for delivering analytical services that meet the requirements of this SAP. Reviews and understands all analytical requirements of this SAP. Works with BRADY's QAM to confirm sample delivery schedules and ensure performance according to specifications. Reviews the laboratory data package before it is delivered to the BRADY QAM.
Linda Rauto	Operations Manager	Laboratory Data Consultants, Inc.	Conducts independent third-party validation of analytical data received from laboratory. Assures the data end user of known and documented data quality.

Acronyms:

BRADY	Richard Brady & Associates
H&S	Health and Safety
NEDD/NIRIS	Navy Electronic Data Deliverable/Naval Installation Restoration Information Solution
PM	Project Manager
QA	Quality Assurance
SAP	Sampling and Analysis Plan
UFP-QAPP	Uniform Policy for Quality Assurance Project Plans

8.0 SAP WORKSHEET #8 – SPECIAL PERSONNEL TRAINING REQUIREMENTS TABLE

No specialized training is required for this project.

The Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements, as described in Title 29 Code of Federal Regulations (CFR) §1910.120, apply to those persons conducting field work. The regulation states that all personnel involved in characterization or remediation of an uncontrolled hazardous waste site shall be required to have 40 hours of certified training and three days of supervised field experience. In compliance with Title 29 CFR §1910.120, BRADY's Environmental Department protocol requires "general site workers," those individuals performing field activities such as collecting media samples, to have completed the appropriate OSHA HAZWOPER training course.

Personnel who are on site to perform occasional inspection and sampling activities and are unlikely to experience exposure over the permissible exposure limit and published exposure limits may be considered "workers on site only occasionally for a specific limited task." These workers must have 24 hours of training and one day of actual field experience. Employees who have minimal (low risk) exposure or low probability of exposure to hazardous substances are covered by other OSHA standards, such as the Hazard Communication standard, Title 29 CFR §1910.120.

All BRADY site workers will be 40-hour trained and will meet the minimum standard for supervised field experience. In compliance with regulatory procedures related to training, at least one BRADY supervisor having received the OSHA 8-hr Hazardous Waste Supervisor training will be on-site at all times. All BRADY employees have been trained in first aid, cardiopulmonary resuscitation (CPR), and blood borne pathogen awareness. At least two BRADY personnel, properly trained and certified in adult first aid and CPR and trained in the blood borne pathogens, will be assigned and on-site at all times work is being performed.

All drilling and sampling activities will be supervised by a professional geologist licensed in California. Drilling will be conducted by a C-57 licensed driller.

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9.0 SAP WORKSHEET #9 – PROJECT SCOPING SESSION PARTICIPANTS SHEET

9.1 Project Kickoff Meeting July 16, 2012

Project Name: Site Characterization for Petroleum Contamination at the Building 500 Former UST Site Projected Date(s) of Sampling: February, 2013 Project Manager: Brenda Reese, NAVFAC SW			Site Name: Building 500 Former UST Site Site Location: NAVWPNSTA Seal Beach, CA		
Date of Session: July 16, 2012 Scoping Session Purpose: Site Visit					
Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Ms. Brenda Reese	RPM	NAVFAC SW	619.532.4209	brenda.reese@navy.mil	RPM
Paul Nguyen	Activity Point of Contact	NAVFAC SW	562.626.7655	paul.d.nguyen@navy.mil	Point of Contact
Pei-Fen Tamashiro	Activity Representative	NAVFAC SW	562.626.7897	pei-fen.tamashiro@navy.mil	Historical Information
Tim Shields	Program Manager	BRADY	619.571.4176	tshields@rbrady.net	Program Manager

Acronyms:

BRADY	Richard Brady and Associates
NAVFAC SW	Naval Facilities Engineering Command Southwest
RPM	Remedial Project Manager

9.1.1 Comments/Decisions

Visited site and observed location of former UST. Discussed the history of the site and the filling of the UST and some of the surrounding excavation with cement grout. T. Shields collected global positioning system (GPS) coordinates of the former UST location for use in creating Work Plan/SAP figures. Collected GPS coordinates of site features and obstructions. Navy personnel warned that there were underground utilities at the site, particularly electrical lines. Discussed location of Site Characterization and Analysis Penetrometer System (SCAPS) laser-induced fluorescence (LIF) initial screening pushes and step-outs.

9.1.2 Action Items

NAVWPNST Seal Beach will provide available information on location of underground utilities at the site.

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10.0 SAP WORKSHEET #10 – PROBLEM DEFINITION

This worksheet provides the first of seven steps of the Data Quality Objectives (DQO) process as detailed by the U.S. EPA (U.S. EPA, 2006). The process is used to determine the type, quantity, and quality of the data necessary to support decision-making regarding current site conditions and future site management decisions.

Inherent in the development of DQOs is a systematic and logical approach intended to yield an efficient sampling design based on accepted levels of potential decision errors. The conceptual site model (CSM) is the basis for Step 1 of the DQO process. The following subsections provide a site description of the former UST site (UST 500, also known as UST 000008) at Building 500. The CSM is presented in Section 10.2.

10.1 Site Description and History

NAVWPNSTA Seal Beach is located in the northwest corner of Orange County, CA, in the City of Seal Beach; which is approximately 20 miles south of Los Angeles (Figure 1). Nearby communities include the Cities of Huntington Beach, Westminster, Los Alamitos, and Garden Grove. Comprised of 5,256 acres, NAVWPNSTA Seal Beach is a Navy weapons and munitions loading, storage, and maintenance facility. NAVWPNSTA Seal Beach has been operated by the Navy and its contractors since its inception in 1944.

10.1.1 Site Background

The former UST site is within truck holding yard in the southeastern region of NAVWPNSTA Seal Beach (Figures 2 and 3). The former UST is located in a paved area adjacent to an electrical transformer pad.

The UST was discovered in November 2009 during site renovation of the holding yard at Building 500. Based on Navy personnel knowledge, the UST was used for supplying diesel fuel to an emergency generator, and was abandoned in the 1950s.

An initial subsurface investigation revealed the UST was a 1,200-gallon single-walled steel tank, and contained approximately 1,000 gallons of diesel fuel. Under direction of the County of Orange Health Care Agency, Environmental Health Division (a Certified Unified Program Agency [CUPA] implementing the UST Program), the remaining fuel was removed, the UST interior was triple rinsed, and soil samples were collected for analysis. A backhoe was used to pothole and collect three soil samples adjacent to the bottom of the UST. Because the UST was situated adjacent to the transformer pad, near underground utilities, and in a remote area that may not pose any environmental health risks to the public or any beneficial uses of water, the UST was allowed to be filled in-place with cement grout. Some of the sampling excavation surrounding the UST was also filled with cement grout (NAVFACT SW, Personal Communication).

The laboratory reported the following results from the analysis of the three soil samples:

Sample SB-01-2	
Napthalene	0.0037 mg/kg
All other analytes were non-detect.	
Sample SB-02-8	
All analytes were non-detect	
Sample SB-03-8	
TPH quantified as gasoline	270 mg/kg
TPH quantified as diesel	7000 mg/kg
1,2,4-Trimethylbenzene	3.5 mg/kg
1,3,5-Trimethylbenzene	0.82 mg/kg
2-butanone	1.9 mg/kg Q
4-Isopropyltoluene	0.44 mg/kg
Isopropylbenzene	0.10 mg/kg
napthalene	5.6 mg/kg Q
n-butylbenzene	0.48 mg/kg
n-propylbenzene	0.22 mg/kg
sec-butylbenzene	0.23 mg/kg
m,p-xylenes	0.66 mg/kg
o-xylene	0.24 mg/kg
All other analytes were non-detect.	
Q = One or more quality control criteria did not meet specifications.	

No third party validation was performed on the laboratory data, and the exact location of the samples is not available.

10.1.2 Land Use

Since NAVWPNSTA Seal Beach was first commissioned in 1944, the facility has been used for weapons and munitions loading, storage, and maintenance. Prior to 1962 it was known as the Naval Ammunition and Net Depot and was used to service anti-submarine nets used to protect fleet bases and anchorages around the world. NAVWPNSTA Seal Beach has evolved into the Navy's primary West Coast ordnance storage, loading and maintenance facility. All current facility operations are industrial, and the Navy's proposed future use for the entire facility will remain industrial, with controlled access restricted to authorized badged personnel.

10.2 Conceptual Site Model

The existing CSM was developed from the limited historical information presented in section 10.1. The current CSM is presented in the following sections.

10.2.1 Geology

Regionally, the Los Angeles Basin is a thick sedimentary sequence of Pliocene and Quaternary age alluvial sediments eroded from the mountains that surround the area. Deposition of these variably weathered sediments that form the broad synclinal depression of the basin was influenced by sea level changes and encroachment that occurred across the depositional time frame (United States Geologic Survey [USGS] 2009). These sedimentary rocks lie on a pre-Tertiary, metamorphic and crystalline basement (Geological Survey, 1956).

The present topography in the area of the site was created by the geologically-recent and ongoing activity of the Newport Inglewood Structural Zone. This tectonic movement has formed the topographic low that incorporates the former UST site within the Sunset gap and the flanking subtle elevation changes of the Bolsa Chica Mesa southeast of the site and Landing Hill to the northwest (State of California Department of Water Resources, 1968).

Within the Sunset Gap area, the near surface geology at the study area is expected to consist of Holocene age sediments characterized as silt, sand, gravel and clay deposited in a floodplain/lagoonal environment. Underlying the recent deposits are the shallow marine, littoral, and continental Pleistocene sediments consisting of interfingering beds of sand, gravel, silt, and clay (Geological Survey, 1956).

10.2.2 Source

The source was a former 1,200 gallon, single walled, steel tank used to store diesel fuel to operate a generator. The generator was reportedly abandoned in the 1950s. When the tank was discovered in 2009, it was found to contain approximately 1000 gallons of diesel fuel, suggesting that the tank had sufficient integrity to contain fuel. The fuel was removed from the tank and the tank was triple rinsed, then filled with cement grout, thereby removing it as a potential future source of contamination.

The laboratory reported that a soil sample collected from adjacent to the bottom of the tank contained 7000 mg/kg of total petroleum hydrocarbons quantitated as diesel (TPH-d) and 270 mg/kg total petroleum hydrocarbons quantitated as gasoline (TPH-g). Non-detectable concentrations of TPH-d were reported in the two other soil samples. Some detections of volatile organic compounds (VOCs) were reported; however, the concentrations were below the May 2012 US EPA Region 9 Regional Screening Levels (RSLs).

Because this data was not validated by a third party, it is of limited value in supporting decisions regarding risk to human health or the environment. However, the data does indicate that fuel was released to soil in the near vicinity of the former UST.

10.2.3 Migration Pathways

To date, the deepest soil contamination has been documented at 8 feet. Based on regional geologic data, the shallow soil in the area would be predominantly fine grained, lagoonal-alluvial sediments.

Based on available data, the primary pathway for petroleum contaminant migration in the current CSM would be predominantly vertical, in a downward direction through the vadose zone toward the groundwater interface. If the fuel reached the groundwater, potential lateral migration of a dissolved contaminant phase is possible in the downgradient direction.

The depth to groundwater and the groundwater gradient are not known based on available data for UST 500. For planning purposes, the depth of groundwater is assumed to be less than 15 feet below ground surface (bgs).

10.2.4 Receptors

No current pathways have been identified linking subsurface petroleum hydrocarbons to human or ecological receptors.

10.3 Step 1 – State the Problem

Existing data suggests that there is residual diesel contamination in soil at the location of one of the three samples collected in the close vicinity of the former UST. Because this data was not validated by a third party and because the locations of the samples are not known, this data is of limited value in supporting decisions regarding risk to human health or the environment.

It is not known whether or not the released fuel migrated laterally and/or downward to the water table.

11.0 SAP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES/ SYSTEMATIC PLANNING PROCESS STATEMENTS

This worksheet provides Steps 2 through 7 of the DQO process as detailed by the U.S. EPA (U.S. EPA, 2006). The process is used to determine the type, quantity, and quality of the data necessary to support decision-making regarding current site conditions and future site management decisions.

Inherent in the development of DQOs is a systematic and logical approach intended to yield an efficient sampling design based on accepted levels of potential decision errors. The following subsections provide the primary study goal of the proposed investigation, the information inputs and analytical approach that will be used to achieve the study goal, as well as the performance criteria that will be used to assure that the data used to make project decisions is of sufficient quality.

11.1 Step 2 – Identify the Goals of the Study

Primary Goal: Assess data gaps in the current CSM to further define the nature and extent of the petroleum hydrocarbon fuel in soil at UST 500.

The primary goal will be achieved by answering the following decision questions:

1. Has the vertical and horizontal extent of fuel-related constituents in soil been defined?
2. Do fuel constituent concentrations relative to project screening levels indicate the need for further action?

11.2 Step 3 – Identify Information Inputs

Inputs to project decisions include:

- project screening levels (Worksheet #15),
- decisions made in stakeholder planning meetings (Worksheet #9),
- information from historical record review,
- interviews and site reconnaissance

Existing data inputs include:

- Case Narrative, analytical results, and chain of custody from the 12/04/09 soil sampling event.
- U.S. EPA Region 9 RSLs for industrial soil (May 2012).

New data inputs will consist of:

- Screening LIF data collected from locations generally radiating downgradient and outward from the tank area to evaluate the horizontal and vertical extents of the petroleum hydrocarbon impact.
- Validated fixed-base laboratory analytical data from three confirmation soil samples collected at locations based on LIF screening data. The three soil sample locations will target representative locations to confirm non-detect and maximum detection LIF responses.

11.3 Step 4 – Define the Boundaries of the Study

The preliminary boundary for this investigation was developed based on a review of historical data from the initial sampling in December 2009. Available records from the 2009 sampling indicate there is diesel present at a depth of 8 feet bgs at one of the 2009 sampling locations. Since deeper samples were not collected, the preliminary lower vertical extent of the diesel release is not defined. The vertical boundary of this study will be approximately 25 feet bgs, which is expected to be at least 10 feet below water table.

The lateral boundary of the study area will ultimately be determined based on real time LIF data and the results of any step-out locations that may be required. The proposed initial LIF locations and possible step out locations are shown on Figure 3. The SCAPS Investigation will proceed by pushing the LIF probe at the initial locations. At each LIF location, the real time LIF screening data will be reviewed immediately following collection to evaluate if the extent of the fuel release has been delineated. Step-out locations will be investigated as described in the soils investigation decision rules below.

The following decision rules will apply to the dynamic work strategy of defining the boundaries of the fuel release.

Soils Investigation: Decision Rules to Define the Boundaries of the Study

- **If** elevated LIF intensity at a fuel-related wavelength at an intensity over 10,000 counts (which, in general, correlates to greater than 100 parts per million TPH) is detected at a location, **then** petroleum fuel presence is inferred, and a new step-out LIF screening location will be selected and investigated to determine the lateral extent of the plume. The probe will be advanced to approximately 10 feet below the zone of elevated fluorescence to determine the lower vertical extent of the plume.
- **If** elevated LIF intensity at a fuel-related wavelength is not detected at a location, **then** that location is outside of the screening-level boundary for the fuel release, and the LIF screening investigation will proceed to an uninvestigated initial location.
- **If**, based on LIF intensity, the lateral extent of petroleum contamination of soil is considered defined prior to the advancement of all proposed step-out LIF

locations shown on Figure 3, **then** the field team may eliminate proposed locations that are not required to determine lateral extent.

- **If**, based on LIF intensity, the lateral extent of petroleum contamination of soil is considered defined, **then** the field team will select three soil sample locations for fixed-base laboratory analysis to confirm the boundary for petroleum contamination of soil as follows;
 - At the location and depth of the highest screening LIF detection.
 - At the map location of the highest screening LIF detection from a depth of non-elevated fluorescence overlying the highest LIF detection. This sample will be used to confirm the vertical extent of the plume defined by LIF.
 - At one lateral location with non-elevated fluorescence at a depth equivalent to the depth of the highest LIF detection.

There are no temporal limitations to this field work.

11.4 Step 5 – Develop the Analytical Approach

To assess impacts to soil and frame the horizontal and vertical plume extents, LIF screening will be done with analytical confirmation of representative soil samples. Field screening will be conducted as follows:

Analyte	Screening Method
Petroleum fuel in soil	SCAPS LIF (qualitative)

SCAPS LIF data will be reported as qualitative to semi-quantitative fluorescence intensity, and will not provide concentration data. All LIF screening data will clearly be identified as screening data on all figures, tables, text, and appendices in the investigation summary report. The LIF data will be used to optimize the location and depth of samples collected for laboratory analysis, as described above in section 11.3 and below in section 11.6.

All soil samples will be collected using the methods described in Worksheets # 14 and 18 of this SAP. Three soil samples will be analyzed by a fixed-base laboratory for fuel-related constituents as follows:

Analyte	Analytical Method
TPH-g and TPH-d	U.S. EPA Method 8015 Modified
VOCs	U.S. EPA Methods 8260B
Polynuclear Aromatic hydrocarbons (PAHs)	U.S. EPA Method 8270C SIM

Soil samples for analysis and validation will be collected with a piston type soil sampler. The samples for VOCs and TPH-g will be taken using en-core soil sampler. Nonvolatile samples for analysis of TPH-d and polynuclear aromatic hydrocarbons (PAHs) will be submitted to the lab in the sealed stainless steel or brass collection tubes.

Based on the analytical approach, the following decision rules addressing Step 2 Decision Questions 1 through 2 are proposed:

1. **If** the former diesel fuel release area is bounded vertically and horizontally by SCAPS LIF locations with LIF intensity counts below 10,000, and the fixed base laboratory samples confirm the LIF data, **then** the vertical and horizontal extent of fuel-related constituents in soil has been defined.
2. **If** the validated soil sample data from the fixed-base laboratory reports concentrations of fuel-related constituents above project screening criteria (Worksheet #15), **then** a recommendation for future work will be made based on the magnitude of the petroleum release, otherwise a recommendation for no further action may be made.

Primary Goal: **If** the nature (i.e. concentrations relative to project screening criteria) and extent of the fuel release has been defined by the preceding decision rules, **then** a recommendation for site closure or for further action will be made based on the revised CSM.

11.5 Step 6 – Specify Performance or Acceptance Criteria

There are two types of decision errors: sampling design errors and measurement errors. Sampling design errors are a function of the selection of sample locations or analytical methods used to characterize the site to be studied. Measurement errors are a function of the procedures used to collect and analyze the samples.

In sampling designs that use a statistical approach to evaluate the data using decision rules, numerical limits on allowable error can be set and controlled by the sampling design (e.g., the number of samples). The use of classical statistics for this project would require a significant number of sampling locations to systematically examine the area potentially affected by the identified release. In this case, the source of the release and type of compounds of potential concern from that specific release have been identified, reducing the necessity for statistically derived broad-based plume mapping and constituent analysis.

In sampling designs that base the conclusions on the judgment of the decision makers, decision errors are reduced by subjective definition of the factual basis for the judgment. Based on the initial CSM for the site, the proposed sampling design is a fundamentally judgmental approach.

Measurement errors that arise during the various steps of the sample-measurement process (e.g., sample collection, sample handling, sample preparation, sample analysis, data reduction, and data handling) are possible regardless of the sampling design. Neither measurement errors nor variability can be eliminated, but they can be controlled by

selecting appropriate procedures and using properly trained personnel. The analytical methods and method reporting limits for soil samples are listed in Worksheet #15.

Measurement error is further managed by using Standard Operating Procedures (SOPs) and data quality management. Attachment 2 of this SAP presents SOPs that will be followed to minimize and control measurement error.

Decision uncertainty is managed by increasing the density of sampling points, especially in areas where there is high uncertainty about the correctness of a decision. This is cost-effectively accomplished by using tools such as the SCAPS to build a detailed CSM in near real-time. By collecting and analyzing data in near real-time, critical data gaps are identified and filled, an accurate and complete CSM is developed, and field mobilizations and work plan cycles are reduced.

Table 1 presents possible decision error, identifies associated consequences, and addresses related uncertainties. The most severe error in judgmental sampling would be to conclude that action is not required when, in reality, an unacceptable risk to human-health and/or the environment exists. The judgmental sampling approach is designed to limit the probability of this error.

Table 1 - Possible Decision Errors

Possible Error	Associated Consequences	Uncertainty
Concluding that fuel is present at a depth when it is not present.	Investigating or cleaning up a non-impacted site.	Low: Conclusions will be based on LIF screening data with confirmation by soil samples analyzed by an approved fixed base laboratory, and laboratory data validated by a third party. See Decision Rules.
Concluding that fuel is not present at a depth when it is present.	Not investigating or cleaning an impacted site.	Low: Conclusions will be based on LIF screening data with confirmation by soil samples analyzed by an approved fixed base laboratory, and laboratory data validated by a third party. See Decision Rules.

11.6 Step 7 – Develop the Detailed Plan for Obtaining Data

This soil investigation was designed using analytical data from a previous sample event that showed elevated hydrocarbon concentrations in the study area. This investigation is designed to use field methods to include SCAPS LIF, Cone Penetrometer Test (CPT), and validated soil sample analysis by a fixed base laboratory to define the nature and extent of petroleum hydrocarbon impacts to soil at UST 500.

A grid of potential sample locations has been identified and will be cleared for underground utilities and assessed for logistics prior to mobilization. The LIF

investigation will begin at the locations shown on Figure 3 closest to the former UST and proceed as needed to the surrounding, pre-cleared step-out locations using the decision rules in Section 11.3 above.

Following the screening delineation of the plume by LIF, soil samples will be collected from locations designed to confirm the LIF data. One soil sample will be taken at the location and depth of the greatest LIF intensity, to confirm the LIF response and potentially represent the maximum residual fuel concentration. A second soil sample will be proposed from a depth interval of non-elevated fluorescence directly above the sample with the highest fluorescence, to confirm the vertical extent of the plume defined by LIF. A third soil sample will be proposed from an area where non-elevated fluorescence is measured through the entire push interval, from a depth corresponding to the highest fuel fluorescence at an adjacent push location, to confirm the vertical extent of the plume defined by LIF. The soil samples will be analyzed for TPH-g, TPH-d, VOCs and PAHs by a fixed-base analytical laboratory. All soil samples for off-site analysis will be handled in accordance with Worksheet #27.

12.0 SAP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA

12.1 Measurement Performance Criteria Table – Field QC Samples (Soil)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Equipment Rinsate (Equipment Blank) (Rinsate Blank)	TPH as gasoline, TPH as diesel, VOCs, PAHs	One per day	Sensitivity/Contamination (Accuracy/Bias)	Criteria listed in Worksheet #28	S
Source Water Blank (Field Blank)	TPH as gasoline, TPH as diesel, VOCs, PAHs	One per sampling event or source of water used for the final decontamination rinse	Sensitivity/Contamination (Accuracy/Bias)	Criteria listed in Worksheet #28	S
Trip Blank	TPH as gasoline, VOCs	One per shipping container containing samples for TPH-g & VOCs	Sensitivity/Contamination (Accuracy/Bias)	Criteria listed in Worksheet #28	S
Temperature Blank	TPH as gasoline, TPH as diesel, VOCs, PAHs	One per shipping container	Representativeness	4 °C (± 2 °C)	S

Acronyms:

°C degrees Celsius
 PAHs polynuclear aromatic hydrocarbons
 QC quality control
 TPH total petroleum hydrocarbon
 VOCs volatile organic compounds

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13.0 SAP WORKSHEET #13 – SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
Analytical data apparently from a UST inspection	Microbac Laboratories, Inc. Narrative, analytical results, and COC from the 12/04/09 soil sampling event.	Names on the COC include OCHCA.	The data was used to identify the possibility of residual contamination in the soil in excess of SWQCB requirements	Due to the possible inaccuracies of analytical results caused by the unknown sample collection method used, the data from this investigation will be used for screening level purposes only.

Acronyms:

COC chain of custody
 OCHCA Orange County Health Care Agency
 SWQCB Santa Ana Regional Water Quality Control Board

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14.0 SAP WORKSHEET #14 – SUMMARY OF PROJECT TASKS

The scope of work for this project includes an initial screening investigation in which SCAPS will be deployed for two days to collect LIF and CPT data. Additionally three soil samples will be collected, analyzed, and validated for LIF screening confirmation. The SCAPS platform will be used to advance an LIF/CPT probe and the soil sampling probe as described in Worksheet #11.

Following the screening level LIF delineation around UST 500, the field team will review the LIF responses and select soil sample locations and depths for three representative soil samples to confirm the LIF data as described in Worksheet #11. The soil samples will be analyzed for TPH-g, TPH-d, VOCs and PAHs by a fixed-base analytical laboratory. All soil samples collected for off-site analysis will be handled in accordance with Worksheet #27.

This worksheet summarizes the tasks that will be performed as part of this proposed investigation. SOPs for pertinent tasks are presented in Attachment 2.

14.1 Permitting and Notification

The information for direct push boring permits will be provided to Orange County Health Care Agency (OCHCA). Dig permits and hot work permits will be obtained from the Navy. Dig Alert notifications will be secured prior to initiation of field activities.

14.2 Utility Clearance

Underground utility clearance will be completed for each subsurface investigation location in accordance with BRADY SOP T-014 (Attachment 2). The entire area within a 6-foot radius of each proposed subsurface sampling location will be cleared using the following protocol:

- Mark the proposed direct-push and hollow-stem auger boring locations and the utility lines in the immediate vicinity using color-coded surveyor paint.
- Coordinate utility-locating activities with the utility locator service.
- Coordinate utility-locating activities with Underground Service Alert.
- Obtain an Authorization to Excavate from Public Works Engineering in accordance with NAVWPNSTA Seal Beach Instruction 11014.2C, Policy for Excavating within the Boundaries of NAVWPNSTA Seal Beach.
- Use geophysical equipment and pipe locating procedures to ensure underground obstruction clearance.

Wherever possible, a transmitter/receiver unit will be attached to the exposed pipe or utility to trace metallic pipes or utilities that are either indicated on base utility maps or obvious via surface expression. The location of the utility will be marked on the ground using color-coded surveyor paint.

If a utility is identified within 3 feet of the proposed sampling/drilling location, the sampling/drilling point will be moved and the clearance procedures will be repeated.

14.3 SCAPS Screening Investigation

The data discussed in the following sections will be used to delineate the fuel release associated with UST 500 and to identify soil sample locations and depths that support the LIF data.

14.3.1 LIF

SCAPS uses a CPT probe with integrated LIF capabilities to detect subsurface petroleum hydrocarbons. SCAPS uses the LIF via the push-rod and probe fiber-optic cable system to detect relative subsurface petroleum hydrocarbon concentrations. The LIF probe is advanced into the soils at the tip of case-hardened steel rods with a truck-mounted hydraulic ram assembly that generates the appropriate downward force to advance the probe into most types of unconsolidated soils. Probe wiring, fiber optic cable, and a grouting hose are run through a single umbilical cord at the center of the push rods from the probe directly to the analytical and support equipment located in the SCAPS truck.

As the LIF probe is pushed into the ground, laser light is transmitted via fiber optics within the rod-probe assembly. The laser light is transmitted to the soil through an optical window mounted in the side of the probe. As the laser light passes over the soil, the two-ring polynuclear aromatics (and/or greater) contained in the petroleum hydrocarbons, if present, are induced to fluoresce at a specific wavelength. This fluorescence signal is carried back to the surface through a second optical fiber in the probe-rod assembly. The return signal is analyzed by a linear photodiode array spectrophotometer and recorded on the onboard computer. The LIF provides measurements of petroleum hydrocarbons with a vertical resolution of approximately 2 inches as the probe is pushed into the ground at a rate of about 3 feet per minute.

As the probe is advanced, computer-generated real-time continuous logs of fluorescence intensity and wavelength are produced simultaneously with the CPT sleeve resistance, cone pressure and soil classification logs. Fluorescence intensity, wavelength logs, and spectral curves are used to evaluate the relative abundance of subsurface petroleum hydrocarbons and to evaluate whether or not different types of petroleum hydrocarbons are present.

The CPT/LIF probe will be advanced to approximately 10 feet below a zone of elevated fluorescence (if present), or to 25 feet below ground surface if no elevated fluorescence is present.

14.3.2 Temporary Piezometer Installation

One or more temporary piezometers may be installed to measure depth to groundwater. If there are no elevated LIF readings at any of the screening locations, SCAPS will install a temporary piezometer to determine the depth to groundwater so that LIF confirmation soil samples can be located in the capillary fringe on the presumed downgradient

(southwesterly) side adjacent to the UST. These samples will target a potential fuel smear zone with concentrations lower than the LIF detection threshold.

