4/1/06-01308

Phase II Closure

Sampling and Analysis Plan

Buildings 2009, 2009A, 2009B, 2009C, and 2009D

Defense Reutilization and Marketing Office

U.S. Naval Activity Puerto Rico

Ceiba, Puerto Rico

Prepared for

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Naval Facilities Engineering Command
Atlantic

Under the

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Prepared by

AGVIQ
AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

4350 West Cypress Street
Suite 600
Tampa, FL 33607-4155

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Acronyms

CI	confidence interval
COC	chain of custody
DQE	data quality evaluation
DQO	data quality objectives
DRMO	Defense Reutilization and Marketing Office
DRO	Diesel range organics
DV	data validation
EDD	electronic data deliverable
EQB	Puerto Rico Environmental Quality Board
EPA	U.S. Environmental Protection Agency
FACLANT	Naval Facilities Engineering Command, Atlantic
ft	foot/feet
GIS	Geographic Information Systems
GRO	gasoline range organics
IDW	investigation-derived waste
JV I	AGVIQ-CH2M HILL Joint Venture I
LCS	Laboratory confirmation sample
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	Milligrams per Liter
MS/MSD	matrix spike/matrix spike duplicate
NAPR	U.S. Naval Activity Puerto Rico
NFESC	Naval Facilities Engineering Support Center
NTR	Navy Technical Representative
OVM	organic vapor meter
PARCC	precision, accuracy, representativeness, comparability, and completeness
PPE	Personnel protective equipment
QA/QC	quality assurance/quality control
QC	quality control

RA	risk assessment
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SOW	Statement of Work
SWMU	Solid Waste Management Unit
TM	technical memorandum
TRPH	total recoverable petroleum hydrocarbons
UCI	upper confidence interval
VOC	volatile organic compound

SECTION 1

Introduction

The sampling and analysis results for the 2005 closure investigation of Buildings 2009, 2009A, 2009B, 2009C, and 2009D conducted by AGVIQ-CH2M HILL Joint Venture I (JV I) at the Defense Reutilization and Marketing Office (DRMO) facility at Naval Activity Puerto Rico (NAPR) indicated that the closure standards for arsenic and total recoverable petroleum hydrocarbons (TRPH) were not met. Specifically, the arsenic levels found in the soil samples collected from the areas underlying and surrounding the buildings exceeded the arsenic closure standard (background level), as well as the U.S. Environmental Protection Agency (EPA) Region 3 Risk Based Concentration (RBC) for arsenic. The TRPH levels also exceeded the TRPH closure standard. In addition, both arsenic and TRPH were detected in the concrete samples collected from the floor of Building 2009 at levels exceeding their respective closure standards. Buildings 2009A, 2009B, 2009C, and 2009D (which were portable steel buildings specifically designed for flammable material storage) were decontaminated, demolished, and disposed of offsite in Class I landfills, and no concrete floor samples were collected from these buildings.

The above-referenced sampling and analysis results were presented in the following reports:

- *Closure Sampling Report, Building 2009, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico* (JV I, 2005a)
- *Closure Sampling Report, Building 2009A, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico* (JV I, 2005b)
- *Closure Sampling Report, Buildings 2009B, 2009C, and 2009D, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico* (JV I, 2005c)

EPA and the Puerto Rico Environmental Quality Board (EQB) submitted comments (dated September 27, 2005) on the above-referenced Closure Sampling Reports. The comments included the following:

- Approval of the recommendation included in the reports to conduct additional background soil sampling to establish a new background arsenic concentration that is more representative of either natural conditions, or non-waste-related, anthropogenic activities at NAPR.
- Requirements to conduct additional soil sampling in the vicinity of Building 2009 to more fully delineate the nature and extent of the elevated TRPH levels.
- Approval of the recommendation to perform a site-specific risk assessment of the approximate 0.25-acre area that encompasses Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D to address the arsenic-impacted and TRPH-impacted soils, if appropriate following determination of the new soil background arsenic level and the full nature and extent of elevated TRPH levels. The risk assessment will also address the arsenic and TRPH detected in the concrete floor samples collected in Building 2009.

This sampling and analysis plan (SAP) describes the supplemental, or Phase II closure sampling and analysis to be conducted to establish the new background soil arsenic level, and to delineate the TRPH-impacted soil in the vicinity of Building 2009. Consistent with the original *Site-Specific Sampling and Analysis Plans for Building 2009, Building 2009A, and Buildings 2009B, C, and D* (JV I, 2004), the sampling and analysis activities described in this SAP support clean closure of the hazardous waste storage facility at the DRMO facility at NAPR. The clean closure is based on the expected future industrial use of the property, and implementation of appropriate land use controls consistent with the requirements of the pending 7003 Administrative Order on Consent from the EPA (i.e., restriction to preclude future residential or similar use of the property).

The above-referenced Closure Sampling Reports have been revised in accordance with the EPA and EQB comments, and these final reports (dated November 2005) were submitted to EPA and EQB in early December 2005. These reports contain background and historical information on NAPR, as well as for Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D. They also contain information on the types of waste stored in these buildings in the past, and describe the current conditions of the buildings and surrounding area.

The remaining sections of this SAP are organized as follows:

Section 2, Sampling and Analysis Objectives - Describes the sampling and analysis objectives to support clean closure.

Section 3, Field Sampling Plan - Identifies the approach, methods, and operational procedures to be employed during investigation activities.

Section 4, Data Quality Objectives - Describes the project-specific data quality objectives , quality assurance/quality control (QA/QC) procedures, quality control acceptance criteria, and data deliverables.

Section 5, Data Validation and Reporting - Details the procedures for data validation, data quality evaluation, and reporting.

Section 6, Project Organization – Provides a project organization chart and contact information for Naval Facilities Engineering Command, Atlantic (FACLANT) and NAPR technical representatives.

Section 7, References – Lists documents cited in this SAP.

SECTION 2

Sampling and Analysis Objectives

The objectives of the sampling and analysis to be conducted in support of the clean closure of the approximate 0.25-acre area encompassing DRMO Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D are to:

- Determine a soil background concentration for arsenic that is more representative of either natural conditions, or non-waste-related, anthropogenic activities. The new arsenic background concentration will then be used to evaluate arsenic concentrations detected in the previously collected soil samples directly below and surrounding Buildings 2009, 2009A, 2009B, 2009C, and 2009D.
- Delineate the elevated TRPH (Diesel Range Organics [DRO]) concentration in the vicinity of previous sample locations SB4, SB8, and SB10 in the vicinity of Building 2009.

Once the new arsenic background level is established for site soils, all of the soil sampling data for Buildings 2009, 2009A, 2009B, 2009C, and 2009D will be evaluated together for compliance with the closure standard (background level or EPA Region 3 RBC, whichever is higher) using the same statistical analysis methodology described in the *Site-Specific Sampling and Analysis Plan, Building 2009* (JV I, 2005d). Should the arsenic level in the soil exceed background or the EPA Region 3 RBC for arsenic (whichever is higher), then the planned risk assessment for the approximate 0.25-acre area that encompasses Buildings 2009, 2009A, 2009B, 2009C, and 2009D will also address the arsenic-impacted soils. The Risk Assessment Work Plan for this planned risk assessment is provided under separate cover.

On the other hand, if the arsenic level in the soil does not exceed the new background arsenic level or the EPA Region 3 RBC for arsenic of 1.91 milligrams per kilogram (mg/kg), whichever is higher, then a Risk Assessment will not be conducted to address arsenic concentrations in site soils.

Similarly, once the full extent of the TRPH-impacted soils in the vicinity of Building 2009 is assessed, the soil sampling data for Buildings 2009, 2009A, 2009B, 2009C, and 2009D will be evaluated together for compliance with the TRPH closure standard of 100 mg/kg. This evaluation will be conducted using the same statistical analysis methodology described in the *Site-Specific Sampling and Analysis Plan, Building 2009* (JV I, 2005d). Should the TRPH level in the soil exceed the closure standard of 100 mg/kg, then the planned risk assessment for the approximate 0.25-acre area that encompasses Buildings 2009, 2009A, 2009B, 2009C, and 2009D will also address the TRPH-impacted soils. The Risk Assessment Work Plan for this planned risk assessment is provided under separate cover.

The following sections provide the specific sampling and analysis objectives for the additional background soil sampling for arsenic, and the soil delineation sampling for TRPH in the vicinity of Building 2009.

2.1 Background Soil Sampling

To determine a soil background concentration for arsenic that is more representative of either natural conditions or non-waste-related anthropogenic activities, 24 additional soil background samples will be collected from around other buildings at NAPR that are of similar construction and at least as old as Building 2009, but with no prior history of waste management activity. The samples will be analyzed for arsenic. The locations of the 24 additional soil background samples are presented in Section 3.

To determine the new background arsenic concentration for soil, the existing background soil data for arsenic included in the Closure Sampling Reports for Buildings 2009, 2009A, and 2009B, 2009C, and 2009D will be combined with the additional background soil concentrations for arsenic, and statistically analyzed to establish the new background arsenic level. The existing background soil concentration data for arsenic from the Closure Sampling Reports are presented in Exhibit 2-1.

EXHIBIT 2-1
Existing Background Soil Sampling Concentrations for Arsenic

Inorganic Constituent	Background Soil Sample Concentrations (mg/kg)						
	SW-846 Analytical Method	9BGSS01	9BGSS01D	9BGSS02	9BGSS03	9BGSS04	9BGSS05
Arsenic	6010B	2.2	0.8	2.5	2.3	2.1	0.21

Notes:
mg/kg = milligrams per kilogram

As described in the Closure Sampling Reports for Building 2009, Building 2009A, and Buildings 2009B, 2009C, and 2009D, the existing background soil sampling data came from the final *Corrective Measures Study Investigation Report for SWMU 9* (Baker Environmental, Inc., 2003). These background data included analytical results for Resource Conservation and Recovery Act (RCRA) Appendix IX inorganic parameters for surface soil samples (sampling depth of 0 to 6 inches) collected from five different locations. A duplicate sample was collected from one of the five background sampling locations. These sampling locations, which are shown in Exhibit 2-2, are at a sufficient distance away from both Solid Waste Management Unit (SWMU) 9 and the DRMO facility to avoid potential impacts from SWMU 9 and the DRMO facility.

To establish the background limit for inorganic constituents in soil, the background limit for each constituent will be calculated as follows:

Limit = (M) + (T * D)

Where:

M = Mean constituent concentration for the 29 background samples (5 existing samples and 24 new samples)

T = Student t factor for 2 degrees of freedom and a 95% confidence interval (CI) (2.92 for a single tailed t).

D = Standard deviation of the background concentration data

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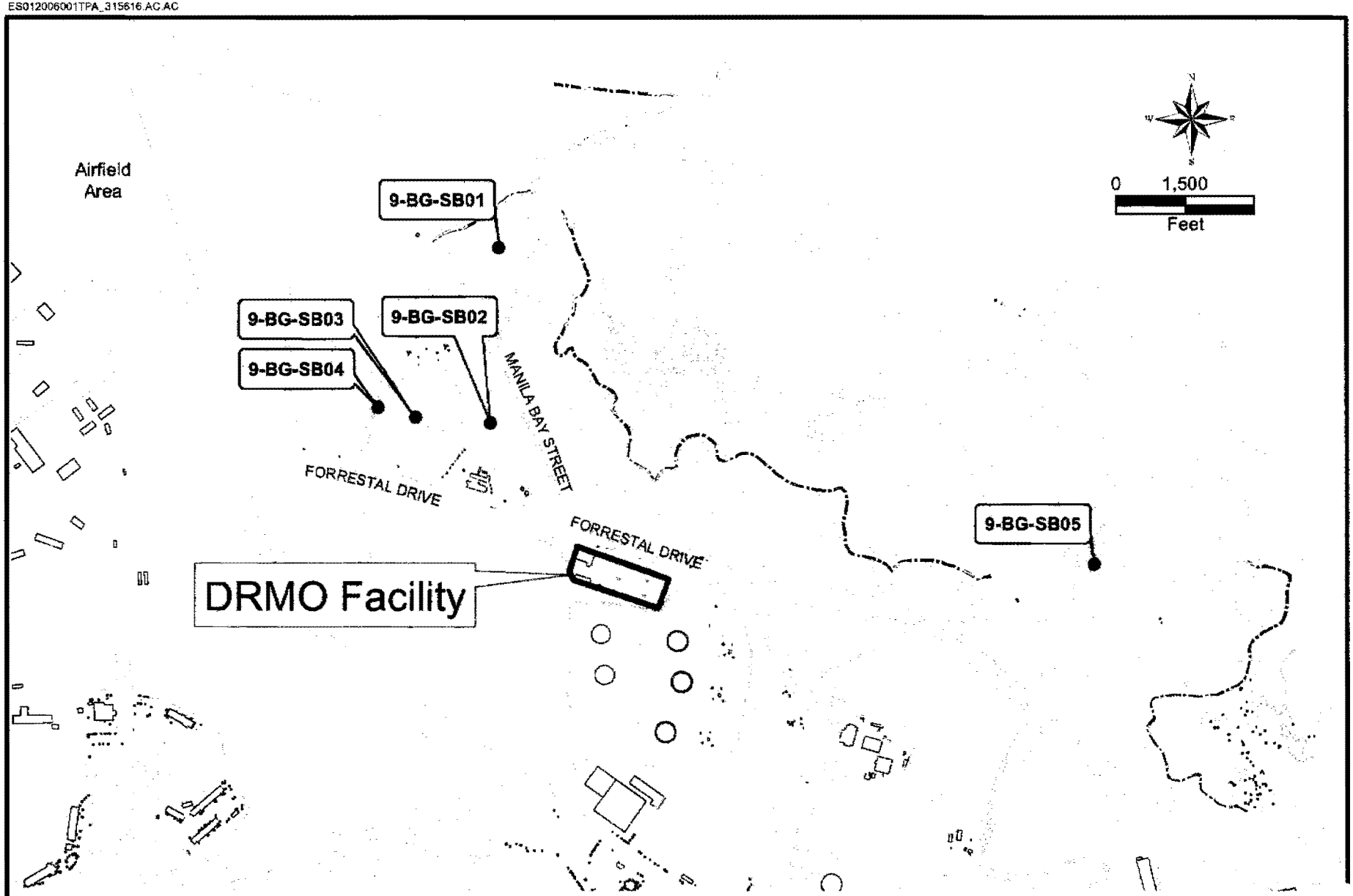

Exhibit 2-2
Locations of Previously Collected Background Soil Samples
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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With respect to the arsenic levels in the soil, clean closure will be achieved when, using the Student's t-test with a 95% CI, the upper limit of the confidence level for the mean arsenic concentration of the sample data must be less than or equal to the background limit (as calculated above), or the EPA Region 3 RBC of 1.91 mg/kg, whichever is higher. The sample data will consist of arsenic concentrations for all of the soil samples collected from the approximate 0.25-acre area that encompasses Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D. This database consists of a total of 50 soil sample concentrations for arsenic.

