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REVISED FINAL
REMEDIAL ACTION WORK PLAN
OPERABLE UNIT NO. 12 (SITE 3)
REMEDIATION OF PAH CONTAMINATED SOIL
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 Site Background 1-2
1.2 Site Description 1-3
1.3 Site History 1-3
1.4 Previous Investigations 1-4
1.5 Treatability Study 1-5

2.0 REMEDIAL ACTION OBJECTIVES 2-1
2.1 Remedial Action Objectives for Soil 2-1

3.0 ENVIRONMENTAL PROTECTION PLAN 3-1
3.1 Historical and Archaeological Finds 3-1
3.2 Temporary Road Construction 3-1
3.3 Protection of Trees and Shrubs 3-2
3.4 Restoration 3-2
3.5 Water Resources Protection 3-2
3.5.1 Erosion Sediment Control 3-3
3.5.2 Spill Control 3-3
3.6 Dust and Air Pollution Control 3-3
3.6.1 Air and Noise Monitoring 3-3
3.6.2 Particulate Emission Controls 3-4
3.6.3 Burning 3-4
3.7 Post Excavation Clean-up 3-4

4.0 MOBILIZATION AND PREPARATORY WORK 4-1
4.1 Preparatory Work 4-1
4.1.1 Preconstruction Meeting 4-1
4.1.2 Subcontractor/Product Submittals 4-1
4.1.3 Waste Profiling 4-1
4.1.4 Health and Safety Training 4-2
4.1.5 Permitting 4-2
4.2 Mobilization 4-2

5.0 FIELD ACTIVITIES 5-1
5.1 Clearing and Grubbing 5-1
5.2 Excavation 5-1
5.3 Backfilling and Site Restoration 5-2
5.3.1 Backfill 5-2
5.3.2 Gravel 5-3
5.3.3 Topsoil 5-3
5.3.4 Seeding 5-3
5.4 Monitoring Well Installation (If Necessary) 5-3

TABLE OF CONTENTS (cont.)

6.0 TRANSPORTATION AND DISPOSAL PLAN 6-1
- 6.1 Characterization of Waste Systems 6-1
- 6.2 Waste Disposal Approval 6-2
- 6.3 Preparation of Required Documentation 6-3
- 6.4 Waste Packaging 6-3
- 6.5 Transportation and Disposal 6-4

7.0 DEMOBILIZATION AND FINAL REPORT 7-1

8.0 PROJECT SCHEDULE 8-1

9.0 REFERENCES 9-1

TABLES

TABLE 2.1 Site Soil Remediation Goals
TABLE 6.1 Remedial Activity Derived Wastes

DRAWINGS

FIGURE 1 Site Location Map
FIGURE 2 Site Map and Soil Contaminant Levels
FIGURE 3 Excavation Plan
FIGURE 4 Silt Fence Detail and Straw Silt Barrier

APPENDICES

APPENDIX A Site Specific Health and Safety Plan
APPENDIX B Quality Control Plan
APPENDIX C Sampling and Analysis Plan
APPENDIX D Treatability Test Report

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) reviews OHM Remediation Services Corp. (OHM) approach to implementation of the scope of work under Delivery Order 100 of Navy Atlantic Division (LANTDIV) Contract N62470-93-D-3032. The elements of this work plan are based on:

- OHM's proposal and cost estimate dated August 25, 1997
- The Draft Amendment to Record of Decision (ROD), Operable Unit No. 12 (OU 12) (Site 3) dated September 25, 1998 prepared by Baker Environmental, Inc. (Baker)
- The Statement of Work (specification section 01010) dated June 9, 1997 by Baker
- The Draft Final 100% Design Package dated April 9, 1998 by Baker
- OHM's Bench-Scale Treatability Study Report dated March 1998
- The approved ROD, OU 12 (Site 3) signed April 3, 1997

Refer to Section 9.0 for a complete list of references used to prepare this work plan. The ROD, prepared by Baker, contained background data, design considerations and assumptions for executing the project.