Prior to installation, each temporary piezometer well location will be hand-augered to a depth of 5 ft bgs (or to the maximum depth practicable) to ensure clearance from subsurface utilities. The temporary wells will be installed with SCAPS using factory-cleaned and packaged, flush-threaded, ¾ -inch diameter, schedule 40 poly vinyl chloride (PVC) pipe with 10 feet of 0.010 slotted well screen, or equivalent. Each temporary piezometer well will be installed under the supervision of a Professional Geologist (PG) registered in the State of California. Temporary direct-push well installations will be conducted in accordance with the BRADY SOP T-012 (Attachment 2).

All fluids and tools introduced into the subsurface will be free of petroleum-based materials, including fuels, oils, grease, and/or solvents. A surface seal will be used as needed to prevent precipitation run-off or other materials from entering the borehole. Non-disposable field equipment will be decontaminated between sampling locations.

Following water level measurement activities, all temporary piezometers will be destroyed within 24-hours of installation

14.3.3 Water Level Measurement

The depth to groundwater will be measured in each temporary well by using a Solinst water level indicator marked in 0.01 foot increments, or equivalent, relative to a permanently marked survey point located at the top of the well casing. The measurements will be recorded on the Groundwater/Product Depths form (Attachment 1). The water level indicator will be decontaminated between wells in accordance with BRADY SOP T-001.

14.4 Soil Sampling

Soil sample locations are determined by LIF readings. One sample will be collected at the location and depth of greatest fluorescence intensity. The second soil sample will be collected from the same location where the greatest fluorescence intensity was measured, but from a depth above the interval of elevated fluorescence. The third sample is collected to confirm the lateral extent of contaminated soil, and will be collected at the same depth as the greatest fluorescence intensity measurement, but in a step out location where no fuel fluorescence was measured.

Soil samples will be collected using 6-inch long, stainless steel or brass tubes and a direct-push drive SCAPS-deployed soil sampling tool. Samples will be collected and analyzed as per Worksheet #19 and BRADY SOPs T-003 and T-006. Samples for TPH-gas and VOC analysis will be immediately collected from the drive tube using 5-gram EnCore® samplers, or equivalent, for each analysis. The remaining soil will either be left in the 6-inch sleeves and capped at both ends with Teflon® swatches and polyurethane caps, or transferred into a 4-oz. glass jar with a Teflon® lined lid. Sample containers will be sent directly to the fixed-base lab for analyses (Worksheet #30). Fixed-base laboratory data will be submitted for third party data validation.

All drilling and sampling activities will be performed by experienced field personnel under the supervision of a California PG. The field staff will use their judgment to adjust the sampling depths or collect additional samples based on field observations of petroleum hydrocarbon impacts (mechanical, visual and/or olfactory) or changes in lithology. Lithologic descriptions of all the soil samples will be made in accordance with the Unified Soils Classification System; and descriptions of visible evidence of soil contamination (i.e., staining) and odor will be recorded on the location specific boring log and in the field logbook by the field staff during sampling activities.

14.5 Geospatial Data Collection

Horizontal coordinates of the sample locations will be measured by SCAPS personnel using differentially corrected global positioning system with sub-foot horizontal accuracy. Elevations of locations will not be surveyed.

14.6 Quality Control Requirements

Quality Assurance (QA) is an integrated system of activities in the area of quality planning, assessment, and improvement to provide the project with a measurable assurance that the established standards of quality are met. Quality Control (QC) checks, including both field and laboratory, are specific operational techniques and activities used to fulfill the QA requirements. Worksheets #12 and #28 summarize the collection frequencies for the various field and laboratory QC samples, respectively.

14.6.1 Field Quality Control

The field QC samples will be assigned unique sample numbers and will be submitted blind to the analytical laboratory. If abnormalities are detected in field QC samples, the data associated with the QC samples will be flagged and appropriate actions will be taken to rectify issues.

14.6.2 Equipment Rinsate Blanks

Equipment rinsate blanks will be collected daily during sampling to ensure that non-dedicated sampling devices (i.e. EnCore[®] sampling T-handles) have been decontaminated effectively. Equipment rinsate blanks will consist of the rinse water used in the final step of the sampling equipment decontamination procedure. Rinsate samples will be collected at a frequency of one per day during sampling events.

14.6.3 Trip Blanks

Trip blanks are hydrochloric acid (HCl)-preserved organic-free water prepared by the fixed-base laboratory in 40-milliliter (mL) volatile organic analysis (VOA) vials that will be carried into the field, stored with the samples, and returned to the laboratory for VOC analysis. Trip blanks will be used to determine whether samples have been cross-contaminated with TPH-g and/or VOCs during sample collection and transportation. Since trip blanks pertain only to TPH-g and VOCs, the vial must be free of any headspace. Trip blanks will be provided in each cooler and analyzed for TPH-g and VOCs for each shipment of confirmation samples sent to the fixed-base laboratory.

14.6.4 Source Blanks

Source blanks are collected to ensure that water used during decontamination is not a source of contamination. Source blank samples will be collected at a frequency of one for each source of water used for equipment rinsate blanks (for the duration of the sampling). If the source for decontamination water changes, additional source blank samples will be collected. To prepare source blanks, the sample containers will be filled with source water at the same time that it is used for decontamination.

14.6.5 Temperature Blanks

Temperature blank samples will accompany each cooler that contains samples with a temperature preservative requirement. The temperature blank will be prepared either by the analytical laboratory or the field sampling crew by filling VOA vials with de-ionized (DI) water. The temperature of the samples will be verified upon arrival at the analytical laboratory using the temperature blank.

14.6.6 Laboratory Quality Control

Laboratory QC is addressed through the analysis of laboratory QC samples, documented internal and external laboratory QC practices, and laboratory audits. The types of laboratory QC samples will be project/chemical specific, but may include laboratory control samples, laboratory duplicates, matrix spikes (MSs), surrogate standards, internal standards, method blanks, and instrument blanks. MSs, matrix spike duplicates (MSDs), and laboratory controls samples (LCSs) are analyzed for every batch of up to 20 samples and serve as a measure of analytical accuracy. Surrogate standards are added to all samples, blanks, MSs, MSDs, and LCSs which are analyzed for organic compounds in order to evaluate the method's accuracy and to help determine matrix interferences. Definitions of each type of laboratory QC sample are listed in the following subsections. For laboratory measurements, if any of the QC checks are outside the acceptance criteria, corrective actions (CA) will be taken based on procedures in the Laboratory Quality Assurance Program (LQAP).

14.6.7 Laboratory Control Samples

Laboratory control samples include blank spikes and blank spike duplicates. Blank spike samples are designed to check the accuracy of the laboratory analytical procedures by measuring a known concentration of an analyte in the blank spike samples. Blank spike duplicate samples are designed to check laboratory accuracy and precision of the analytical procedures by measuring a known concentration of an analyte in the blank spike duplicate sample. Blank spike and blank spike duplicate samples are prepared by the laboratory using clean laboratory matrices spiked with the same spiking compounds used for matrix spikes at levels approximately 10 times greater than the method detection limit (MDL). Laboratory control samples will be processed with each analytical batch consisting of 20 samples or less.

14.6.8 Laboratory Duplicates

Laboratory duplicates are two aliquots of a sample taken from the same sample container under laboratory conditions and analyzed independently. The analysis of laboratory

duplicates allows the laboratory to measure the precision associated with laboratory procedures. Laboratory duplicate samples will be processed with each analytical batch consisting of 20 samples or less.

14.6.9 Matrix Spikes

MS and MSD samples are designed to check the precision and accuracy of the analytical methods through the analysis of a field sample with a known amount of analyte added. Additional sample volume for MS and MSD samples is collected in the field in the same manner as field duplicate samples. In the laboratory, two portions of the sample are spiked with a standard solution of target analytes. MS and MSD samples are analyzed for the same parameters as the field samples, and analytical results will be evaluated for precision and accuracy of the laboratory process and effects of the sample matrix. One MS/MSD will be collected and analyzed during this event.

14.6.10 Surrogate Standards

Surrogates are chemical compounds with properties that mimic analytes of interest, but that are unlikely to be found in environmental samples. Surrogates will be added to all field and QC samples analyzed for volatiles, analyzed by gas chromatography (GC) or GC/mass spectroscopy (GC/MS) to assess the recovery of the laboratory process, and to detect QC problems. The concentration and type of the surrogates used will be based on the LQAP.

14.6.11 Internal Standards

Like the surrogate standard, an internal standard is a chemical compound, unlikely to be found in environmental samples, that is added as a reference compound for sample quantification. Internal standard procedures are used for the analysis of volatile organics and extractable organics using GC/MS and also can be used for other GC and high-performance liquid chromatography (HPLC) analytical methods. The concentration and type of the internal standards used will be based on the LQAP.

14.6.12 Method Blanks

Method blanks are designed to detect contamination of field samples that may occur in the laboratory. Method blanks verify that method interference caused by contaminants in solvents, reagents, glassware, and other sample processing hardware are known and minimized. A minimum of one method blank will be analyzed each day that field samples are analyzed at the rate of 1 per 20 field samples. A method blank must be analyzed daily. The concentration of the target compounds in the method blank sample must be less than five times the detection limit. If the blank is not under the specified limit, the source contamination is to be identified and CAs taken.

14.7 Equipment Decontamination

Decontamination of non-disposable sampling equipment (i.e. EnCore® sampling T-handles) will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. Equipment will be decontaminated in accordance with BRADY SOP T-001 (Attachment 2).

14.8 Investigation Derived Waste Disposal

The use of SCAPS direct push technology will minimize the generation of wastes, since soil cuttings are not produced. Minor amounts of wastes that are anticipated to be generated during the fieldwork include petroleum hydrocarbon impacted soil, decontamination water, and personal protective equipment. These wastes will be containerized on-site and stored temporarily in 55-gallon drums or other suitable containers for future disposal. Drums will be labeled and stored in a secure facility on pallets with spill control as appropriate.

Disposal of the investigative derived waste will be coordinated by BRADY following approval by the NAVWPNSTA Seal Beach and the disposal facility. All investigative-derived waste will be disposed of in accordance with Federal, State, and local laws and regulations.

14.9 Data Management

All field observations and laboratory results will be linked to a unique sample location through the use of the sample identification (ID) system described in Worksheet #27. Field observations and measurement data will be recorded on the field forms and in a field logbook to provide a permanent record of field activities. All data that are hand-entered will be subjected to a review by a second person to minimize data entry errors. A check for completeness of field records (logbooks, field forms, databases, electronic spreadsheets) will ensure that all requirements for field activities have been fulfilled, complete records exist for each activity, and the procedures specified in this SAP have been implemented. Field documentation will ensure sample integrity and provide sufficient technical information to recreate each field event.

Hard copies of the data reports received from the laboratories will be filed chronologically and will be stored separately from the electronic files. Hard copies of data signed by a representative of the analytical laboratory will be compared to any electronic versions of the data to confirm that the conversion process has not modified the reported results. Any additional reporting formats will be completed and electronic and hard copies will be stored in different locations at BRADY facilities.

Following the data review process, BRADY will enter the sample results into an electronic database. This electronic database will be submitted to NAVFAC SW in Navy Electronic Data Deliverable (NEDD) format in accordance with the most current version of the NAVFAC SW Environmental Work Instruction (EWI) #6. Data will be compiled with spatial and temporal qualifiers (location ID and sample date) so that it will be possible to rapidly plot or review changes in the concentration of target analytes at each sampling point over time.

14.10 Third Party Data Validation

Data generated for this project will be reviewed and verified by the BRADY QA Manager and validated by an independent outside reviewer. Data verification involves the process of generating qualitative and quantitative sample information through observations, field procedures, analytical measurements and calculations. The data verification and reporting

process for the field data involves ensuring that blank samples and duplicates defined in this SAP are within the acceptance criteria. The verification process for the laboratory data involves ensuring that the holding times, precision, accuracy, laboratory blanks, and detection limits are within the acceptance criteria outlined in this SAP.

The field and laboratory personnel will provide the BRADY QA Manager with all the data. The BRADY QA Manager will be responsible for overall review of the data verification results for compliance with the specified DQOs. Data verification tasks include confirmation that laboratory sample receipt forms match chain of custody (COC) documentation and logbook entries. The sampling data will be validated by an independent third-party in accordance with NAVFAC SW EWI #1 (Chemical Data Validation). For this project, a 10% Level-IV and 90% Level-III data validation strategy will be implemented.

14.11 Level-III Validation

Level-III begins the process of data validation and includes assessment of all the results reported in the standard data package. Qualifiers are issued at Level III and above. For level III data validation, the data values for routine and QC samples are generally assumed to be correctly reported by the laboratory. Data quality will be assessed by comparing the QC parameters to the appropriate criteria (or limits) as specified in this SAP, by Contract Laboratory Program (CLP) requirements, or by method-specific requirements (e.g., CLP, SW-846). If calculations for quantitation are verified, it is done on a limited basis and may require raw data in addition to the standard data forms normally present in a data package.

14.12 Level-IV Validation

Level-IV data validation constitutes the most extensive and exhaustive review and includes requantification of reported QC and field sample values using the raw data files. Level-IV data validation follows the U.S. EPA protocols and CLP criteria set forth in the functional guidelines for evaluating organic analyses (U.S. EPA, 2008). These guidelines apply to analytical data packages that include the raw data (e.g., spectra and chromatograms) and backup documentation for calibration standards, analysis run logs, LCS, dilution factors, and other types of information. This additional information is utilized in the Level-IV data validation process for checking calculations of quantified analytical data. Calculations are checked for lab QC samples (e.g., MS/MSD and LCS data) and routine field samples (including field duplicates, field and equipment rinsate blanks, and VOC trip blanks). To ensure that detection limit and data values are accurate and appropriate, an evaluation is made of instrument performance, calibration methods, and the original data for calibration standards.

Analytical data may be qualified based on data validation reviews. Qualifiers will be consistent with the applicable U.S.EPA functional guidelines and will be used to provide data users with an estimate of the level of uncertainty associated with the result “flagged”.

Data validation results will be evaluated with respect to the attached qualifiers to determine data usability issues, if any. The following qualifiers may be assigned during the validation process:

- J – estimated concentration
- R – rejected value (unusable)
- U – not detected (e.g., not present based on blank contamination)
- UJ – sample detection limit is estimated.

For any instances where the validation qualifiers impact the overall data interpretation and project recommendations, the Data Quality Assessment will discuss the issue and the necessary CA.

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15.0 SAP WORKSHEET #15 – REFERENCE LIMITS AND EVALUATION TABLES

15.1 TPH as gasoline by EPA Method 8015M – Matrix: Soil

Analyte	CAS Number	Project Screening Level ^a (mg/kg)	Project Screening Level Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD ^b (mg/kg)	DL (mg/kg)
TPH-gasoline (C ₆ – C ₁₀)	8006-61-9	NA	NA	1	1	0.5	0.35

Notes and Acronyms:

^a Screening levels for soil are not required for this analysis. This analysis is to confirm and corroborate the laser-induced fluorescence data.

^b Analytes will be reported to the LOD.

CAS Chemical Abstracts Service
 DL detection limit
 LOD limit of detection
 LOQ limit of quantitation
 mg/kg milligrams per kilogram
 NA not applicable

15.2 TPH as diesel by EPA Method 8015M – Matrix: Soil

Analyte	CAS Number	Project Screening Levels ^a (mg/kg)	Project Screening Levels Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD ^b (mg/kg)	DL (mg/kg)
TPH-diesel (C ₁₀ – C ₂₈)	-3527 ^c	NA	NA	10	10	5	3

Notes and Acronyms:

^a Screening levels for soil are not required for this analysis. This analysis is to confirm and corroborate the laser-induced fluorescence data.

^b Analytes will be reported to the LOD.

^c The NIRIS code for TPH (diesel range) has been used in place of the CAS number.

CAS	Chemical Abstracts Service
DL	detection limit
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
NA	not applicable
NIRIS	Naval Installation Restoration Information Solution

15.3 PAHs by EPA Method 8270C SIM– Matrix: Soil

Analyte	CAS Number	Project Screening Level (mg/kg)	Project Screening Level Reference ^a	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Acenaphthene	83-32-9	33,000	RSL	0.33	0.33	0.17	0.08
Acenaphthylene	208-96-8	NA	NA	0.33	0.33	0.17	0.08
Anthracene	120-12-7	170,000	RSL	0.33	0.33	0.17	0.08
Benzo(a)anthracene	56-55-3	2.1	RSL	0.33	0.33	0.17	0.08
Benzo(a)pyrene	50-32-8	0.21 ^b	RSL	0.33	0.33	0.17	0.08
Benzo(b)fluoranthene	205-99-2	2.1	RSL	0.33	0.33	0.17	0.08
Benzo(k)fluoranthene	207-08-9	21	RSL	0.33	0.33	0.17	0.08
Benzo(g,h,i)perylene	191-24-2	NA	NA	0.33	0.33	0.17	0.08
Chrysene	218-01-9	210	RSL	0.33	0.33	0.17	0.08
Dibenzo(a,h)anthracene	53-70-3	0.21 ^b	RSL	0.33	0.33	0.17	0.08
Fluoranthene	206-44-0	22,000	RSL	0.33	0.33	0.17	0.13
Fluorene	86-73-7	22,000	RSL	0.33	0.33	0.17	0.08
Indeno(1,2,3-cd)pyrene	193-39-5	2.1	RSL	0.33	0.33	0.17	0.08
Naphthalene	91-20-3	18	RSL	0.33	0.33	0.17	0.08
Phenanthrene	85-01-8	NA	NA	0.33	0.33	0.17	0.08
Pyrene	129-00-0	17,000	RSL	0.33	0.33	0.17	0.16

Table Continues

SAP WORKSHEET #15 – 15.3 PAHS BY EPA METHOD 8270C SIM (SOIL) – CONTINUED

Notes and Acronyms:

^a U.S. EPA Region 9 Regional Screening Levels (RSLs) for industrial soil (May 2012) were used.

^b The analytical method selected provides the lowest reporting limits available using routinely accepted methodology. Since the Project Screening Level is less than the Project Quantitation Limit Goal (PQL), analytes will be reported to the LOD.

Surrogate parameters for this analytical method and associated QC limits are available in Table 2.

CAS	Chemical Abstracts Service
DL	detection limit
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
NA	not available (No RSL is available for this analyte)

15.4 VOCs by EPA Method 8260B – Matrix: Soil

Analyte	CAS Number	Project Screening Level (mg/kg)	Project Screening Level Reference ^a	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD ^b (mg/kg)	DL (mg/kg)
1,1,1-Trichloroethane	71-55-6	38,000	RSL	0.005	0.005	0.001	0.0005
1,1,1,2-Tetrachloroethane	630-20-6	9.3	RSL	0.005	0.005	0.001	0.0005
1,1,2,2-Tetrachloroethane	79-34-5	2.8	RSL	0.005	0.005	0.001	0.0005
1,1,2-Trichloroethane	79-00-5	5.3	RSL	0.005	0.005	0.001	0.0005
1,1-Dichloroethene	75-35-4	1,100	RSL	0.005	0.005	0.001	0.0005
1,2-Dichloroethane	107-06-2	2.2	RSL	0.005	0.005	0.001	0.0005
1,2,3-Trichlorobenzene	87-61-6	490	NA	0.005	0.005	0.002	0.001
1,2,3-Trichloropropane	96-18-4	0.095	RSL	0.005	0.005	0.002	0.001
1,2,4-Trimethylbenzene	95-63-6	260	RSL	0.005	0.005	0.001	0.00055
1,3,5-Trimethylbenzene	108-67-8	10,000	RSL	0.005	0.005	0.001	0.00059
Benzene	71-43-2	5.4	RSL	0.005	0.005	0.001	0.0005
Chlorobenzene	108-90-7	1,400	RSL	0.005	0.005	0.001	0.0005
Chloroform	67-66-3	1.5	RSL	0.005	0.005	0.001	0.0005
Diisopropyl Ether (DIPE)	108-20-3	10,000	RSL	0.005	0.005	0.001	0.0005

Table Continues

SAP WORKSHEET #15 – VOCS BY EPA METHOD 8260B (SOIL) – CONTINUED

Analyte	CAS Number	Project Screening Level (mg/kg)	Project Screening Level Reference ^a	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD ^b (mg/kg)	DL (mg/kg)
Ethylbenzene	100-41-4	27	RSL	0.005	0.005	0.001	0.0005
Ethyl Tert-Butyl Ether (ETBE)	637-92-3	NA	NA	0.005	0.005	0.001	0.0005
Isopropyl Benzene (Cumene)	98-82-8	11,000	RSL	0.005	0.005	0.001	0.00064
m,p-Xylene (xylenes)	1330-20-7	2,700	RSL	0.010	0.010	0.002	0.001
Methylene Chloride	75-09-2	960	RSL	0.005	0.005	0.002	0.001
Methyl t-butyl ether (MTBE)	1634-04-4	220	RSL	0.005	0.005	0.001	0.0005
Naphthalene	91-20-3	18	RSL	0.005	0.005	0.002	0.001
n-Butylbenzene	104-51-8	51,000	RSL	0.005	0.005	0.001	0.0007
n-Propylbenzene	103-65-1	21,000	RSL	0.005	0.005	0.001	0.00065
o-xylene	95-47-6	3,000	RSL	0.005	0.005	0.001	0.0005
p-Isopropyltoluene	99-87-6	NA	NA	0.005	0.005	0.001	0.00062
sec-Butylbenzene	135-98-8	NA	NA	0.005	0.005	0.001	0.00067
Styrene	100-42-5	36,000	RSL	0.005	0.005	0.001	0.0005
Tert-butanol	75-65-0	NA	NA	0.020	0.020	0.010	0.00918
Tertiary Amyl Methyl Ether	994-05-8	NA	NA	0.005	0.005	0.001	0.0005

Table Continues

SAP WORKSHEET #15 – VOCS BY EPA METHOD 8260B (SOIL) – CONTINUED

Analyte	CAS Number	Project Screening Level (mg/kg)	Project Screening Level Reference ^a	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific		
					LOQ (mg/kg)	LOD ^b (mg/kg)	DL (mg/kg)
Tetrachloroethene (PCE)	127-18-4	110	RSL	0.005	0.005	0.001	0.0005
Toluene	108-88-3	45,000	RSL	0.005	0.005	0.001	0.0005
Trichloroethene (TCE)	79-01-6	6.4	RSL	0.005	0.005	0.001	0.0005
Trichlorofluoromethane	75-69-4	3,400	RSL	0.005	0.005	0.002	0.00106
Vinyl Acetate	108-05-4	4,100	RSL	0.005	0.005	0.002	0.00126
Vinyl Chloride	75-01-4	1.7	RSL	0.005	0.005	0.002	0.001

Notes and Acronyms:

^a U.S. EPA Region 9 Regional Screening Levels (RSLs) for industrial soil (May 2012) were used.

^b Analytes will be reported to the LOD.

Surrogate parameters for this analytical method and associated QC limits are available in Table 2.

CAS Chemical Abstracts Service
 DL detection limit
 LOD limit of detection
 LOQ limit of quantitation
 mg/kg milligrams per kilogram
 NA not available (No RSL is available for this analyte)

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16.0 SAP WORKSHEET #16 – PROJECT SCHEDULE / TIMELINE TABLE (OPTIONAL FORMAT)

The following schedule is planned for the execution of proposed site assessment activities at UST Site 500:

- November, 2012 – Submittal of Draft Work Plan for review.
- January, 2013 – Agency comments received on Draft Work Plan.
- February, 2013 – Submittal of Final Work Plan.
- February, 2013 – Commencement of field investigation.
- April, 2013 – Receipt of validated laboratory data.
- August, 2013 – Submittal of Draft Site Characterization Report for review.
- October, 2013 – Agency comments received on Draft Site Characterization Report.
- December, 2013 – Submittal of Final Site Characterization Report.

Field work will commence after regulatory partner concurrence of the final project plans.

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17.0 SAP WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

NAVFAC SW identified UST 500 during site renovation. A December 2009 inspection showed that UST 500 was a 1,200-gallon single-walled steel tank that contained approximately 1000 gallons of diesel fuel. The fuel was removed, the UST interior was triple rinsed, and three soil samples were collected from the approximate depth of the bottom of the UST for analysis of TPH-g, TPH-d, and VOCs. Following sampling, the UST was filled in-place with cement grout.

The Navy has identified SCAPS LIF screening with confirmation by validated soil sample analysis as appropriate to assess data gaps in the current CSM.

The scope of work for this project consists of soil sampling optimized by a screening investigation. LIF screening level data will be used to delineate the vertical and horizontal extent of the petroleum hydrocarbons associated with UST 500. Following review of the LIF screening data, three representative confirmation soil samples will be collected for analysis of TPH-g, TPH-d, VOCs and PAHs by a fixed-base analytical laboratory. The soil analytical data will be validated by a third party and used to confirm the LIF screening data as described in Worksheet #11.

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18.0 SAP WORKSHEET #18 – SAMPLING LOCATIONS AND METHODS/SOP REQUIREMENTS TABLE

Sampling Location / ID Number ¹	Matrix	Depth ² (ft bgs)	Analytical Group	Number of Samples	Sampling SOP Reference ³
SCAPS Screening Investigation					
U500-SB01-S-01	Soil	10	TPH-G, TPH-D, VOCs, PAHs	1	T-003, T-005, T-006
U500-SB02-S-01	Soil	10	TPH-G, TPH-D, VOCs, PAHs	1	T-003, T-005, T-006
U500-SB03-S-01	Soil	10	TPH-G, TPH-D, VOCs, PAHs	1	T-003, T-005, T-006

Notes and Acronyms:

¹ The actual Station IDs will be determined in accordance with Worksheets #11 and #27.

² The soil sample depths are approximations which may vary slightly depending on data collected during Phase 1.

³ SOPs are available in Attachment 2.

bgs below ground surface

ID Identification

SOP standard operating procedure

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19.0 SAP WORKSHEET #19 – ANALYTICAL SOP REQUIREMENTS TABLE

19.1 Matrix: Soil

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference ¹	Containers (number, size, and type)	Sample Volume ² (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time ³ (preparation /analysis)
Soil	TPH-g	8015M/5035 EMAX-8015G	2 x 5 gram EnCore [®] soil samplers	15 g	4°C (±2°C)	48 hr. (7days ⁴) / 14 days
Soil	TPH-d	8015M/3520C EMAX-8015D	1 x 4 oz. glass jar or stainless steel or brass sleeve	30 g	4°C (±2°C)	7/40
Soil	PAHs	8270C SIM/ 3520C EMAX-8270	1 x 4 oz. glass jar or stainless steel or brass sleeve	30 g	4°C (±2°C)	7/40
Soil	VOCs	8260B/5030B EMAX-8260	3 x 5 gram EnCore [®] soil samplers	15 g	4°C (±2°C)	48 hr. (7days ⁴) / 14 days

Notes:

¹ Analytical SOP Reference from Worksheet #23.

² Laboratory sample volume requirements.

³ Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

⁴ Holding time for preparation of EnCore samplers can be 7 days if samples are frozen.

°C degrees Celsius

g grams

PAH polynuclear aromatic hydrocarbons

SOP standard operating procedures

TPH-g total petroleum hydrocarbons quantified as gasoline

TPH-d total petroleum hydrocarbons quantified as diesel

VOC volatile organic compounds

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20.0 SAP WORKSHEET #20 – FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates ¹	No. of MS/MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks	No. of PT Samples ²	Total No. of Samples to Lab
Soil	TPH-g	3	0	1/1	1	1	1	0	8
Soil	TPH-d	3	0	1/1	1	1	0	0	7
Soil	PAHs	3	0	1/1	1	1	0	0	7
Soil	VOCs	3	0	1/1	1	1	1	0	8

Notes and Acronyms:

¹ Soil duplicate samples will not be collected as part of the sampling efforts since assessment of spatial heterogeneity is not an objective of this project.

² PT samples will not be collected during this project.