If this criterion is not met, then the planned site-specific Risk Assessment for the approximate 0.25-acre area encompassing Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D will address the arsenic-impacted soil. The Site-Specific Risk Assessment Work Plan for the planned risk assessment is provided under separate cover.

If the results of the Risk Assessment indicate that arsenic-impacted soils at the site present an unacceptable risk to human health under the future industrial land use condition, then additional soil delineation sampling and remediation may be required. If such a risk to human health is indicated by the Risk Assessment, the Navy will confer with EPA and EQB regarding the path forward to address the arsenic-impacted soils.

2.2 Soil Delineation Sampling for TRPH

As described in the *Closure Sampling Report, Building 2009* (JV I, 2005a), the Adjusted 95% upper confidence interval (UCI) for TRPH (DRO) was 230 mg/kg, which exceeded the closure standard of 100 mg/kg. However, of the 21 samples collected from underneath and around Building 2009, only three of the individual sample concentrations exceeded the closure standard, with concentrations ranging from 101 to 267 mg/kg.

Exhibit 2-3 shows the previous soil sample locations and TRPH (DRO) concentrations. As shown, the three samples that had a TRPH (DRO) concentration exceeding the closure standard of 100 mg/kg occurred in the following locations:

- Outside the building under the pavement at the bottom of the northwest corner of the entrance ramp (SB10)
- Immediately west of the bottom of the entrance ramp (SB8)
- At the southwest corner of the building near the fence line (SB4)

Soil delineation sampling will be conducted in the vicinity of these sample locations, both horizontally and vertically, to delineate the extent of TRPH (DRO)-impacted soils above the closure standard of 100 mg/kg. The details of the soil delineation sampling are provided in Section 3.

With respect to the TRPH (DRO) levels in the soil, clean closure will be achieved when, using the Student's t-test with a 95% CI, the upper limit of the confidence level for the mean TRPH (DRO) concentration of the sample data must be less than or equal to the closure standard of 100 mg/kg. The sample data will consist of TRPH (DRO) concentrations for all of the soil samples collected from the approximate 0.25-acre area that encompasses Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D. This database consists

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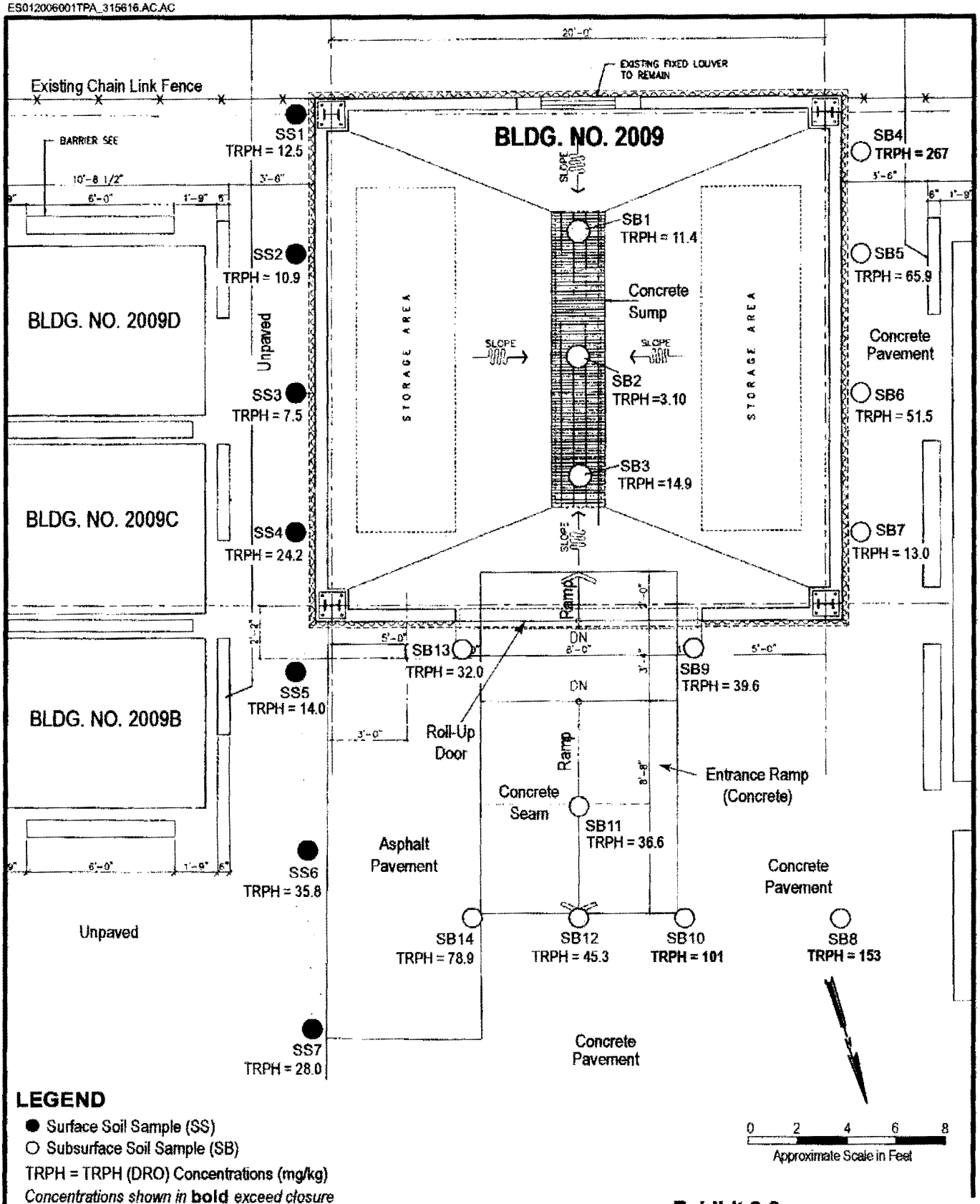

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- ● Surface Soil Sample (SS)
- ○ Subsurface Soil Sample (SB)

TRPH = TRPH (DRO) Concentrations (mg/kg)

Concentrations shown in **bold** *exceed closure standard of 100 mg/kg*

NOTE: Sample IDs are abbreviated. Example: SB1 is an abbreviation for sample NRS 2009ASB1-R01.

Exhibit 2-3

Building 2009 - Locations of Previously Collected Soil Samples and TRPH (DRO) Concentrations

U.S. Naval Activity Puerto Rico

Ceiba, Puerto Rico

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of a total of 21 previously collected soil sample concentrations and the 9 newly proposed soil sample concentrations for TRPH.

If this criterion is not met, then the planned site-specific Risk Assessment for the approximate 0.25-acre area encompassing Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D will address the TRPH-impacted soil. The Site-Specific Risk Assessment Work Plan for the planned risk assessment is provided under separate cover.

If the results of the Risk Assessment indicate that TRPH-impacted soils at the site present an unacceptable risk to human health under the future industrial land use condition, then additional soil delineation sampling and remediation may be required. If such a risk to human health is indicated by the Risk Assessment, the Navy will confer with EPA and EQB regarding the path forward to address the TRPH-impacted soils.

SECTION 3

Field Sampling Plan

The field sampling activities described in this section were designed to meet the sampling and analysis objectives presented in Section 2 to support the achievement of clean closure of the approximate 0.25-acre area encompassing Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D.

Specific Standard Operating Procedures (SOPs) to be used in the execution of the field activities are provided in Appendix A. All personnel conducting field work on NAPR property will be trained and have the appropriate level of experience to successfully complete the sampling activities described in this SAP. In addition, they will be trained and certified in health and safety in accordance with Title 29 of the Code of Federal Regulations Part 1910.120 (29 CFR 1910.120), and will comply with the site Health and Safety Plan (provided under separate cover) during the field work activities.

Equipment calibration and maintenance records that are generated during the field work will be documented in field logbooks, retained, and reviewed as part of the project quality records.

3.1 Mobilization/Demobilization

Mobilization activities will include procurement and rental of necessary field equipment, and initial transport of equipment and supplies to the site. Equipment and supplies will be shipped to the site prior to the mobilization of the field team to NAPR. Mr. Manuel Vargas of the EQB will be notified at least 5 business days prior to sampling activities to provide field oversight. The telephone number for Mr. Vargas is (787) 767-8181, ext. 2849.

Coolers containing sample containers and sampling equipment (coring bits, stainless steel augers, organic vapor meter [OVM], personnel protective equipment [PPE], and supplies) will be stored in one of the offices within Building 1973 at DRMO. The office will be kept clean and access to this room will be controlled to prevent contamination of the equipment and supplies.

Demobilization activities will include time for packaging and return shipping of equipment and disposal of investigation-derived waste (IDW). The only liquid IDW that is expected to be generated during the soil background sampling is a small volume (less than 50 gallons) of potable rinse water used to decontaminate sampling equipment. This water will be collected in clean labeled containers and discharged to the sanitary sewer at NAPR.

With regard to the soil delineation sampling for TRPH (DRO), no more than 50 gallons of rinse water IDW is expected to be generated by the decontamination of sampling equipment. The rinse water IDW will be collected in clean labeled containers. The previous sampling results for rinse water and decontamination fluids during the 2005 closure sampling event at Building 2009 indicated that these liquids were not a characteristic hazardous waste and were approved for discharge to the sanitary sewer at NAPR. If the OVM measurements observed during soil sample collection, and the TRPH (DRO) concentrations in the soil samples are similar to or less than those previously documented, then the rinse water IDW will be discharged to the sanitary sewer at NAPR. On the other hand, if the OVM measurements or the TRPH (DRO) concentrations in the soil

samples are significantly higher than those previously documented, then the rinse water IDW will be disposed offsite at an appropriate, licensed waste management facility.

The only solid IDW that will be generated during the Phase II closure sampling activities described in this SAP will consist of waste paper towels and used PPE, which will be collected in plastic garbage bags. If the OVM measurements observed during soil sample collection, and the TRPH (DRO) concentrations in the soil samples are similar to or less than those previously documented, then the solid IDW will be disposed of in a solid waste dumpster at NAPR, and ultimately in an offsite permitted solid waste landfill.

On the other hand, if the OVM measurements or the TRPH (DRO) concentrations in the soil samples are significantly higher than those previously documented, then the solid IDW will be disposed offsite at an appropriate, licensed waste management facility.

Demobilization will also include general site restoration of sampled areas during the field investigation.

3.2 Decontamination of Personnel and Equipment

During the field investigation activities, personnel and sampling equipment will be decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP contained in Appendix A.

Prior to and between successive sample collection activities, the coring bit used in the collection of soil samples underlying the pavement, and the stainless steel hand auger to be used in the collection of soil samples will be decontaminated as described in Section IV.C of the above-referenced SOP. The sampling probe for the OVM to be used in conducting field screening of soil samples will be decontaminated as described in Section IV.D of the above-referenced SOP.

3.3 Utility Clearance

Utility clearance will be coordinated with the NAPR Public Works Department prior to initiating any intrusive work (soil sampling). No underground utilities should be impacted since only shallow soil samples (0 to 6 inches) will be collected outside of Building 2009 and the other buildings where additional background samples will be collected.

3.4 Background Soil Samples

A total of 24 additional background surface soil samples will be collected for arsenic analysis using SW846 Method 6010B. The 24 samples will be collected from around five separate buildings, as follows:

- Building 1728 - Six surface soil samples
- Building 1759 - Six surface soil samples
- Building 3098 - Three surface soil samples
- Building 3134 - Four surface soil samples
- Building 3084 - Five surface soil samples

Exhibit 3-1 shows the location of each of these buildings within NAPR, and Exhibit 3-2 provides information on the date of construction, square footage, and historical usage of each building. Similar information is provided in Exhibit 3-2 for Building 2009.