Several other plans have been developed for this delivery order and are to be considered as complementary components to this work plan. They include:

- Environmental Protection Plan (EPP) (Section 3.0)
- Site-Specific Health and Safety Plan (SHSP) (Appendix A)
- Quality Control Plan (CQCP) (Appendix B)
- Sampling and Analysis Plan (SAP) (Appendix C)
- Transportation and Disposal Plan (TDP) (Section 6.0)

This RAWP identifies and describes how OHM will implement the major tasks encompassing the removal action at OU 12 (Site 3) in conformance with the contract requirements. It includes the following sections:

- Section 2 Remedial Action Objectives
- Section 3 Environmental Protection Plan
- Section 4 Mobilization and Preparatory Work
- Section 5 Field Activities
- Section 6 Transportation and Disposal Plan
- Section 7 Demobilization and Closeout Report
- Section 8 Project Schedule
- Section 9 References

1.1 SITE BACKGROUND

MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Priorities List (NPL) effective October 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Protection Agency (USEPA) Region IV, the State of North Carolina Department of Environment and Natural Resources (NC DENR) and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at MCB Camp Lejeune were thoroughly investigated. Also, those appropriate CERCLA response or Resources Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect the public health and environment.

The original ROD for this site was submitted January 6, 1997 and accepted by the NC DENR and the USEPA. The remedy in the ROD was source removal and biological treatment using either a new biocell or the existing on-Base biocell; however, results of a pilot scale treatability study indicated that biological treatment of the site soils was not effective. Therefore, an amendment to the original ROD was required to document this fundamental change. The amended selected remedy for the soil at OU 12 (Site 3) includes excavation of PAH contaminated subsurface soil to an estimated depth of nine feet below ground surface (bgs) and disposal in a Subtitle D landfill.

1.2 SITE DESCRIPTION

Located in Onslow County, North Carolina, MCB Camp Lejeune is a training base for the United States Marine Corps. The base covers approximately 153,000 acres and includes 14 miles of coastline. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean and to the northeast by state route 24. Wooded areas are located North, East, and West of the site.. The town of Jacksonville, North Carolina is located north of the base.

OU 12 is one of 18 OUs located within MCB Camp Lejeune. Operable units were developed at the base to combine one or more individual sites that share a common element. OU 12 contains only one site, Site 3, which is otherwise known as the (Old Creosote Plant). Figure 1.0 illustrates the location of OU 12 (Site 3) within MCB, Camp Lejeune.

Figure 2.0 presents a map of OU 12 (Site 3) with contaminant levels in the subsurface soil area of concern. Located within the Mainside Supply and Storage areas at MCB Camp Lejeune, Site 3 is generally flat and unpaved. Open Storage Lots 201 and 203 (i.e., Site 6) are located nearby along Holcomb Boulevard approximately 1.5 miles from OU 12 (Site 3). However, OU 12 (Site 3) is not currently used for open storage.

As shown in Figure 2.0, the site is intersected by two roadways: a dirt path that runs north-south and forms a loop in the southern portion of the site, and a gravel road that runs east-west and leads directly to Holcomb Boulevard. Access to the site using these roads is currently unrestricted. In addition, the Camp Lejeune railroad line runs parallel to the site's western edge and intersects an old railroad spur line at the site's southern extreme. The intersection of these two lines creates a spike formation that points south.

1.3 SITE HISTORY

The Old Creosote Plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Base railroad. Reportedly, an onsite sawmill, located in the northern portion of the site, was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment procedures that were used are not known, records show that preservatives (i.e., creosote) were stored for reuse in a railroad tank car.

In typical pressure treatment processes, wood ties are placed inside cylindrical chambers, which are filled with wood treating preservatives. Then, hydrostatic or pneumatic pressures, ranging from 50 to 200 pounds per square inch (psi), are applied within the treatment chamber until the wood absorbs the desired amount of preservatives. When the treatment process is complete, a pump removes the excess preservative from the chamber and sends it to a storage vessel for reuse. Excess preservative is then removed from the wood by applying a vacuum, or by allowing the wood to drip dry. In the past, treated wood lay in open areas for several days, allowing excess preservative to drip.