MS/MSD matrix spike/matrix spike duplicate
 PT proficiency testing
 PAHs polynuclear aromatic hydrocarbons
 TPH-g total petroleum hydrocarbons quantified as gasoline
 TPH-d total petroleum hydrocarbons quantified as diesel
 VOCs volatile organic compounds

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21.0 SAP WORKSHEET #21 – PROJECT SAMPLING SOP REFERENCES TABLE

Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
T-001	Equipment Decontamination, 4/3/12	BRADY	Non-disposable drilling and sampling equipment	N	
T-003	Soil Sampling Procedure for Volatile Organics Using the EnCore® Sampler, 4/3/12	BRADY	EnCore® Sampler T-Handle, Disposable EnCore® Sampler	N	
T-005	SCAPS Data Acquisition Procedures for Laser-Induced Fluorescence 5/5/12	BRADY	SCAPS rig LIF	N	
T-006	Environmental Soil Sampling, 4/4/12	BRADY	Soil Sampling Equipment	N	
T-014	Utility Avoidance, 7/31/12	BRADY	Hand Auger, Air Knife, EMPCL, EMIMD, GPR, Magnotometer, Electromagnetic Meter	N	

Acronyms:

BRADY Richard Brady & Associates
 EMIMD Electromagnetic Induction Metal Detector
 EMPCL Electromagnetic Pipe and Cable Locator
 LIF laser induced fluorescence
 GPR Ground Penetrating Radar
 SCAPS Site Characterization and Analysis Penetrometer System
 SOP standard operating procedure

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22.0 SAP WORKSHEET #22 – FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION TABLE

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
Solinst Interface Meter	Maintenance	As needed. Decontaminate after each use.	Operational. Depress the battery test button to test the battery and circuitry.	In house repair/ Return to manufacturer	BRADY Staff – Project Manager	BRADY T-001	Replace batteries as needed. Decontaminate after each well sampled.

Acronyms:

BRADY Richard Brady and Associates
 SOP standard operating procedures

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23.0 SAP WORKSHEET #23 – ANALYTICAL SOP REFERENCES TABLE

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix/ Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
EMAX-8015G	Gasoline Range Organics Rev. 4	Definitive	Soil / TPH Purgable	GC	EMAX	N
EMAX-8015D	Diesel Range Organics Rev. 4	Definitive	Soil / TPH Extractable	GC	EMAX	N
EMAX-8260	Volatile Organics by GCMS Rev. 8	Definitive	Soil/ VOCs	GC/MS	EMAX	N
EMAX-8270	Semivolatile Organics by GCMS Rev. 5	Definitive	Soil/ PAHs	GC/MS	EMAX	N

Acronyms:

GC gas chromatography
 GC/MS gas chromatograph/mass spectrometry
 PAHs polynuclear aromatic hydrocarbons
 TPH total petroleum hydrocarbon
 VOCs volatile organic compounds

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24.0 SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	<ol style="list-style-type: none"> 1. Average response factor (RF) for SPCCs: VOCs ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, and ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethene. 2. RSD for RFs for CCCs: VOCs $\leq 30\%$ and one option below: <ol style="list-style-type: none"> a. Option 1: linear-mean RSD for all analytes $\leq 15\%$ b. Option 2: linear least squares regression $r \geq 0.995$ when RSD $>15\%$ c. Option 3: non-linear regression – coefficient of determination $r^2 \geq 0.99$ (6 points will be used for second order, 7 points shall be used for third order) 	<p>Locate the source of the problem. If expected RFs are not met, check for standard degradation or perform instrument adjustment and/or maintenance to correct the problem then repeat initial calibration</p> <p>If SPCC is non-compliant, it could be a result of standard degradation or active presence to active sites in the system. Correct the problem and repeat calibration.</p> <p>If CCC is non-compliant, it could be a result of system leaks or reactive column sites or standard degradation. Correct the problem and recalibrate.</p> <p>If RSD is non-compliant, check for outlier and repeat that ICAL point; otherwise perform instrument troubleshooting and repeat calibration.</p>	Analyst, EMAX Laboratories, Inc.	EMAX-8260 / DoD QSM

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Second source calibration verification	Once after each initial calibration.	Value of second source for all project analytes within $\pm 20\%$ of expected value (initial source) except for the following compounds due to erratic chromatographic behavior: bromomethane, chloroethane, chloromethane, dichlorodifluoromethane within $\pm 35\%$ of expected value.	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst, EMAX Laboratories, Inc.	EMAX-8260 / DoD QSM

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Calibration Verification (CV)	Daily, before sample analysis and every 12 hours of analysis time.	1. Average RF for SPCCs: VOCs \geq 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, and \geq 0.1 for chloromethane, bromoform, and 1,1-dichloroethene. %Difference/Drift for CCCs and target compounds \leq 20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.) except for the following compounds due to erratic chromatographic behavior: bromomethane, chloroethane, chloromethane, dichlorodifluoromethane within +/- 30% of expected value (unless they are project analytes of interest)	If SPCC is non-compliant, it could be a result of standard degradation or active presence to active sites in the system. Correct the problem and repeat calibration. If CCC is non-compliant, it could be a result of system leaks, reactive column sites, or standard degradation. Correct the problem and recalibrate	Analyst, EMAX Laboratories, Inc.	EMAX-8260 / DoD QSM

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	SPCCs average RF \pm 0.050 and %RSD for RFs for CCCs < 30% and one option below 1. linear – mean RSD for all analytes \leq 15% 2. linear – least squares regression $r \geq 0.995$, when RSD > 15% 3. non-linear – COD $r^2 > 0.990$ (6 points shall be used for second order, 7 points shall be used for third)	Locate the source of the problem. If expected RFs are not met, check for standard degradation or perform instrument adjustment and/or maintenance to correct the problem then repeat initial calibration If SPCC is non-compliant, it could be a result of standard degradation or active presence to active sites in the system. Correct the problem and repeat calibration. If CCC is non-compliant, it could be a result of system leaks, or reactive column sites or standard degradation. Correct the problem and recalibrate. If RSD is non-compliant, check for outlier and repeat that ICAL point; otherwise perform instrument troubleshooting and repeat calibration	Analyst, EMAX Laboratories, Inc.	EMAX-8270 / DoD QSM

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Second source calibration verification	Once after each initial calibration.	Value of second source for all analytes within $\pm 20\%$ of expected value (initial source) except for the following compounds due to erratic chromatographic behavior: benzidine, 4,6-dinitro-2-methylphenol, 4-chloroaniline, benzylalcohol, n-Nitrosodimethylamine, 4-nitrophenol, 2-nitroaniline, pyridine, benzoic acid and 3-nitroaniline within $\pm 35\%$ of expected value.	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst, EMAX Laboratories, Inc.	EMAX-8270 / DoD QSM

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Calibration Verification (CV)	Daily, before sample analysis and every 12 hours of analysis time.	SPCCs average RF \geq 0.050; and CCCs and target analytes \leq 20% difference (when using RFs) or drift (when using least squares regression or non-linear calibration) except for the following compounds due to erratic chromatographic behavior: benzidine, 4,6-dinitro-2-methylphenol, 4-chloroaniline, benzylalcohol, n-Nitrosodimethylamine, 4-nitrophenol, 2-nitroaniline, pyridine, benzoic acid and 3-nitroaniline within +/- 30% of expected value.	If SPCC is non-compliant, it could be a result of standard degradation or active presence to active sites in the system. Correct the problem and repeat calibration. If CCC is non-compliant, it could be a result of system leaks, reactive column sites, or standard degradation. Correct the problem and recalibrate	Analyst, EMAX Laboratories, Inc.	EMAX-8270 / DoD QSM
GC	Initial Calibration (ICAL)	Initial calibration prior to sample analysis and as needed.	One of the following options: 1. RSD for all analytes \leq 20% 2. linear – least squares regression $r > =0.995$ 3. non-linear – COD $>$ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Locate the source of the problem. If expected RSD is not met, check for standard degradation or perform instrument adjustment and/or maintenance to correct the problem then repeat initial Calibration	Analyst, EMAX Laboratories, Inc.	EMAX-8015G EMAX-8015D

Table Continues

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE – CONTINUED

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	ICV	Once after each initial calibration.	All project analytes within established retention time windows. <u>GC Methods:</u> All project analytes within $\pm 20\%$ of expected value from ICAL.	Prepare fresh standard and re-analyze ICV to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance to correct the problem and repeat ICAL.	Analyst, EMAX Laboratories, Inc.	EMAX-8015G EMAX-8015D
GC	CCV	Daily, before sample analysis, after every 10 field samples, and at the end of analysis sequence.	All project analytes within established retention time windows. <u>GC Methods:</u> All project analytes within $\pm 20\%$ of expected value from ICAL.	Diagnose problem. Prepare fresh standard and re-analyze CCV to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance to correct the problem. Reanalyze all samples since last successful CCV. If problem persists, repeat ICAL.	Analyst, EMAX Laboratories, Inc.	EMAX-8015G EMAX-8015D

Acronyms:

- CCC criteria continuing concentration
- COD chemical oxygen demand
- CCV continuous calibration verification
- DCC daily calibration check
- GC gas chromatography
- GC/MS gas chromatograph/mass spectrometry
- ICAL initial calibration
- ICV initial calibration verification
- RPD relative percent difference
- %RSD percent relative standard deviation
- RSD relative standard deviation
- SPCC system performance check compound

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25.0 SAP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC/MS GC	Parameter Setup	Physical check	<p><u>Examples:</u> Check that the autosampler is functioning as expected.</p> <p>Check that temperature program is set at the most recently determined optimum condition.</p>	Initially; prior to each use.	<p>Autosampler must move to the expected position when activated.</p> <p>Refer to instrument optimize temperature program setup.</p>	<p>Reset to SOP set-up, if parameter checks reveal deviations. Notate all adjustments in Daily Maintenance Log.</p> <p><u>Examples:</u> Reset autosampler, if problem persists, perform autosampler troubleshooting prior to instrument use.</p> <p>Reset to optimized temperature setup (e.g., if temperature program is optimized at the following conditions: Initial Temp=40°C, hold for 1 min, Ramp= 6°C, Final Temp=200°C, Injection port=160°C Interface=250°C, then the instrument setting must be on that condition when checked.)</p>	Analyst, EMAX Laboratories, Inc.	<p>EMAX-8260</p> <p>EMAX-8270</p> <p>EMAX-8015G</p> <p>EMAX-8015D</p>

Table Continues

SAP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE – CONTINUED

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC/MS	Tune Check	Instrument Performance	Conformance to instrument tuning.	Initially; prior to DCC	Compliance to ion abundance criteria as specified by the method.	Repeat tune check to rule out standard degradation or inaccurate injection. If problem persists, perform retune the instrument and repeat tune check.	Analyst, EMAX Laboratories, Inc.	EMAX- 8260 EMAX- 8270

Table Continues

Acronyms

- DCC daily calibration check
- GC gas chromatograph
- GC/MS gas chromatograph/mass spectrometer
- SOP standard operating procedure

26.0 SAP WORKSHEET #26 – SAMPLE HANDLING SYSTEM

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Field Sampling Personnel / Richard Brady & Associates
Sample Packaging (Personnel/Organization): Field Sampling Personnel / Richard Brady & Associates
Coordination of Shipment (Personnel/Organization): Quality Assurance Manager or Project Manager / Richard Brady & Associates
Type of Shipment/Carrier: Commercial shipment courier or laboratory courier
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian, EMAX Laboratories, Inc.
Sample Custody and Storage (Personnel/Organization): Sample Custodian, EMAX Laboratories, Inc.
Sample Preparation (Personnel/Organization): Various chemists and technicians, EMAX Laboratories, Inc.
Sample Determinative Analysis (Personnel/Organization): Various chemists and technicians, EMAX Laboratories, Inc.
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 30 days, or as required on a project specific basis
Sample Extract/Digestate Storage (No. of days from extraction/digestion): 30 days, or as required on a project specific basis
Biological Sample Storage (No. of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodian, EMAX Laboratories, Inc.
Number of Days from Analysis: 30 days, or as required on a project specific basis

Acronyms:

NA Not Applicable

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27.0 SAP WORKSHEET #27 – SAMPLE CUSTODY REQUIREMENTS

27.1 Sample Identification

To provide a method of tracking each sample through collection, analysis, data review, and data reduction, a sample identification system has been established for sampling activities at NAVWPNSTA Seal Beach. The sample identification system is designed to be compatible with both the California State Water Resources Control Board's GeoTracker database requirements, as well as the NEDD standard. Sample number identification will be assigned in the field according to the following sample identification system:

- A nine-character maximum designation of the Station ID.
- A one-character designation of the matrix type, i.e. "S" for soil or "W" for water.
- A two-character designation of the consecutive sample number from each matrix type collected at the location. Leading zeros are used as needed to create two characters.

For example, sample identification number U500-02-S-01 refers to Station ID "U500-02" (where "U500" refers to UST 500, and "02" refers to the second consecutive station), "S" refers to the soil matrix, and "01" refers to the first soil sample collected at the station.

Field QC samples subjected to chemical analysis, such as equipment rinsate blanks, field blanks, and trip blanks will also be named this way; sequentially numbered as collected in the field with the site characterization samples. Field QC samples will be submitted to the laboratory under blind identification. Field QC samples will *not* be identified as QC samples in the sample name or on the COC. Field QC samples will be labeled with a Sample ID comprised of the following sequential components, all separated by dashes:

- The Station ID of the preceding station sampled (i.e. the station sampled immediately prior to collecting the field QC sample).
- A one-character designation of the matrix type.
- A two-character designation of the consecutive sample number of each matrix type collected, continuing from the preceding station. Leading zeros are used as needed to create two characters.

In the following hypothetical example, the first sample collected at the site is from the station with the Station ID U500-02, named in accordance with the protocol described above. In this hypothetical situation:

- One soil sample is collected.
- An MS/MSD is collected with the soil sample.
- Following the sampling, an equipment blank and a field blank are collected.

The samples would be named as follows:

The soil sample would be named U500-02-S-01, referring to:

- Station ID “U500-02” (where “U500” refers to UST 500, and “02” refers to the second consecutive station).
- Matrix type “S” (soil)
- Consecutive sample “01”.

The extra containers collected for the MS/MSD would also be labeled U500-02-S-01, and the COC would identify this sample to the lab for use as an MS/MSD for lab QA/QC. The sample will be shown as a single line on the COC, with the total number of sample containers entered in the appropriate field.

The equipment blank would be named U500-02-W-01, referring to:

- Station ID U500-02, representing the Field Point name of the preceding station where the sampling equipment was used.
- Matrix type “W” (water sample)
- Consecutive sample “01” refers to the first water sample related to the station.

Similarly, the field blank would be named U500-02-W-02.

Temperature blanks will be labeled as temperature blanks. Temperature blanks are not subject to chemical analysis.

Cross-reference information regarding the Station ID, the assigned sample identification number, and whether the sample is a field quality control sample, will be documented on the Sample ID and Analysis Form (Attachment 1). These forms will be maintained in the bound project logbook.

27.2 Sample Custody

All samples will be recorded on COC forms using the sample ID described above. COCs will be completed using waterproof ink and in a manner to ensure entries are legible. Any errors made by the individual completing the COC shall be crossed out with a single line, initialed, and dated. The COC serves as the legal documentation of the sample custody since it records the transfer of the samples from field personnel to the laboratory to ensure that no tampering occurs.

The COC form will be signed by the individual responsible for custody of the sample containers, and the original will accompany the samples to the laboratory. One copy of the COC form will be kept by the project manager and/or the Quality Assurance Manager (QAM) and included in the project files. Information to be recorded on the COC form should include:

- Sample matrix

- Sample collector's name
- Dates/times of sample collection
- Sample identification numbers
- Number and type of containers for each sample aliquot
- Type of preservation
- Laboratory QC sample designation
- Analysis method
- Special handling instructions
- Destination of samples
- Name, date, time, and signature of each individual releasing the shipping container.

27.3 Sample Packaging and Shipment

Sample packaging will be conducted to ensure that samples arrive at the laboratory undisturbed and in good condition. The following packaging procedures are also designed to meet U.S. EPA and Department of Transportation regulations:

- Immediately after sample collection, a sample label will be completed with indelible ink and affixed to each sample container. Each sample will be placed in a re-sealable plastic bag to keep the sample container and label dry.
- As samples are accumulated, they will be stored in a designated sample cooler and properly protected from breakage. Sufficient packing material will be used to prevent sample containers from making contact during shipment. Enough wet ice will be added (double-bagged in re-sealable plastic bags) to maintain sample temperature requirements ($4 \pm 2^{\circ}$ Centigrade). Field samples and ice will be collectively bagged in plastic trash bags, taped shut, and placed in the shipping container, to avoid water leakage. If the shipping container used is equipped with a drain plug, the plug will be taped shut both inside and outside to further ensure that there is no water leakage.
- The COC form will be completed and signed by BRADY's field personnel and courier (if other than the sampler) for the samples transported to the laboratory. The COC will be placed in a re-sealable plastic bag, and taped to the inside of the shipping container lid.
- The shipping container will be closed and taped shut with strapping tape (filament-type) completely around at both ends.
- Since the samples are to be delivered to the laboratory using a commercial shipment courier service, custody seals will be used on each container to provide tampering detection. The signed and dated custody seals will be placed on the front right and back left of the shipping container, and will be covered with wide, clear tape.

International Air Transportation Association regulations will be adhered to when shipping samples by air courier services. The package must be scheduled for priority overnight service to ensure that the temperature preservative requirement is not exceeded. Saturday deliveries will be coordinated with the laboratory.

27.4 Laboratory Receipt and Custody

The laboratory will designate a sample custodian. Upon receipt, this individual is responsible for inspecting the sample shipment, recording the temperature of the temperature blank and verifying the correctness of the COC records. The sample custodian will accept the samples by signing the COC form and noting the condition of the samples in the space provided on the COC form and on the Sample Receipt form. In case of breakage or discrepancies between the COC form, sample identification numbers, or requested analysis, the sample custodian will notify the BRADY QA Manager as soon as possible. All discrepancies associated with COC forms or sample breakage will be relayed to BRADY's QA Manager within 24-hours so CA can be implemented appropriately. The COC is generally considered to be a legal document and thus will be filled out legibly and as error free as possible.

Samples received by the laboratory will be entered into a sample management system, which must include:

- Laboratory sample number
- Field sample designation
- Analytical batch numbers
- List of analyses requested for each sample container.

Immediately after receipt, the samples will be stored in an appropriate secure storage area. The laboratory will maintain custody of the samples as required by the contract or until further notification by the BRADY Project Manager or QA Manager. The analytical laboratory will maintain written records showing the chronology of sample handling during the analysis process by various individuals at the laboratory.

27.5 Field Documents and Records

A project-specific field logbook will be used to provide daily records of significant events, observations, and measurements during the field investigation. The field logbook also will be used to document all sampling activities. The logbooks will be kept in the possession of the field team leader during the on-site work and all members of the field team will have access to the logbook. The logbook will be maintained as a permanent record. Any errors found in the logbook will be verified, crossed-through, and initialed by the person discovering the error.

The field logbook is intended to provide sufficient data and observations to reconstruct events that occurred during field activities. The field logbook should be permanently bound and pre-paginated; the use of designated forms should be used whenever possible to

ensure that field records are complete. The following items are examples of information that may be included in the field logbook:

- Weather conditions, health and safety briefing
- Name, date, and time of entries
- Names and responsibilities of field crew members
- Names and titles of any site visitors
- Descriptions of field procedures, and problems encountered
- Number and amount of samples taken at each location
- Details of sampling location, including sampling coordinates
- Sample identification numbers of all samples collected
- Date and time of collection
- Sample collector
- Sample collection method
- Decontamination procedures
- Field instrument calibration and maintenance
- Field measurements (e.g., organic vapor) and general observations.

Example forms are included as Attachment 1.

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28.0 SAP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE

28.1 Total Petroleum Hydrocarbons (TPH) - Soil

Matrix	Soil					
Analytical Group	TPH-g/-d/-mo					
Analytical Method / SOP Reference	8015B EMAX-8015					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation batch	No analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)	Determine cause of contamination and re-prepare and reanalyze method blank and all samples processed with the non-conforming method blank.	EMAX Chemist	Accuracy/Bias - Contamination	No analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)
Surrogate	Every analytical sample	Refer to QC Limit Table (Table 2)	Correct problem then re-prepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)
LCS	One per sample preparation batch	Refer to QC Limit Table with DoD ME Guidance (Table 2)	Re-prepare and reanalyze LCS and all samples processed with the non-conforming LCS.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)
MS/MSD	Project designated sample matrix QC	Refer to QC Limit Table (Table 2)	If result is indicative of matrix interference, discuss in case narrative. Otherwise check for possible source of error, and extract / reanalyze the sample.	EMAX Chemist	Interferences - Accuracy/Bias - Precision	Refer to QC Limit Table (Table 2)

Table Continues

SAP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE - 28.1- Total Petroleum Hydrocarbons (TPH) - Soil

Acronyms:

DoD	Department of Defense
DQI	data quality indicator
LCS	laboratory control sample
LOQ	limit of quantitation
ME	marginal exceedance
MS/MSD	matrix spike/matrix spike duplicate
QC	quality control

28.2 PAHs - Soil

Matrix	Soil					
Analytical Group	SVOCs					
Analytical Method / SOP Reference	8270C EMAX-8270					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation batch	No analytes detected > 1/2LOQ. For common laboratory contaminants, no analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)	Determine cause of contamination and re-prepare and reanalyze method blank and all samples processed with the non-conforming method blank.	EMAX Chemist	Accuracy/Bias - Contamination	No analytes detected > 1/2LOQ. For common laboratory contaminants, no analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)
Surrogate	Every analytical sample	Refer to QC Limit Table (Table 2)	Correct problem then re-prepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)

Table Continues

SAP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE - 28.2 - PAHs - Soil

Matrix	Soil					
Analytical Group	SVOCs					
Analytical Method / SOP Reference	8270C EMAX-8270					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per sample preparation batch	Refer to QC Limit Table with DoD ME Guidance (Table 2)	Re-prep and reanalyze LCS and all samples processed with the non-conforming LCS.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)
MS/MSD	Project designated sample matrix QC	Refer to QC Limit Table (Table 2)	If result is indicative of matrix interference, discuss in case narrative. Otherwise check for possible source of error, and extract / reanalyze the sample.	EMAX Chemist	Interferences - Accuracy/Bias - Precision	Refer to QC Limit Table (Table 2)

Acronyms:

DoD Department of Defense
 DQI data quality indicator
 LCS laboratory control sample
 LOQ limit of quantitation
 ME marginal exceedance
 MS/MSD matrix spike/matrix spike duplicate
 PAH polynuclear aromatic hydrocarbons
 QC quality control
 SVOC semivolatile organic compounds

28.3 VOCs - Soil

Matrix	Soil					
Analytical Group	VOCs					
Analytical Method / SOP Reference	8260B EMAX-8260					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation batch	No analytes detected > 1/2LOQ. For common laboratory contaminants, no analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)	Determine cause of contamination and re-prepare and reanalyze method blank and all samples processed with the non-conforming method blank.	EMAX Chemist	Accuracy/Bias - Contamination	No analytes detected > 1/2LOQ. For common laboratory contaminants, no analytes detected > LOQ. Blank result must not otherwise affect sample results. (Worksheet #15)
Surrogate	Every analytical sample	Refer to QC Limit Table (Table 2)	Correct problem then reprepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)

Table Continues

SAP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE - 28.3 - VOCs – Soil

Matrix	Soil					
Analytical Group	VOCs					
Analytical Method / SOP Reference	8260B EMAX-8260					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per sample preparation batch	Refer to QC Limit Table with DoD ME Guidance (Table 2)	Re-prep and reanalyze LCS and all samples processed with the non-conforming LCS.	EMAX Chemist	Accuracy/Bias	Refer to QC Limit Table (Table 2)
MS/MSD	Project designated sample matrix QC	Refer to QC Limit Table (Table 2)	If result is indicative of matrix interference, discuss in case narrative. Otherwise, check for possible source of error, and extract / reanalyze the sample.	EMAX Chemist	Interferences - Accuracy/Bias - Precision	Refer to QC Limit Table (Table 2)

Acronyms:

DoD Department of Defense
 DQI data quality indicator
 LCS laboratory control sample
 LOQ limit of quantitation
 ME marginal exceedance
 MS/MSD matrix spike/matrix spike duplicate
 %R percent recovery
 QC quality control
 VOC volatile organic compounds

29.0 SAP WORKSHEET #29 – PROJECT DOCUMENTS AND RECORDS TABLE

Document	Where Maintained
Draft WP/SAP/APP/SSHP	BRADY project file and NAVFAC SW Administrative Record
Final WP/SAP/APP/SSHP	BRADY project file and NAVFAC SW Administrative Record
Field notes/logbook	BRADY project file
COC forms	BRADY and laboratory project file
Audit checklists/reports	BRADY and laboratory project files
Corrective action forms/reports	BRADY and laboratory project files
Laboratory data package	BRADY, laboratory project file, and NAVFAC SW Administrative Record
Laboratory equipment calibration logs	Laboratory project file
Sample preparation logs	Laboratory project file
Run logs	Laboratory project file
Sample disposal records	Laboratory project file
Validated data package	BRADY, data validator project file, and NAVFAC SW Administrative Record

Acronyms:

APP	Accident Prevention Plan
BRADY	Richard Brady & Associates
COC	Chain of Custody
NAVFAC SW	Naval Facilities Engineering Command Southwest
SAP	Sampling and Analysis Plan
SSHP	Site Safety and Health Plan
WP	Work Plan

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30.0 SAP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

For this project, analytical services will be provided by EMAX Laboratories, Inc. of Torrance, CA. Turnaround times for the laboratory data package will be based on the date in which the laboratory receives the samples. The final data package will be available in electronic format in 21 days, and a hardcopy version will be mailed to the Brady office. The backup laboratory for this project is Calscience Environmental Laboratories, Inc. of Garden Grove, CA. Both labs are currently certified by the California Department of Public Health Environmental Laboratory Accreditation Program (ELAP) Board for the analysis of hazardous materials for the methods specified in this SAP and have received accreditation from a Department of Defense ELAP accrediting body.

Matrix	Analytical Group	Sample Locations/ ID Number	Analytical Method ¹	Data Package Turnaround Time	Laboratory / Organization ²	Backup Laboratory / Organization ²
Soil	TPH-G TPH-D VOC PAH	Worksheet #18 contains all sample locations and/or ID numbers	8015M 8260B 8270C SIM	21 Day Final	EMAX Laboratories, Inc. 1835 W. 205 th St., Torrance, CA 90501 (310) 618-8889 Molly Nguyen	Calscience 7440 Lincoln Way, Garden Grove, CA 92841-1427 714-895-5494 Ranjit Clarke

Notes and Acronyms:

¹ Copies of the analytical SOPs will be provided in Attachment 3 of the final version of the SAP (CD-ROM). The field copy will have Attachment 3 as a hard copy.

² EMAX laboratories, Inc. and Calscience Environmental Laboratories, Inc. are both currently State of California ELAP certified and DoD ELAP accredited for the methods listed.

PAH polynuclear aromatic hydrocarbons
 TPH total petroleum hydrocarbons
 VOC volatile organic compounds

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31.0 SAP WORKSHEET #31 – PLANNED PROJECT ASSESSMENTS TABLE

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)	Person(s) Responsible for Monitoring Effectiveness of CA
Readiness Review ¹	Prior to initiating fieldwork	Internal	BRADY	Project Manager, BRADY	Project team, BRADY	Project Manager, BRADY	Project Manager, BRADY
Field Sampling TSA ¹	At start of field sampling activities	Internal	BRADY	QA Manager, BRADY	Project Manager, BRADY	QA Manager, BRADY	QA Manager, BRADY Project Manager, BRADY
Field Documentation Review ¹	Daily	Internal	BRADY	QA Manager, BRADY Project Manager, BRADY	Project Manager, BRADY	QA Manager, BRADY	QA Manager, BRADY Project Manager, BRADY

Notes and Acronyms:

¹ Attachment 1 contains the examples of the review and audit forms.

BRADY Richard Brady & Associates
 CA Corrective Action
 QA Quality Assurance
 TSA technical systems audit

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32.0 SAP WORKSHEET #32 – ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Readiness Review ¹	Written readiness review report	Jesse MacNeill, QA Manager, BRADY	5 days after review	Completed Action Item List	Jesse MacNeill, QA Manager, BRADY Tim Shields, Program Manager, BRADY	5 days
Field Sampling TSA ¹	Written audit report	Fred Essig, Project Manager, BRADY	5 days after audit	Corrective Action Form and/or Field Change Notice	Jesse MacNeill, QA Manager, BRADY Tim Shields, Program Manager, BRADY Brenda Reese, RPM, NAVFAC SW (if FCN issued only)	Within 24 hours
Field Documentation Review ¹	Field Data Review Checklist	Fred Essig, Project Manager, BRADY	Upon completion of the review	Corrective Action Form	Jesse MacNeill, QA Manager, BRADY	2 days

Notes and Acronyms:

¹ Attachment 1 contains the examples of the review and audit forms.