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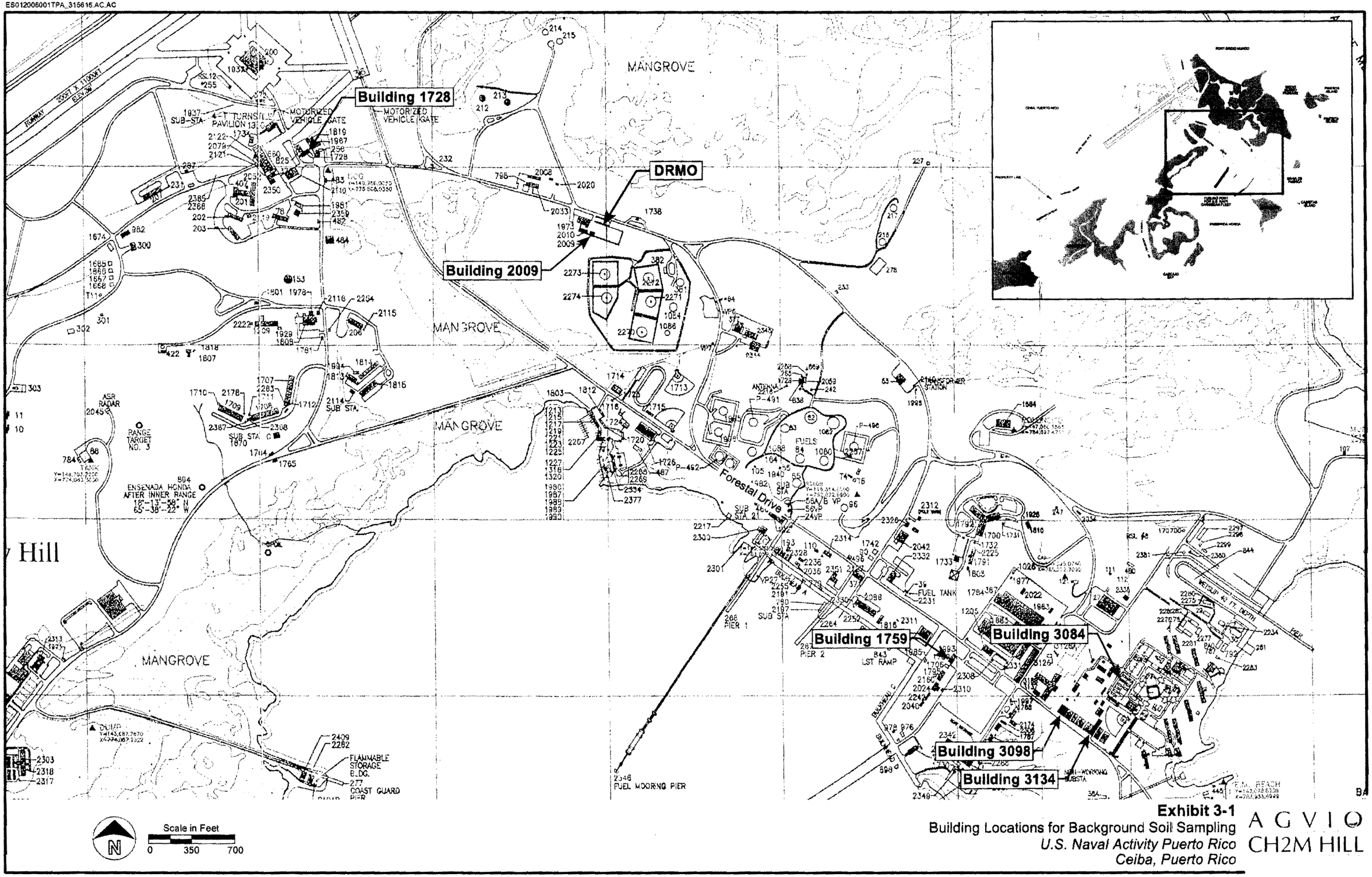

Exhibit 3-1
Building Locations for Background Soil Sampling
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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EXHIBIT 3-2
Building Information
U.S. Naval Activity Puerto Rico

Building	Date of Construction	Area (Ft^2)	Building Usage
2009	1981	360	Hazardous Waste Storage
1728	1971	4,000	Supply Warehouse
1759	1973	7,505	Postal Office
3098	1969	4,000	Tool Room
3134	1980	8,000	Supply Warehouse
3084	1969	960	Enlisted Lounge

All surface soil samples will be collected at a depth of 0 to 6 inches. These samples will be collected with a hand auger. The surface sampling locations relative to Buildings 1728, 1759, 3098, 3134, and 3084 are shown in Exhibits 3-3, 3-4, 3-5, 3-6, and 3-7, respectively. In addition to these samples, a total of seven quality control (QC) samples will be collected and analyzed as follows:

- Three field duplicate samples
- Two matrix spike/matrix spike duplicate (MS/MSD) samples
- One equipment blank
- One field blank

The samples will be placed immediately on ice, and packed in coolers for shipment to the laboratory. The soil samples will be collected in 4-ounce glass jars with Teflon®-lined caps, preserved at 4°C, with a maximum holding time of 6 months. The water samples (equipment and field blanks) will be collected in clean 1,000-milliliter plastic or glass jars with Teflon®-lined caps, preserved with nitric acid to adjust the pH to less than 2 and stored at 4°C, with a maximum holding time of 6 months.

3.5 Soil Delineation Sampling for TRPH

Soil delineation sampling will be conducted in the vicinity of previous sampling locations SB4, SB8, and SB10, where the TRPH (DRO) concentrations exceeded the closure standard of 100 mg/kg. The soil delineation sample locations are shown as samples SB15 through SB21 on Exhibit 3-8, and a total of 20 soil delineation samples will be collected from previous borings SB4, SB8, SB10, and new borings SB15 through SB21. At borings SB4, SB8, and SB10, samples will be collected from the 1 to 2 foot (ft) and 2 to 3 ft depth intervals. At borings SB15 through SB21, samples will be collected from the 0 to 6 inch and 2 to 3 ft depth intervals.

Each of these soil boring locations is located in an area that is paved with concrete. The soil samples to be collected from the 0 to 6 inch depth interval will be collected from 0 to 6 inches directly below the concrete pavement. All of the soil samples will be collected using a concrete coring device to penetrate the concrete pavement, followed by a hand auger to collect the soil samples from beneath the pavement.

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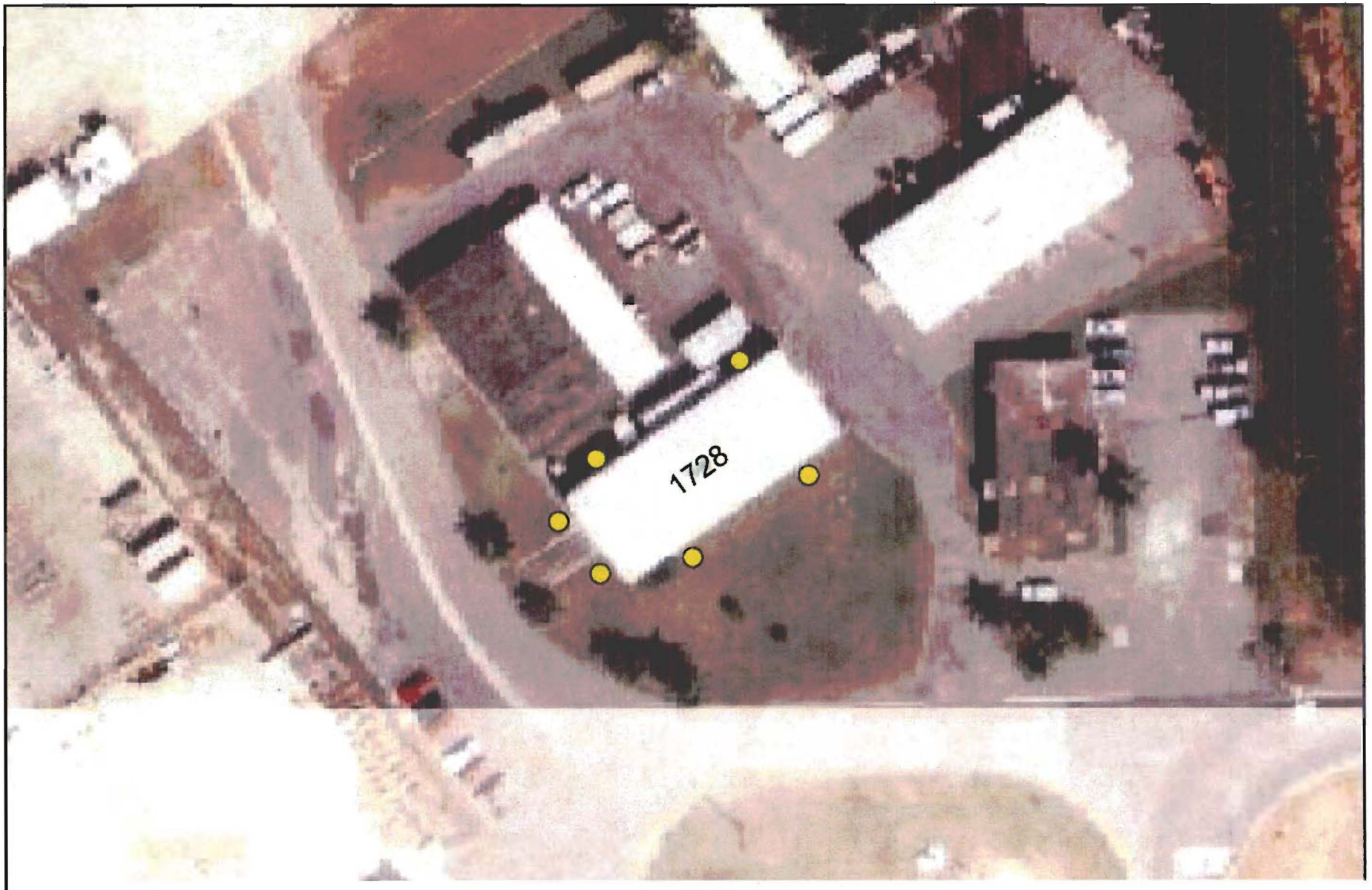

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Background Soil Sample

Exhibit 3-3
Background Soil Sampling Locations at Building 1728
U.S. Naval Activity Puerto Rico
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N

Background Soil Sample

Exhibit 3-4
Background Soil Sampling Locations at Building 1759
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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N

Background Soil Sample

Exhibit 3-5
Background Soil Sampling Locations at Building 3098
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Background Soil Sample

Exhibit 3-6
Background Soil Sampling Locations at Building 3134
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N

Background Soil Sample

Exhibit 3-7
Background Soil Sampling Locations at Building 3084
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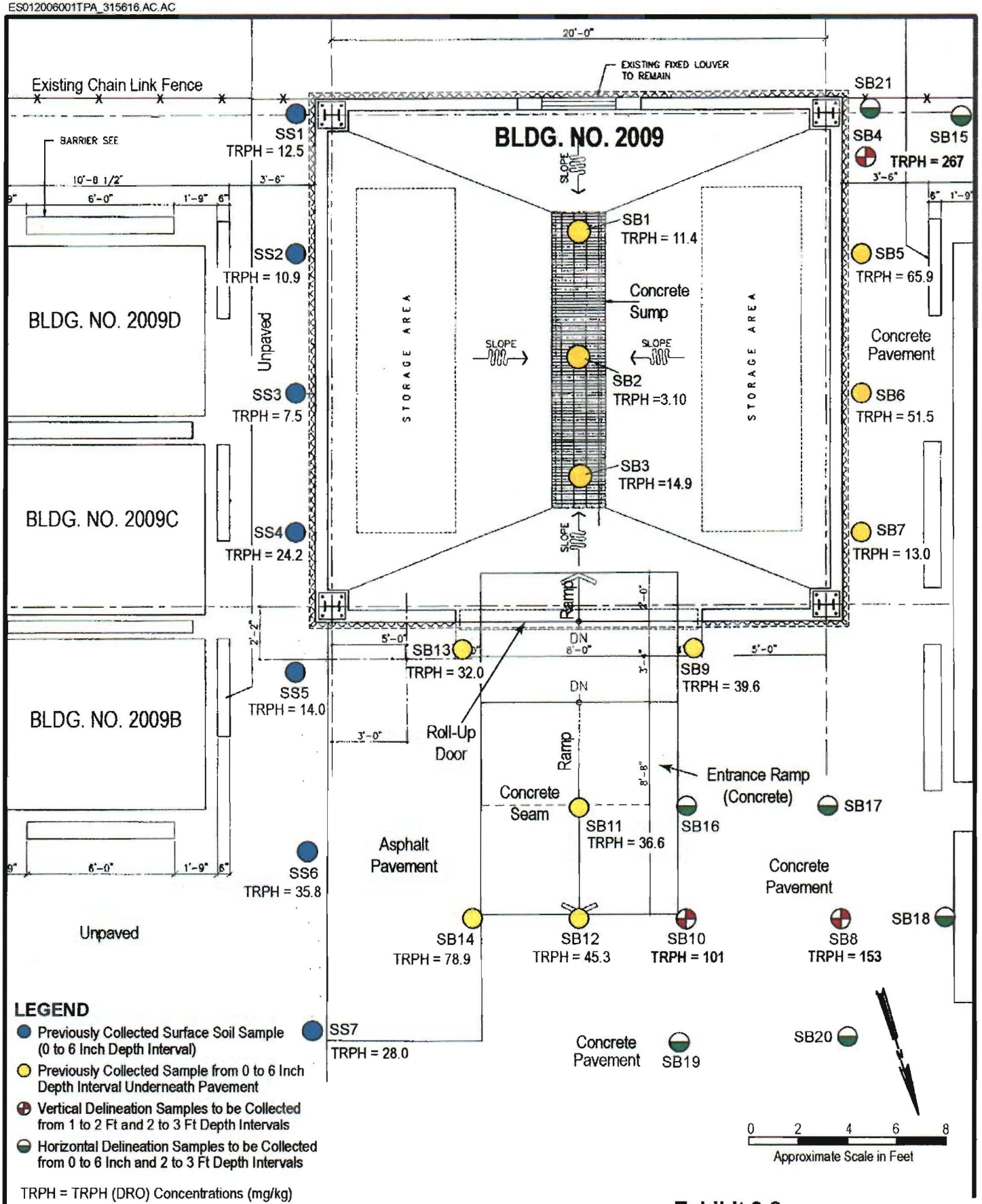

LEGEND

- Previously Collected Surface Soil Sample (0 to 6 Inch Depth Interval)
- Previously Collected Sample from 0 to 6 Inch Depth Interval Underneath Pavement
- Vertical Delineation Samples to be Collected from 1 to 2 Ft and 2 to 3 Ft Depth Intervals
- Horizontal Delineation Samples to be Collected from 0 to 6 Inch and 2 to 3 Ft Depth Intervals

TRPH = TRPH (DRO) Concentrations (mg/kg)

Concentrations shown in **bold** *exceed closure standard of 100 mg/kg*

NOTE: Sample IDs are abbreviated. Example: SB1 is an abbreviation for sample NRS 2009ASB1-R01.