The main treatment area at OU 12 (Site 3) was most likely located within and immediately surrounding the dirt path loop in the southern portion of the site. This area contains an abandoned chimney that was probably associated with creosote heating and cooling activities (creosote is often heated and mixed with fuel oil to create a less viscous consistency). The 240-foot long concrete pad encircled by the dirt path loop was probably used for a drip track for pressure cylinder chambers or treated wood ties. However, the concrete pad does not exhibit visual evidence of contamination. South of the pad, evidence of rail lines was observed indicating that a railroad connection may have been located in this area. The railroad connection may have transported creosote or ties to and from the treatment area.

1.4 PREVIOUS INVESTIGATIONS

Previous investigations completed at OU 12 (Site 3) include a Site Inspection (1991) and a Remedial Investigation (1994-95). Field activities for these investigations included soil, groundwater and sediment investigations. In general, these investigations indicated that the most frequently detected organic compounds were polynuclear aromatic hydrocarbons (PAHs). Because creosote is comprised of PAH compounds, the PAHs detected at OU 12 (Site 3) are believed to be associated with past operations at the former wood treatment plant. The highest PAH concentrations in soil occurred in the treatment area of the site (i.e., the area encircled by the dirt path loop). Fuel constituents, such as ethylbenzene and xylene, were also detected in surface and subsurface soil at the former treatment area.

More detailed information is available in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker, 1996). Tables and figures presenting analytical results and showing sampling locations for soil and groundwater are located in the original ROD for OU 12 (Site 3) dated January 6, 1997.

1.5 TREATABILITY STUDY

OHM performed a bench scale treatability study to determine the potential for biological remediation of PAH contaminated soil at OU 12 (Site 3), MCB Camp Lejeune, North Carolina. The primary objectives of the bench scale treatability study were to:

- Determine if biological treatment can render the soil "nonhazardous" by definition, (assuming as-received soil exhibited hazardous characteristic)
- Assess biological treatment efficiencies of the 7 target PAH contaminants for on-site remediation in an engineered biocell.
- Develop performance data and design parameters to estimate costs for larger scale operations.

Based on the results of the Bench Scale Treatability Study, the following conclusions were made concerning the biological treatment of the creosote contaminated soils:

- The soil sample collected for the treatability study can be classified as non-characteristically hazardous following RCRA TCLP testing for volatile and semi-volatile compounds.
- Solid-phase biological treatment of the PAH contaminated soil could not achieve all of the treatment criteria for the target PAH constituents. Given similar initial concentrations of target PAH constituents, biological land treatment technology using an engineered biocell approach is not likely to achieve the established risk based treatment criteria. Other treatment and disposal options should be explored to determine the most cost effective management alternative for the estimated 1,340 cubic yards of creosote contaminated material at OU 12 (Site 3).

The details of the study are discussed in the March 1998 Bench Scale Treatability Study Report, which is attached as Appendix D.

2.0 *REMEDIAL ACTION OBJECTIVES*

In accordance with Section 121(d)(1) of CERCLA, remedial actions must obtain a degree of clean up which assures protection of human health and the environment. This soil remedial action will significantly reduce the human health risks associated with groundwater at OU 12 (Site 3) by completely removing a potential source of the groundwater contamination – the subsurface soil area of concern above the water table. This will prevent the further leaching of PAH contaminants from the subsurface soil (at 3 to 9 feet bgs) to the groundwater. Soil remedial goals were established based on federal and state soil screening levels that estimate the concentrations at which soil contaminants may leach and create unsafe groundwater conditions.

2.1 REMEDIAL ACTION OBJECTIVES FOR SOIL

The remedial objective for soil in OU 12 (Site 3) is to remove and dispose of in a landfill the contaminated soils above the water table which have contaminants of concern (PAHs) exceeding the established remediation goals.

The remediation goals for the subsurface soils above the water table from OU 12 (Site 3) were provided in the design specifications prepared by Baker. The subsurface soil remediation goals were revised to match the levels in the final amended ROD signed July 28, 1999. Table 2.1 presents the applicable requirements for contaminated subsurface soils above the water table.