BRADY Richard Brady & Associates
 NAVFAC SW Naval Facilities Engineering Command Southwest
 QA Quality Assurance
 RPM remedial project manager
 TSA technical systems audit

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33.0 SAP WORKSHEET #33 – QA MANAGEMENT REPORTS TABLE

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Readiness Review ¹	Prior to initiating fieldwork	10 days prior to initiation of field activities	Fred Essig, Project Manager, BRADY	Tim Shields, Program Manager, BRADY; Jesse MacNeill, QA Manager, BRADY
Field Sampling TSA ¹	At start of field sampling activities	5 days after initiation of sampling activities	Jesse MacNeill, QA Manager, BRADY	Tim Shields, Program Manager, BRADY; Fred Essig, Project Manager, BRADY
Field Documentation Review ¹	Daily	5 days after completion of field activities	Jesse MacNeill, QA Manager, BRADY	Tim Shields, Program Manager, BRADY; Fred Essig, Project Manager, BRADY

Notes and Acronyms:

¹ Attachment 1 contains the examples of the review and audit forms.

BRADY Richard Brady & Associates
 QA quality assurance
 TSA technical systems audit

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34.0 SAP WORKSHEET #34 – VERIFICATION (STEP I) PROCESS TABLE

Verification Input	Description	Internal / External	Responsible for Verification
COC forms	COC forms will be reviewed internally upon their completion and verified against the packed sample containers they represent. The shipper's signature on the COC should be initialed by the reviewer, a copy of the COC retained in the project file, and the original and remaining copies taped inside the container for shipment.	Internal	Field Sampling Personnel (BRADY)
Field notes/logbook	Field notes and/or entries into the field logbook will be reviewed internally and placed in the project file upon project completion.	Internal	Field Sampling Personnel (BRADY) QA Manager (BRADY)
Audit reports	Upon report completion, a copy of all audit reports will be placed in the project file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the project file.	Internal	Project Manager (BRADY) QA Manager (BRADY)
Sample Receipt Forms	Sample receipt forms from the laboratory will be reviewed and verified for completeness in accordance with the COC forms.	Internal/ External	QA Manager (BRADY) Laboratory PM (EMAX)
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in Worksheet # 36 of this SAP.	Internal/ External	EMAX Laboratories, Inc. LDC, Inc.
Electronic data deliverables	All EDDs will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received EDDs will be verified externally against the hardcopy laboratory data packages.	Internal/ External	EMAX Laboratories, Inc. LDC, Inc.

Acronyms:

BRADY Richard Brady & Associates
 CA Corrective Action
 COC Chain-of-Custody
 EDD Electronic data deliverables
 LDC Laboratory Data Consultants
 PM Project Manager
 QA quality assurance

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35.0 SAP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE

Step Iia / Iib ¹	Validation Input	Description	Responsible for Validation
Iia	Communication	Establish that required communication procedures were followed by field or laboratory personnel.	Project Manager (BRADY) QA Manager (BRADY)
Iia	Sampling Methods and Procedures	Establish that the required sampling methods were used and that any deviations were noted. Ensure that the sampling procedures and field measurements met performance criteria and that any deviations were documented.	Project Manager (BRADY) QA Manager (BRADY)
Iia	Holding Times	Ensure that samples were analyzed within holding times specified in method, procedure, or contract requirements. If holding times were not met, confirm that deviations were documented, that appropriate notifications were made as stated in BRADY's Statement of Work to the laboratory.	QA Manager (BRADY) Data Validator (LDC)
Iia	Analytes	Ensure that required lists of analytes were reported as specified in governing documents (i.e., method, procedure, or contract).	QA Manager (BRADY) Data Validator (LDC)
Iia	Analytical Methods and Procedures	Establish that the required analytical methods were used and that any deviations were noted. Ensure that the QC samples met performance criteria and that any deviations were documented.	QA Manager (BRADY) Data Validator (LDC)
Iia	Data Qualifiers	Determine that the laboratory data qualifiers were defined in the laboratory data package and applied as specified.	QA Manager (BRADY) Data Validator (LDC)
Iia	Field Transcription	Authenticate transcription accuracy of sampling data (i.e., from field logbook to report).	Project Manager (BRADY) QA Manager (BRADY)
Iib	Sampling Plan	Determine whether the sampling plan was executed as specified (i.e., the number, location, and type of field samples were collected and analyzed as specified in the SAP).	Project Manager (BRADY) QA Manager (BRADY)
Iib	Sampling Procedures	Evaluate whether sampling procedures were followed with respect to equipment and proper sampling support (e.g., techniques, equipment, decontamination, volume, temperature, preservative, etc.).	Project Manager (BRADY) QA Manager (BRADY)
Iib	Co-located Field Duplicates	Compare results of collocated field duplicates with criteria established in the SAP.	QA Manager (BRADY) Data Validator (LDC)

Table Continues

SAP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE – CONTINUED

Step Iia / Iib ¹	Validation Input	Description	Responsible for Validation
Iib	Project Quantitation Limits	Determine that quantitation limits were achieved, as outlined in the SAP and that the laboratory successfully analyzed a standard at the limit of quantitation (LOQ).	QA Manager (BRADY) Data Validator (LDC)
Iib	Performance Criteria	Evaluate QC data against project-specific performance criteria in the SAP (i.e., evaluate quality parameters beyond those outlined in the methods).	QA Manager (BRADY) Data Validator (LDC)

Notes and Acronyms:

¹Iia=compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005.]
 Iib=comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005]

BRADY Richard Brady & Associates
 LDC Laboratory Data Consultants, Inc.
 QA quality assurance
 QC quality control
 SAP sampling and analysis plan

36.0 SAP WORKSHEET #36 – ANALYTICAL DATA VALIDATION (STEPS IIa AND IIb) SUMMARY TABLE

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria ¹	Data Validator (title and organizational affiliation)
IIa	Soil	TPH-G	In accordance with this project-specific SAP, DoD QSM v4.2, EPA Contract Lab Program National Functional Guidelines, SW-846 Methods, NAVFAC SW EWI #1, and EPA Level III and IV guidelines.	Project Manager, LDC, Inc.
IIa	Soil	TPH-D	In accordance with this project-specific SAP, DoD QSM v4.2, EPA Contract Lab Program National Functional Guidelines, SW-846 Methods, NAVFAC SW EWI #1, and EPA Level III and IV guidelines.	Project Manager, LDC, Inc.
IIb	Soil	VOC	In accordance with this project-specific SAP, DoD QSM v4.2, EPA Contract Lab Program National Functional Guidelines, SW-846 Methods, NAVFAC SW EWI #1, and EPA Level III and IV guidelines.	Project Manager, LDC, Inc.
IIb	Soil	PAH	In accordance with this project-specific SAP, DoD QSM v4.2, EPA Contract Lab Program National Functional Guidelines, SW-846 Methods, NAVFAC SW EWI #1, and EPA Level III and IV guidelines.	Project Manager, LDC, Inc.

Notes and Acronyms:

¹Validation shall be conducted in accordance with NFESC Special Publication SP-2056-ENV, Navy Installation Restoration Chemical Data Quality Manual, Naval Facilities Engineering Command, September 1999.

LDC Laboratory Data Consultants
 PAH polynuclear aromatic hydrocarbons
 TPH total petroleum hydrocarbon
 VOC volatile organic compound

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37.0 SAP WORKSHEET #37 – USABILITY ASSESSMENT

This section describes the QA/QC activities that occur after the data collection phase of the project has been completed to ensure that data conform to the specified criteria and thus are useful for their intended purpose.

37.1 Usability Assessment Objectives

The data quality is a function of the sampling plan rationale and the procedures used to collect the samples, as well as the analytical methods and instrumentation used. As discussed in the following sections, data collected during this investigation will be evaluated for usability with respect to precision, accuracy, representativeness, completeness, comparability and sensitivity to determine whether the project DQOs have been met. All validated data collected for this investigation will be identified and included in a data usability assessment. The data usability assessment will be completed by BRADY personnel under the oversight of Tim Shields, BRADY Program Manager. The BRADY Project Manager, Fred Essig, will be responsible for the coordination and performance of the usability assessment.

37.2 Precision

Precision quantifies the repeatability of a given measurement. Given the limited number of field and QC samples for this project, precision will be measured by the analyses of both field and laboratory duplicate samples, including MS/MSD. 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 CAs taken. The findings of the usability of the data relative to precision will be included in the report, including any limitations on the data set and/or individual analytical results. Precision is estimated by calculating the RPD of the duplicate samples, as shown in the following equation:

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

Where:

- A = First duplicate concentration
- B = Second duplicate concentration

37.3 Accuracy

Accuracy refers to the percentage of a known amount of analyte recovered from a given matrix. It measures the bias in a measurement system. A measurement is accurate when the value reported does not differ (by a specified amount) from the true value, or from the known concentration of a MS or standard. The accuracy of the analytical determinations will be evaluated based on the analyses of LCS, MS/MSD, and surrogate spikes (where applicable). The findings of the usability of the data relative to accuracy will be included

in the report, including any limitations on the data set and/or individual analytical results. Percent recoveries are estimated using the following equation:

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

Where:

- S = Measured spike sample concentration
- C = Sample concentration
- T = True or actual concentration of the spike

37.4 Representativeness

Representativeness expresses 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. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Sample representativeness will be assessed in terms of adherence to established sample collection procedures, required preservation, storage, and holding times. The findings of the usability of the data relative to representativeness will be included in the report, including any limitations on the data set and/or individual analytical results.

37.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount expected to be obtained under normal conditions. Completeness is determined based on the number of valid points (data not rejected) relative to the total number of validated data. In addition to validated results, broken, spilled samples, and any other problems that may compromise sample representativeness are included in the assessment of completeness.

$$\text{Completeness (\%)} = \frac{\text{Number of Valid Measurements}}{\text{Total Number of Measurements}} \times 100$$

A completeness standard of 90% has been established for this project. The findings of the usability of the data relative to completeness will be included in the report, including any limitations on the data set and/or individual analytical results.

37.6 Comparability

Comparability expresses the confidence with which one data set is compared with another. This evaluation criterion is critical for use in analyzing temporal trends in constituent variations within the sampling domain. Comparability will be achieved by the using standard methods for sampling and analyses, presenting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. The findings of the usability of the data relative to comparability will be included in the report, including any limitations on the data set and/or individual analytical results.

37.7 Sensitivity

Sensitivity is the ability of the analytical test method and/or instrumentation to differentiate between detector responses to varying concentrations of the target constituent. Methodology to establish sensitivity for a given analytical method or instrument includes examination of standardized blanks, instrument detection limit studies, and calibration of the quantitation limits. The findings of the usability of the data relative to sensitivity will be included in the report, including any limitations on the data set and/or individual analytical results.

37.8 Usability Findings

The findings of the usability assessment will be presented in the investigation report and will include, in addition to the criteria described above, an analysis of any discrepancies in the chain of custody, missed holding times for analysis, modifications to the scope of work, field changes, potential matrix interferences, and potential environmental impacts due to site conditions or meteorological effects.

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Appendix A Tables

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TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
<i>Volatile Organic Compounds by EPA Method 8260B</i>		<i>Soil</i>	
1,1,1-Trichloroethane	50	70	135
1,1,1,2-Tetrachloroethane	50	75	125
1,1,2,2-Tetrachloroethane	50	55	130
1,1,2-Trichloroethane	50	60	125
1,1-Dichloroethene	50	65	135
1,2-Dichloroethane	50	70	135
1,2,3-Trichlorobenzene	50	60	135
1,2,3-Trichloropropane	50	65	130
1,2,4-Trimethylbenzene	50	65	135
1,3,5-Trimethylbenzene	50	65	135
Benzene	50	75	125
Chlorobenzene	50	75	125
Chloroform	50	70	125
Diisopropyl Ether (DIPE)	50	TBD	TBD
Ethylbenzene	50	75	125
Ethyl Tert-Butyl Ether (ETBE)	50	TBD	TBD
Isopropyl Benzene (Cumene)	50	75	130
m,p-Xylenes	50	80	125
Methylene Chloride	50	55	140
Methyl Tert-Butyl Ether (MTBE)	50	60	150
Naphthalene	50	40	125
n-Butylbenzene	50	65	140
n-Propylbenzene	50	65	135
o-Xylene	50	75	125
p-Isopropyltoluene	50	75	135
sec-Butylbenzene	50	65	130
Styrene	50	75	125
Tert-butanol	50	TBD	TBD
Tertiary Amyl Methyl Ether (TAME)	50	TBD	TBD
Tetrachloroethene (PCE)	50	65	140
Toluene	50	70	125
Trichloroethene (TCE)	50	75	125
Trichlorofluoromethane	50	25	185
Vinyl Acetate	50	TBD	TBD
Vinyl Chloride	50	60	125

Table Continues

TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
Surrogates			
1,2-dichloroethane -d 4	--	70	140
4-bromofluorobenzene	--	85	120
toluene-d8	--	85	115
Volatile Organic Compounds by EPA Method 8260B		Water	
1,1,1-Trichloroethane	30	65	130
1,1,1,2-Tetrachloroethane	30	80	130
1,1,2,2-Tetrachloroethane	30	65	130
1,1,2-Trichloroethane	30	75	125
1,1-Dichloroethene	30	70	130
1,2-Dichloroethane	30	70	130
1,2,3-Trichlorobenzene	30	55	140
1,2,3-Trichloropropane	30	75	125
1,2,4-Trimethylbenzene	30	75	130
1,3,5-Trimethylbenzene	30	75	130
Benzene	30	80	120
Chlorobenzene	30	80	120
Chloroform	30	65	135
Diisopropyl Ether (DIPE)	30	TBD	TBD
Ethylbenzene	30	75	125
Ethyl Tert-Butyl Ether (ETBE)	30	TBD	TBD
Isopropyl Benzene (Cumene)	30	75	125
m,p-Xylenes	30	75	130
Methylene Chloride	30	55	140
Methyl Tert-Butyl Ether (MTBE)	30	65	125
Naphthalene	30	55	140
n-Butylbenzene	30	70	135
n-Propylbenzene	30	70	130
o-Xylene	30	80	120
p-Isopropyltoluene	30	75	130
sec-Butylbenzene	30	70	125
Styrene	30	65	135
Tert-butanol	30	TBD	TBD
Tertiary Amyl Methyl Ether (TAME)	30	TBD	TBD
Tetrachloroethene (PCE)	30	45	150
Toluene	30	75	120

Table Continues

TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
Trichloroethene (TCE)	30	70	125
Trichlorofluoromethane	30	60	145
Vinyl Acetate	30	TBD	TBD
Vinyl Chloride	30	50	145
Surrogates			
1,2-dichloroethane -d 4	--	70	120
4-bromofluorobenzene	--	75	120
dibromofluoromethane	--	85	115
toluene-d8	--	85	120

Notes:

CL-LL	LCS and MS control limit, lower limit
CL-UL	LCS and MS control limit, upper limit
RPD	relative percent difference as calculated by the pair of analytical duplicates
% Recovery	percent recovery of spiked compounds

TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
<i>Semi-Volatile Organic Compounds by EPA Method 8270C</i>		<i>Soil</i>	
Acenaphthene	50	45	110
Acenaphthylene	50	45	105
Anthracene	50	55	105
Benzo(a)anthracene	50	50	110
Benzo(a)pyrene	50	50	110
Benzo(b)fluoranthene	50	45	115
Benzo(k)fluoranthene	50	45	125
Benzo(g,h,i)perylene	50	40	125
Chrysene	50	55	110
Dibenz(a,h)anthracene	50	40	125
Fluoranthene	50	55	115
Fluorene	50	50	110
Indeno(1,2,3-cd)pyrene	50	40	120
Napthalene	50	40	105
Phenanthrene	50	50	110
Pyrene	50	45	125
<u>Surrogates</u>			
2-Fluorobiphenyl	--	45	105
Terphenyl-d14	--	30	125
2,4,6-Tribromophenol	--	35	125
2-Fluorophenol	--	35	105
Phenol-d5/d6	--	40	100
Nitrobenzene-d5	--	35	100
<i>Semi-Volatile Organic Compounds by EPA Method 8270C</i>		<i>Water</i>	
Acenaphthene	30	45	110
Acenaphthylene	30	50	105
Anthracene	30	55	110
Benzo(a)anthracene	30	55	110
Benzo(a)pyrene	30	55	110
Benzo(b)fluoranthene	30	45	120
Benzo(k)fluoranthene	30	45	125
Benzo(g,h,i)perylene	30	40	125
Chrysene	30	55	110

Table Continues

TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
Dibenz(a,h)anthracene	30	40	125
Fluoranthene	30	55	115
Fluorene	30	50	110
Indeno(1,2,3-cd)pyrene	30	45	125
Napthalene	30	40	100
Phenanthrene	30	50	115
Pyrene	30	50	130
Surrogates			
2-Fluorobiphenyl	--	50	110
Terphenyl-d14	--	50	135
2,4,6-Tribromophenol	--	40	125
2-Fluorophenol	--	20	110
Phenol-d5/d6	--	10	115
Nitrobenzene-d5	--	40	110

Notes:

CL-LL LCS and MS control limit, lower limit
CL-UL LCS and MS control limit, upper limit
RPD relative percent difference as calculated by the pair of analytical duplicates
% Recovery percent recovery of spiked compounds

TABLE 2
Precision and Accuracy Requirements for U.S. EPA Methods
8260B, 8270C SIM and 8015M

Analyte	Precision (RPD)	Accuracy (% Recovery)	
		CL-LL	CL-UL
Total Petroleum Hydrocarbons by EPA Method 8015M	Soil		
Gasoline	50	60	130
Diesel	50	60	150
Surrogates			
Bromobenzene	--	50	130
Hexacosane	--	60	140
1,1,1-Trifluorotoluene	--	60	140
4-Bromofluorobenzene	--	60	140
Total Petroleum Hydrocarbons by EPA Method 8015M	Water		
Gasoline	30	60	130
Diesel	30	60	140
Surrogates			
Bromobenzene	--	50	130
Hexacosane	--	60	140
1,1,1-Trifluorotoluene	--	60	140
4-Bromofluorobenzene	--	60	140

Notes:

CL-LL	LCS and MS control limit, lower limit
CL-UL	LCS and MS control limit, upper limit
RPD	relative percent difference as calculated by the pair of analytical duplicates
% Recovery	percent recovery of spiked compounds

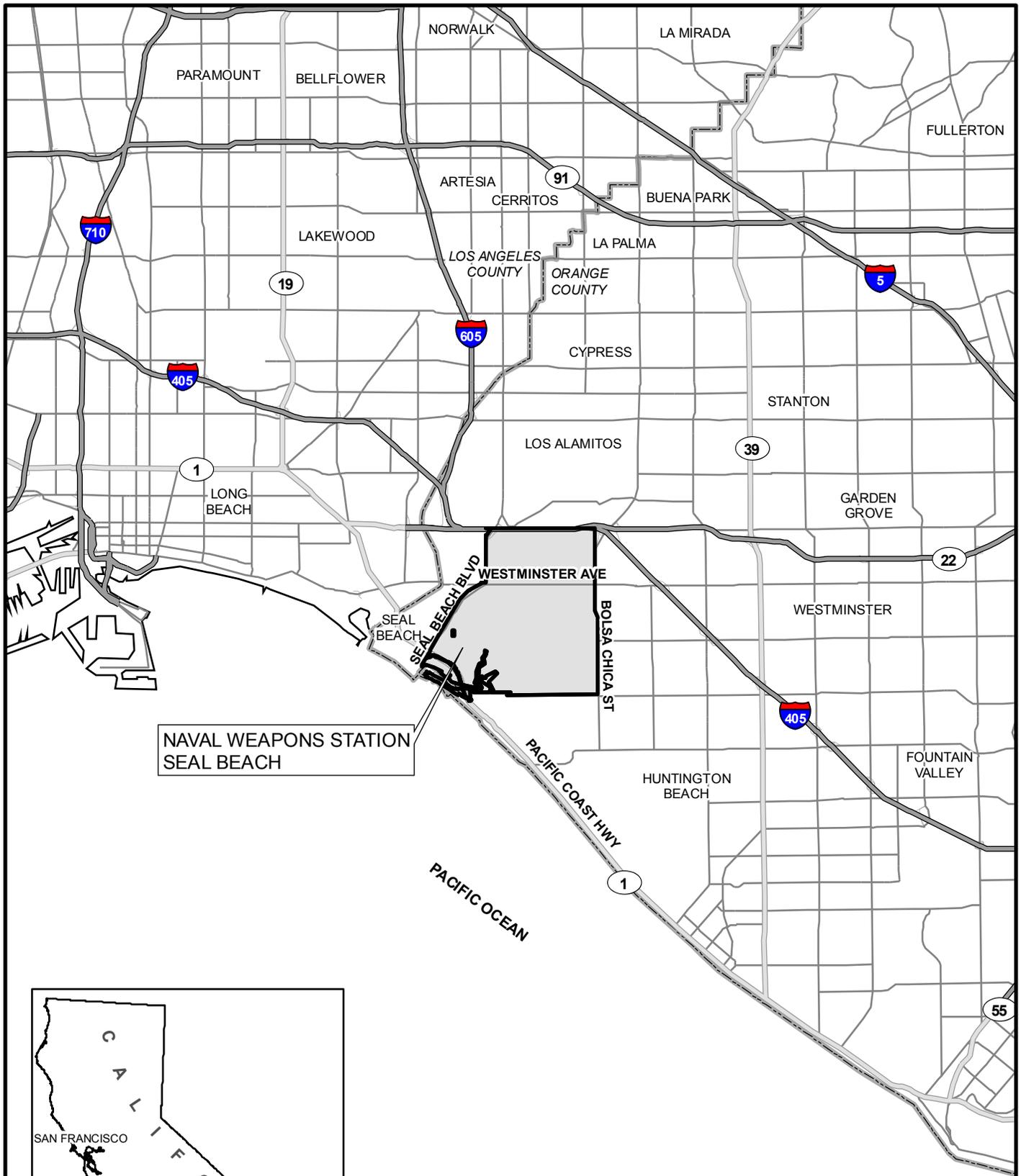
TABLE 3
References

Author	Source
Geological Survey, 1956	Water Supply Paper 1109, Ground-water Geology of the Coastal Zone Long Beach-Santa Ana Area, California.
State of California Department of Water Resources (DWR), 1968.	Bulletin No. 63-2 Sea-Water Intrusion: Bolsa-Sunset Area Orange County. Jan.
The Weather Channel (TWC), 2012.	Monthly Weather Averages for Anaheim, CA, accessed May 2012: http://www.weather.com/weather/wxclimatology/monthly/USCA0027
USGS, 2009.	Ground-Water Quality Data in the Coastal Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program. March.

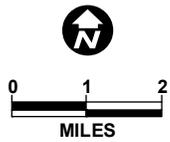
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Appendix A Figures

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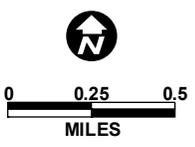


NAVAL WEAPONS STATION
SEAL BEACH



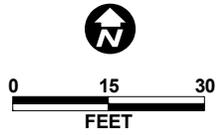
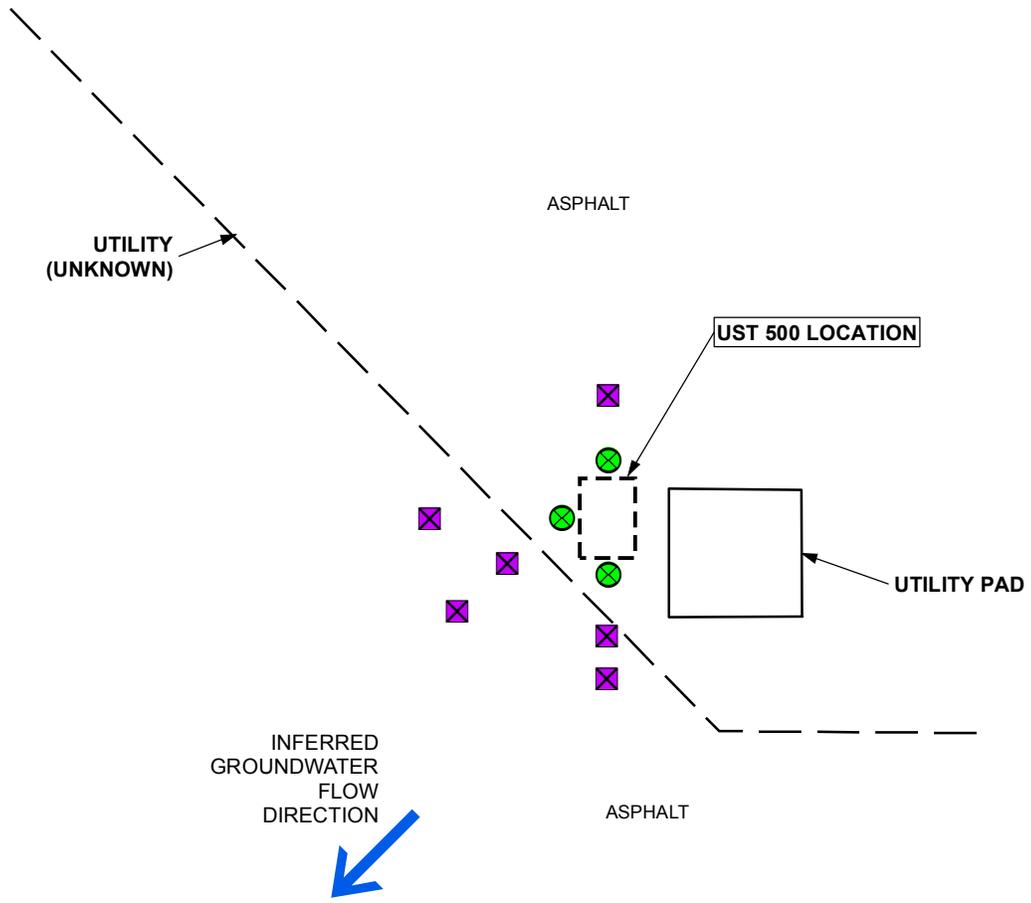
FACILITY LOCATION MAP	
NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA	
BRADY	DATE: July 31, 2012 FILE: LocMap _120731
FIGURE 1	

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<p>UST 500 SITE LOCATION MAP</p>	
<p>NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA</p>	
<p>BRADY</p>	<p>DATE: Jan 4, 2013 FILE: SiteLocMap_120710</p>
<p>FIGURE 2</p>	

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LEGEND

- PROPOSED INITIAL LIF LOCATION
- PROPOSED STEP-OUT LIF LOCATION

NOTES

LIF = LASER INDUCED FLUORESCENCE

UST 500 SITE PLAN AND PROPOSED LIF LOCATIONS	
NAVAL WEAPONS STATION SEAL BEACH SEAL BEACH, CALIFORNIA	
BRADY	DATE: Jan 8, 2013 FILE: PropLoc_130108
FIGURE: 3	

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Appendix A Attachment 1

Form Examples

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FIELD CHANGE FORM

Site Name/Project Title: _____

Project Manager: _____

Date: _____

Client: _____

SAP Approved by: _____

SAP Date: _____

Field Change:

Reason for Field Change:

Overall Project Impact: Insignificant

Significant (list below corrective action)

Corrective Action:

Requested by: _____

Date: _____

Approved by (PM) : _____

Date: _____

Approved by (QC Manager): _____

Date: _____



Field Documentation Review

Project: _____ Date of Fieldwork _____

Date of Review: _____ Reviewer(s) _____

Field Logbook Filename(s) _____

Y N

- Was a Field Logbook used for this project?
- Are all entries to the Field Logbook complete?
- Are all entries legible and is the information consistent with other field documents?
- Were there entries or corrections made in the logbook that needed clarification?

Comments:

Health and Safety Filename(s) _____

Y N

- Was a Health and Safety meeting conducted?
- Are all entries to the Health and Safety meeting form complete?
- Are all entries legible and is the information consistent with other field documents?
- Were there entries or corrections made in the Health and Safety meeting form that needed clarification?

Comments:

Chain-of-Custody Filename(s) _____

Y N

- Is all the project and contact information correct and complete?
- Are all Sample IDs and the additional sampling information correct?
- Does the Sample ID structure conform to the description in the planning document?
- Were the correct number and type of sample containers used?
- Do the requested analyses match the descriptions in the planning document?
- Was the correct TAT requested?
- Were the "comment" and "instruction" sections clear and complete?

Comments:

SCAPS Profiles Filename(s) _____

Y N

- Were the push locations named in accordance with the planning document?
- Were the depths at each location consistent with the planning document?
- Were the three profiles collecting data down to the appropriate depth?

Comments:



Checklist Instructions

1. Field Logbook / Health and Safety meeting form

- Read all daily entries in the logbook and/or Health and Safety form to verify the **completeness** of ideas and events. If any ideas or information looks incomplete, contact the appropriate person to make the corrections.

- Make sure all entries are **legible** and information such as Station ID, Sample ID, collection time and date are **consistent** with other field documents. If any inconsistencies are found, try to resolve which entries are correct with the appropriate person and make all necessary corrections.

* Initial and date all corrections, and always notify the QA Manager and Project Manger when corrections are needed.