Exhibit 3-8
Building 2009 Soil Delineation Sampling Locations for TRPH (DRO)
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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In addition to the soil samples described above, a total of six QC samples will be collected and analyzed as follows:

- Two field duplicate samples
- Two MS/MSD samples
- One equipment blank
- One field blank

Each sample will be collected for TRPH (DRO) analysis using SW846 Method 8015(B). The samples will be placed immediately on ice, and packed in coolers for shipment to the laboratory. The soil samples will be collected in clean 4-ounce glass jars with Teflon®-lined caps, preserved at 4°C, with a maximum holding time of 14 days. The water samples (equipment and field blanks) will be collected in clean 1-liter amber glass jars with Teflon®-lined caps, preserved with hydrochloric acid to adjust the pH to less than 2 and stored at 4°C, with a maximum holding time of 14 days.

An OVM will be used to screen all soil samples for volatile organic vapors prior to shipping the samples to the laboratory for analysis. The intent of the OVM screening is only to provide a preliminary indication of the degree of potential volatile organic compounds (VOC) contamination of the samples. If an elevated OVM reading is noted, the laboratory will be alerted prior to analysis by indicating on the chain of custody (COC) form that an elevated OVM measurement reading occurred during sample collection. This will allow the laboratory the opportunity to adjust the analytical approach to more accurately measure the anticipated high concentration within the required quality control acceptance criteria for the EPA-approved analytical method. If the OVM readings are elevated, indicating the potential presence of VOCs, then additional sample fractions will be collected for analysis of VOCs and TRPH gasoline range organics (GRO). The VOCs to be analyzed are the target VOCs for the Building 2009 area (benzene, 1,2-dichloroethane, ethylbenzene, methyl-t-butyl-ether, toluene, and total xylenes).

The VOC samples will be collected using an EnCore™ sampler (three each 5 grams), and the samples will be analyzed using SW846 Methods 5035 and 8015B. The samples will be placed immediately on ice, and packed in coolers for shipment to the laboratory. The soil samples will be stored at 4°C, with a maximum holding time of 48 hours to preservation, and 14 days from preservation to analysis. The water samples (equipment and field blanks) will be collected in three clean 40-milliliter vials with Teflon®-lined caps, and analyzed using SW846 Method 8260B. The water samples will be stored at 4°C, with a maximum holding time of 14 days preserved, or 7 days unpreserved.

The TRPH (GRO) samples will be collected in clean, 2-ounce glass jars with Teflon®-lined caps, and the samples will be analyzed using SW846 Method 8015 (GRO). The samples will be placed immediately on ice, and packed in coolers for shipment to the laboratory. The soil samples will be stored at 4°C, with a maximum holding time of 14 days. The water samples (equipment and field blanks) will be collected in three clean 40-milliliter vials with Teflon®-lined caps. The water samples will be preserved with hydrochloric acid to a pH<2, and stored at 4°C, with a maximum holding time of 14 days.

No onsite laboratory will be required for this project. The OVM will be calibrated before being sent to the field and field calibration results will be documented in the field logbook. Where available, calibration materials will be traceable to relevant, recognized performance standards.

3.6 Sample Designation

Sampling locations and samples collected during the investigation will be assigned unique designations to allow the sampling information and analytical data to be entered into the existing Geographic Information System (GIS) Data Management system for NAPR. The existing designation scheme for NAPR will be followed by field personnel. The following sections describe the sample designation specifications.

3.6.1 Specifications for Field Location Data

Field station data is information assigned to a physical location in the field at which some type of sample is collected. For example, each surface soil location will require a name that will uniquely identify it with respect to other surface soil locations, or other types of sampling locations. The station name provides for a key in the database to which any samples collected from that location can be linked, to form a relational database.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all field activities. Each station will be designated by an alphanumeric code that will identify the stations location by facility, site type, site number, station type, and sequential station number. Exhibit 3-9 documents the scheme that will be used to identify field station data.

EXHIBIT 3-9
Field Station Scheme

First Segment	Second Segment	
Facility, Station Type, Site Number	**Station Type**	**Station Number**
AAANNN	**AA**	**NNN**
Facility: NR = NAPR Station Type: S = Site Site Number: 2009 = Building 2009	Station Type: SS = Surface Soil Sample Location SB = Subsurface Soil Sample Location Station Number: Sequential Station Number	

Notes:
"A" = alphabetic
"N" = numeric

3.6.2 Specifications for Analytical Data

Analytical data will be generated through sampling of various media at DRMO. Each analytical sample collected will be assigned a unique sample identifier. The scheme used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is documented below.

3.6.3 Sample Identification Scheme

A standardized numbering system will be used to identify all samples collected during soil sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be

maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the investigations will use the following format.

Each sample will be designated by an alphanumeric code that will identify the facility, site, matrix sampled, and contain a sequential sample number. QA/QC samples will have a unique sample designation. Exhibit 3-10 documents the general guide for sample identification. If one qualifier is pertinent to the sample ID but another is not, only the Exhibit 3-10 applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

EXHIBIT 3-10
Sample Designation Scheme

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	**Sample Type**	**Sample Location + Sample Qualifier**	**Additional Qualifiers (sample depth, sampling round, etc.)**
AAANN	**AA**	**NNNA or NNAA**	**ANN or NNNN**
Facility: NR = NAPR Station Type: S = Site Site Number: 2009 = Building 2009	Sample Type: SS = Surface Soil SB = Subsurface Soil EB = Equipment Blank FB = Field Blank FD = Field Duplicate	Sample Location: 1. Station Samples (NNAN) **NN**AN - refers to sequential station number NN**AN** – alpha numeric qualifier for background sample or sample depth. B1 = Background surface soil sample, 0-6 inches S1 = Subsurface sample, 0-6 inches (directly beneath pavement) S2 = Subsurface sample, 1-2 feet S3 = Subsurface sample, 2-3 feet 2. QC Samples (NNN) **N**NN - numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling N**NN** - refers to month of sampling event	Additional Qualifiers: 1. QC Samples NNNN – refers to day and year of sampling event

Notes:
"A" = alphabetic
"N" = numeric

3.6.4 Labeling

To avoid any misidentification, all sample containers will be labeled immediately prior to the sample being collected. Preprinted labels with spaces for the required information will be available and used to label each container. The information to be provided on the label may be found in the SOP included in Appendix A.

3.6.5 Packaging and Shipping

Samples will be packaged and shipped in accordance with the SOP in Appendix A as follows:

- Sample lids will be properly tightened and checked.
- If samples have not been bagged in the field, sample bottles will be placed in separate Ziplock-type bags and sealed. Bottles will be placed in a cooler with sufficient space between the bottles for bubble wrap. Ziplock-type bags filled with ice (three or four per cooler) will be placed in between and on top of the samples.
- The completed COC form will be placed in a plastic Ziplock-type bag and taped to the inside lid of the cooler. The cooler will be securely taped shut with strapping tape. Signed custody seals will be placed on the front and back hinges of the cooler.
- Coolers will be shipped via Federal Express for next day delivery to the designated laboratory.

3.6.6 Custody Control

Custody seals will be affixed to all sample coolers after sample collection. Custody seals will be taped to the front and back cooler lid to secure the samples in the cooler. A COC record will be included in each cooler before shipping the samples to the analytical laboratory.

SECTION 4

Data Quality Objectives

4.1 Data Quality Objectives

Data quality objectives (DQOs) are the qualitative and quantitative statements which specify the quality of the data required to support the decision-making process during the project activities. The credibility of the data is strengthened by the level of the supporting QA/QC documentation. The greater the importance of the data or the resulting decision, the more QA/QC information that is needed to demonstrate the validity of the data. This reasoning must be applied to the data collected for any project.

Data must be of sufficient quality to support decisions to eliminate sites or individual matrices (for example, soil) from further investigation if contamination is either not present or will not adversely affect human health and the environment, or to justify additional investigation or remediation activities.

The intended use of the data to be collected through the implementation of this SAP will be to determine the following:

- The background concentration of arsenic in soil
- Whether possible past releases of hazardous waste have resulted in soil contamination, through sampling and analysis of soil samples

The overall objective of the data quality is to determine whether the closure standards for soil samples presented in this SAP have been met, whereby the permitted hazardous waste storage area can be deemed closed requiring no further regulatory action. To achieve this DQO, Level IV QC procedures will be implemented. This includes appropriate QC procedures relative to sample collection, preservation, sample shipment, and laboratory analysis, combined with an evaluation of analytical performance through analysis of QC samples.

4.2 QA/QC Procedures

4.2.1 Field QA/QC Procedures

During field sampling activities, appropriate QA/QC will be achieved by strictly following the requirements described in this SAP, including the SOPs provided in Appendix A. In addition, quality control duplicate samples and blank samples will be collected and analyzed to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process. Quality control samples will be collected for all media sampled as part of the DRMO closure activities. Details regarding the collection of QC blank and duplicate samples are provided in the following subsections.

4.2.1.1 Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. American Society for Testing and Materials (ASTM) Type II water will be used for blanks. Three types of blanks will be used or collected during the sampling activities: field blanks, equipment rinseate blanks, and temperature blanks.

One field blank (ambient blank) will be collected per sampling event. If sampling events extend beyond 1 week (5 working days) or for windy and dusty field conditions, the number of field blanks will be increased. Field blanks are used to determine the chemical quality of water used for such procedures as decontamination and blank collection.

One equipment blank per sample medium will be obtained every other day of sampling. Equipment blanks will give an indication of the efficiency of decontamination procedures of the tools and instruments used in the field.

A temperature blank will be included in each cooler containing samples for analyses so that the laboratory can record the temperature without disturbing the samples. The temperature blank will be labeled, but will not be given a sample number, nor will it be listed as a sample on the COC form.

4.2.1.2 Duplicates

Field duplicate samples will be collected at a frequency of one field duplicate per 10 field samples per matrix. The locations from which the duplicates are taken will be selected randomly. Each duplicate sample will be split evenly into two sample containers and submitted for analysis as two independent samples.

4.2.1.3 Matrix Spike/Matrix Spike Duplicate

MS/MSD samples will be collected at a frequency of one MS/MSD for every 20 field samples collected. Analytical results of these samples indicate the impact of the matrix (water, concrete, soil) on extracting the analyte for analysis. MS/MSD samples give an indication of the laboratory's analytical accuracy and precision within the sample matrix. Data validators will use these results to evaluate the accuracy of the analytical data.

4.2.2 Laboratory QA/QC Procedures

All analyses of soil samples will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and SW 846. All laboratory analyses will be performed by a laboratory approved by Naval Facilities Engineering Support Center (NFESC).

The laboratory will follow the scope of work prepared by the project team. A signed certificate of analysis will be provided with each laboratory data package, along with a certificate of compliance certifying that all work was performed in accordance with the Scope of Work (SOW). Analyses will include the proper ratio of field QC samples recommended by NFESC guidance for the DQOs (NFESC, 1999), as described in Section 4.1.

Sample containers and coolers will be supplied by a laboratory that meets EPA Region 2 QA/QC procedures and guidelines. The laboratory will supply clean first-quality sample containers. Custody seals will also be used on each cooler and sample container to prevent tampering prior to sample collection. All tests will be performed within EPA recommended extraction and analysis times. All extracts will be preserved in glass containers with Teflon®-lined septa and stored at 4°C. The laboratory will be required to retain the sample for a minimum of 90 days and sample extracts for a minimum of 60 days after submission, pending the need for re-analysis.