Table 2.1
Site Soil Remediation Goals

Contaminant of Concern	RL (ug/kg)	Basis of Goal
Naphthalene	585	NC DENR
2-Methylnaphthalene	4,900	NC DENR
Carbazole	273	NC DENR
Benzo(a)anthracene	343	NC DENR
Chrysene	3,810	NC DENR
2-Methylphenol	1,050	NC DENR
4-Methylphenol	17.4	NC DENR
Acenaphthene	8,160	NC DENR
Phenol	1,750	NC DENR

Notes:
RL = Remediation Level
NC DENR = North Carolina Department of Environment and Natural Resources Soil to Groundwater (S3:G1)

3.0 ENVIRONMENTAL PROTECTION PLAN

This Environmental Protection Plan (EPP) has been prepared with standard OHM policies and procedures. The EPP provides specific information relating to the scope of work under Delivery Order No. 0100, OU 12 (Site 3). The plan provides specific information for:

- Land resources management
- Water resources management
- Air and noise pollution control
- Non-compliance/corrective action
- Post-excavation clean-up

The control of environmental pollution will consider air, water and land impacts, as well as solid waste management.

The land resources within the property of MCB Camp Lejeune, but outside the limits of permanent work, will be preserved in their condition or restored to a condition that does not detract from the appearance of the area after completion of construction. As much as is possible, construction activities will be limited to areas defined by the plans and specifications.

3.1 HISTORICAL AND ARCHAEOLOGICAL FINDS

Although the presence of historical artifacts is not anticipated, if a historical artifact is encountered during field operations, OHM will stop work and notify the NTR. The NTR will be responsible for contacting federal, state and local authorities to determine if the site may contain other important historical artifacts, and whether this site qualifies for possible placement on the National Registrar of Historical Places. Field operations will not resume until the NTR issues a written authorization to proceed.

3.2 TEMPORARY ROAD CONSTRUCTION

In the event that temporary road construction is required at the project site, road construction will be performed in a manner that will minimize impact to the natural environment. Water will be used as dust control as necessary.

3.3 PROTECTION OF TREES AND SHRUBS

Prudent steps will be taken to protect trees and shrubs outside of the excavation zone. Shrubs, landscaping and other vegetation within the area to be excavated will removed by OHM. All trees and shrubs removed as result of excavation activities will be cut into manageable pieces and removed from the project site so as not to interfere with operations.

Precautions will be taken to minimize the construction activities' impact on existing vegetation and will include, but not be limited to:

- Utilization of existing or temporary roads only.
- Closely supervised equipment operators with an emphasis placed on preservation of vegetation in non-work areas.
- Proper guidance of heavy equipment and truck operators by site personnel to minimize damage to adjacent vegetation not directly affected by construction activities
- Utilization of equipment appropriately designed and sized for precise excavation

3.4 RESTORATION

Upon completion of the soil removal activities, disturbed areas that are to be re-vegetated will be backfilled, graded, 4-inches of topsoil added, and seeded at 5 pounds per 1000 square feet. Fertilizer will be applied at 25 pounds per 1000 square feet.

3.5 WATER RESOURCES PROTECTION

Stormwater run-off leaving the site will be controlled by temporary erosion/sediment control techniques such as berms, silt fencing, straw bales and grading. Prior to disturbance of vegetation and soil, temporary erosion and sediment control will be established on the down gradient side of the excavation. Open excavations and stockpiles vulnerable to erosion will be held to a minimum. Control techniques to be utilized will involve installation of silt fencing. Stormwater runoff will continue to flow off-site via its normal routes. Stormwater will not be collected, stored, sampled or treated before leaving the site.

3.5.1 Erosion Sediment Control

Silt fencing will be installed with the fabric a minimum of 6-inches below grade and extending 36-inches above grade and fastened to posts no more than 6-feet apart. The posts will be installed with a minimum of 24-inches below grade and extend a minimum of 36-inches above grade. Fabric will be attached to the up-slope side of the posts using 1-inch staples or tie wire. Silt fences will be inspected after every rain and daily during extended rainfall. Accumulated sediment will be removed before the depth reaches 12-inches.