2. COC

- Verify that all project and contact information (client name, project name, project coordinator, address, phone number, etc.) is correct.

- Cross-check all **Sample IDs** and **sampling information** (location, date & time) against the field logbook and/or field notebook. Verify that the **Sample IDs** conform to the description in the appropriate planning document (SAP, WP, etc).

- Verify the **sample container information** and the **requested analyses** against the appropriate planning document.

- Verify the **turnaround time (TAT)** for lab results against the laboratory Statement of Work (SOW). Look for instructions regarding both preliminary and final results.

- Check the “comments” and “instructions” sections of the COC. Determine if any clarification is needed. MS/MSD should be listed in the comments, if applicable.

* Report any changes or corrections immediately to the QA Manager or Project Manager so the correct information can be relayed to the lab in a timely matter.

3. SCAPS Profiles

- Verify that the naming convention used for the push locations (ex. RBSD-01) and the depth of each push correlate with what is written in the planning document.

- Verify that the three SCAPS profiles (Soil Class, Wavelength @ Peak, & Peak Intensity) collected data down to the appropriate depth.

SCAPS Soil Sample Description Form

<u>SAMPLE ID:</u>	SAMPLED BY:	DATE:	TIME:	SAMPLE LOCATION RELATIVE TO CPT LOCATION
SAMPLE PUSH INTERVAL (AS PUSHED): SAMPLE INTERVAL (CONVENTIONAL DRILLING): RECOVERY (TUBES OR FOOTAGE): 0 ½ 1 1½ 2 2½ 3 3+				
TUBE COLLECTED FOR SAMPLE: <i>TOP MIDDLE BOTTOM</i> END OF TUBE MARKED FOR ANALYSIS: <i>TOP BOTTOM NA</i> NOTES REGARDING SAMPLE DEPTH:				
<u>SOIL DESCRIPTION: COLOR (MUNSELL)</u>				
GRAIN SIZE / SOIL DESCRIPTION:				
USCS CLASSIFICATION:				
DENSITY DESCRIPTION:				
MOISTURE DESCRIPTION:				
STAIN AND ODOR DESCRIPTION:				
NOTES REGARDING SOIL DESCRIPTION:				

<u>SAMPLE ID:</u>	SAMPLED BY:	DATE:	TIME:	SAMPLE LOCATION RELATIVE TO CPT LOCATION
SAMPLE PUSH INTERVAL (AS PUSHED): SAMPLE INTERVAL (CONVENTIONAL DRILLING): RECOVERY (TUBES OR FOOTAGE): 0 ½ 1 1½ 2 2½ 3 3+				
TUBE COLLECTED FOR SAMPLE: <i>TOP MIDDLE BOTTOM</i> END OF TUBE MARKED FOR ANALYSIS: <i>TOP BOTTOM NA</i> NOTES REGARDING SAMPLE DEPTH:				
<u>SOIL DESCRIPTION: COLOR (MUNSELL)</u>				
GRAIN SIZE / SOIL DESCRIPTION:				
USCS CLASSIFICATION:				
DENSITY DESCRIPTION:				
MOISTURE DESCRIPTION:				
STAIN AND ODOR DESCRIPTION:				
NOTES REGARDING SOIL DESCRIPTION:				

Appendix A Attachment 2

Standard Operating Procedures

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STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION

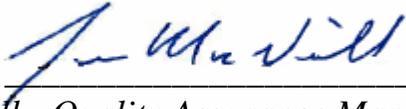
SOP NUMBER: T-001

REVISION NUMBER: 04

REVISION DATE: April 3, 2012

REVIEW DATE: April 3, 2012

Prepared by:  September 23, 2011
Jason Williams Date

Approved by:  September 23, 2011
Jesse MacNeill - Quality Assurance Manager Date

Approved by:  September 23, 2011
Tim Shields - Program Manager Date

BRADY

3710 Ruffin Road
San Diego, CA 92123

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STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION PROCEDURES

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes procedures for field decontamination of drilling and sampling equipment. This SOP provides a description of methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination. This SOP also provides general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations. Implementation of this procedure will help protect site and community personnel by preventing removal of non-decontaminated equipment from a controlled area.

2.0 BACKGROUND

Samples of media such as soil and groundwater, collected during field investigations, are used to evaluate the presence and extent of potential contaminants. All equipment that comes in contact with the sampled material should be free of components that could influence (contaminate) the true physical or chemical composition of the material. Decontamination of the sampling equipment is required to minimize the risk of exposure to hazardous substances, prevent cross-contamination, and ensure the collection of representative samples. Disposable equipment or the use of dedicated equipment provides the most effective means of avoiding cross-contamination; however, the use of such equipment is not always practical. When non-dedicated equipment is used, physical and chemical steps shall be implemented to decontaminate or remove any chemical or material contamination from the sampling equipment.

Equipment shall be decontaminated to a level that meets the minimum requirements of the data collection effort. Decontamination steps (e.g., use of solvents versus use of only soap and water), should be selected based on the constituents present, their concentration levels in the waste or materials sampled, and their potential to introduce bias in the sample analysis results if not removed from the sampling equipment. Project-specific decontamination procedures shall be described in a work plan.

3.0 APPLICABILITY

This procedure is applicable for field decontamination of drilling, excavating, and/or sampling equipment that comes into contact with potentially contaminated soil, water, or other potentially hazardous materials. This procedure is applicable to drill rigs, backhoes, hand-augers, samplers, and other equipment or containers used in sampling.

This procedure may vary or change depending on site conditions, equipment limitations, or limitations imposed by the procedure. Use procedures specified in a site-specific work plan or

Health and Safety Plan, where in conflict with or superior to this procedure. In all instances, document actual procedures used in the field log book.

4.0 DEFINITIONS

Decontamination – the removal of contamination from persons or objects.

Container – a portable device, in which a material is stored, transported, treated, disposed of, or otherwise handled.

Cross-Contamination – the inadvertent introduction of contaminated materials from one location to another.

HSP – Health & Safety Plan developed specific for a site or field activity that has been approved by the Site Safety and Health Representative. The HSP provides information specific to the project including relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g. personal protective equipment) and hazard mitigation.

IDW – Investigation Derived Waste.

Field Logbook – Permanent record of field activities. Must be bound. Off site personnel should be able to reconstruct all activities of the field investigation team using the field logbook.

PPE – Personal Protective Equipment.

Residual Contamination – Contamination residue that requires a detergent or solvent solution to remove from equipment, as in a wet decontamination area.

Gross Contamination – Contaminated matter that can be removed from equipment mechanically, as in the dry decontamination area.

Dry Decontamination Area – An optional division of the Decontamination Zone where gross decontamination is removed by physical means without water or solvents.

Wet Decontamination Area – Part of the Decontamination Zone where aqueous detergent and/or solvent solutions are used to remove contamination from equipment.

ACS - American Chemical Society, sets standards for the highest quality of chemical purity; publisher of Reagent Chemicals, 9th Edition, a guide to testing chemical purity.

5.0 REFERENCES

NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities [PB85-115/October 1985]

EPA, Office of Emergency and Remedial Response, Standard Operating Safety Guides, [PB9285.1-03/June 1992]

29 Code of Federal Regulations, 1910.132; Personal Protective Equipment Standard

Navy/Marine Corps Installation Restoration Manual, Naval Facilities Engineering Services Command (NFESC), February 1997

U.S. EPA, "RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment", EPA530-D-02-002, August 2002.

U.S. EPA, "Sampling Equipment Decontamination," SOP Number 2006, August 11, 1994.

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, Update IV, 2008.

California Department of Toxic Substances Control, Hazardous Materials Laboratory, User's Manual, Revision 9, (October 1995).

6.0 APPARATUS AND MATERIALS

See attached equipment and material checklist for equipment and supplies for typical decontamination activities. Some equipment may not be applicable for some projects. Consider equipment based on availability, ease of decontaminating or disposing equipment, and type of contaminants encountered.

7.0 PROCEDURE

Use this procedure to remove or neutralize contaminants from equipment to minimize the likelihood of sample cross contamination, reduce or eliminate transfer of contaminants to clean areas, and prevent the mixing of incompatible substances.

7.1 Responsible Personnel

The following personnel are responsible for activities identified in this procedure.

Project Manager (PM) - is responsible for ensuring that field personnel have been trained in the use of this procedure. The PM is responsible for ensuring that field personnel have the proper equipment and decontamination line established prior to starting any invasive field activities. The PM is also responsible for making arrangements to dispose of all decontamination generated wastes (i.e., liquids and solids) and keeping documentation demonstrating proper disposal of such wastes.

Physical Science Technician (PST) – is responsible for conducting decontamination procedures. The PST is responsible for monitoring and aiding in the decontamination of personnel, PPE, and equipment. The PST must be appropriately protected to accomplish this task without exposure to the contamination. The PST is also responsible for communicating to the PM any problems encountered during the field activities.

7.2 Establish Decontamination Areas

Prior to starting field work, define geographic boundaries where contaminated equipment is restricted and where decontamination activities are performed:

- **Exclusion Zone:** The area where active and invasive activities (i.e. drilling, excavation, sampling, etc) will be undertaken. The zone of maximum hazard for exposure to contaminants.
- **Contamination Reduction Zone:** The decontamination station(s) are located here.
- **Support Zone:** The area that sits outside the Exclusion Zone and the Contamination Reduction Zone, which has minimal hazards from physical activities and chemical contaminants.

7.2.1 Dry Decontamination Area

Remove loose, contaminated soil adhering to the equipment in a dry decontamination area. Remove gross contamination physically without the use of water to reduce the amount of liquid waste. Separate “dry” and “wet” decontamination areas may not be applicable for all project sites. All excess water and loose soil on the drill rigs, augers, pipes, and other equipment should be removed to the maximum extent possible in the exclusion zone, prior to moving into the contamination reduction zone for more thorough cleaning. Using brushes, knock loose soil off flight augers or other sampling equipment onto plastic sheeting, into soil containment vessels, and/or back into the open boring.

7.2.2 Wet Decontamination Area

Remove residual contaminants in a wet decontamination area that were not removed during dry decontamination. For projects utilizing drilling or excavating equipment, use a liquid containment vessel in the wet decontamination area. Use a high-pressure steam cleaner, a pump to transfer liquid wastes, and drums or other containers with liners for storing liquid wastes, as needed. Use secondary containment with drums or containers containing liquid waste.

7.3 Generic Decontamination Procedures

Use these general guidelines for decontamination:

1. Decontaminate reusable equipment before use, between samples, and upon completion of field activities. Do not use/reuse a piece of equipment if it appears discolored or otherwise obviously contaminated.
2. Decontaminate the decontamination workers themselves before they enter a clean or Support Zone.
3. Use only labeled, dispensing devices to disperse water, alcohol, acid, and solvent rinses.
4. Do not clean rubber or plastic surfaces with hexane, methanol, or isopropyl alcohol.
5. Manage contamination wash and rinse solutions and contaminated articles as either hazardous waste or investigation-derived wastes.

Decontaminate equipment using these three general steps:

1. Remove gross contaminants.

2. Remove residual contaminants.
3. Prevent contamination.

7.3.1 Remove Gross Contamination

Remove gross contamination by:

- physical removal (dry decontamination) or
- steam or high-pressure hot water cleaning and/or vigorous brushing with a non-phosphate detergent or
- soaking and brushing.

Consider the type of equipment being decontaminated (e.g., drilling tools or electronic equipment) and the contaminating medium.

7.3.2 Remove Residual Contamination

Use this generic procedure for removing residual contamination as recommended by U.S. EPA, Region IX.

Set up a decontamination line in sequential order, over a plastic drop cloth.

1. Wash equipment with a low or non-phosphate detergent.
2. Rinse with potable water.
3. Rinse with de-ionized or distilled water.

7.3.3 Prevent Recontamination after Decontamination

After decontamination, protect equipment from further contamination. Protection measures include wrapping with oil-free aluminum foil or plastic, and storing in Ziploc bags.

7.3.4 Disposal of Contaminants

Manage gross contamination and all washing and rinsing solutions as investigative derived waste (IDW). After use, manage gloves and other contaminated personal protective equipment as IDW.

8.0 SPECIFIC DECONTAMINATION PROCEDURES

8.1 Decontamination of Field Instruments

Field instruments such as organic vapor monitors and gas analyzers are typically not constructed to allow immersion or aggressive scrubbing. Care should be taken to minimize the exposure to solid or liquid contaminants. In environments with high potential for contamination, instruments may be operated in plastic bags, allowing only detector assemblies to be exposed. Manufacturer instructions should be consulted. Probes of pH, temperature, and specific conductance meters should be thoroughly washed with deionized or distilled water then rinsed with deionized water.

8.2 Drilling/Excavation Equipment Decontamination

This section applies to drilling equipment and other hardware that goes down a borehole, including drill pipe, augers, drill bits. Decontaminate vehicles and downhole drilling equipment prior to moving to a site, between each drilling location, and prior to leaving the site. Decontamination of drilling equipment shall be performed by the drilling subcontractor.

Drill rig vehicle decontamination should be conducted on decontamination pads or in designated decontamination areas located close enough to the work site that contamination is not spread during the movement of the vehicle. Decontamination of drilling/excavating equipment shall be conducted in general accordance with the following steps:

1. Remove coarse soil adhered to equipment with a steel brush or equivalent instrument in dry decontamination area and/or in exclusion zone.
2. Move equipment to rack in the wet decontamination area (contaminant reduction zone).
3. Wash with a high pressure steam cleaner.
4. Air dry.
5. Protect decontaminated drilling and excavating equipment not in active use, such as hollow-stem auger sections, drill rods, down-hole hammers and bits, from dirt and dust until needed.
6. Remove soil from dry decontamination area and place in designated containers or disposal area.
7. Remove liquid from decontamination vessel and place in designated containers.
8. Dispose rags, plastic, PPE, etc., in designated container.
9. Secure decontamination area daily.

8.3 Decontamination of Soil and Sediment Sampling Equipment

Soil and sediment sampling equipment includes sample barrels, sleeves (i.e. tube, liners), retainers, hand augers, trowels, spoons, corers, grab samplers, dredges, and any other objects that might come into contact with a soil or sediment sample in the course of its collection and handling. Decontaminate before each use, and before departing the field. Decontaminate sample collection and sample preparation equipment used for soil sampling as follows:

1. Place equipment on a sawhorse or rack for inspection and decontamination in dry decontamination area and/or contaminant reduction zone.
2. Remove coarse soil adhered to equipment with a steel brush. Remove more cohesive material from equipment with a flat scraper such as a wooden spatula. A water spray bottle may be used to lightly moisten dry soil being removed from the equipment, if needed to control dust. Only the minimum amount of water spray should be used to keep the waste moisture content low.

3. Move equipment to wet decontamination area (if a separate dry decontamination area is used).
4. Scrub equipment in a containment vessel with a low or non-phosphate detergent.
5. Rinse in a containment vessel with potable tap water.
6. Rinse in a containment vessel with distilled or deionized water.
7. Air dry.
8. Protect decontaminated equipment from recontamination by dust, spray, and airborne contaminants by aluminum foil and/or plastic wrap and segregate from contaminated equipment until needed.
9. Sample preparation equipment used to collect sub-samples that will constitute a single composite sample does not need to be decontaminated between each sub-sample collection.
10. If the rinsate in the liquid containment vessel includes methanol, it should be kept separate from methanol-free waste to minimize cross-contamination and mixed waste. Do not overfill drums to allow for expansion. Methanol-soaked rags or towelettes should be bagged and placed into a separate lined drum.
11. Remove soil from dry decontamination area and place in designated containers or disposal area.
12. Remove liquid from decontamination vessel and place in designated containers.
13. Dispose rags, plastic, PPE, etc., in designated container.
14. Secure decontamination area daily.

8.4 Decontamination of Groundwater Sampling Equipment

Groundwater sampling equipment includes bailers, well sounder tapes, water level indicators, interface probes, pumps, hoses and wires introduced into the well, bailers, filters, and any other objects that might come into contact with groundwater that might be sampled. Gross contamination is typically not a problem unless viscous non-aqueous-phase liquids (NAPL) have accumulated.

Avoid introducing gross contaminants to wells. Tapes, hoses, and wires should not be permitted to lie on the ground or on contaminated surfaces. If such items become contaminated by ground contact, decontaminate prior to use. Equipment may be protected by hose reels, plastic sheeting, or plastic tubs.

Rinse or wipe equipment prior to inserting into wells, and when removed from wells. Manufactures instructions shall be consulted for decontamination of pumps and interface probes. NOTE: Certain materials may be susceptible to damage from organic solvents and/or acidic solutions.

Decontaminate water-sampling equipment by:

1. To decontaminate well casings/screens, prior to installation:

- scrub with a laboratory grade detergent/water solution and
- rinse with tap water or potable water.

NOTE: In the case that the well casings/screens are obtained in a previously sealed plastic wrapping from the manufacturer, there is no need to decontaminate.

2. To decontaminate water level measurement devices:

- scrub with a laboratory grade detergent/water solution and
- rinse with tap water or potable water.
- Avoid organic solvents which can remove the numbers from the tape.

3. To decontaminate well purging apparatus; bailers, pumps, and hand-held tools:

- scrub with a laboratory-grade detergent/water solution,
- rinse with tap or potable water, then
- rinse with deionized-grade water, and
- allow to air dry between uses.

4. Wrap hand-held equipment in aluminum foil or plastic to prevent contamination by airborne contaminants during transportation to the sampling site.

9.0 PERSONNEL PROTECTIVE EQUIPMENT

9.1 Personal Protective Equipment Requirements

Personnel in potential contact with known or suspected hazardous substances contamination must wear protective equipment. The types and levels of PPE and the procedures for decontaminating personnel upon leaving a contaminated zone are beyond the scope of this SOP. The purpose of PPE is to protect field personnel. PPE may be effective in protecting personnel from chemical hazards, but could compromise the usefulness of media samples if inadequately decontaminated between samples.

- Avoid contact with media samples.
- Use disposable gloves. Replace with fresh gloves for each sample.
- Decontaminate PPE using the same procedures for sampling equipment.

10.0 DOCUMENTATION

Record decontamination activities in the field logbook daily. Describe any deviations in procedures or conditions and/or problems that occur. The PST shall be responsible for submitting completed, legible copies of the field logbook to the Project Manager for review. The Project Manager shall be responsible for maintaining the logbook.

11.0 ATTACHMENTS

1. Equipment Supply Check List

STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION

ATTACHMENT 1

EQUIPMENT SUPPLY CHECKLIST

EQUIPMENT AND SUPPLY CHECKLIST

- Work Plan
- Sampling and Analysis Plan
- Low or non-phosphate laboratory detergent such as Alconox™ or Liquinox™ or equivalent. Liquinox is the preferred detergent.
- Sodium Hypochlorite, (bleach, i.e., Clorox).
- Disinfectant, (EPA registered biocide).
- Selected Rinses and Solvent Rinses (U.S. EPA, 1994)

Solvent	Examples of Solvent Rinse	Soluble Contaminant
Water	Deionized Water - Recommended maximum conductivity 1 μ S/cm. Tap Water - From an approved source with known chemistry	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	1:1 Hydrochloric Acid - ACS trace element grade (5 percent by volume) 1:1 Nitric Acid - ACS trace element grade (10 percent by volume)	Nutrients Metals, Basic (caustic compounds (e.g., amines and hydrazines)
Organic Solvents	Hexane –pesticide grade	Organics (heavily contaminated), PCBs
Organic Solvents	Acetone - Pesticide-grade Isopropanol – Pesticide grade Methanol	Organics

Decontamination Tools and Supplies

- High-pressure portable steam cleaner.
- Liquid containment vessel and support rack.
- Solids containment vessel and support rack.
- Shovel.
- Electrical generator (if power source is not available) and fuel.
- Power cord (to connect steam cleaner to generator).
- Sturdy equipment table for tool assembly and disassembly.
- Stool or chair.
- Portable liquids pump and 10-foot (minimum) discharge hose.
- Bottlebrush.
- Long handled steel and soft bristled scrub brushes.
- Heavy plastic sheeting/drop cloths.
- Plastic or galvanized containers, buckets or tubs to hold wash and rinse solutions.
- Non-reactive solvent sprayers.
- Paper or clothe towels.

- Aluminum foil.
- Plastic wrap.
- Bound field logbook and ink pens.
- Labels and marking pens.
- Saw horses or racks for drill stem and other drilling hardware.

Waste Disposal

- Plastic trash bags.
- 55-gallon drums.
- Trash containers.
- Trash liners.
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions.
- Wooden pallets (for drums).
- Secondary containment for drums containing liquid.

Health and Safety Equipment

- Chemical-resistant safety glasses, goggles, or splash shield.
- Chemical-resistant disposable clothing (i.e., Tyvek, coated-Tyvek, Saranex, etc.).
- Chemical-resistant gloves (i.e., natural rubber, nitrile, latex, etc.).
- Duct tape.
- Air Purifying Respirators, equipped with organic vapor cartridges.
- Any additional PPE, as required.
- Portable emergency eyewash station (if one is not available within 50 feet).
- First Aid Kit.

STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE FOR VOLATILE ORGANICS USING THE EnCore® SAMPLER

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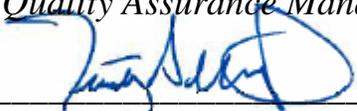
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STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE FOR VOLATILE ORGANICS USING THE En Core® SAMPLER

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes a procedure for collecting soil samples for volatile organic compounds (VOCs) using the En Core® Sampler. The outlined procedure is based on the EPA Method 5035 methodology presented in Update III of SW-846 promulgated in June 1997 and may be used in conjunction with analytical determinations of volatile organics including EPA Method 8015 Modified (gasoline fraction only), 8021A, and 8260B.

EPA Method 5035 addresses four on-site handling options from which to select. This SOP focuses on the collection of soil samples for VOC analyses using a headspace-free, gas-tight sampler known as the En Core® Sampler. This SOP is not intended to replace thorough training and reading of reference materials

2.0 BACKGROUND

Collection and storage of soils for VOC analyses using previous EPA methodology (EPA Method 5030) has shown to be inadequate. The primary reasons are the loss of volatiles in the sampling and sub-sampling stages, and microbial degradation of aromatic volatiles. The methodology presented in EPA Method 5035 was designed to minimize VOC losses through volatilization and biodegradation. To address these problems and minimize the loss of VOCs during sample handling stages, EPA Method 5035 includes provisions such as field-preservation or the use of an En Core® Sampler designed to store and transfer soils (no field preservation required) with minimal loss of VOCs.

The En Core® Sampler can be used as applicable (cohesive granular soils) to collect and store samples without preservation for a maximum of 48 hours. A minimum of three En Core® Samplers per location is required to determine whether the concentration is high- or low-level, and to cover the potential for low-level and high-level contamination. Moisture content (so VOC results can be reported on a dry-weight basis) can be determined from unpreserved samples and may be collected from the conventional sample sleeve. The En Core® Sampler is a single use device.

3.0 APPLICABILITY

The procedures presented in this SOP are applicable to field investigation activities involving soil sample collection for VOC analyses. If needed, other methods of field preservation are covered under EPA method 5035. The other methods are not covered in this SOP.

Prior to determining the most appropriate VOC sample collection and preservation method, it is important to gather information regarding the type of soil to be sampled. If this information is not available, the project Sampling and Analysis Plan (SAP) should address all potential available methods of sample collection and preservation to minimize the loss of VOCs during sampling activities. In this case, field personnel should be prepared to perform any of the potential methods.

- **Cohesive Granular Soils**– The En Core® Sampler should be used on sites where cohesive soils are anticipated or known to occur. This sample collection and preservation method is preferable since it eliminates weighting and the addition of preservation in the field. In this case, samples must be stored at 4°C and prepared for analysis within 48 hours of sample collection.
- **Non-cohesive Granular Soils**– If gravel or a mixture of gravel and fines cannot be transferred using the En Core® Sampler, the soil may be quickly sampled using a stainless steel spatula or scoop and placed in a sealed VOC vial and analyzed as soon as possible. In this case, it is recommended to use a mobile laboratory to analyze samples as soon as they are collected. Caution should be taken in the interpretation of these results since loss of VOCs is likely due to the sampling method and the non-cohesive nature of the soil being sampled.
- **Cemented Soil**– If the soil requiring sampling is cemented in a manner that the En Core® Sampler can not be used, subsamples of the soil may be sampled by fragmenting a larger portion of the material using a clean spatula or chisel to generate a fragment that can be placed in a VOC vial. Care should be taken when transferring the aggregate to the sample container to prevent compromising the sealing surfaces and threads of the container. Caution should be taken in the interpretation of these results since loss of VOCs may occur during generation of the aggregate sample.

4.0 DEFINITIONS

Accuracy – The degree of agreement between an observed value and a true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Action Levels – The numerical value specified that causes the decision maker to choose one of the alternative actions (e.g., compliance or noncompliance). It may be a regulatory threshold standard, such as a Maximum Contamination Level, a risk-based concentration level, a technological limitation, or a reference-based standard. The action level is specified during the planning phase of a data collection activity.

Analyte - A chemical component of a sample to be determined or measured.

Bias – The systematic or persistent distortion of a measurement process which causes errors in one direction (i.e., the expected sample measurement is different than the sample's true value).

Cohesive Soil – Soil that possess some resistance to deformation because of the surface tension present in the water films. For example, wet clays can be molded into various shapes without breaking and will retain these shapes. Gravels or a mixture of gravel and fines that can not be easily obtained or transferred using coring tools are not cohesive and are called non-cohesive.

Contaminant of Potential Concern - Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil.

Data Quality Objectives – Qualitative and quantitative statements derived from the DQO process that clarify study objectives, define the appropriate type of data to collect, determine the most appropriate conditions from which to collect data, and specify the tolerable probabilities of making a decision error. These statements are used as the basis for establishing the type, quality, and quantity of data needed to support decisions.

Matrix Spike (MS) - An aliquot sample with known quantities of compounds (target analytes) that is mixed with a field sample and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The sample provides information on the target analyte stability and loss due to matrix interference and volatility after collection and during transport, storage, sample preparation and analysis.

Matrix Spike Duplicate (MSD) - A second aliquot of the same compounds as the matrix spike that is spiked into a duplicate field sample in order to verify the precision and accuracy of the results of the matrix spike.

Sampling – The process of obtaining samples and/or measurements of a subset of population units from the population. Proper sampling techniques must be employed to obtain samples that are representative of actual site conditions.

Target Analyte – The element, compound, or class of compounds detected and quantitated through the analytical measurement process.

Test Method – An adoption of a scientific technique for a specific measurement problem, as documented in a SOP.

Volatile Organic Compounds – Chemicals that have a low boiling point, evaporate easily, and contain hydrogen (H), carbon (C), and possibly other elements.

5.0 REFERENCES

En Novative Technologies Inc., 2009, Disposable En Core Sampler Sampling Procedures Using the En Core T-Handle.

Naval Facilities Engineering Service Center (NFESC), 1999, Navy Installation Restoration Chemical Data Quality Manual, September.

United States Environmental Protection Agency (EPA), 1994, Guidance for The Data Quality Objectives Process, USEPA QA/G-4

U.S. EPA, 1999 Memorandum, Regional Interim Policy for Determination of Volatile Organic Compound (VOC) Concentrations in Soil and Solid Matrices.

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, Update IV, 2008.

6.0 APPARATUS AND MATERIALS

- Stainless steel spatula, scoop or knife.
- En Core® Sampler T-Handle and/or En Core® Sampler Extrusion Tool.
- Disposable En Core® Sampler and En Core® Sampler bag (labeled zipbag).
- Decontamination supplies, including a plastic tarp.
- Ice chest and wet ice (double bagged).
- Paper towel.
- Field Logbook.
- Soil Sample Collection Log forms.
- Chain-of-custody forms; sample labels, and custody seals.

7.0 PROCEDURE

This procedure addresses the specific activities to collect soil samples for VOC analyses (any volatile organic compound). The sampling protocol described below focuses on the use of a coring device (En Core® Sampler) that also serves as a shipping container.

7.1 Review of SAP or Work Plan

In preparation for a sampling effort involving the collection of soil samples for VOC analyses (TPH-gasoline and/or VOCs) at a given site, the Project Manager shall meet with the designated field personnel in charge of collecting the samples to review the site SAP and convey the following information:

- Access requirements (e.g., permission of owner, locked gates, road conditions).
- Identification number(s) of the areas to be sampled.
- Specific sample locations and sample identification strategy.
- Soil type being sampled, if known and any special considerations.
- Selected VOC sampling procedure (En Core® Sampler versus preservation).
- The potential use of a mobile lab (instant on-site analyses) and selection of confirmation samples using an En Core® Sampler to the fixed-based laboratory.