JV I will be responsible for tracking sample analysis and obtaining results from the laboratory. 100 percent of the analytical data generated during the DRMO Phase II closure investigation field program will be validated by an independent third party data validation subcontractor according to EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999) and EPA's *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2004).

4.3 QC Acceptance Criteria

This section presents the QC acceptance criteria that must be met to ensure the analytical data meet the DQO for the project. The analytical data collected through the implementation of this SAP will be evaluated in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). Each of these terms is described in the sections that follow. The QC acceptance criteria to satisfy the DQO for this project relative to the degree of PARCC of the project analytical data are presented in Exhibit 4-1. The quality objectives for the field parameter (OVM) are included in SOPs in Appendix A.

EXHIBIT 4-1
QC Acceptance Criteria – Precision, Accuracy, Representativeness, Completeness, and Comparability

Parameter	Precision[1] (Relative Percent Difference)	Accuracy[1] (Percent Spike Recovery)	Analytical Method	Intended Data Use
		Water		
TRPH (DRO)	≤ 20	50 – 150	SW-846 Method 8015B	Quality control sample analysis
TRPH (GRO)	≤ 20	50 – 150	SW-846 Method 8015B	Quality control sample analysis
VOCs	≤ 20	50 – 150	SW-846 Method 8260B	Quality control sample analysis
Arsenic	≤ 20	75-125	SW-846 Methods 6010B	Quality control sample analysis
		Soil		
TRPH (DRO)	≤ 35	50 – 150	SW-846 Method 8015B	Assess compliance with closure standards
TRPH (GRO)	≤ 35	50 – 150	SW-846 Method 8015B	Assess compliance with closure standards
VOCs	≤ 35	50 – 150	SW-846 Method 8260B	Assess compliance with closure standards
Arsenic	≤ 35	75-125	SW-846 Methods 6010B	Assess compliance with closure standards

[1]Target QC limits until laboratory specific limits are generated.

4.3.1 Precision

Precision is the measure of the agreement or repeatability of a set of duplicate results obtained from repeat determinations made under the same conditions. The precision of a duplicate determination can be expressed as the relative percent difference (RPD), which is determined by the following equation:

$$RPD = \frac{|X1 - X2|}{X1 + X2} \times 200$$

where: X1 = first duplicate value
X2 = second duplicate value

For a given laboratory analysis, the duplicate RPD values are tabulated, and the mean and standard deviations of the RPD are calculated. Control limits for precision usually are plus or minus two standard deviations from the mean.

4.3.2 Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter. Analytical accuracy can be determined by using known reference materials or matrix spikes (MS). Spiking of reference materials into the actual sample matrix is the preferred technique because it quantifies the effects of the matrix on the analytical accuracy.

$$\% R = \frac{SSR - SR}{SA} \times 100$$

Accuracy can be expressed as percent recovery (%R) determined by the following equation:

where: SSR = spiked sample result
SR = sample result (native)
SA = spike added

Accuracy and precision will be monitored by using field duplicate, MS, and MSD samples. These data alone cannot be used to evaluate the accuracy and precision of individual samples, but will be used to assess the long-term accuracy and precision of the analytical method.

4.3.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent parameter variations at a sampling point. Representativeness is a measure of how closely the measured results reflect the actual distribution and concentration of certain chemical compounds in the medium sampled. This SAP and the SOPs describe the procedures to be used for collecting samples. This process will generate samples that are as representative as possible. Documentation of laboratory and field procedures will be used to verify that protocols have been followed and that sample identification and integrity have been maintained.

4.3.4 Completeness

Completeness is defined as the percentage of analytical measurements that are judged to be valid, validity being defined by the QC acceptance criteria. Percent completeness is calculated as the number of analyses meeting all quality criteria divided by the total number of analyses performed, multiplied by 100. The completeness goal for the project is 85 percent.

4.3.5 Comparability

Comparability is the term that describes the confidence with which one data set can be compared to another. Comparability refers to such issues as using standard field and analytical techniques, following the same QA/QC procedures, and reporting data in the same units. This criterion becomes important if more than one field team is collecting samples or more than one laboratory is analyzing samples. Consistency in sampling and laboratory procedures will be maintained throughout the project. In addition, accepted methodologies will be used for sample analysis, and these methods will not be changed during the project.

4.4 Electronic Deliverable File Format

An offsite laboratory will analyze the closure samples for the DRMO Phase II closure investigation and tabulate the results in an electronic format specified by the Closure Project Team. Exhibit 4-2 presents the electronic data deliverable (EDD) specification to be used by the laboratory.

The EDD file from the laboratory will be a comma-delimited ASCII (CDA) file. There will be one file per hard copy report and the filename of the EDD file will be in the format REPORTID.txt or REPORTID.csv, where REPORTID is the hard copy report identifier of sample delivery group.

The first row of the EDD will contain the 47 field name values as listed in the second column of EDD specification (Exhibit 4-2). The attributes for each of the 47 columns to be included in the EDD are presented in the columns titled "Data Type", "Date Length", "Rqmt", and "Description and Comments" in Exhibit 4-2.

The **Data Type** column describes the value in the field as either text (alphanumeric), number (numeric only), date (format: mm/dd/yyyy), or time (24-hour format hh:mm). If the field is conditional or optional and there is no value to be reported, report a null (i.e., no) value. For a text field, do not report a zero-length string (i.e., "").

The **Data Length** column contains the maximum length of a text value for the particular data field.

The **Rqmt** column contains a code indicating whether the value is required (R) for all rows, optional (O) for all rows, or conditional (C) and depends on the type of result reported.

The data validator will add data validation qualifiers to the table of analytical results. In addition to the hard copy data package deliverable, the Project Team will receive an electronic file from the data validator in a table format that will facilitate downloading into a database.

EXHIBIT 4-2
Electronic Data Deliverable Specification for Laboratory Data

Field Number	Field Name	Data Type	Data Length	Rqmt	Description and Comments
1	VersionCode	text	15	R	Code identifying the version of the EDD deliverable.
2	LabName	text	10	R	Identification code for the laboratory performing the work. This value is used to distinguish among different facilities.
3	SDG	text	8	R	Sample delivery group designation. Always populated for all samples, including QC.
4	FieldID	text	13	R	Client sample ID as appears on COC with optional lab-assigned suffixes and/or prefixes to make it unique. If the sample identifier on the COC and the prefix/suffix is greater than 13 characters, abbreviate the value but make it unique. For laboratory QC samples (i.e., method blanks, lab control samples), use a unique lab sample identifier.
5	NativeID	text	13	R	Client sample ID, exactly as on the COC. No prefix or suffix allowed. Used to identify the native sample from which other samples are derived (e.g., QAQCType = "LR", "MS", or "SD"). For laboratory QC samples (i.e., method blanks, lab control samples), use a unique lab sample identifier. For lab blank spike (and blank spike duplicate) samples, use the FieldID value that was assigned to the associated method blank.
6	QAQCType	text	2	R	This is the code for the sample type. Any field sample that is not used as lab QC and is not otherwise marked on the COC should have the designation of "N" (normal field sample). No suffix allowed (i.e., do not add numbers as suffixes to the QAQCType values as is called for in the ERPIMS guidelines). Note that if all analyses for a given sample are diluted, then the first dilution should be designated as the normal sample. If more dilutions are required, then the next dilution should be designated as the first true dilution with a QAQCType value of "LR" and a LRType value of "DL" (see LRType, below).
7	LRType	text	3	C	This is the code for laboratory replicate sample type. Values are: • blank (if QAQCType value is not "LR"), • "DL" (dilution), • "RE" (re-analysis), • "D" (inorganic duplicate), • "CF" (confirmation).

EXHIBIT 4-2
Electronic Data Deliverable Specification for Laboratory Data

Field Number	Field Name	Data Type	Data Length	Rqmt	Description and Comments
					For multiple dilutions or re-analyses of the same sample, append the replicate number after the LRType value (i.e., "RE", "RE2", "RE3", etc.).
8	Matrix	text	5	R	Sample matrix code. Valid values are as follows: "AIR", "WATER", "SOIL", unless otherwise provided by the project data manager and marked on the COC. The use of "liquid", "solid", etc. for lab QC is not allowed.
9	LabSampleID	text	20	R	Laboratory sample ID. Prefix or suffix is allowed. This is where dilutions or re-extractions are noted. Ex: "D97-11111RE" is acceptable.
10	AnalysisMethod	text	20	R	Analysis method code. This is the identifier of the analytical method that was performed on the sample. Example: SW8260A. Generic names such as "EPA" should not be used.
11	ExtractionMethod	text	20	R	Preparation method code. A value in this field is required. If the preparation is described in the method, use "METHOD". If there is no separate preparation required, use "NONE". Note that Total and Dissolved metal analyses are differentiated by the value in this column. Note that Total, TCLP, and SPLP analyses are now differentiated by the value in the LeachMethod column (see below).
12	SampleDate	date		C	Date of sample collection. Value is required for all samples sent to the laboratory and samples derived from those samples. Format: mm/dd/yyyy
13	SampleTime	time		C	Time of sample collection. Value is required for all samples sent to the laboratory and samples derived from those samples. 24-hour format: hh:mm
14	ReceiveDate	date		C	Date of sample receipt in the lab. Value is required for all samples sent to the laboratory and samples derived from those samples. Format: mm/dd/yyyy
15	ExtractDate	date		C	Date of sample preparation (extraction or digestion). Value is required if the ExtractionMethod field value is other than "NONE". Format: mm/dd/yyyy
16	ExtractTime	time		C	Time of sample preparation. Value is required if the ExtractionMethod field value is other than "NONE". 24-hour format: hh:mm

EXHIBIT 4-2
Electronic Data Deliverable Specification for Laboratory Data

Field Number	Field Name	Data Type	Data Length	Rqmt	Description and Comments
17	AnalysisDate	date		R	Date of sample analysis. Value is required for all records. Format: mm/dd/yyyy
18	AnalysisTime	time		R	Time of sample analysis. Value is required for all records. 24-hour format: hh:mm
19	PercentSolids	number		R	Percent solids within the sample. Should be zero for water samples.
20	LabLotCtlNum	text	10	C	Identifier of an autonomous group of environmental samples and associated QC samples **prepared** together. For example, its value can be a digestion or extraction batch ID. If there is no separate extraction or preparation performed, leave this field blank.
21	CAS	text	20	C	CAS number of analyte, if available.
22	ParamID	text	12	R	Parameter identifier code for the parameter listed in the Analyte field.
23	Analyte	text	60	R	Name of analyte, chemical name.
24	Result	text	10	R	Result of the analysis. Surrogate analytes will be reported in units of percent. All others will be reported in sample concentration units. If undetected, report the adjusted MDL or adjusted RL, depending on the project. (Reported as a text field to preserve significant figures.)
25	ExpectedValue	number		C	"100" for surrogates; "0" (zero) for blanks; spike level plus parent result for LCS, and MS/MSD; parent value for lab duplicate; etc.
26	Units	text	10	R	Units of measure used in the analysis. Report "PERCENT" for surrogate analytes and concentration units for all others.
27	Dilution	number		R	Total dilution reported in the analysis. Default value should be 1 (one). This value should reflect changes to sample preparation amounts as defined by the method (e.g., less sample used for standard VOC analysis).
28	MDL	number		C	Minimum detection limit adjusted for preparation and dilution. Note that this value may be the method detection limit or the instrument detection limit, depending on the method and the project requirements. This value is **not** adjusted for percent moisture.
29	RL	number		C	Reporting limit adjusted for preparation and dilution. Value is **not** adjusted for percent moisture. Equivalent to PQL.
30	LabQualifier	text	6	R	Lab qualifier for the results, as reported on

EXHIBIT 4-2
Electronic Data Deliverable Specification for Laboratory Data

Field Number	Field Name	Data Type	Data Length	Rqmt	Description and Comments
					the hard copy. Use "=" as first (or only) qualifier value for detected results.
31	Surrogate	text	1	R	Is the chemical a surrogate? Report "Y" for yes or "N" for no.
32	Comments	text	240	O	Comment field
33	ParValUncert	text	16	C	Radiological parameter value uncertainty.
34	Recovery	number		C	Percent recovery for MS, SD, LCS, and surrogate compounds.
35	LowerControlLimit	number		C	Lower control limit value for spiked compounds, expressed in units of Percent. A value in this field is required if there is a value in the Recovery field (Field No. 34).
36	UpperControlLimit	number		C	Upper control limit value for spiked compounds, expressed in units of Percent. A value in this field is required if there is a value in the Recovery field (Field No. 34).
37	Basis	text	1	R	Weight basis for soil (or solid) sample analysis. Use "D" for dry-weight basis, "W" for wet-weight basis, or "X" if not applicable.
38	ConcQual	text	1	R	Concentration qualifier. Use "=" for detects, "J" for estimated value (value between detection limit and reporting limit), "U" for undetected result, or "E" for exceeded result.
39	MDLAdjusted	number		C	Minimum detection limit adjusted for preparation, dilution **and percent moisture**. See the description of the MDL field (Field No. 28) for an explanation of the contents of this field.
40	RLAdjusted	number		C	Reporting limit adjusted for preparation, dilution **and percent moisture**. Equivalent to PQL
41	SampleDescription	text	20	C	Full sample identifier value as it appears on the COC. In some cases, this may be the name of the sampling location instead of the sample. Required for all samples that are either collected in the field and specified on the COC, or derived from samples that are collected in the field and specified on the COC.
42	LeachMethod	text	20	R	Analytical method used for leaching the sample. This applies to TCLP, SPLP, or other leaching or pre-extraction leaching procedures. Use "NONE" if the sample was not leached.
43	LeachDate	date		C	Date that the leaching method was

EXHIBIT 4-2
Electronic Data Deliverable Specification for Laboratory Data

Field Number	Field Name	Data Type	Data Length	Rqmt	Description and Comments
					performed (start date for multi-date leaching procedures). Value is required if the LeachMethod field value is other then "NONE". Format: mm/dd/yyyy.
44	LeachTime	time		C	Time that the leaching procedure started. Value is required if the LeachMethod field value is other then "NONE". 24-hour format: hh:mm.
45	LeachLot	text	20	C	Identifier of an autonomous group of environmental samples and associated QC samples **leached** at the same time. If the sample was not leached, leave this field blank.
46	AnalysisLot	text	20	R	Identifier of an autonomous group of environmental samples and associated QC samples **analyzed** together. A value in this field is mandatory (i.e., it should not be blank).
47	CalRefID	text	20	C	Identifier of a group of environmental and QC samples linked by a common set of calibration records. All results with the same CalRefID value will have had the same initial calibration run.