3.5.2 Spill Control

Measures will be taken to prevent chemicals, fuels, oils, greases, bituminous materials and contaminated materials from entering streams, rivers or lakes. Absorbents will be available to recover any leaks outside containment areas. Any soil contaminated with fuel spills will be immediately removed and placed into appropriate containers and sampled to determine proper disposition.

3.6 DUST AND AIR POLLUTION CONTROL

The following sections describe methods that will be used to monitor and control dust and air pollution that may be generated during RA activities.

3.6.1 Air and Noise Monitoring

Personnel and ambient air monitoring will be conducted as necessary in order to determine airborne dust and contaminant levels (refer to the Site Specific Health and Safety Plan). Ambient air monitoring will be conducted at working locations and on occasion at the perimeter of each site. This ensures that respiratory protection is adequate to protect personnel against the contaminants that are encountered as well as ensuring that harmful levels of airborne contaminants are not leaving the site.

OHM will only perform operations of heavy equipment during daylight hours to minimize the impact of off-site noise pollution. Noise exposure to off-site residents or personnel is expected to be minimal. Hearing protection for on-site workers will still be implemented if necessary as specified in the SHSP.

3.6.2 Particulate Emission Controls

Specific measures to be taken to minimize particle emissions for major activities during site construction include the following:

Soil Excavation, Handling, Site Grading and Transportation

- Apply water to work and traffic areas as necessary to minimize dust emissions.
- Cover stockpiles with sheeting to minimize wind and/or stormwater erosion.
- Move and load soil for transport within each site that limits free fall of material and is least likely to generate dust emissions.
- Halt dust-generating work when on-site wind conditions exceed 35 miles per hour.

Movement of Equipment

- Water traffic areas as required to minimize dust emissions.
- Designate equipment traffic patterns to minimize travel distance and vehicular dust emissions.
- Limit vehicle speed to minimize dust emissions.

3.6.3 Burning

No burning will be performed on-site. In the event of an unexpected fire on-site, work will stop immediately and the MCB Camp Lejeune fire department will be notified.

3.7 POST-EXCAVATION CLEAN-UP

All excavation equipment will be decontaminated prior to demobilizing from the site. Decontamination will consist of scraping and/or pressure washing to remove visible soil and debris from tires and undercarriage of vehicles and heavy equipment. Decontamination liquids, erosion control materials and PPE will be containerized, sampled, analyzed, and disposed. The site will then be turned over to the base.

4.0 *MOBILIZATION AND PREPARATORY WORK*

The preparatory work and mobilization activities to be preformed by OHM in completion of the removal action at OU 12 (Site 3) are presented in the following sections.

4.1 PREPARATORY WORK

Preparatory for the OU 12 (Site 3) removal action includes these items.

4.1.1 Preconstruction Meeting

Prior to mobilization, OHM will arrange a pre-construction meeting at MCB Camp Lejeune with LANTDIV and other responsible parties. The purpose of this meeting will be to:

- Confirm roles and responsibilities of key personnel and flow of communication for project execution.
- Review the project schedule, sequence of tasks and key milestones.
- Identify and discuss Base-specific issues relative to the upcoming mobilization and construction activities.
- Obtain the necessary security clearances for operations personnel.

4.1.2 Subcontractor/Product Submittals

OHM will submit the qualifications and licenses of subcontractors performing waste transportation and disposal. The qualifications of subcontractors including small and disadvantaged businesses proposed to do work at the site will also be submitted. Additionally, other material/product submittals jointly identified as necessary, will be submitted in accordance with the approved submittal register.

4.1.3 Waste Profiling

During the treatability testing, OHM obtained a representative sample of soil from 3 to 9 bgs at OU 12 (Site 3) in the soil area of concern for laboratory analysis of waste stream characterization. Laboratory analysis of the soil samples determined that the soil was non-hazardous waste and could be disposed of in a Subtitle D Landfill. The Treatability Testing Report, which includes the laboratory analysis reports is contained in Appendix D. Prior to mobilization the NTR will be notified of the selected disposal facility for the excavated soils.