- Anticipated number of environmental samples and QC samples to meet project DQOs.
- Sample volume requirements (5 grams versus 25 grams) and/or En Core® Samplers needed by the contracted laboratory. The 25-gram sampler is typically used when Toxicity Characteristic Leaching Procedure (TCLP) and other leaching tests [i.e., synthetic precipitation leaching procedure (SPLP) and waste extraction test (WET)] are required.
- Required Field Logbook entries and any supporting documentation.
- Type of equipment needed for the scheduled sampling activity.

7.2 Sample Collection

The following procedure is designed to provide detailed information in the collection of soil samples using the En Core® Sampler. For a diagram of the sampling device, refer to the Manufacturer's Instructions (Attachment 1)

1. Label all sample pouches with the sample identification scheme indicated in the SAP.
2. Before taking the samples, hold coring device and push the plunger rod down until small o-ring rests against tabs. Depress the locking lever and place coring body plunger end first, into open end of T-handle, aligning the slots on the coring body with the locking pins in the T-handle. Twist coring body clockwise to lock pins in slots. Make sure sampler is locked in place.
3. Immediately before sampling, remove approximately half inch of soil from the exposed surface soil with a clean spatula, scoop, or knife. When inserting a clean coring tool into a fresh surface for sample collection, air should not be trapped behind the sample. This procedure will ensure that a fresh exposed surface is sampled.
4. Turn the T-Handle with the T up and coring down. Using the T-Handle, push sampler into soil until coring body is completely full. The coring body will be full when the small o-ring is centered in the T-Handle viewing hole. Remove sampler from soil sleeve and quickly wipe the coring body exterior to ensure a tight seal.
5. Cap the coring body while it is still on T-Handle. Push and twist cap over bottom until grooves on locking arms seat over ridge on coring body. Cap must be sealed to seal sampler.
6. Remove the capped sampler by depressing locking lever on the T-Handle while twisting and pulling sampler from T-Handle. Lock plunger by rotating extended plunger rod fully counterclockwise until wings rest firmly against tabs.
7. Insert the sampler into the sealable/labeled pouch and immediately place samples in a cooled (4°C) ice chest.

8. Collect field QC samples in accordance with the SAP requirements. A minimum of 3 En Core® Samplers are needed for each sample. A total of 9 En Core® Samplers are needed if collecting sample for MS/MSD.
9. Samples must be analyzed or frozen within 48 hours. Samples that are frozen shall be analyzed within 7 days to meet holding time requirements. Sampler should not be frozen below -20°C due to potential problems with tool seals and the loss of VOCs upon sample thawing.
10. Record laboratory and field identification numbers in the Soil Sample Collection form. Chain of custody forms will be completed with the laboratory identification number only so QC samples are submitted “blind” to the laboratory. .

8.0 DOCUMENTATION

Document all procedures and equipment used during soil sampling in the Field Logbook or appropriate soil sample collection form. Recorded field data shall include:

- Soil type and any relevant visual observations (i.e., stains).
- Inability to collect a representative sample.
- Sample collection date and times.
- Any observation that may impact data interpretation.

9.0 ATTACHMENTS

1. En Core® Sampler Manufacturer’s Instructions

STANDARD OPERATING PROCEDURE

**SOIL SAMPLING PROCEDURE FOR VOLATILE ORGANICS
USING THE EnCore® SAMPLER**

ATTACHMENT 1

EnCore® SAMPLER MANUFACTURER'S INSTRUCTIONS

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Disposable En Core® Sampler



En Novative Technologies, Inc.

1795 Industrial Drive

Green Bay, WI 54302

Phone: 920-465-3960 • Fax: 920-465-3963

Toll Free: 888-411-0757

www.ennovativetech.com

Sampling Procedures

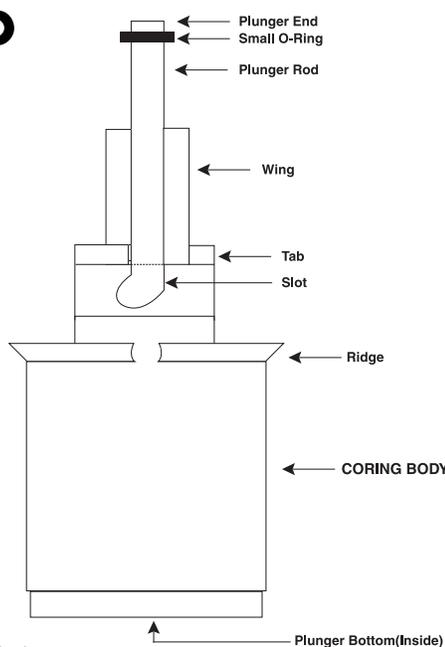
NOTE:

1. En Core® Sampler is a SINGLE USE device. It cannot be cleaned and/or reused.
2. En Core® Sampler is designed to store soil. Do not use En Core Sampler to store solvent or free product!
3. En Core® Sampler must be used with En Core® T-Handle and/or En Core® Extrusion Tool exclusively. (These items are sold separately.)

Using The En Core® T-Handle

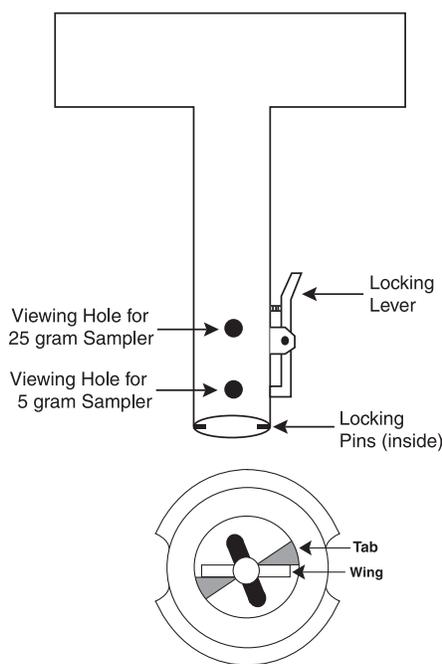
En Core®

Top



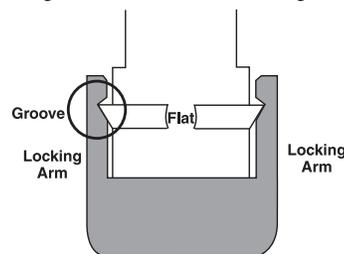
Bottom

En Core® T-Handle



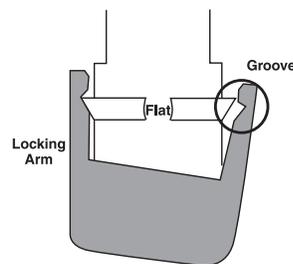
Sampler Correctly Capped

(Locking arm grooves seated over coring body ridge.)



Sampler Incorrectly Capped

(Cap appears crooked; locking arm grooves not fully seated over coring body ridge.)



BEFORE TAKING SAMPLE:

1. Hold **coring body** and push **plunger rod** down until **small o-ring** rests against **tabs**. This will assure that plunger moves freely.

2. Depress **locking lever** on En Core T-Handle. Place coring body, **plunger end first**, into open end of T-Handle, *aligning the (2) slots on the coring body with the (2) locking pins in the T-Handle*. Twist coring body clockwise to lock pins in slots. Check to ensure Sampler is locked in place. Sampler is ready for use.

TAKING SAMPLE:

3. Turn T-Handle with T-up and coring body down. This positions plunger bottom flush with bottom of coring body (ensure that plunger bottom is in position). Using T-Handle, push Sampler into soil until coring body is completely full. When full, small o-ring will be centered in T-Handle **viewing hole**. Remove Sampler from soil. Wipe excess soil from coring body exterior.

4. Cap coring body while it is still on T-handle. *Push* cap over **flat** area of **ridge** *and twist* to lock cap in place. **CAP MUST BE SEATED TO SEAL SAMPLER (see diagram).**

PREPARING SAMPLER FOR SHIPMENT:

5. Remove the capped Sampler by depressing locking lever on T-Handle while twisting and pulling Sampler from T-Handle.

6. Lock plunger by rotating extended plunger rod fully counter-clockwise until **wings** rest firmly against tabs (see plunger diagram).

7. Attach completed tear-off label (from En Core Sampler bag) to cap on coring body.

8. Return full En Core Sampler to zipper bag. Seal bag and put on ice.

Disposable En Core® Sampler

EXTRUSION PROCEDURES

USING THE En Core® EXTRUSION TOOL

CAUTION! Always use the Extrusion Tool to extrude soil from the En Core Sampler. If the Extrusion Tool is not used, the Sampler may fragment, causing injury.

1. To attach En Core Sampler to En Core Extrusion Tool: Depress locking lever on Extrusion Tool and place Sampler, plunger end first, into open end of Extrusion Tool, aligning slots on coring body with pins in Extrusion Tool. Turn coring body clockwise until it locks into place. Release locking lever.

2. Rotate and gently push Extrusion Tool plunger knob clockwise until plunger slides over wings of coring body. (When properly positioned plunger will not rotate further.)

3. Hold Extrusion Tool with capped Sampler pointed upward so soil does not fall out when cap is removed. Remove cap from Sampler by rotating cap until locking arms are aligned with the flat area of ridge and pull cap off. To release soil core push down on plunger knob of En Core Extrusion Tool. Remove and properly dispose of En Core Sampler.

Warranty and Disclaimers

IMPORTANT: FAILURE TO USE THE EN CORE® SAMPLER IN COMPLIANCE WITH THE WRITTEN INSTRUCTIONS PROVIDED HEREIN VOIDS ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

PRINCIPLE OF USE. The En Core Sampler Cartridge System is a volumetric sampling system designed to collect, store and deliver a soil sample. The En Core Sampler comes in two sizes for sample volumes of approximately 25 or 5 grams. There are four components: the cartridge with a movable plunger; a cap with two locking arms; a T-handle (purchased separately); and an extrusion handle (purchased separately). NOTE: The En Core Sampler is designed to store soil. It is not designed to store solvent or free product.

The soil is stored in a sealed headspace-free state. The seals are achieved by three special Viton® * o-rings, two located on the plunger and one on the cap of the Sampler. At no time and under no condition should these o-rings be removed or disturbed.

QUALITY CONTROL. The cartridge is sealed in an airtight package to prevent contamination prior to use. Due to the stringent quality control requirements associated with the use of this system, the disposable cartridge is designed to be used only once.

WARRANTY. En Novative Technologies, Inc. ("En Novative Technologies") warrants that the En Core Sampler shall perform consistent with the research conducted under En Novative Technologies' approval, within thirty (30) days from the date of delivery, provided that the Customer gives En Novative Technologies prompt notice of any defect or failure to perform and satisfactory proof thereof. THIS WARRANTY DOES NOT APPLY TO THE FOLLOWING, AS SOLELY DETERMINED BY EN NOVATIVE TECHNOLOGIES: (a) Damage caused by accident, abuse, mishandling or dropping; (b) Samplers that have been opened, taken apart or mishandled; (c) Samplers not used in accordance with the directions; and (d) Damages exceeding the cost of the sampler. Seller warrants that all En Core Samplers shall be free from defects in title. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY INFORMATION PROVIDED BY SALES REPRESENTATIVES OR IN MARKETING LITERATURE. IMPLIED WARRANTIES OF FITNESS AND MERCHANTABILITY SHALL NOT APPLY. En Novative Technologies' warranty obligations and Customer's remedies, except as to title, are solely and exclusively as stated herein.

LIMITATION OF LIABILITY. IN NO EVENT SHALL EN NOVATIVE TECHNOLOGIES

BE LIABLE FOR ANTICIPATED PROFITS, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF REVENUE, DOWN TIME, REMEDIATION ACTIVITIES, REMOBILIZATION OR RESAMPLING, COST OF CAPITAL, SERVICE INTERRUPTION OR FAILURE OF SUPPLY, LIABILITY OF CUSTOMER TO A THIRD PARTY, OR FOR LABOR, OVERHEAD, TRANSPORTATION, SUBSTITUTE SUPPLY SOURCES OR ANY OTHER EXPENSE, DAMAGE OR LOSS, INCLUDING PERSONAL INJURY OR PROPERTY DAMAGE. En Novative Technologies' liability on any claim of any kind shall be replacement of the En Core Sampler or refund of the purchase price. En Novative Technologies shall not be liable for penalties of any description whatsoever. In the event the En Core Sampler will be utilized by Customer on behalf of a third party, such third party shall not occupy the position of a third-party beneficiary of the obligation or warranty provided by En Novative Technologies, and no such third party shall have the right to enforce same. All claims must be brought within one (1) year of shipment, regardless of their nature.



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The En Core™ Sampler is covered by One or More of the Following U.S. Patents: 5,343,771; 5,505,098; 5,517,868; 5,522,271. Other U.S. and Foreign Patents Pending.

* Viton® is a registered trademark of DuPont Dow Elastomers.

STANDARD OPERATING PROCEDURE

SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED FLUORESCENCE

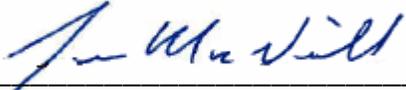
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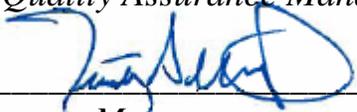
REVISION NUMBER: 04

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Prepared by:  April 5, 2012
Fred Essig *Date*

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Jesse MacNeill - *Quality Assurance Manager* *Date*

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STANDARD OPERATING PROCEDURE

SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED FLUORESCENCE

1.0 PURPOSE

The primary objective of a SCAPS Laser Induced Fluorescence (LIF) push is to obtain high resolution vertical profile of contaminant and soil characteristics data in real time. The purpose of this Standard Operating Procedure (SOP) is to provide direction on proper data acquisition techniques through adherence to a site-specific Sampling and Analysis Plan (SAP) or Work Plan and implementation of quality assurance/quality control (QA/QC) measures.

2.0 BACKGROUND

SCAPS was developed as an alternative to collecting large numbers of soil samples using conventional drilling techniques and testing those samples at an off-site analytical laboratory. Conventional techniques provide assessment data following a delay of hours to days. Contaminated soil cuttings need to be disposed of and several deployments are typically required. SCAPS provides real time, high resolution assessment data using a direct-push probe based on Cone Penetrometer Test (CPT) technology that yields no soil cuttings. Time and expense of field deployments for contamination assessments are typically reduced using SCAPS.

3.0 APPLICABILITY

SCAPS LIF data acquisition techniques are applicable for assessing sites contaminated with petroleum, oils, and lubricants in soils of low to moderate density, and at locations and to depths accessible with a standard CPT rig. LIF and CPT soil classification data can be collected above and below the water table.

4.0 DEFINITIONS

SCAPS – Site Characterization and Analysis Penetrometer System. A system to obtain real time, subsurface assessment data on soil and chemical characteristics using a direct-push soil probe.

Clipping – Fluorescence intensity that exceeds the capability of the detector to quantitate, nominally greater than 250,000 counts.

CPT – Cone Penetrometer Testing relates cone pressure and sleeve resistance with soil types. Performed concurrently with LIF measurement while pushing the probe into the soil. CPT data can be used to objectively describe physical soil properties.

Data Acquisition Specialist – Person who operates the SCAPS laser and data acquisition system.

Field Logbook – A project-specific logbook maintained by the Project Manager. The field logbook is intended to provide sufficient data and observations to reconstruct events that occurred during field activities.

SCAPS Data Acquisition Logbook – A bound logbook dedicated to documenting the operation, maintenance, and quality assurance/quality control of the SCAPS system. The SCAPS Data Acquisition Logbook is system specific, and is separate from the project-specific field logbook

FSS – “Fischer Sea Sand” is a standard used as a system check for background fluorescence. A sample of washed sea sand, obtained from Fischer Scientific, is sieved and placed in a cuvette.

LIF – Laser Induced Fluorescence. The property of certain compounds to fluoresce in the presence of laser light. The character of the fluorescence can be related to petroleum and other compounds. Used as a primary tool in SCAPS assessment.

OMA – Optical multichannel analyzer spectrograph.

Pushroom Operator – The person who operates the direct-push hydraulic rams.

Push – Used as a verb or noun. The act of using the SCAPS rig to push an LIF probe into the soil, or the result of this action.

Qs10 – Quinine sulfate solution at 10 parts per million in a cuvette used as a fluorescence systems check before and after LIF pushes.

SAP – Sampling and Analysis Plan

Slit – A device that blocks incoming light, placed between the return fiber and the detector. Used to protect the detector from ambient light overload.

Window - Sapphire window mounted on a probe. Laser light and return fluorescence pass through the window.

WinOCPT – Software used to calibrate, control, and record LIF data.

5.0 REFERENCES

American Society for Testing Materials (ASTM). 1995, “Standard Test for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils”. Designation D5778-95. Philadelphia, PA.

American Society for Testing and Materials, 1998, “Standard Test Method for Mechanical Cone Penetrometer Tests in Soil”. Designation D3441-98. Philadelphia, PA.

6.0 APPARATUS AND MATERIALS

The Project Manager and SCAPS team shall plan for site assessment using LIF by reviewing the site-specific work plan. Prior to deploying, supplies shall be assembled, equipment shall be calibrated (if applicable), and tested. Procedures for equipment maintenance and calibration are addressed in separate standard operating procedures. Apparatus and materials that may be required include the following:

- SCAPS rig.
- SCAPS Data Acquisition Logbook.
- Calibration and control standards.
- Paper towels.
- Methanol.
- Pen with indelible waterproof ink.
- Calibration standards.
- Approved SAP and/or Work Plan.
- Accident Prevention Plan and required personal protective equipment.
- Tool box equipped with maintenance supplies and equipment (e.g., replacement O-rings, rubber gaskets, expendable tips).

7.0 WARNINGS AND CAUTIONS

Laser light can cause eye and skin damage. The light is ultraviolet and invisible. Keep laser powered off unless the window is covered or below ground surface. Wear laser protective eyewear if working near exposed laser beam.

Keep the slit in to protect the detector from ambient light unless the window is covered or below ground surface. **Ambient light can damage the detector, which is difficult or impossible to replace.**

When the slit that blocks ambient light to the detector is removed, the slit receptacle slot is covered using an abbreviated slit (short slit), shortened to allow light traveling in the fiber optic to reach the detector while blocking the light that could travel down the unoccupied slit receptacle potentially damaging the detector.

Use caution when the truck is in motion. When the ladder is up, the truck may move. Brace yourself and secure loose items when the truck is in motion. Do not leave or enter the truck if the ladder is up.

8.0 PROCEDURE

This procedure addresses the specific activities to be performed to acquire data during LIF pushes using SCAPS.

8.1 Review of SAP or Work Plan

To prepare for LIF pushes, the Project Manager shall meet with the designated Data Acquisition Specialist to review the site SAP or Work Plan and convey the following information:

- Identification number(s) of the pushes.
- Push locations.
- Data requirements, including total depths.
- Anticipated soil condition and depths, and depth(s) of contamination.
- Thickness of pavement cores, if applicable.
- Other SCAPS testing, in addition to LIF, that may be performed.

The Project manager shall record information obtained during LIF pushing in the Field Logbook that is dedicated to the project, as described in the SAP or Work Plan.

The SCAPS Data Acquisition Specialist shall record all SCAPS QA/QC systems checks and systems operation and maintenance notes in the separate SCAPS Data Acquisition Logbook.

8.2 Equipment Inspection

Prior to using LIF equipment:

- Make sure all necessary equipment and supplies are on board.
- Inspect equipment for dirt and damage.

8.3 Daily Equipment Initialization – Power Up Sequence

When the SCAPS rig has arrived at the site, the equipment may be powered up:

1. Lift the bench top to access the laser. Take care to avoid bumping fiber optics!
2. Check and record the xenon chloride gas pressure. The gauge is on the laser unit.
3. Turn the laser on, turning the the laser key ¼ turn to the right.
4. Verify the larger of the two slits is “in” place on the detector. It is Extremely Important to keep this slit in when the probe is exposed to ambient light (i.e., at all times the probe is out of the ground except when calibrating.)
5. Turn on the optical multichannel analyzer (OMA) unit.

6. Turn on the computer.
7. Initiate the pre-push calibration sequence as follows.
8. Open WinOCPT software.
9. Select the drop-down File menu, click New, enter a push name
10. Select Edit > Probe geometry, ensure that all values are correct for the probe in use. Measure probe with tape measure if necessary.
11. Place probe on metal supports, on the side of the bench.
12. Inspect the window for fogging, dirt, and damage.
13. Gently clean window with a drop of methanol on a laboratory tissue.
14. Carefully place the cuvettes of quinine sulfate (Qs10) calibration standard and Fischer Sea Sand (FSS) control standard on the probe with the Qs10 on the sapphire window and the FSS immediately next to it.
15. Remove the larger slit and replace with the short slit.
16. Make sure laser operation is external so that the computer controls laser firing by selecting the “EXT” switch position on the laser unit.
17. Select the Run dropdown menu, follow the single point measurement sequence, record the Maximum, Average, standard deviation, and wavelength in the SCAPS Data Acquisition Logbook laser statistics for QS10 and FSS.
18. Adjust laser power during the QS10 systems check, if necessary, to avoid clipping (>250,000 counts) and low response (<150,000 counts).
19. Repeat the QS10 systems check sequence a minimum of three times.
20. Turn laser off. Replace the larger light-blocking slit. Remove cuvettes.

8.4 SCAPS Push Sequence

When probe is clamped and ready:

1. In WinOCTP software, open a new push file. “File > New” (Insert a “0” to the automatic numbering if less than 10).
2. Click “Yes” (usually) to “preload documentation from WinOCPT?” For the first push of a project, insure accuracy of the data such as project name and personnel.
3. Minimize project information window.
4. “File > Load Views” and select “3+.vew” or another project specific view.

5. Initiate a scripted push. For the first of day, perform single-point pre-push measurements described above in “Daily Equipment Initialization”.
6. Initiate the script sequence.
7. Click Run then Script then press <enter> <enter> to accept defaults. (There is only one script, “SCAPS LIF collection sequence #1”).
8. Record push filename in log book.
9. Window showing cone and sleeve readings appear. Record cone and sleeve readings in the SCAPS Data Acquisition Logbook. Cone readings should be ± 5 , sleeve ± 0.5 .
10. Close cone/sleeve window.
11. “Check sapphire window”
12. Put Qs cuvette on window.
13. Take slit out and replace with the short slit.
14. Turn the switch on the laser unit to “RUN”
15. Confirm trigger mode switch on the laser body is on external (EXT).
16. Press <enter> <enter> to accept defaults when asked to “Identify This Measurement”
17. Review the data graph and “Show Statistics”. If acceptable, select “Script > Accept” and record data in SCAPS Data Acquisition Logbook.
18. Slide the cuvettes so the FSS cuvette covers the window. Allow no ambient light into the window.
19. Click <enter> <enter> to accept defaults.
20. Review the data graph and “Show Statistics”. If acceptable, select “Script > Accept” and record data in SCAPS Data Acquisition Logbook.
21. Put the longer ambient light blocking slit in. Turn laser off. Remove cuvettes.
22. Verify tip is on probe.
23. Tell pushroom operator: “You may now lower probe to ground level.” Operator will lower the probe to ground surface then say “Depth Zero”.
24. Close graphs to clear the screen.
25. Click <Enter> when the probe is at ground level.
26. Record time in SCAPS Data Acquisition Logbook.
27. Click <Enter> <enter> to accept defaults.
28. Tell pushroom operator: “Begin the push”.

29. Turn laser on.
30. At 2.2 feet (or more if surface cored), remove slit. For a 6” core, allow laser to fire twice before lifting slit and replacing it with the shortened slit.
31. Observe data acquisition. Verify that depth is recorded consistently. Look for possible sensor failures in cone and sleeve. Note high LIF readings and wavelength changes. Tell project manager immediately of any noted observations.
32. At bottom of hole, click “Run > Terminate”
33. Put the larger slit in.
34. Turn laser off.
35. Suspend Script (defer system checks).
36. Record time in SCAPS Data Acquisition Log book.
37. Tell the pushroom operator to initiate tremie grouting and raise the probe to surface.
38. Wipe probe window first with paper towel, then with tissue moistened with methanol.
39. Inspect window for fogging, pitting, damage, etc.
40. Place Qs cuvette on probe window. Place FSS cuvette next to Qs cuvette.
41. Remove the larger slit and replace it with the small slit
42. Click <enter> <enter> to accept defaults.
43. Review the data graph and “Show Statistics”. If acceptable, click “Script > Accept” and record data in SCAPS Data Acquisition Logbook.
44. Slide the cuvettes so the FSS cuvette covers the window. Allow no ambient light into the window.
45. Press <enter> <enter> to accept defaults.
46. Review the data graph and “Show Statistics”. If acceptable, select “Script > Accept” and record data in SCAPS Data Acquisition Logbook.
47. Put the larger slit in.
48. If last push of the day, confirm the larger light blocking slit is in. Turn laser off. Remove cuvettes. Otherwise, repeat push sequence.
49. Copy push files to auxiliary computer.

8.5 Shut down – Power off

At the end of the day, the following steps shall be followed:

1. Copy remaining push files to auxiliary computer.

2. Copy the files on data acquisition computer to subdirectory.
3. Turn off equipment in reverse order:
4. Turn off computers.
5. Switch OMA off.
6. Switch off laser with key.
7. Secure computer monitor, log books, methanol bottles, and other loose objects.

9.0 DOCUMENTATION

Document all procedures and equipment used in data acquisition in the log book. Record all applicable data including:

- Equipment calibration.
- Equipment configuration.

10.0 ATTACHMENTS

Attachment 1: Example log book entry.

STANDARD OPERATING PROCEDURE

**SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED
FLUORESCENCE**

ATTACHMENT 1

SCAPS DATA ACQUISITION LOGBOOK ENTRY

11 1808

Initial LIF test ~ 180

adjust fiber

change gas

check delay

check terminations of all but raw pig tail end

get back to > 200 K

Suspect Alignment maybe more likely the photo detector

	max	\bar{x}	SD	λ	H.V
2510	225515	209323	5.14	467	8.5
	231223	217894	3.97	468.1	
	224080	219323	.934	468.0	
FSS	4616			466.5	

Nitrogen Press: _____ Energy 8.5

CLFF-MW04
 Push Filename: _____ PSH Cone: 0.254 Sleeve: 0.021

2510 Pre Push: 467.5 nm 227312 max 215889 \bar{x} 3.34 s

SS Pre Push: 485.2 nm 4227 max Start 11:23

End: 11:45 @ 68'00" Cone: 0.254 Sleeve: 0.019

2510 P st Push: 467.5 nm 151771 max 140052 \bar{x} 3.57 s

SSP Push: 466.5 nm 2758 max Spec ra Depth: _____

Window fogged Post C.1
R & R window

Nitrogen Press: _____ Energy 9.0

CLFF-MW03
 Push Filename: _____ PSH Cone: 0.235 Sleeve: 0.023

2510 Pre Push: 467.8 nm 203976 max 198925 \bar{x} .991 s

SS Pre Push: 479.6 nm 4542 max Start 12:30

End: 13:07 @ 68'06" Cone: 0.285 Sleeve: 0.050

2510 P st Push: 476.0 nm 149576 max 114173 1399 s

SSP Push: 467.4 nm 2873 max Spec ra Depth: _____

Post C.1
Window fogged

Back to MW02

Nitrogen Press: _____ Energy _____

CLFF-MW02B
 Push Filename: _____ PSH Cone: _____ Sleeve: _____

2510 Pre Push: _____ nm _____ max _____ \bar{x} _____ s

SS Pre Push: _____ nm _____ max Start 14:40

End: 15:15 @ 67'78" Cone: _____ Sleeve: _____

2510 P st Push: _____ nm _____ max _____ \bar{x} _____ s

SSP Push: _____ nm _____ max Spec ra Depth: _____

run in to install well
No LIF

put in well
1st try was too shallow
to hit H2O

11/18/08

STANDARD OPERATING PROCEDURE

ENVIRONMENTAL SOIL SAMPLING

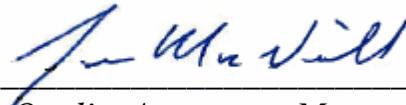
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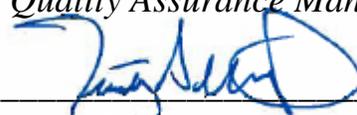
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Prepared by:  September 23, 2011
Jason Williams Date

Approved by:  September 23, 2011
Jesse MacNeill - Quality Assurance Manager Date

Approved by:  September 23, 2011
Tim Shields - Program Manager Date

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STANDARD OPERATING PROCEDURE

ENVIRONMENTAL SOIL SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) provides direction and establishes guidelines and procedures for field personnel collecting soil samples for environmental laboratory chemical analysis. This SOP is not intended to apply to every situation that may be encountered, nor is intended to replace thorough training and reading of reference materials.