Notes:
Each row is uniquely identified by the values in the following fields:

- FieldID
- AnalysisMethod
- ExtractionMethod
- LeachMethod
- ParamID

If an analytical sample must be diluted or reanalyzed and reported in addition to the original analytical sample, the diluted or reanalyzed sample should have a FieldID value that is different that that of the original sample. This can be accomplished through the addition of a suffix to the original FieldID that establishes a new and unique FieldID for the associated records.

SECTION 5

Data Validation and Reporting

5.1 Data Validation

Analytical results will be validated by Navy-approved contractors, who will use EPA Region 2 guidance (*Contract Laboratory Program National Functional Guidelines for Organic Data Review* [EPA, 1999] and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* [EPA, 2004]).

The hard copy data packages will be reviewed by the contractor chemists using the process outlined in EPA's *National Functional Guidelines for Data Review* (EPA, 1999; EPA, 2004). Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by laboratory confirmation samples (LCSs), field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A third party Data Validation Contractor will append a completed EPA Region 2 data validation workbook to each data package and include the marked up Form I's. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes. 100 percent of the raw data will be provided for validation of the data to a QA Level IV.

Data that are not within the acceptance limits will be appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. The following flags will be used in the evaluation:

> **U** - Undetected. Analyte was analyzed for but not detected above the method detection limit (MDL).
>
> **UJ** - Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.
>
> **J** - Estimated. The analyte was present, but the reported value may not be accurate or precise.
>
> **R** - Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

Numerical sample results that are greater than the MDL but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by EPA's *National Functional Guidelines* (EPA, 1999; EPA, 2004).

5.2 Data Quality Evaluation

Analytical data will be collected during this investigation in the form of laboratory analytical results and the database will be populated with data validation qualifier results.

The data quality evaluation (DQE) is the quantitative and qualitative evaluation of overall trends in the project-specific database. The objective of the DQE process is to understand the effects of the overall analytical process on data usability to support project-specific DQOs. The DQE includes an analysis of the effect of the specific sample matrix on the overall analytical process.

The DQE deliverable is a DQE technical memorandum (TM) that will be used by the project team to readily understand project-specific data usability. Topics to be addressed in the DQE TM include the following:

- *Potential blank contamination*—the effect on the usability of data for compounds detected in both the field or laboratory blank samples and the corresponding field samples
- *Laboratory performance*—evaluation of the recovery for blank spike samples such as the LCS, calibration criteria, etc.
- *Potential matrix interferences*—evaluation of the accuracy and precision for surrogates, spiked field samples, and duplicate field sample results
- *Assessment of PARCCs*—comparison of data validation (DV) findings with PARCCs (precision, accuracy, representativeness, comparability, and completeness)

This task also includes the evaluation of validated laboratory data. The data evaluation will include incorporation of historical data from the previous investigations, tabulation of the data, and generation of figures and/or tables associated with data (e.g., sampling location maps).

The Data Validation Contractor will submit both an electronic and hard copy data deliverable to include all data validation qualifiers, and these deliverables will be made part of the overall project file.

SECTION 6

Project Organization

The Navy Technical Representative (NTR) for the Phase II closure investigation of DRMO Building 2009 and former Buildings 2009A, 2009B, 2009C, and 2009D is Mr. Kevin Cloe. Mr. Cloe is the FACLANT representative and provides technical direction on the project and coordinates funding and overall interaction with other agencies and interested parties. Mr. Cloe can be contacted at the address and telephone number listed below.

Mr. Pedro Ruiz and Mr. Hector Nazario are the Public Works Department contacts for NAPR. Mr. Ruiz is responsible for the coordination of DRMO closure sampling activities at NAPR, and Mr. Nazario is responsible for coordination of any possible demolition, construction, or remediation activities at DRMO. Mr. Ruiz and Mr. Nazario can be contacted at the addresses and telephone numbers listed below.

Mr. Kevin Cloe
Navy Technical Representative
FACLANT Code EV12
Naval Facilities Engineering Command
6506 Hampton Blvd.
Norfolk, VA 23508-1278
Attn: Code EV24KC (Mr. Kevin Cloe)
(757) 322-4741

Mr. Pedro Ruiz
U.S. Naval Activity Puerto Rico
Environmental Engineering Division
Public Works Dept. Bldg. 31
Ceiba, Puerto Rico 00735
(787) 865-4152, x459

Mr. Hector Nazario
U.S. Naval Activity Puerto Rico
Resident Officer in Charge of Construction
Public Works Dept. Bldg. 31
Ceiba, Puerto Rico 00735
(787) 865-4066, x225

The JV I Project Manager designated for the management and technical direction of this sampling and analysis project is Mr. Russell Bowen. Mr. Bowen will be responsible for such activities as technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with FACLANT, NAPR, and subcontractors. An organization chart is shown in Exhibit 6-1.

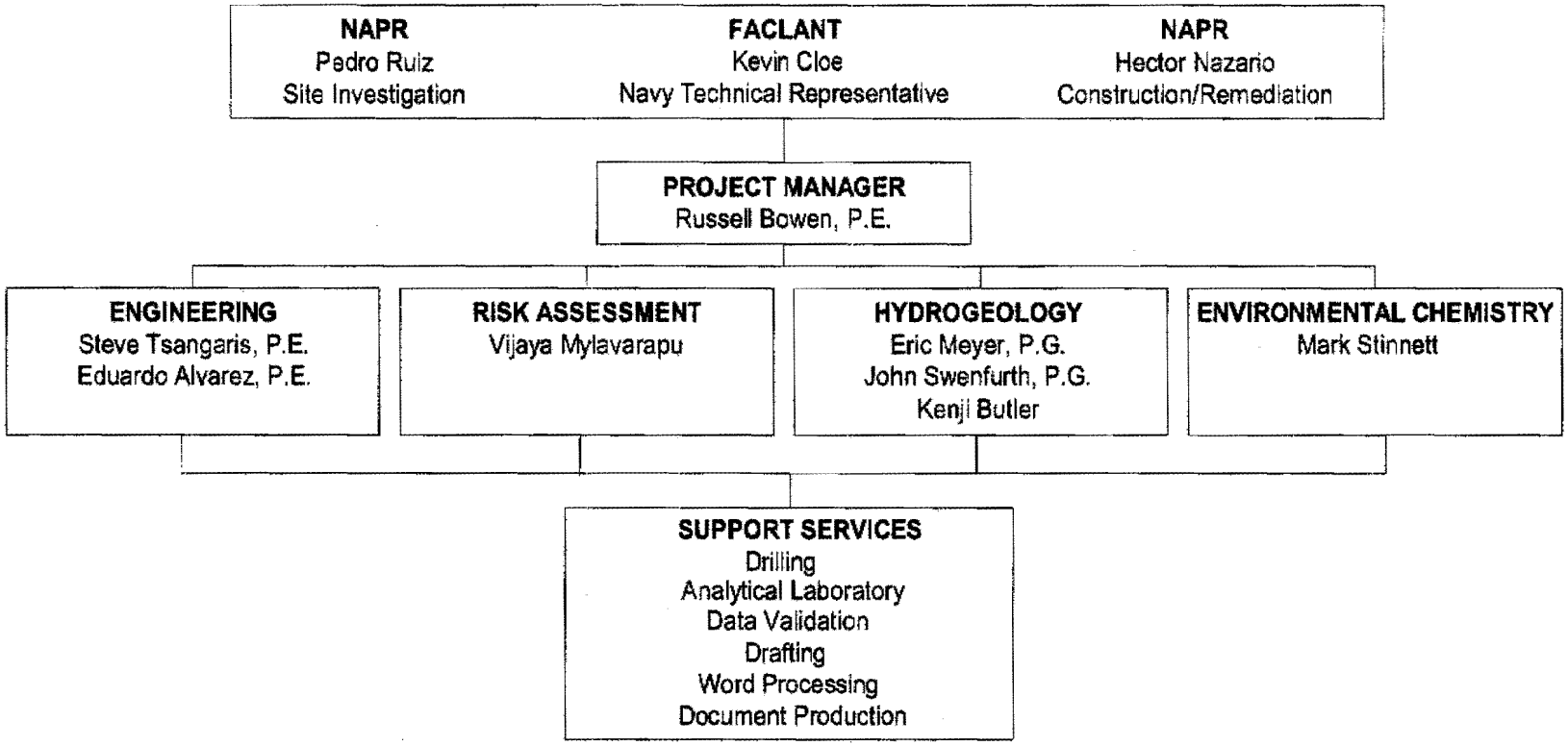

Exhibit 6-1
Organization Chart
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

AGVIQ CH2M HILL

The Phase II closure sampling investigation at DRMO will be performed by qualified JV I staff members. JV I will notify FACLANT and NAPR as to which JV I personnel will mobilize to the site prior to initiating field activities.

Anticipated subcontract services required for the completion of tasks documented in this SAP include analytical laboratory services and data validation.

SECTION 7

References

Baker Environmental, Inc. 1996. *RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7, NSRR, Ceiba, Puerto Rico.*

Baker Environmental, Inc. 2003. *Corrective Measures Study Investigation Report for SWMU 9.* April 25.

JV I. 2005a. *Closure Sampling Report, Building 2009, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico.* December.

JV I. 2005b. *Closure Sampling Report, Building 2009A, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico.* August.

JV I. 2005c. *Closure Sampling Report, Buildings 2009B, 2009C, and 2009D, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico.* August.

JV I. 2005d. *Site-Specific Sampling and Analysis Plan, Building 2009, U.S. Naval Activity Puerto Rico.* April.

JV I. 2004. *Site-Specific Sampling and Analysis Plan, Building 2009, Defense Reutilization and Marketing Office, U.S. Naval Activity Puerto Rico.* December.

NFESC. 1999. *Navy Installation Restoration Chemical Data Quality Manual (IR CDQM).* NFESC Interim Guidance Document.

U.S. Environmental Protection Agency. 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review.*

U.S. Environmental Protection Agency. 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* EPA 540-R-04-004, October.

Appendix A
Table of Contents for Standard Operating Procedures

Standard Operating Procedures attached are the following:

Equipment Blank and Field Blank Preparation

Chain-of-Custody

Decontamination of Personnel and Equipment

Documentation and Records

Preparing Field Log Books

Shallow Soil Sampling

Soil Sampling for VOCs Using the EnCore® Sampler

Volatiles Monitoring by OVM

Disposal of Waste Fluids and Solids

STANDARD OPERATING PROCEDURE

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II grade water)
- HPLC deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

A. Decontaminate all sampling equipment that has come in contact with sample according to SOP *Decontamination of Personnel and Equipment.*

B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used,

remove the disposable tubing after sampling but before decon. When decon is complete, put a 3 to 5 foot segment of new tubing onto the pump to collect the equipment blank.

D. To collect a field blank, slowly pour ASTM Type II water directly into sample containers.

E. Document and ship samples in accordance with the procedures for other samples.

F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II grade water.

STANDARD OPERATING PROCEDURE

Chain-of-Custody

I Purpose

The purpose of this SOP is to provide information on chain-of-custody procedures to be used during the sampling activities.

II Scope

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities. Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over region specific or site-specific requirements for chain-of-custody.

III Definitions

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under one's custody if:

- It is in one's actual possession.
- It is in one's view, after being in one's physical possession.
- It was in one's physical possession and then he/she locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

IV Responsibilities

Project Manager - The Project Manager is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that

other, approved procedures are developed. The Project Manager is responsible for development of documentation of procedures which deviate from those presented herein. The Project Manager is responsible for ensuring that chain-of-custody procedures are implemented. The Project Manager also is responsible for determining that custody procedures have been met by the analytical laboratory. Field Team Leader - The Field Team Leader is responsible for determining that chain-of-custody procedures are implemented up to and including release to the shipper or laboratory. It is the responsibility of the Field Team Leader to ensure that these procedures are implemented in the field and to ensure that personnel performing sampling activities have been briefed and trained to execute these procedures.

Sample Personnel - It is the responsibility of the field sampling personnel to initiate chain-of-custody procedures, and maintain custody of samples until they are relinquished to another custodian, the sample shipper, or to a common carrier.