4.1.4 Health and Safety Training

OHM will use personnel and equipment from the MCB Camp Lejeune Base. Prior to beginning work at the site, a training meeting will be conducted to brief all site personnel on the Site Specific Health and Safety Plan, construction drawings and other relevant site-specific plans. Site hazards and conditions will be discussed and all personnel will acknowledge their understanding and compliance with the plan by signing an approved acceptance form.

4.1.5 Permitting

An excavation permit will be obtained from the Public Works Officer, Utilities Division.

4.2 MOBILIZATION

Project mobilization and setup will consist of the following main activities:

- **Temporary Facilities Installation** - OHM will use its' office trailer already located at the Base. In addition, a canopy may be setup onsite to serve as the control check point for contractor/subcontractor personnel entering the site.
- **Site Survey** - A professional licensed surveyor will be subcontracted to mark the limits of the excavation as shown on Figure 3. The limits will be visibly marked using reinforcing bars and/or wood stakes. The surveyor will also mark the location of other features such as construction roads, fencing, soil stockpile areas and equipment lay down areas.
- **Clearing and Grubbing** - Trees located within the excavation zone will be cut into salable lengths and staged in a convenient location for pickup by the forestry service. The under growth, tree limbs, and other non-salable non-contaminated debris removed in the excavation area will be disposed at the base landfill.
- **Erosion and Sedimentation Control** - OHM will establish controls to prevent erosion and sedimentation through the use of sediment fencing and diversion berms. This will mitigate the spread of contamination to other areas and minimize run-on into the active work area. Silt fencing will be placed along the down gradient side of the excavation. Clean soil will be used to construct a berm on the up gradient side of the excavation to prevent the intrusion of surface water into the excavation prior to backfill. The Environmental Protection Plan included in this RAWP provides details on environmental controls.

- **Install Construction Fence** - OHM personnel will erect safety fencing around the planned work area. Fencing will be 4-feet high, bright orange, polyethylene, mesh fence to prevent personnel from accidentally entering the work area. Additional fencing will be placed around monitoring wells located in close proximity to construction activities.

- **Decontamination Areas** - Personnel and equipment decontamination areas will be provided within the Contamination Reduction Zone (CRZ) upon exiting the contaminated work area. The Site Specific Health and Safety Plan addresses this area in detail.

- **Site Security** - All persons entering the site will be required to sign in and out daily. OHM reserves the right to deny access to any individual not showing proper identification.

- **Health and Safety Zones** - The site will be segregated into work areas on the basis of degree of hazard and PPE requirements. In general, the fenced area excluding the open excavation will comprise the CRZ. Personnel working within the CRZ will be required to wear the appropriate PPE as outlined in the Site Specific Health and Safety Plan. The excavation area within the CRZ will be designated the exclusion zone and will be delineated by orange safety fencing. OHM health and safety personnel will provide site air monitoring and will adjust work zone boundaries as appropriate.

- **Personnel Decontamination Facility** - OHM will set up a personnel decontamination area at the site. The location will be near the construction area. It will be furnished with portable wash basins. All decontamination and cleaning water generated from decontamination activities will be collected and stored prior to analysis and subsequent disposal.

5.0 *FIELD ACTIVITIES*

The approximate limits of subsurface soils contaminated with PAH compounds in excess of the Remedial Action Objectives (RAOs) listed in Table 2.1 are indicated on Figure 3. Baker obtained numerous samples from OU 12 (Site 3) to determine the limits of the soil contamination shown on Figure 3.

5.1 CLEARING AND GRUBBING

Trees located within the excavation zone will be cut into salable lengths and staged in a convenient location for pickup by the forestry service. The under growth, tree limbs, and other non-salable non-contaminated debris removed in the excavation area will be disposed at the base landfill.