2.0 BACKGROUND

Responsible parties and regulatory agencies make decisions about protecting human health and the environment from chemicals that may have been released during historic or current site activities. Chemical analysis of soil samples is often one source of information used in making environmental decisions. Soil sampling may be used in conjunction with various methods of subsurface investigations using various techniques.

3.0 APPLICABILITY

Soil sampling activities are applicable but not limited to activities associated with site construction, site demolition, underground storage tank removal, pipeline removal, site investigations, and remedial activities. This SOP is applicable to all soil sampling activities.

4.0 DEFINITIONS

Analyte - A chemical component of a sample to be determined or measured.

Analytical (or Testing) Method - A specification for sample preparation and instrumentation procedures or steps that must be performed to estimate the quantity of analyte in a sample.

Auger – A device for sampling subsurface soil.

Chain-of-custody - A protocol to insure the integrity of samples and resulting analytical results. Written forms indicating the date and time of transfer (e.g., from a sampler to the lab) are used. The procedure accounts for the whereabouts and handling of a sample and data from collection to final determination.

Drive sampler - A sample device that utilizes a hand held slide hammer to drive a six inch barrel to shallow subsurface depths. Typically used when collecting samples with a hand auger.

Encore sampler – One of several specific types of sampling devices for collecting samples for analysis for Volatile Organic compounds (VOCs) in accordance with EPA test method 5035/8260.

Field Log book – A project-specific record of information in a bound field notebook gathered by field personnel.

Hand auger – A small manual auger used for shallow subsurface sample borings

Hollow-stem auger – A small-diameter (typically 6- to 12-inch) drilling technique commonly used for collecting soil samples and installing monitoring wells.

Matrix - The sample medium in which analytes of interest are tested. The media in which analytes are tested includes water, soil and solids.

Piston-type sampler - Sampling device used to collect soil samples at a discrete depth when a piston is released to allow soil to enter the sampler. The sampler is typically lined with 21” (three-6”, and one-3”) of brass or stainless steel tubing. It does not split or break apart, the soil sample, inside the tubing, is carefully extruded from the sampler. Piston-type samplers are typically used with direct-push technology.

SAP – Sampling and Analysis Plan

SCAPS – Site Characterization and Analysis Penetrometer System. A system to obtain real time, subsurface assessment data on soil and chemical characteristics using a direct-push soil probe. Soil samples can also be collected using a direct-push piston-type sampler.

Split-barrel/spoon sampler – One of several specific types of sampling devices for retrieving representative soil samples from discrete depths. Use of these samplers requires the lining the interior of the sampler with appropriate sampling tubes, usually brass or stainless steel.

VOC - (Volatile Organic Compound). Chemicals that have a low boiling point and evaporate easily containing hydrogen (H), carbon (C), and possibly other elements.

Underground utilities - Include, but are not limited to, utilities (sewer, telephone, fuel, electric, water, and other product lines), tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during excavation operations.

5.0 REFERENCES

Navy Installation Restoration Laboratory Quality Assurance Guide, Naval Facilities Engineering Service Center (NFESC), Interim Guidance Document (Feb 1996).

Navy/Marine Corps Installation Restoration Manual, Naval Facilities Engineering Services Command (NFESC) (February 1997).

San Diego County, Department of Environmental Health (DEH), Site Assessment and Mitigation Program (DEH-SA/M), Site Assessment Manual (2004).

California Department of Toxic Substances Control, Hazardous Materials Laboratory, User’s Manual, Revision 12, January 2001.

CCR Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.20(c).

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, Update IV, 2008.

County of San Diego, Department of Environmental Health, Land & Water Quality Division, Site Assessment and Mitigation Program (SD DEH). Site Assessment and Mitigation Manual. http://www.sdcounty.ca.gov/deh/lwq/sam/manual_guidelines.html (This manual is updated yearly.)

6.0 APPARATUS AND MATERIALS

Select and assemble the types of equipment, instruments, and supplies necessary to perform the scope of work in accordance with the project specifications. A suggested checklist of apparatus and materials is included as Attachment A.

7.0 SOIL SAMPLE PROCEDURES

This procedure addresses the specific activities to be performed to accomplish a soil sampling event, including review of the Sampling and Analysis Plan (SAP) and general sample collection procedures, preparation for a sampling event by identifying necessary equipment, supplies and field documentation requirements.

7.1 Responsibilities

Project Manager (PM): The PM is responsible for ensuring that field Personnel have been trained in the use of this procedure and for verification that soil sampling activities are performed in compliance with the Work Plan and this SOP.

Physical Science Technician (PST): The PST is responsible for compliance with this SOP including collection of samples, containerization of samples, and documentation.

7.2 Review of Sampling and Analysis Plan

In preparation for a soil sampling event at a given site, field Personnel will review the site Sampling and Analysis Plan (SAP) and identify the following information:

- Identification number(s) of samples to be collected,
- Locations of the sample points,
- Location access requirements (e.g., permission of owner, locked gates, road conditions),
- Field and analytical parameters to be tested,
- Type and number of sample containers needed,
- Sample preservation methods,
- Volume of samples required for analysis,

- Type and number of QA/QC samples to be collected (e.g., duplicates, splits, and blanks), and
- Type of equipment needed for the scheduled sampling activity.

A location map shall be provided for use in the field. Copies of sampling specifications shall also be provided for field reference (if necessary).

Field information and data obtained during the sampling event shall be recorded in a logbook that is dedicated to the project.

7.3 Equipment and Supplies

Field Personnel staff shall plan for the sampling event by assessing, selecting, and assembling the types of equipment, instruments, and supplies necessary to perform the scope of work. Prior to going to the field, instrumentation shall be assembled, calibrated (if applicable), and tested. See Attachment 1.

7.4 General Soil Sampling Procedures

- Determine sampling locations and depths. Determining these locations depends on the nature of the sampling. In most cases, sample locations and depths will be determined prior to field mobilization and outlined in the site-specific SAP.
- After sample locations have been determined, penetrate the existing surface with sampling device; the depth will depend on the circumstances.
- When sample depth is attained, push/hammer sample (depending on sample method), until reaching undisturbed soil.
- If the soil is potentially impacted with hydrocarbons, it is usually desirable to obtain field organic vapor readings. After removing and breaking apart the sampler, collect a representative soil sample and place in a suitable container, such as a Ziplock bag, and record the result from the organic vapor analyzer (OVA).
- Collect representative soil samples in accordance with the SAP, ensuring correct sample container, preservation, labeling, storage, packing, and conveyance.
- Record the sampling information on the site plan, soil sample log, and a chain of custody form. Collect sample location information in accordance with the SAP, which may call for GPS or other location reference.
- Place the soil samples in a cooler packed with ice packets for cold storage pending transport to the environmental laboratory.
- The Project Manager is responsible for monitoring and documenting observations made during excavation activities in a field log. At a minimum the following information should be recorded prior to excavation activities: date, arrival time, site location, weather, onsite staff, any contractors (names and phone numbers), and the type and quantity of

equipment. During sampling activities the following information should be logged: start and stop time and location of all activities, blow counts performed to advance the sampler through each 6-inch interval, description of the lithology encountered in accordance with the Unified Soil Classification System, odors and/or staining observed, depths and times which samples were taken, OVA readings (if taken), depth to water (if applicable), and problems causing delays during any activities.

- All sampling equipment should be decontaminated in accordance with the Brady SOP T-001 Equipment Decontamination between all samples collected.

7.5 Subsurface Sampling Using a Split-barrel/spoon Sampler

Split-barrel/spoon samplers can be various lengths and are typically used for deeper samples with the hollow-stem auger. The following procedures provide directions for each step for this method of sampling.

- Decontaminate the split-barrel sampler and all other equipment.
- Begin augering to specified sample depths following SOP T-004 Hollow Stem Auger Drilling.
- After augering to a depth above the specified sample interval, stop augering and hammer the split-barrel sampler to the desired sample depth.
- Remove the sampler, break the sampler apart by unscrewing the ends and retrieve the tubing containing the sample.
- Collect the samples from the tubing depending on the preferred analysis. If the analysis is for VOCs, the SOP T-003 for Soil Sampling Procedure for Volatile Organics using the En Core® Sampler should be followed.
 - The stainless steel or brass tubing can be used for some other analysis or kept as a back-up sample. If this is the case, the tube ends should be wrapped in Teflon sheets and capped. Sealing the caps with silicon tape is optional. Do not use adhesive tape to seal the caps.
- The sampler and all equipment used to collect the sample should then be decontaminated following the SOP T-001 Equipment Decontamination.
- Repeat these steps until the specified number of samples have been collected from each boring.

7.6 Subsurface Sampling Using a Hand Auger (with drive sampler)

Hand augering may be used to collect soil samples from shallow depths when larger drilling equipment is not warranted. The collection of soil samples using a hand auger is typically used in conjunction with a drive sampler. The following procedures provide the minimum direction

for each step of a soil sampling activity using hand auger equipment in conjunction with a drive sampler.

- Decontaminate the hand auger, drive sampler barrel and other equipment.
- Hold the auger vertical, apply pressure, and rotate in a clockwise direction through the soil.
- When the auger bucket is full of soil, remove it from the boring and transfer the contents to the plastic sheeting located around or next to the bore hole.
- Repeat previous two steps until achieving a depth above the desired sample depth.
- Using the drive sampler, hammer the sample barrel (loaded with specified tubing) until it has been driven to the desired depth.
- Remove the sample by gently tapping the hammer in an upwards motion as to not remove the soil sample from the sample barrel.
- Once the sample has been removed from the boring removed the tubing from the barrel by unscrewing the end and carefully extruding the sample.
- The hand auger, drive sampler, and all other equipment used to take the sample should then be decontaminated following the SOP T-100 Equipment Decontamination.
- Repeat these steps until the specified number of samples have been collected from the boring or until a depth is reached at which other means of collecting samples are necessary.

7.7 Subsurface Sampling Using SCAPS

Collecting soil samples using SCAPS utilizes a hydraulic press to push a piston-type sampler to the desired sample depth. This method is extremely precise in collecting samples from specific depths. The following procedure provides each step of a soil sampling activity using the SCAPS direct-push piston-type sampler.

- Decontaminate the piston-type sampler (must be taken apart) and all other equipment that comes in direct contact with the sample.
- The SCAPS unit is aligned above the specific sample location.
- The piston-type sampler is pushed to a depth above the desired sample depth.
- The piston is released using a wire cable, and the sampler is pushed to the desired sample depth. The typical sample interval is 18" (1.5').
- Once the sample has been taken, the piston-type sampler is removed by retracting the hydraulic press.
- The sample is removed by carefully extruding the tubing from the sampler.

- The piston-type sampler and all other equipment used to take the sample should then be decontaminated following the SOP T-100 Equipment Decontamination.
- Repeat these steps until the specified number of samples have been collected from the push.

7.8 Subsurface Sampling during Trench Excavation Activities

Soil samples are collected from trench excavation sidewalls and bottom at a spatial intervals and depth specified in the project work plan or field sampling plan to accomplish specific project goals. The samples are collected by hand directly from excavation equipment. This is done specifically to eliminate hazards associated with having personnel enter potentially unstable excavations.

- Soil samples are immediately collected as soon as the excavation equipment is withdrawn from the hole. Soil is initially collected by placing approximately four cubic inches of soil from the excavator bucket into a decontaminated stainless steel bowl. The sample is then obtained by packing a laboratory-supplied sample container with soil, being careful to leave no headspace in the container. The soil in the bowl will not be mixed and as many soil horizons as possible will be sampled to obtain as representative a sample as possible. All soil sample containers are immediately sealed capped with the supplied lid, and are labeled with the project and sample number, collection depth, date, and time. This information is then entered on the chain of custody document. The sample is stored at the proper preservation temperature in an ice chest packed with double-bagged wet ice (4° C environment) until analysis. In the case of Encore samples, the sample is collected using the Encore sampling SOP T-003.
- Residual sample soil not placed in containers for laboratory analysis may be screened for combustible vapors using a combustible gas indicator (CGI) or equivalent instrument. For each vapor-screening event, soil is added to a 6-inch long by 2.5-inch diameter sample insert until it is approximately 1/3 full. The insert is capped, shaken, and penetrated with a probe inserted through a small opening in the cap. For hydrocarbon impacted soils, use an organic vapor analyzer (OVA) and place the probe inside the borehole and record the flame ionization detector (FID) reading taken after approximately 20 seconds and record the value in the boring logs.

7.9 Stockpile Soil Sampling

Generate a 2-dimensional grid to represent the stockpile, and select sample locations at random. Third dimension grid points (depths) are also randomly selected at each 2-dimensional grid location. Undisturbed samples are to be collected using a hand-auger / hammer driven system. A schematic of the contoured and gridded stockpiles with sample locations is shown in a figure in the final report.

7.10 Demobilization/Site Restoration

After the excavation has been backfilled:

- Repair surfaces to approximate pre-drilling conditions;
- Repair all surface structures as per the contract;
- Identify and isolate with barricades remaining hazards, if any;
- Containerize, label, and manage investigative derived waste,

8.0 DOCUMENTATION

Document all procedures, observations, and equipment used during excavation and sampling activities on the field log and forms related to the project.

9.0 ATTACHMENTS

1. Equipment Supply Checklist

STANDARD OPERATING PROCEDURE

ENVIRONMENTAL SOIL SAMPLING

ATTACHMENT 1

EQUIPMENT SUPPLY CHECKLIST

EQUIPMENT AND SUPPLY CHECKLIST

- Work Plan or Sampling and Analysis Plan
- Health and Safety Plan
- Underground Service Alert (USA) number
- Personal safety gear:
 - traffic vest,
 - steel toe shoes,
 - work gloves
 - earplugs,
 - sunscreen,
 - hardhat,
 - drinking water
 - Gloves (e.g., powder-free nitrile)
- Warning signs, barricades, cones, and yellow caution tape
- Field log (notebook and forms)
- Log forms
- Pens
- Hand auger
- Shovel and other various hand tools
- Buckets
- Brushes
- Liquinox
- Deionized water
- Deionized water sprayer
- Gas and vapor monitoring equipment
- Utility mark out report
- Underground Locating Service (ULS)
- Drilling permit issued by local government agency
- Digging Permit issued by facility (e.g., Public Works Center)
- Safety fence and flashing lights for night-time vehicle or pedestrian traffic
- Soil logging equipment
- Chain of Custody forms
- Sample forms
- Sampling trowel, scoop, spoon, etc. (not too big, expect 4 oz jars)
- Soil sampling equipment
- Teflon sheets for sample sleeves
- Sample jars
- Tool box
- Hammer
- Vise
- Baggies, large and small
- Sample labels
- Sharpie pens
- Plastic sheets for sample prep

- Plastic sheeting (6 mil. Min.)
- Soil classification chart
- Color chart
- Hand lens
- Ice Coolers for samples
- Ice
- Visqueen
- Drum labels
- Clipboards
- Paint for marking out auger locations
- Water level indicator
- Survey equipment (e.g., GPS unit)
- Camera
- Trash bags
- Dustpan foxtail
- Two tables: one for sampling, one for drying samplers
- Large paper clamps/clips for windy days
- Ice Coolers for drinks (must be marked FOOD ONLY)
- Shade
- Chairs
- EnCore® sampling devise extractor (if applicable),
- Instrument for measuring organic vapor concentrations such as a photoionization detector (PID) and/or a flame ionization detector (FID),

NOTE: The SCAPS truck and support trucks should be equipped with all SCAPS specific equipment for collecting soil samples.

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STANDARD OPERATING PROCEDURE

DEPTH DISCRETE DIRECT PUSH GROUNDWATER SAMPLING

SOP NUMBER: T-012

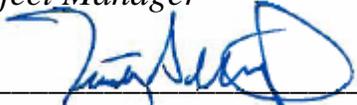
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Prepared by:  September 30, 2009
Craig Haverstick Date

Approved by:  September 30, 2009
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STANDARD OPERATING PROCEDURE

DEPTH DISCRETE DIRECT PUSH GROUNDWATER SAMPLING

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide direction and establish procedures for field personnel to use during collection of direct-push, discrete interval groundwater samples. This SOP is specific for the Site Characterization and Analysis Penetrometer System (SCAPS) however the following procedures are also intended to guide discrete interval sampling using direct push technology equivalent to the SCAPS. This SOP is not intended to replace thorough training and reading of reference materials.

2.0 BACKGROUND

SCAPS can collect discrete groundwater samples from targeted depth intervals. SCAPS uses a direct push tool that can install and isolate a 3/4-inch diameter schedule 40 polyvinyl chloride (PVC) screen within a selected interval.

3.0 APPLICABILITY

Direct push discrete sampling activities are applicable but not limited to activities associated with environmental site investigation and remedial activities.

Discrete interval sampling is indicated when there is a need to sample a specific vertical interval of the water column due to aquifer and geologic complexity in addition to migratory and dispersive behavior of a target analyte set.

4.0 DEFINITIONS

The following definitions are specific to the SCAPS direct push tools and techniques. Equivalent direct push sampling technology may differ.

Equivalent direct push technology – direct push platforms similar to the SCAPS marketed with different names, capable of allowing collection of a groundwater sample from a predetermined and isolated interval.

Discrete-interval groundwater sampling – refers to the tools and techniques necessary for collection of a groundwater sample from a subsurface interval, physically isolated so as to prevent, to the best extents practicable, mixing of groundwater from below and/or above the targeted interval.

Push (direct push context) – (noun) a type of soil boring where the ground is penetrated by a non-rotating probe pressed into the subsurface by mechanical pressure. (Verb) the application of mechanical pressure (typically hydraulic) to force a spear-shaped, metal probe into the ground.

Push rods – Hollow steel push rods approximately three feet long, sealed at the threaded joints with o-rings to prevent groundwater from entering. The push rods when connected in sequence effectively form a water tight, hollow tube.

Expendable drive point – becomes the bottom cap of the screened interval

Casing – Standard ¾ to 1-inch (nominal) flush-threaded PVC riser pipe

Screen – Standard ¾ to 1--inch (nominal) flush-threaded PVC 0.010-inch slotted wellscreen.

Underground utilities - Include, but are not limited to, utilities (sewer, telephone, fuel, electric, water, and other product lines), tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during subsurface investigation.

5.0 REFERENCES

ASTM International. D:6771-02. 2002. Standard Practice for Low-Flow Purging and Sampling for Wells and Devices for Ground-Water Quality Investigations.

County of San Diego, Department of Environmental Health, Land & Water Quality Division, Site Assessment and Mitigation Program (SD DEH). Site Assessment and Mitigation Manual. Updated annually.

Yeskis, D. and B. Zavala. 2002. “Groundwater Sampling Guidelines for Superfund and RCRA Project Managers.” U.S. EPA, Ground Water Forum Issue Paper, Publication Number EP542-S-02-001, May 2002.

6.0 DOCUMENTATION APPARATUS AND MATERIALS

Select and assemble the documentation, types of equipment, instruments, and supplies necessary to perform the scope of work in accordance with the project specifications. Documentation, apparatus and materials may include but is not limited to the following:

- Work Plan
- Statement of Work/Request for Quote
- Health and Safety Plan
- Underground Service Alert (USA) number
- Personal safety gear
- Gloves (e.g., powder-free nitrile)
- Warning signs, barricades, cones, and yellow caution tape

- Field log (notebook and forms)
- Log forms
- Pens
- Hand auger
- Shovel and other various hand tools
- Buckets
- Brushes
- Liquinox
- Deionized water
- Deionized water sprayer
- Gas and vapor monitoring equipment
- Utility mark out report
- Underground Locating Service (ULS) report
- Drilling permit issued by local government agency
- Digging Permit issued by facility (e.g., Public Works Center)
- Safety fence and flashing lights for night-time vehicle or pedestrian traffic
- Chain of Custody forms
- Sample forms
- Groundwater sampling equipment
- Sample containers
- Sample labels
- Sharpie pens
- Ice Coolers for samples
- Ice
- Visqueen (plastic sheeting)
- Drum labels
- Clipboards

- Paint for marking out auger locations
- Water level indicator
- Survey equipment (e.g., GPS unit)
- Camera
- Trash bags
- Dustpan foxtail
- Work table: one for sampling, one for decontamination procedures
- Large paper clamps/clips for windy days
- Ice Coolers for drinks (must be marked FOOD ONLY)
- Shade
- Chairs

6.1 Site Preparation

Complete the following preparations prior to mobilization:

- Obtain site approval as required by the specific site.
- Post site notification at several locations in the site vicinity.
- Call all vendors involved to reconfirm commitments and start times.
- Check USA and update if needed.
- Visit the site.
- Confirm the internal and non-navy utilities mark out completed including a post mark out site walk with the utilities technician.
- Notify regulatory representatives.

6.2 Health and Safety Requirements

Follow the approved site-specific health and safety plan. Check that all personnel conducting work at the site have appropriate training and qualifications.

Topics included in the daily Health and Safety briefing conducted prior to the start of work each day include but are not limited to the following risks specific to the SCAPS rig or equivalent:

- falls
- underground and overhead utilities

- hearing
- traffic
- moving heavy equipment
- hydraulic jack deployment
- steep roads

Clarify that it is every crew member's responsibility to inform the rig geologist/engineer of any unforeseen hazard, or when anyone approaches the exclusion zone.

6.3 Site Mobilization

Inspect equipment for proper maintenance and appropriate decontamination prior to each time the rig is mobilized to a site. Following mobilization of the rig over the push location:

- Confirm utility clearance.
- Secure exclusion zone with barricades.
- During on-site location changes, either remain on board or stay clear of the SCAPS truck until the jacks are deployed and the truck is leveled.
- Understand that you need to see the driver to be in the driver's field of view.

6.4 Breaking Ground

During the initial ground penetration:

- Required is a dedicated observer to visually monitor the probe's movement within the first 2 feet of penetration.
- The operator will be immediately informed by the observer if there is sideways probe movement greater than approximately 1.5 inches.
- At the discretion of the operator and/or geologist, the push may be abandoned.

6.5 Push Advancement

During pushing operations:

- Observe and monitor rig operations.
- Conduct health and safety monitoring and sampling as dictated by site conditions.
- Supervise health and safety compliance.

- Suspend investigation operations immediately and take appropriate actions if any potentially unsafe conditions are evident from drilling observations and/or health and safety sampling and monitoring.

In the event suspension of direct push activities occur:

- Inform the Site Superintendent.
- Take corrective action prior to resumption.
- Enter the observed problem, suspension, and corrective action in the field log.

7.0 DISCRETE INTERVAL WELL SETTING PROCEDURE

The following sequence addresses the specific activities performed during discrete-interval direct push groundwater sampling activities. These procedures may vary based on site-specific conditions and requirements.

To acquire depth-discrete groundwater samples, screen intervals will likely be equal to or less than five feet long. SCAPS or equivalent direct push technology will to install a $\frac{3}{4}$ or 1-inch diameter Schedule 40 polyvinyl chloride (PVC) screen isolated at intervals selected following evaluation of the CPT data. The tool consists of:

- 2-inch outside diameter push rods that are sealed at the joints with o-rings to prevent groundwater from entering
- An expendable drive point that becomes the bottom cap of the screened interval
- Standard $\frac{3}{4}$ -inch flush-threaded PVC riser pipe
- Standard $\frac{3}{4}$ -inch flush-threaded PVC 0.010-inch slotted wellscreen.

An expendable drive point is attached to the bottom of a push-rod assembly. The SCAPS truck is used to push the assembly to a predetermined depth. Standard $\frac{3}{4}$ -inch flush-threaded PVC screen and riser pipe are fed down through the push-rod assembly, and threaded onto the top of the drive point.

The push-rod assembly is pulled back toward the surface until the desired screened interval is exposed. The drive point, held in place by soil friction, anchors the screen at the desired depth.

To isolate a sampling interval targeted for below the water table, a foam bridge, installed on the casing at a predetermined depth and topped with approximately six inches of bentonite pellets, forms a seal around the exterior of the PVC riser pipe. The push rods and the exterior of the foam bridge are in contact with the soil, providing a tight annular seal above the screened interval.

Following well emplacement, groundwater samples will be collected in accordance with the project Sampling and Analysis Plan.

7.1 Well Destruction

After sampling, the PVC well materials are unthreaded from the expendable tip in preparation for destruction. SCAPS small-diameter wells are grouted, during destruction, using the well casing as it is being removed for a tremie pipe, effectively grouting the hole from bottom to top.

7.2 Demobilization/Site Restoration

After the direct push rig is has grouted the borehole and moved from the location:

- Remove and appropriately dispose of debris generated by direct push sampling operations.
- Clean surface to approximate pre-push conditions.
- Containerize, label, and manage any investigative derived waste.
- Inspect site for post-investigation restoration compliance.

8.0 DOCUMENTATION

Document all procedures, observations, and equipment used during subsurface activities on the field log and forms related to the project.

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STANDARD OPERATING PROCEDURE

UTILITY AVOIDANCE

SOP NUMBER: T-014

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REVISION DATE: July 31, 2012

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Prepared by: _____
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January 12, 2010
Date

Reviewed by: _____
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January 12, 2010
Date

Approved By: _____
Timothy Shields - Program Manager



January 12, 2010
Date

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STANDARD OPERATING PROCEDURE

UTILITY AVOIDANCE

1.0 PURPOSE

The purpose of This Standard Operating Procedure (SOP) is to provide alternatives that shall be implemented to reduce the potential and mitigate the hazards of unintentional contact with underground utilities. The procedure also provides a standard form for a project to document and track underground utility hits.

2.0 BACKGROUND

Subsurface activities may involve the use of equipment that has the potential to damage buried utilities. Working in areas where underground utilities exist is recognized as one of the most hazardous construction operations. Health risks and equipment damage associated with buried utilities are due, in large part, to a failure to follow utility markout procedures.

3.0 APPLICABILITY

This SOP is intended for projects where trenching, excavation, boring, and plowing present hazards from unintentional contact with public and private utilities, but may be applied to other construction operations as applicable. This SOP is not intended to replace or to add additional requirements where project specific procedures exist that implement required controls to ensure utility avoidance.

4.0 DEFINITIONS

Underground utilities - Include, but are not limited to, utilities (sewer, telephone, fuel, electric, water, and other product lines), tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during intrusive subsurface operations.

As-Builts/Existing Records/Documentation - Written information that is solely from the utility, local municipal, or client records.

Utility Identification Services - A single utility identification service (Dig Alert, Underground Service Alert, USA, etc.) This service is a single point of contact for a state and/or local municipality that can be used to request identification of existing underground utilities.

Locating - The geophysical signature of a utility, so that measurements regarding its position and data regarding its character can be obtained.

5.0 APPARATUS AND MATERIALS

Utilization of all or some combination of the utility avoidance measures identified in this procedure is required to eliminate unintentional utility contacts. A suggested checklist of apparatus and materials is included as Attachment A.

6.0 PROCEDURE

This procedure addresses methods that will provide the highest level of assurance that all underground utilities and obstructions have been identified. These methods may vary based on site-specific conditions and requirements.

7.0 UNDERGROUND UTILITY RECORD/DOCUMENTATION RESEARCH

The Project manager gathers underground utility information from the utility, local municipalities or facility as-builts and transfers the information onto the design drawings. This is the first step in identifying the scope of potential utilities and obstructions and should also be used when proposing the location of borings and other subsurface excavation work. When conducting the research, all agencies contacted shall be documented. All information supplied shall be recorded, retained and made available for review during the planning process.

7.1 Use of State Required Utility Identification Services

Most states, local municipalities, and military installations require utility companies to subscribe to a single utility identification service (Dig Alert, Underground Service Alert, USA, etc.). Likewise, most municipalities and military installations require contractors to use this service prior to any excavation. Military organizations may also require each contractor to obtain a subsurface operations permit from the Public Works Department prior to the start of subsurface activities.

Although some utility owners use a method of detection in addition to as-built drawings, the information provided has also been found to be somewhat inaccurate. The hiring of a subcontractor to locate all underground interferences is highly recommended due to the inaccuracies many as-built drawings contain. Locating marked utilities should be performed in accordance with Section 9.

7.2 Approval to Excavate

Once the site has been marked showing locations of all utilities the Project Manager will establish specific safety guidelines regarding excavation methods and execution, including locates, surveys and hand digs. Example, prior to subsurface excavation, mandate that the route and utility locates be visually inspected by the supervisor, documenting the inspection and approving authorization to proceed.

Subsurface excavation procedures should employ the use of daily pre-bore and excavation checklist, utility pothole log, and utility profile template. These aids should be developed, maintained by the and remain as part of the standard work practice for all site work involving excavation.