V Procedures

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is valid. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom, as well as providing security for the evidence as it is moved and/or passed from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain-of-possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

V.1 Sample Identification

The method of identification of a sample depends on the type of measurement or analysis performed. When in-situ measurements are made, the data are recorded directly in bound logbooks or other field data records with identifying information. Information which shall be recorded in the field logbook, when in-situ measurements or samples for laboratory analysis are collected, includes:

- Field Sampler(s);
- CTO Number;
- Project Sample Number;
- Sample location or sampling station number;
- Date and time of sample collection and/or measurement;
- Field observations;
- Equipment used to collect samples and measurements; and,
- Calibration data for equipment used.

Measurements and observations shall be recorded using waterproof ink.

V.1.1 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling and Analysis Plan. Each sample container is identified by a sample label (see Attachment A). Sample labels are provided, along with sample containers, by the analytical laboratory. The information recorded on the sample label includes:

- Project - Contract Task Order (CTO) Number.
- Station Location - The unique sample number identifying this sample.
- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 12/21/85).
- Time - A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type and quantity of preservation added.
- Analysis - VOA, SVOCs, metals, other.
- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

Using only the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing the analysis from knowing the identify of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site).

V.2 Chain-of-Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed.

V.2.1 Field Custody Procedures

- Samples are collected as described in the site Sampling and Analysis Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the Chain-of-Custody Record exactly.

- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once developed, the photographic prints shall be serially numbered, corresponding to the logbook descriptions; photographs will be stored in the project files. It is

good practice to identify sample locations in photographs by including an easily read sign with the appropriate sample/location number.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions, e.g., a logbook notation would explain that a pencil was used to fill out the sample label if the pen would not function in freezing weather.

V.2.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. A Chain-of-Custody Record Form example is shown in Attachment B. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as given below.

- Enter header information (CTO number, samplers, and project name).
- Enter sample specific information (sample number, media, sample analysis required and analytical method grab or composite, number and type of sample containers, and date/time sample was collected).
- Sign, date, and enter the time under "Relinquished by" entry.
- Have the person receiving the sample sign the "Received by" entry. If shipping samples by a common carrier, print the carrier to be used in this space (i.e., Federal Express).
- If a carrier is used, enter the airbill number under "Remarks," in the bottom right corner;
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in a plastic zipper-type bag or other appropriate sample shipping package. Retain the copy with field records.
- Sign and date the custody seal, a 1- by 3-inch white paper label with black lettering and an adhesive backing. Attachment C is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seal across the shipping container opening so that it would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the shipping container (enclosed with other documentation in a plastic zipper-type bag). As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

VI Quality Assurance Records

Once samples have been packaged and shipped, the Chain-of-Custody copy and airbill receipt becomes part of the quality assurance record.

VII References

USEPA. *User's Guide to the Contract Laboratory Program.* Office of Emergency and Remedial Response, Washington, D.C. (EPA/540/P-91/002), January 1991.

Attachment A
Example Sample Label

Station:

_____ **Client Name**

Analysis: _____

Sample ID _____ Matrix: _____ Pres: _____

Lab: _____ Bottle: _____

Sampled By:_____ Date/Time: / /

Attachment B
Example Chain-of-Custody Record

CH2M HILL Applied Sciences Laboratory
CHAIN OF CUSTODY RECORD

CVO 2300 NW Walnut Boulevard
Corvallis, OR 97330-3538
(541) 752-4271 FAX (541) 752-0276

Project/Contact Information	
Project #	
Project Name	
Report Copy to	
Company Name/Contact	

THIS AREA FOR LAB USE ONLY		
Lab #	Pg 1	of 1
Lab PM	Custody Review	
Log In	LIMS Verification	
pH	Cust Seals Y N Ice Y N	
QC Level 1 2 3		
Cooler Temperature		

Requested Analysis

Preservative

Sampling		Type		Matrix			Client Sample ID (9 Characters Max)	LAB QC	Total Number of Containers	Alternate Description	Lab ID
Date	Time	Comp	Grab	Water	Soil	Air					

Sampled By	Relinquished By	
Received By	Relinquished By	
Received By	Date/Time	
Special Instructions		

File: Lab_COC.xls

Attachment C
Example Custody Seal

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CUSTODY SEAL

Date

Signature

STANDARD OPERATING PROCEDURE

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water)
- Distilled water
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) Alconox® and water solution
- Concentrated (V/V) high-grade isopropyl
- Large plastic pails or tubs for Alconox® and water, scrub brushes, squirt bottles for Alconox® solution, isopropyl and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Phthalate-free gloves
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. Personnel Decontamination

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Alconox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Alconox® solution, remove, and discard into DOT-approved 55-gallon drum.
2. Wash outer gloves in Alconox® solution, rinse, remove, and discard into DOT-approved 55-gallon drum.
3. Remove disposable coveralls ("Tyveks") and discard into DOT-approved 55-gallon drum.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the work day, shower entire body, including hair, either at the work site or at home.
7. Sanitize respirator if worn.

B. Sampling Equipment Decontamination—Water Sampling Pumps

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Spread plastic on the ground to keep hoses from touching the ground
3. Turn off pump after sampling. Remove pump from well and place pump in decontamination tube, making sure that tubing does not touch the ground
4. Turn pump back on and pump 1 gallon of Alconox® solution through the sampling pump.
5. Rinse with 1 gallon of 10% isopropyl solution pumped through the pump. (DO NOT USE ACETONE).
6. Rinse with 1 gallon of tap water.
7. Rinse with 1 gallon of deionized water.
8. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.
9. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
10. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

C. Sampling Equipment Decontamination—Other Equipment

Reusable sampling equipment is decontaminated after each use as follows:

1. Don phthalate-free gloves.
2. Before entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Alconox® solution.
5. Rinse with potable water.
6. Rinse with distilled or potable water and isopropyl solution (DO NOT USE ACETONE).
7. Air dry.
8. Rinse with deionized water.
9. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
10. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
11. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

D. Health And Safety Monitoring Equipment Decontamination

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Alconox® solution, then a towel wet with isopropyl solution, and finally three times with a

towel wet with distilled water. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

E. Sample Container Decontamination

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Alconox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

F. Heavy Equipment And Tools

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Navy
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of Alconox®, isopropyl, and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

STANDARD OPERATING PROCEDURE

Documentation and Records

I. Purpose and Scope

The purpose of this guideline is to provide guidance for the documentation of records taken in the field in the form of field notebooks and/or field logbooks.

II. Field Notebooks

Field notebooks are maintained to document field equipment maintenance and contain calibration logs and field forms, as described below. The notebooks provide centrally-located three-ring binders, for information which is not recorded in sequentially-numbered, bound site or field logbooks. As an alternate method to using the field equipment and forms notebooks, the information maintained in these notebooks may be documented in the field logbooks. General site information should be documented into the field notebook that includes:

- Site name, personnel onsite and time and date of arrival
- Ambient weather conditions
- Documentation of field activities including decontamination, sampling, and preparation.
- Lot number and brand name for solvent and acid decontamination solutions and analyte-free water used for equipment and field blanks.

Calibration Logs

Calibration logs may be included in the field equipment notebooks and are used to document the proper maintenance and calibration of field testing equipment. All equipment will be inspected and approved by the Field Team Leader before being used, and a calibration log sheet shall be maintained for each instrument used on-site and shall be kept in the logbook. The calibration log will document:

- Name and identifying number of the instrument
- Date calibrated
- Calibration points
- Identification of the calibrator
- Manufacturer, lot number, and expiration date of calibration standards
- Results of the calibration.

Field Forms

Field forms may also be kept in the field notebook if using a three-ring binder form. Field forms include the following:

- Soil boring log
- Instrument Calibration log

III Attachments

Soil Boring Log Sample Form
Instrument Calibration Form

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PROJECT NUMBER	BORING NUMBER SHEET 1 OF 1

SOIL BORING LOG

PROJECT : LOCATION : DATE:

WEATHER: DRILLING CONTRACTOR :

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : START : END : LOGGER :

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.5						
1.0						
1.5						
2.0						
2.5						

Sampler Signature: _____ Date: _____

FIELD INSTRUMENT CALIBRATION LOG

Site Name/Activity: _____

Date: _____

Calibrator: _____

Equipment Make and Model: _____

Serial Number: _____

CONDUCTIVITY

Model: _____ SN#: _____

Initial reading _____ ( ) Calibrated reading _____

At a temperature of _____ °C Standard used: _____

Standard Make and Lot Number: _____ Expiration Date: _____

Calibration check _____ Temp _____ Time _____

PID

Model: _____ SN#: _____

Initial Reading: _____ Calibrated Reading: _____

Calibration Gas: _____ Regulator: _____

Calibration Check: _____

pH _____ Initial Reading _____ Calibrated Reading: _____

At a temperature of _____ °C

Buffer Make and Lot Number: _____

Calibration check _____ Temp _____ Expiration Date: _____

pH _____ Initial Reading _____ Calibrated Reading: _____

At a temperature of _____ °C

Buffer Make and Lot Number: _____ Expiration Date: _____

Calibration check _____ Temp _____ Time _____

TURBIDIMETER

Model: _____ SN#: _____

Standar: _____ _____ _____

Calibrated Reading: _____ _____ _____

DISSOLVED OXYGEN

Model: _____ SN#: _____

Initial Reading: _____ Mg/L ____ % Sat. in Ambient Air

Calibrated Reading: _____ Mg/L _____ % Sat

Barometric Pressure: Set at _____ Mbs .

Calibration check _____ Temp _____ Time _____

ORP

Initial: _____

Calibrated: _____

Temperature: _____

Standard: _____ Check: _____ at _____

Time: _____

SIGNED: _____ Date _____

STANDARD OPERATING PROCEDURE

Preparing Field Log Books

I. Purpose

To provide general guidelines for entering field data into log books during site investigation and remediation field activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement of much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. Procedures For Completing Field Log Books

1. Field notes commonly are kept in bound, orange-covered logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.
2. On the inside cover of the log book the following information should be included:
   - Company name and address
   - Log-holders name if log book was assigned specifically to that person
   - Activity or location
   - Project name
   - Project manager's name
   - Phone numbers of the company, supervisors, emergency response, etc.
3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used

should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."

4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.
5. Daily entries will be made chronologically.
6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.
7. Each page of the log book will have a the date of the work and the note takers initials.
8. The final page of each day's notes will include the note-takers signature as well as the date.
9. Only information relevant to the subject project will be added to the log book.
10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. Information To Be Included In Field Log Books

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.
2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.
3. Scope: Describe the general scope of work to be performed each day.
4. Weather: Record the weather conditions and any significant changes in the weather during the day.
5. Tail Gate Safety Talks: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/ problems, and other pertinent information.
6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.
7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.
8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.

9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.
10. Time: Keep a running time log explaining field activities as they occur throughout the day.
11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.
12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.
13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.
14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.
15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.
16. Any conditions that might adversely affect the work or any data obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).
17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:
    - Description of the general sampling area – site name, buildings and streets in the area, etc.
    - Station/Location identifier
    - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
    - Sample matrix and type
    - Sample date and time
    - Sample identifier
    - Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples
    - Number and type of sample containers collected
    - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
    - Parameters to be analyzed for, if appropriate

- Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. Suggested Format For Recording Field Data

1. Use the left side border to record times and the remainder of the page to record information (see attached example).
2. Use tables to record sampling information and field data from multiple samples.
3. Sketch sampling locations and other pertinent information.
4. Sketch well construction diagrams.

V. Attachments

None.

STANDARD OPERATING PROCEDURE

Shallow Soil Sampling

I. Purpose

To provide general guidelines for the collection and handling of surface soil samples during field operations.

II. Scope

The method described for surface soil sampling is applicable for loosely packed earth and is used to collect disturbed-soil samples.

III. Equipment and Materials

- Sample jars.
- A hand auger or trowel that can be used to remove the soil from the ground. Only stainless steel, Teflon®, or glass materials should be used.
- A stainless steel spatula should be used to remove material from the sampling device.
- Unpainted wooden stakes or pin flags
- Fiberglass measuring tape (at least 10 feet in length)

IV. Procedures and Guidelines

A. Wear protective gear, as specified in the Health and Safety Plan.

B. To locate samples, identify the correct location using the pin flags or stakes. Proceed to collect a sample from the undisturbed soil adjacent to the marker following steps C and D. If markers are not present, the following procedures will be used.

1. Use measuring tape to position sampling point at location described in the sampling plan by taking two measurements from fixed landmarks (e.g., corner of building or concrete sump).
2. Note measurements, landmarks, and sampling point on a sketch in the field notebook, and on a site location map.
3. Proceed to sample as described in Section C below.
4. Repeat steps "a" through "c" above until all samples are collected from the area.

C. To the extent possible, differentiate between fill and natural soil. If both are encountered at a boring location, sample both as prescribed in the field sampling plan. Do not locate samples in debris, tree roots, or standing water. If an obstacle prevents sampling at a measured grid point, move as close as possible, but up to a distance of one half the grid spacing in any direction to locate an appropriate sample. If an appropriate location cannot be found, consult with the Field Team Supervisor (FTS). If the FTS concurs, the

sampling point will be deleted from the program. The FTS will contact the JV I project manager (PM) immediately. The PM and Navy Technical Representative (NTR) will discuss whether the point should be deleted from the program. If it is deleted, the PM will follow-up with the NTR in writing.

D. To collect samples:

1. Use a decontaminated stainless steel scoop/trowel to scrape away surficial organic material (grass, leaves, etc.) adjacent to the stake. New disposable scoops or trowels may also be used to reduce the need for equipment blanks.
2. If sampling:
   a. Surface soil: Collect the sample by scooping soil using the hand auger or trowel, starting from the surface and digging down to a depth of 6 inches.
   b. Subsurface soil (beneath pavement). Obtain the subsurface soil sample directly beneath the pavement using an auger to the depth of 6 inches.
3. Record lithologic description and any pertinent observations (such as discoloration) in the logbook.
4. Empty the contents of the scoop/trowel into a decontaminated stainless steel pan.
5. Repeat this procedure until sufficient soil is collected to meet volume requirements.
6. While soil sample is in stainless steel pan, screen the sample for VOCs by measuring organic vapors directly above the sample using an Organic Vapor Monitor (OVM), and record the OVM reading in the field logbook. Follow the *Volatiles Monitoring by OVM* SOP when using the OVM.
7. Transfer sample for analysis into appropriate containers with a decontaminated utensil.
8. Backfill the hole with original soil retrieved from the hole or with concrete, as appropriate. To the extent possible, replace topsoil and grass and attempt to return appearance of sampling area to its pre-sampled condition.

V. Attachments

None.

VI. Key Checks and Items

- Phthalate-free latex or surgical gloves and other personal protective equipment.
- Transfer volatiles first, avoid mixing.
- Decontaminate utensils before reuse, or use dedicated, disposable utensils.

STANDARD OPERATING PROCEDURE

Soil Sampling for VOCs Using the EnCore® Sampler

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for obtaining all VOC samples of surface and subsurface soils of suitable characteristics using the EnCore® Sampler.

II. Equipment and Materials

- The EnCore® Sampler 5g or 25g versions
- Reusable T-handle with a plunger
- 40 mL VOA vial
- 2 oz wide mouth jar

III. Procedures and Guidelines

The sampling point is located and recorded in the field logbook. Debris should be cleared from the sampling location. The EnCore® sampler is being used to collect, store and deliver soil in a sealed, headspace-free state.

A. **Surface and Shallow Subsurface Sampling**

A shovel, post-hole digger, or other tool can be used to remove soil to a point just above the interval to be sampled. Remove EnCore® sampler from package and attach handle. Quickly collect a 5 or 25 gram sample using the EnCore® sampler. Attach the cap. Fill out a label and attach to sampler. Ship one EnCore® Sampler per sample location. If low-level analyses are needed, two additional EnCore® samplers will be required. **The EnCore® sampler has to reach the lab for preservation within 48 hours.** Please refer to the SOP *Packaging and Shipping Procedures* for guidance on shipping. The soils removed from the borehole should be visually described in the field log book, including approximated depths.

When sampling is completed, photo-ionization device (PID) readings should be taken directly above the hole, and the hole is then backfilled.

B. **Split-Spoon Sampling**

Using a drilling rig, a hole is advanced to the desired depth. For split-spoon sampling, the samples are then collected following the ASTM D 1586 standard (attached). The sampler is lowered into the hole and driven to a depth equal to the total length of the sampler; typically this is 24 inches. The sampler is driven in 6-inch increments using a 140-pound weight

("hammer") dropped from a height of 30 inches. The number of hammer blows for each 6-inch interval is counted and recorded. To obtain enough volume of sample for subsequent laboratory analysis, use of a 3-inch ID sampler may be required. Blow counts obtained with a 3-inch ID spoon would not conform to ASTM D 1586 and would therefore not be used for geotechnical evaluations.

Once retrieved from the hole, the sampler is carefully split open. Care should be taken not to allow material in the sampler to fall out of the open end of the sampler. To collect the sample, the surface of the sample should be removed with an empty EnCore® Sampler. Samples collected for volatiles analysis should be placed directly into the sample containers from the desired depth in the split spoon.

Split-spoon samples also will be collected using a tripod rig. When using a tripod rig the soil samples are collected using an assembly similar to that used by the drilling rig.

IV. Attachments

None

V. Key Checks and Preventative Maintenance

Check that sample collection is swift to avoid loss of volatile organics during sampling.

STANDARD OPERATING PROCEDURE

Volatiles Monitoring by OVM

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for the calibration and use of an OVM Organic Vapor Monitor. This is a broad guideline for field use of an OVM; for specific instruction, refer to the operator's manual.

II. Equipment and Materials

- Operations manual
- An OVM hand readout unit and side pack assembly
- 100 ppm isobutylene as calibration gas
- T-type feeder tube with 1.5 liter/min. regulator

III. Procedures and Guidelines

ONLY PROPERLY TRAINED PERSONNEL SHOULD USE THIS INSTRUMENT. FOR SPECIFIC INSTRUCTIONS, SEE OPERATIONS MANUAL.

OVM, Organic Vapor Monitor

1. Introduction

   The OVM Organic Vapor Monitor is designed to detect organic materials in air. It uses a photo-ionization detector (PID) as its detection principle. This detector allows the monitor to respond to a wide variety of organic compounds.

2. Operational Checks
   - See basic operating instructions in operations manual.
3. Calibration
   - See basic operating instructions in operations manual.

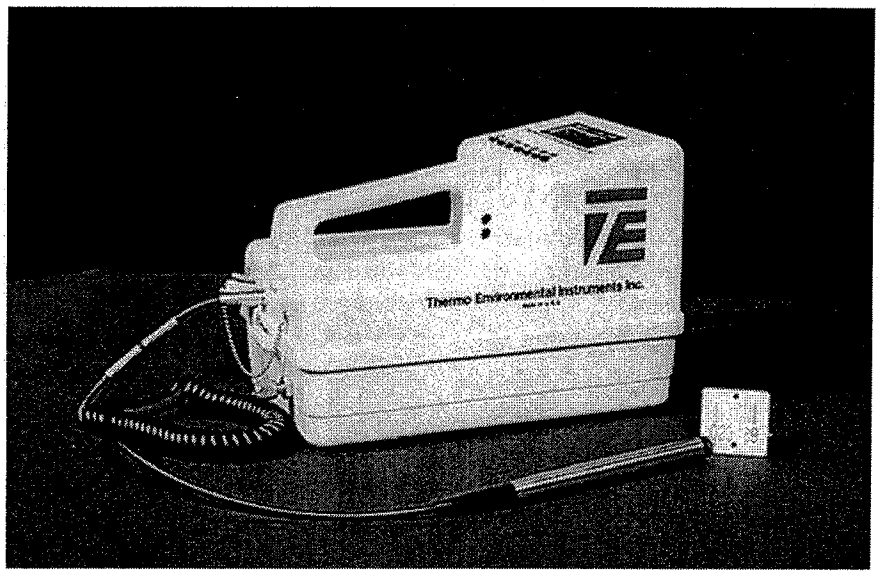
IV. Key Checks and Preventive Maintenance

- Check battery.
- Zero and calibrate at least once every day prior to monitoring.
- Verify sensor probe is working.
- Recharge unit after use.

A complete preventive maintenance program is beyond the scope of this document. For specific instructions, refer to the operations manual. Some key issues are discussed below:

- A complete spare instrument should be available whenever field operations require volatiles monitoring.
- Spare parts should be on hand so minor repairs may be made in the field.
- Batteries should be charged daily.

- Occasionally allow the batteries to totally discharge before recharging to prevent battery memory from occurring.



OVM Datalogger

Calibration Check

Ready Instrument

1. Check to see what lamp is in the instrument.
2. Power-up instrument by plugging in the power plug or the charger cable.

Start Up Instrument

1. Press "ON/OFF" key to ignite lamp and initiate sample pump. The words "LAMP OUT" will be displayed until lamp is ignited. Unit is then operational.

Setting Zero

1. Press "MODE/STORE" key.
2. Using "-/CRSR" key, scroll through: "LOG THIS VALUE"- "R/COMM"- "CONC METER"- "FREE SPACE"-- "RESET TO CALIBRATE." Display should read "RF=1.00".
3. If RF needs to be changed, hold down "RESET" while pressing "-/CRSR" to select cursor position. Then use "+/INC" key to set response factor (RF) to "1.00". Release RESET key only when selection is made.
4. Using "-/CRSR" key, scroll to "LAMP." Verify LAMP setting: If the setting needs to be changed, press "RESET", press "+/INC" for 10 EV LAMP. Press "-/CRSR" for 11 EV LAMP. Press "RESET".
5. Using "-/CRSR" key, scroll through "LAMP"- "ALM"- "AVERAGE"- "LOC. CODE MODE"- "AUTO LOGGING"- "CONC METER"- "FREE SPACE". Display should read "RESET TO CALIBRATE". Press "RESET" key.

6. Press "-/CRSR" in response to "RESTORE BACKUP" prompt.
7. Press "RESET" key. Instrument will zero to ambient air. (Note: Zero gas or a zero filter may be used to set the unit to an absolute zero -- connect prior to pressing "RESET" key.)

Calibration Check and Adjustment

1. Instrument should display "SPAN PPM = - + TO CONTINUE".
2. Press "RESET" and "-/CRSR" keys simultaneously to select cursor position.
3. Press "RESET" and "+/INC" keys simultaneously to scroll through preset SPAN values. Set SPAN = 100, which corresponds to the 100 ppm isobutylene.
4. When span has been entered, press "+/INC" key to continue.
5. Connect span gas cylinder. Turn valve on. Press "RESET" key.
6. When finished calibrating, display will read "RESET TO CALIBRATE". Press "MODE/STORE" key. Display should read about 100 ppm. Turn valve off. Disconnect span gas cylinder.

Troubleshooting

When the analyzer is operating, dust or other foreign matter could be drawn into the probe, forming deposits on the surface of the UV lamp or in the ion chamber. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, drifting, or show apparent moisture sensitivity. These deposits interfere with the ionization process and cause erroneous readings.

- If the battery is low, recharge the instrument.
- Drifting readings can mean that the lamp is dirty and needs to be cleaned.
- Humidity can cause false readings.
- High methane concentrations can result in false low readings.

STANDARD OPERATING PROCEDURE

Disposal of Waste Fluids and Solids

I. Purpose and Scope

This SOP describes the procedures used to dispose of hazardous fluid and solid materials generated as a result of the site operations. This SOP does not provide guidance on the details of Department of Transportation regulations pertaining to the transport of hazardous wastes; the appropriate Code of Federal Regulations (49 CFR 171 through 177) should be referenced. Also, the site investigation-derived waste management plan should be consulted for additional information and should take precedence over this SOP.

II. Equipment and Materials

A. Fluids

- DOT-approved 55-gallon steel drums or Baker® Tanks
- Tools for securing drum lids
- Funnel for transferring liquid into drum
- Labels
- Marking pen for appropriate labels
- Seals for 55-gallon steel drums

B. Solids

- DOT-approved 55-gallon steel drums
- Tools for securing drum lids
- Plastic sheets
- Labels
- Marking pen for appropriate labels

III. Procedures and Guidelines

A. Methodology

Clean, empty drums will be brought to the site by the subcontractor for wastewater collection and storage. The empty drums will be located at the field staging area and moved to field locations as required. The drums will be filled with the wash water, rinse water, and decon fluids, and capped, sealed, and moved to the onsite drum storage area by the subcontractor. The drums will be labeled as they are filled in the field and labels indicating that the contents are potentially hazardous affixed.

The drum contents will be sampled to determine the disposal requirements of the wash and rinse waters. Compositing of the sample will be accomplished by collecting a specific volume of the water in each drum into a large sample container.

B. Labels

Drums and other containers used for storing wastes from cleaning operations will be labeled when accumulation in the container begins. Labels will include the following minimum information:

- Container number
- Container contents
- Origin (source area)
- Date that accumulation began
- Date that accumulation ended
- When laboratory results are received, drum labels will be completed or revised to indicate the hazardous waste constituents in compliance with Title 40 of the Code of Federal Regulations, Part 262, Subpart C.

C. Fluids

Wash water, rinse water, and decontamination fluids generated during cleaning of the facility will be collected in 55-gallon, closed-top drums. When a drum is filled, the bung will be secured tightly. Fluids may also be transferred to Baker® Tanks after being temporarily contained in drums to minimize the amount of drums used.

When development and purging is completed, the water will be tested for appropriate hazardous waste constituents. Compositing and sampling of fluids will comply with applicable state and federal regulations.

D. Solids

The solid waste stream will include plastic sheeting used for decontamination pads, Tyveks, disposable sampling materials, and any other disposable material used during the field operations that appears to be contaminated. These materials will be placed in designated drums.

E. Storage and Disposal

The wastes generated at the site at individual locations will be transported to the fenced drum storage area by the subcontractor.

Waste solid materials that contain hazardous constituents will be disposed of at an offsite location in a manner consistent with applicable solid waste, hazardous waste, and water quality regulations. Transport and disposal will be performed by a commercial firm under subcontract.

The liquid wastes meeting acceptable levels of discharge contamination may be disposed of through the sanitary sewer system at the site. Prior to disposal to the sanitary sewer system, contract arrangements will be made with the appropriate authorities. Wastes exceeding acceptable levels for disposal through the sanitary sewer system will be disposed of through contract with a commercial transport and disposal firm.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

Check that representative samples of the containerized materials are obtained.