7.3 Performance Targets and Incident Critiques

Set project hit targets to zero strikes/incidents (including near misses) and diligently track all strikes, which include near misses (touch, but do not damage) as incidents. All incidents should be reviewed in the office (or an appropriate location) at the start of next shift with the employee and supervisor in attendance. Required corrective actions to prevent reoccurrence shall be documented and communicated as appropriate.

8.0 SURFACE GEOPHYSICAL TECHNIQUES

8.1 Ground Penetrating Radar (GPR)

GPR has been successful in locating underground metallic, plastic, and concrete pipes. This method works well for depths less than 6 feet (1.82 meters). The smaller the object the more difficult it is to identify. On average, 1-inch (2.5 cm) diameter for each foot (30.5 cm) of depth is needed for effective locating. Best results are obtained in wet (freshwater) sandy soils, whereas saturated clay and brackish water limits the penetration.

8.2 Subsurface Utility Tracing

Inducing a signal onto a subsurface utility and tracing the signal as it moves along or within the utility can map underground piping and utilities. This method works well for copper, aluminum, and steel pipes. The effective locating depth is 10 feet with ideal (compact soil) soil conditions and is somewhat less deep for dry sand, alkaline, or high iron content soils. Using this method to identify cast iron usually has poor results, and nonconductive pipes cannot be traced unless a steel tape can be fished through the pipe.

8.3 Non-destructive Vacuum Extraction

Non-destructive Vacuum Extraction, otherwise known as Potholing or Hand Augering, is used to physically expose a marked utility to verify existence and determine its exact location. This method helps insure that the existing utility will not be damaged by adjacent construction activities. Locating marked utilities shall be completed as required by section 9. A typical pothole measuring 12 inches (30.48 centimeter) square and 4 to 5 feet (1.22 to 1.52 meters) deep can be dug in 15 minutes or less with an average time of 7 to 8 minutes in all soil conditions. Many municipalities and military facilities now require the use of potholing by legislation or contract.

8.4 Lateral Identification

Because some utilities do not identify the customer's service line, additional investigation will be required. Gas companies may identify main lines only and will not mark laterals

to the resident or business. Additional investigation is required to check for visual indications of existing utilities. A method of investigation that has been successfully used on a major underground construction project is to enter the basements of all buildings along the proposed excavation route to identify exiting utility lines that may exist as laterals to a main service. Where a lateral has been identified that is potentially within the excavation limits, further investigation is completed to expose or locate the line. Conductive and inductive testing using Radio Frequency and Audio Frequency can easily be used to trace the route where an exposed portion of the line is available.

9.0 LOCATING MARKED UTILITIES

All utility crossings shall be located. Potholing is the preferred method of locating to avoid contact resulting in potential damage.

Where utility markings run parallel and within 5 feet of proposed excavation/boring, the utility shall be located and marked. For proposed excavations/borings that run a continuous parallel route, the utility shall be located every 500 feet.

10.0 IDENTIFICATION / TRENDING OF UTILITY HITS

To identify a potential trend associated with a specific utility or method of locating, all unplanned contact with underground utilities must be reported and documented using a standard format. This information is also valuable in communicating lessons learned information to prevent reoccurrence. Attachment B, Utility Hit Investigation Report Form should be used in collection and documentation of this information. Using the form, field personnel/subcontractor should complete the information immediately following any unplanned contact with an underground utility and forward to the corporate management for further processing.

11.0 REFERENCES

United States Department of Labor Occupational Safety and Health Administration (OSHA), Title 29 CFR §1910.651 (Specific Excavation Requirements).

United States Department of Army, 2003. U.S. Army Corps of Engineers (ACOE) Safety and Health Manual, EM 385-1-1. November.

STANDARD OPERATING PROCEDURE

UTILITY AVOIDANCE

ATTACHMENT 1

CHECKLIST OF APPARATUS AND MATERIALS

checklist of apparatus and materials

- Hand Auger
- Air Knife
- Electromagnetic Pipe and Cable Locator (EMPCL)
- Electromagnetic Induction Metal Detector (EMIMD)
- Ground Penetrating Radar (GPR)
- Magnetometer
- Electromagnetic Meter
- Shovel
- Spray Paint
- Stakes
- Pin Flags
- Pry Bar
- Box Wrenches
- Chalk Line
- Hammer
- Survey Flagging
- Power Source

STANDARD OPERATING PROCEDURE

UTILITY AVOIDANCE

ATTACHMENT 2

UTILITY HIT INVESTIGATION REPORT

UTILITY HIT INVESTIGATION REPORT

(3) WORK TASK INFORMATION (SET-UP / PREPARATION ACTIVITIES)		
A.	WHAT METHODOLOGY WAS USED TO LOCATE THE UTILITY? (Detection Devices, Utility Locate Service, Drawing Search, City As-Builts, etc.)	
B.	TYPE OF DEVICES UTILIZED? (Include model numbers and calibration documentation)	
C.	ARE THERE ANY PERCEIVED COSTS AND/OR DELAYS ASSOCIATED WITH THE HIT? If Yes, explain:	<input type="checkbox"/> Yes <input type="checkbox"/> No
D.	METHOD OF EXCAVATION/INSTALLATION? (check one)	<input type="checkbox"/> Drilling <input type="checkbox"/> Open trench excavation <input type="checkbox"/> Directional boring <input type="checkbox"/> Other
E.	ARE DETECTION INSTRUMENTS AN INTEGRAL PART OF MACHINERY? (If so, answer other questions below.)	<input type="checkbox"/> Yes <input type="checkbox"/> No
	1. Was the detection instrument in use at the time?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	2. Was the detection instrument properly calibrated? Date Calibrated: ___/___/___	<input type="checkbox"/> Yes <input type="checkbox"/> No
E.	DID THE OPERATOR RECEIVE PROPER BRIEFING OF EXISTING UNDERGROUND INTERFERENCES PRIOR TO THE START OF WORK?	<input type="checkbox"/> Yes <input type="checkbox"/> No
F.	HAS CURRENT BORING OPERATOR BEEN TRAINED AND CERTIFIED BY THE EMPLOYER ON THE EQUIPMENT USED?	<input type="checkbox"/> Yes <input type="checkbox"/> No
G.	DOES THE SUBCONTRACTOR HAVE PREVIOUS RELEVANT EXPERIENCE?	<input type="checkbox"/> Yes <input type="checkbox"/> No
J.	WAS UNDERGROUND SERVICE ALERT (USA) NOTIFIED PRIOR TO FIELD WORK? TICKET#: _____	<input type="checkbox"/> Yes <input type="checkbox"/> No
K.	WAS THE BRADY SITE SAFETY OFFICER ON SITE DURING THE INCIDENT?	<input type="checkbox"/> Yes <input type="checkbox"/> No
L.	ARE PHOTOGRAPHS OF THE INCIDENT ATTACHED?	<input type="checkbox"/> Yes <input type="checkbox"/> No
M.	DESCRIBE THE INCIDENT IN DETAIL (INJURIES, LOCATION, SPECIFIC EQUIPMENT AND/OR PROPERTY DAMAGE):	
	PREPARED BY:	
	SIGNATURE:	DATE:

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Appendix A Attachment 3

Analytical Standard Operating Procedures
(Included in Final Version of Document)

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Appendix B

Microbac 2009 Laboratory Report

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Mark Horan, Division Manager
Signature / Date	 Mark Horan, Division Manager 12/10/2009 12:00:54
Laboratory Job No. (Certificate of Analysis No.)	0912-00106
Project Name / No.	US NAVY SEAL BEACH BLDG 500
Dates Sampled (from/to)	12/04/09 To 12/04/09
Dates Received (from/to)	12/04/09 To 12/04/09
Dates Reported (from/to)	12/10/09 To 12/10/2009
Chains of Custody Received	Yes

Comments:

Subcontracting
 Organic Analyses
 No analyses sub-contracted

Sample Condition(s)
 All samples intact

Positive Results (Organic Compounds)											
Sample	Analyte	Result	Qual	Units	RL	Sample	Analyte	Result	Qual	Units	RL
SB-01-2	Naphthalene	0.0037		mg/Kg	0.0020	SB-03-8	1,2,4-Trimethylbenzene	3.5		mg/Kg	0.50
SB-03-8	1,3,5-Trimethylbenzene	0.82		mg/Kg	0.050	SB-03-8	2-Butanone (MEK)	1.9	Q	mg/Kg	0.50
SB-03-8	4-Isopropyltoluene	0.44		mg/Kg	0.10	SB-03-8	C4-C12	270		mg/Kg	10
SB-03-8	Diesel (C10-C28)	7000		mg/Kg	10	SB-03-8	Isopropylbenzene	0.10		mg/Kg	0.050
SB-03-8	Naphthalene	5.6	Q	mg/Kg	0.10	SB-03-8	m,p-Xylenes	0.66		mg/Kg	0.10
SB-03-8	n-Butylbenzene	0.48		mg/Kg	0.10	SB-03-8	n-Propylbenzene	0.22		mg/Kg	0.050
SB-03-8	o-Xylene	0.24		mg/Kg	0.050	SB-03-8	sec-Butylbenzene	0.23		mg/Kg	0.10




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CERTIFICATE OF ANALYSIS
0912-00106

 Naval Weapons Stn Seal Beach
 Pei-Fen Tamashiro
 N45W, Building 230
 800 Seal Beach Blvd
 Seal Beach, CA 90740-5000

 Date Reported 12/10/09
 Date Received 12/04/09
 Invoice No. 56893
 Cust # 1443
 Permit Number
 Customer P.O.

Project: US NAVY SEAL BEACH BLDG 500

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 SB-01-2							Date & Time Sampled: 12/04/09 @ 10:50	
[TPH Gasoline (C4-C12)]								
C4-C12	<0.20		mg/Kg	CA LUFT	1	0.20	12/08/09	CMR
[Extractable Hydrocarbons]								
Waste Dilution	Complete			EPA 3580	1		12/08/09	CMR
Diesel (C10-C28)	<10		mg/Kg	EPA 8015B	1	10	12/08/09	CMR
[Surrogate]								
o-Terphenyl (OTP)	75		%REC	EPA 8015B		50-150	12/08/09	CMR
[VOCs by GCMS]								
Closed System P&T VOC Soli	Complete			EPA 5035	1		12/09/09	CMR
Acetone	<0.10		mg/Kg	EPA 8260B	1	0.10	12/09/09	CMR
t-Amyl Methyl Ether (TAME)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Benzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Bromobenzene	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
Bromochloromethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
Bromodichloromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Bromoform	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
Bromomethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
t-Butanol (TBA)	<0.020		mg/Kg	EPA 8260B	1	0.020	12/09/09	CMR
2-Butanone (MEK)	<0.010		mg/Kg	EPA 8260B	1	0.010	12/09/09	CMR
n-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
sec-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
tert-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Carbon Disulfide	<0.010		mg/Kg	EPA 8260B	1	0.010	12/09/09	CMR
Carbon Tetrachloride	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Chlorobenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Chloroethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
Chloroform	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Chloromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
2-Chlorotoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
4-Chlorotoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Dibromochloromethane	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,2-Dibromoethane (EDB)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,2-Dibromo-3-Chloropropane	<0.010		mg/Kg	EPA 8260B	1	0.010	12/09/09	CMR

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0912-00106

Naval Weapons Stn Seal Beach
 Pei-Fen Tamashiro
 N45W, Building 230
 800 Seal Beach Blvd
 Seal Beach, CA 90740-5000

Project: US NAVY SEAL BEACH BLDG 500

Date Reported 12/10/09
 Date Received 12/04/09
 Invoice No. 56893
 Cust # 1443
 Permit Number
 Customer P.O.

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 SB-01-2							Date & Time Sampled: 12/04/09 @ 10:50	
.....continued								
Dibromomethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,2-Dichlorobenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,3-Dichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,4-Dichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Dichlorodifluoromethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
1,1-Dichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,2-Dichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,1-Dichloroethene	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
cis-1,2-Dichloroethene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
trans-1,2-Dichloroethene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,2-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,3-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
2,2-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,1-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
cis-1,3-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
trans-1,3-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Diisopropyl Ether (DIPE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Ethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Ethyl-t-Butyl Ether (EtBE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Hexachlorobutadiene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
2-Hexanone	<0.010		mg/Kg	EPA 8260B	1	0.010	12/09/09	CMR
Isopropylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
4-Isopropyltoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Methylene Chloride	<0.050		mg/Kg	EPA 8260B	1	0.050	12/09/09	CMR
4-Methyl-2-Pentanone (MIBK)	<0.010		mg/Kg	EPA 8260B	1	0.010	12/09/09	CMR
Methyl-t-butyl Ether (MtBE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Naphthalene	0.0037		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
n-Propylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Styrene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,1,1,2-Tetrachloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,1,2,2-Tetrachloroethane	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
Tetrachloroethene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR

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Naval Weapons Stn Seal Beach
 Pei-Fen Tamashiro
 N45W, Building 230
 800 Seal Beach Blvd
 Seal Beach, CA 90740-5000

Project: US NAVY SEAL BEACH BLDG 500

Date Reported 12/10/09
 Date Received 12/04/09
 Invoice No. 56893
 Cust # 1443
 Permit Number
 Customer P.O.

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 SB-01-2							Date & Time Sampled: 12/04/09 @ 10:50	
.....continued								
Toluene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,2,3-Trichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,2,4-Trichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
1,1,1-Trichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,1,2-Trichloroethane	<0.0030		mg/Kg	EPA 8260B	1	0.0030	12/09/09	CMR
Trichloroethene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,2,3-Trichloropropane	<0.0030		mg/Kg	EPA 8260B	1	0.0030	12/09/09	CMR
Trichlorofluoromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Trichlorotrifluoroethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/09/09	CMR
1,2,4-Trimethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
1,3,5-Trimethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
Vinyl Chloride	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
m,p-Xylenes	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/09/09	CMR
o-Xylene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/09/09	CMR
[VOC Surrogates]								
Dibromofluoromethane	98		%REC	EPA 8260B		70-130	12/09/09	CMR
Toluene-D8	95		%REC	EPA 8260B		70-130	12/09/09	CMR
Bromofluorobenzene	86		%REC	EPA 8260B		70-130	12/09/09	CMR
Sample: 002 SB-02-8							Date & Time Sampled: 12/04/09 @ 11:23	
[TPH Gasoline (C4-C12)]								
C4-C12	<0.20		mg/Kg	CA LUFT	1	0.20	12/08/09	CMR
[Extractable Hydrocarbons]								
Waste Dilution	Complete			EPA 3580	1		12/08/09	CMR
Diesel (C10-C28)	<10		mg/Kg	EPA 8015B	1	10	12/08/09	CMR
[Surrogate]								
o-Terphenyl (OTP)	66		%REC	EPA 8015B		50-150	12/08/09	CMR
[VOCs by GCMS]								
Closed System P&T VOC Soil	Complete			EPA 5035	1		12/08/09	CMR
Acetone	<0.10		mg/Kg	EPA 8260B	1	0.10	12/08/09	CMR
t-Amyl Methyl Ether (TAME)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Benzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR

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CERTIFICATE OF ANALYSIS

0912-00106

Naval Weapons Stn Seal Beach
 Pei-Fen Tamashiro
 N45W, Building 230
 800 Seal Beach Blvd
 Seal Beach, CA 90740-5000

Date Reported 12/10/09
 Date Received 12/04/09
 Invoice No. 56893
 Cust # 1443
 Permit Number
 Customer P.O.

Project: US NAVY SEAL BEACH BLDG 500

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 SB-02-8							Date & Time Sampled: 12/04/09 @ 11:23	
.....continued								
Bromobenzene	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
Bromochloromethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
Bromodichloromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Bromoform	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
Bromomethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
t-Butanol (TBA)	<0.020		mg/Kg	EPA 8260B	1	0.020	12/08/09	CMR
2-Butanone (MEK)	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
n-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
sec-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
tert-Butylbenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Carbon Disulfide	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
Carbon Tetrachloride	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Chlorobenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Chloroethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
Chloroform	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Chloromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
2-Chlorotoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
4-Chlorotoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Dibromochloromethane	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,2-Dibromoethane (EDB)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,2-Dibromo-3-Chloropropane	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
Dibromomethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,2-Dichlorobenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,3-Dichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,4-Dichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Dichlorodifluoromethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
1,1-Dichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,2-Dichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,1-Dichloroethene	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
cis-1,2-Dichloroethene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
trans-1,2-Dichloroethene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,2-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR

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CERTIFICATE OF ANALYSIS
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Project: US NAVY SEAL BEACH BLDG 500

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 SB-02-8							Date & Time Sampled: 12/04/09 @ 11:23	
.....continued								
1,3-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
2,2-Dichloropropane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,1-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
cis-1,3-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
trans-1,3-Dichloropropene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Dilsopropyl Ether (DIPE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Ethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Ethyl-t-Butyl Ether (EtBE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Hexachlorobutadiene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
2-Hexanone	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
Isopropylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
4-Isopropyltoluene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Methylene Chloride	<0.050		mg/Kg	EPA 8260B	1	0.050	12/08/09	CMR
4-Methyl-2-Pentanone (MIBK)	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
Methyl-t-butyl Ether (MtBE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Naphthalene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
n-Propylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Styrene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,1,1,2-Tetrachloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,1,2,2-Tetrachloroethane	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Tetrachloroethene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Toluene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,2,3-Trichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,2,4-Trichlorobenzene	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
1,1,1-Trichloroethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,1,2-Trichloroethane	<0.0030		mg/Kg	EPA 8260B	1	0.0030	12/08/09	CMR
Trichloroethene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,2,3-Trichloropropane	<0.0030		mg/Kg	EPA 8260B	1	0.0030	12/08/09	CMR
Trichlorofluoromethane	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
Trichlorotrifluoroethane	<0.0050		mg/Kg	EPA 8260B	1	0.0050	12/08/09	CMR
1,2,4-Trimethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
1,3,5-Trimethylbenzene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR

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CERTIFICATE OF ANALYSIS

0912-00106

Naval Weapons Stn Seal Beach
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 N45W, Building 230
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Project: US NAVY SEAL BEACH BLDG 500

Date Reported 12/10/09
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 Cust # 1443
 Permit Number
 Customer P.O.

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 SB-02-8							Date & Time Sampled: 12/04/09 @ 11:23	
.....continued								
Vinyl Chloride	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
m,p-Xylenes	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
o-Xylene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
[VOC Surrogates]								
Dibromofluoromethane	96		%REC	EPA 8260B		70-130	12/08/09	CMR
Toluene-D8	95		%REC	EPA 8260B		70-130	12/08/09	CMR
Bromofluorobenzene	88		%REC	EPA 8260B		70-130	12/08/09	CMR
Sample: 003 SB-03-8							Date & Time Sampled: 12/04/09 @ 11:35	
[TPH Gasoline (C4-C12)]								
C4-C12	270		mg/Kg	CA LUFT	50	10	12/08/09	CMR
[Extractable Hydrocarbons]								
Waste Dilution	Complete			EPA 3580	1		12/08/09	CMR
Diesel (C10-C28)	7000		mg/Kg	EPA 8015B	1	10	12/08/09	CMR
[Surrogate]								
o-Terphenyl (OTP)	215	I	%REC	EPA 8015B		50-150	12/08/09	CMR
[VOCs by GCMS]								
Closed System P&T VOC Soil	Complete			EPA 5035	1		12/08/09	CMR
Acetone	<5.0		mg/Kg	EPA 8260B	50	5.0	12/08/09	CMR
t-Amyl Methyl Ether (TAME)	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Benzene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Bromobenzene	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
Bromochloromethane	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
Bromodichloromethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Bromoform	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
Bromomethane	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
t-Butanol (TBA)	<1.0		mg/Kg	EPA 8260B	50	1.0	12/08/09	CMR
2-Butanone (MEK)	1.9	Q	mg/Kg	EPA 8260B	50	0.50	12/08/09	CMR
n-Butylbenzene	0.48		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
sec-Butylbenzene	0.23		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
tert-Butylbenzene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Carbon Disulfide	<0.50		mg/Kg	EPA 8260B	50	0.50	12/08/09	CMR

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0912-00106

Naval Weapons Stn Seal Beach
 Pei-Fen Tamashiro
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Project: US NAVY SEAL BEACH BLDG 500

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Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 003 SB-03-8							Date & Time Sampled: 12/04/09 @ 11:35	
.....continued								
Carbon Tetrachloride	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Chlorobenzene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Chloroethane	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
Chloroform	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Chloromethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
2-Chlorotoluene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
4-Chlorotoluene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Dibromochloromethane	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,2-Dibromoethane (EDB)	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,2-Dibromo-3-Chloropropane	<0.50		mg/Kg	EPA 8260B	50	0.50	12/08/09	CMR
Dibromomethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,2-Dichlorobenzene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,3-Dichlorobenzene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,4-Dichlorobenzene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Dichlorodifluoromethane	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
1,1-Dichloroethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,2-Dichloroethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,1-Dichloroethene	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
cis-1,2-Dichloroethene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
trans-1,2-Dichloroethene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,2-Dichloropropane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,3-Dichloropropane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
2,2-Dichloropropane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,1-Dichloropropene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
cis-1,3-Dichloropropene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
trans-1,3-Dichloropropene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Dilsopropyl Ether (DIPE)	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Ethylbenzene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Ethyl-t-Butyl Ether (EtBE)	<0.0020		mg/Kg	EPA 8260B	1	0.0020	12/08/09	CMR
Hexachlorobutadiene	<0.0010		mg/Kg	EPA 8260B	1	0.0010	12/08/09	CMR
2-Hexanone	<0.010		mg/Kg	EPA 8260B	1	0.010	12/08/09	CMR
Isopropylbenzene	0.10		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR

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Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 003 SB-03-8							Date & Time Sampled: 12/04/09 @ 11:35	
.....continued								
4-Isopropyltoluene	0.44		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Methylene Chloride	<0.050		mg/Kg	EPA 8260B	1	0.050	12/08/09	CMR
4-Methyl-2-Pentanone (MIBK)	<0.50		mg/Kg	EPA 8260B	50	0.50	12/08/09	CMR
Methyl-t-butyl Ether (MtBE)	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Naphthalene	5.6	Q	mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
n-Propylbenzene	0.22		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Styrene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,1,1,2-Tetrachloroethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,1,2,2-Tetrachloroethane	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
Tetrachloroethene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Toluene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,2,3-Trichlorobenzene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,2,4-Trichlorobenzene	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
1,1,1-Trichloroethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,1,2-Trichloroethane	<0.15		mg/Kg	EPA 8260B	50	0.15	12/08/09	CMR
Trichloroethene	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,2,3-Trichloropropane	<0.15		mg/Kg	EPA 8260B	50	0.15	12/08/09	CMR
Trichlorofluoromethane	<0.050		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Trichlorotrifluoroethane	<0.25		mg/Kg	EPA 8260B	50	0.25	12/08/09	CMR
1,2,4-Trimethylbenzene	3.5		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
1,3,5-Trimethylbenzene	0.82		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
Vinyl Chloride	<0.10		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
m,p-Xylenes	0.66		mg/Kg	EPA 8260B	50	0.10	12/08/09	CMR
o-Xylene	0.24		mg/Kg	EPA 8260B	50	0.050	12/08/09	CMR
[VOC Surrogates]								
Dibromofluoromethane	92		%REC	EPA 8260B		70-130	12/08/09	CMR
Toluene-D8	94		%REC	EPA 8260B		70-130	12/08/09	CMR
Bromofluorobenzene	122		%REC	EPA 8260B		70-130	12/08/09	CMR



Microbac Laboratories, Inc.

SOUTHERN CALIFORNIA DIVISION
 1401 RESEARCH PARK DRIVE, SUITE 100
 RIVERSIDE CA, 92507
 951-779-0310 FAX 951-779-0344
 www.microbac.com social@microbac.com

FDA#	2030513
LA City#	10159
ELAP#s	2373
	2562
	2665
	2479
	2122

CHEMISTRY · MICROBIOLOGY · FOOD SAFETY · CONSUMER PRODUCTS · MOBILE LABORATORIES
 WATER · AIR · SOIL · WASTES · FOOD · PHARMACEUTICALS · NUTRACEUTICALS · COSMETICS

Respectfully Submitted:



 Mark Horan - Division Manager

QUALIFIERS

- B = Detected in the associated Method Blank at a concentration above the routine RL.
- B1 = BOD dilution water is over specifications . The reported result may be biased high.
- D = Surrogate recoveries are not calculated due to sample dilution.
- E = Estimated value; Value exceeds calibration level of instrument.
- H = Analyte was prepared and/or analyzed outside of the analytical method holding time
- I = Matrix Interference.
- J = Analyte concentration detected between RL and MDL.
- Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
- S = Customer provided specification limit exceeded.

ABBREVIATIONS

- DF = Dilution Factor
- RL = Reporting Limit, Adjusted by DF
- MDL = Method Detection Limit, Adjusted by DF
- Qual = Qualifier
- Tech = Technician

As regulatory limits change frequently, Microbac advises the recipient of this report to confirm such limits with the appropriate federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Mark Horan, the Division Manager at 951.779.0310. You may also contact both James Nokes, President and Robert Morgan, Chief Operating Officer at president@microbac.com.





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QUALITY CONTROL DATA REPORT

Naval Weapons Stn Seal Beach

0912-00106

Date Reported 12/10/2009
 Date Received 12/04/2009
 Date Sampled 12/04/2009

Project: US NAVY SEAL BEACH BLDG 500

RESPECTFULLY SUBMITTED:


 MICROBAC LABORATORIES, INC.

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CHAIN OF CUSTODY
 County of Orange Health Care Agency
 Environmental Health Division
 1241 E. Dyer Rd., Ste. 120, Santa Ana, CA 92705
 Telephone: (714) 433-6000 / FAX: (714) 754-1768

0912-~~000~~
 00106 ^{part}

- ALL SAMPLES ARE TO BE HANDLED AS COURT EVIDENCE, AND ARE TO BE PROPERLY STORED IN A SECURE LOCATION.
- PLEASE WRITE LEGIBLY.
- ATTACH THIS FORM TO THE ORIGINAL REPORT OF THE ANALYTICAL RESULTS AND RETURN THEM TO THIS OFFICE. LABORATORY RESULTS RECEIVED WITHOUT PROPER CHAIN OF CUSTODY DOCUMENTATION WILL NOT BE ACCEPTED.

72-hr TAT.

4. TO BE COMPLETED BY LABORATORY ANALYST

LAB NO.: 0912-00106

DATE RECEIVED: 12-15-09

SAMPLE(S) CONDITION (PLEASE CHECK):

CHILLED: COUNTY SEAL(S) INTACT:

CONTAINER IN GOOD CONDITION:

DATE ANALYSIS COMPLETED: 12/09/2009

ANALYST: Chris Rattray

5. TO BE COMPLETED BY SAMPLE COLLECTOR

SITE NAME/ADDRESS: US Navy
Seal Beach, Building 500

DATE OF COLLECTION: 12/14/09

SAMPLE COLLECTOR/COMPANY: US Navy
Environmental

TELEPHONE NO.: (562) 626 7897

HCA REPRESENTATIVE: Doreen Talan

SAMPLE NUMBER	DETERMINATION REQUESTED	SAMPLE DESCRIPTION/COMMENTS	TIME OF COLLECTION
SB-01-2	8015G, 8015D, 8260 Full scan	2x6" SS sleeve (1-sleeve)	1050
SB-02-8	8015G, 8015D, 8260 Full scan	1, 2x6" SS sleeve (1-sleeve)	1123
SB-03-8	8015G, 8015D, 8260 Full scan	1, 2x6" SS sleeve (1-sleeve)	1135

7. CHAIN OF CUSTODY

1.	<u>Doreen Talan</u> SIGNATURE	<u>OCLUP, OCTCA</u> COMPANY/AGENCY	<u>12-4-09, 1145</u> INCLUSIVE DATES/TIMES
2.	<u>[Signature]</u> SIGNATURE	<u>NWS Seal Beach</u> COMPANY/AGENCY	<u>12-4-09 1410</u> INCLUSIVE DATES/TIMES
3.	<u>[Signature]</u> SIGNATURE	<u>MICROBAC</u> COMPANY/AGENCY	<u>12/04/09 1410</u> INCLUSIVE DATES/TIMES
4.	_____ SIGNATURE	_____ COMPANY/AGENCY	_____ INCLUSIVE DATES/TIMES
5.	_____ SIGNATURE	_____ COMPANY/AGENCY	_____ INCLUSIVE DATES/TIMES
6.	_____ SIGNATURE	_____ COMPANY/AGENCY	_____ INCLUSIVE DATES/TIMES

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