5.2 EXCAVATION

The projected dimensions of contaminated soil within OU 12 (Site 3) will be surveyed and marked prior to beginning excavation activities. Underground utilities in the excavation will be located. There are two monitoring wells (MW02IW and MW02DW) located within the area to be excavated and one monitoring well (MW02) adjacent to the area to be excavated. Care will be exercised when excavating around existing monitoring wells/utilities not to disturb or compromise their integrity. In the event the monitoring wells are damaged during excavation activities; they will be abandoned in accordance with North Carolina regulations. Replacement wells will be installed in accordance with North Carolina regulations and as described in Section 5.4.

The first excavation activity will be the removal of the concrete slab that extends north and south thorough the area to be excavated. The concrete slab will be saw cut on either side of the area to be excavated. The portion of the slab within the excavation area will be demolished and transported to the base landfill for disposal as construction debris. Only portions of the slab that must be removed to allow excavation of underlining soils will be demolished.

Next, the top three feet of soil will be removed and stockpiled. The stockpile will be sampled for PAH compounds and TCLP analysis in accordance with the Sampling and Analysis Plan (SAP). The soil will be placed into the excavation as backfill if analytical results indicate Contaminants

of Concern (COC) are below regulatory guidelines.

The second stage of excavation will remove contaminated soil from three feet bgs to nine feet bgs or groundwater whichever is shallower. This soil will be excavated and direct loaded into transport vehicles, weighed and transported to the selected disposal facility. After excavation to the surveyed limits, a visual inspection will be performed on the surrounding soil. If the visual inspection reveals evidence that additional contaminated soil may exist, OHM will consult with the NTR to discuss and/or recommend the extent of additional excavation. Exposed excavation areas with no evidence of contaminated soil will undergo verification sampling and analysis. Confirmation soil samples will be collected from the sidewalls at one per fifty linear feet and at a depth of eighteen inches above the base of the excavation. Confirmation samples will also be collected from the excavation floor at one per five hundred square feet or fraction thereof. If the water table is encountered no floor samples will be collected. If contaminant levels in the confirmation samples exceed the remediation levels in Table 2.1, OHM will consult with the NTR to discuss and/or recommend the extent of additional excavation.

5.3 BACKFILLING AND SITE RESTORATION

Following removal of contaminated material and confirmation sampling that has verified attainment of ROD objectives; OHM will begin site restoration activities.

5.3.1 Backfill

Backfilling operations will be implemented as soon as possible after off-site analytical confirmation of clean results are received, in order to prevent collection of stormwater in the open excavation. The excavation will be backfilled with suitable material from an offsite source and with the upper three feet of stocked piled material and re-graded to original ground surface. Prior to mobilization, a source with the required volume of suitable backfill material will be identified and the material will be tested to verify acceptability for use as backfill.

Fill will be spread evenly above the approved subgrade in lifts not exceeding 12-inches and compacted in horizontal layers as nearly even as possible. Soil underneath areas designated for vegetation will be compacted using the tracked equipment. Density testing will not be completed.

5.3.2 Gravel

Upon completion of backfill placement, areas, which had previously been graveled, will be covered with gravel meeting NCDOT Standard Specifications for Roads and Structures, Section 905. Gravel thickness will match existing thickness of adjacent areas. Gravel will be compacted using the tracked equipment. Density testing will not be completed.

5.3.3 Topsoil

After placement of the fill layers in areas not to be graveled, OHM will place and grade topsoil over the excavated area. Topsoil will be placed in such a manner that will control erosion and allow quick germination of vegetation.

5.3.4 Seeding

Grass seed matching existing vegetation will be place at the rate of 5 pounds per 1,000 square feet over topsoil areas. Fertilizer, Type I, Class 2, 10-10-10 analysis will be applied at the rate of 25 pounds per 1,000 square feet. Mulch and water will be applied as required to obtain an acceptable stand of grass.

5.4 MONITORING WELL INSTALLATION (IF NECESSARY)

A well installation subcontractor will mobilize a rig to the site to install replacement monitoring wells (if necessary). The wells will be installed using hollow stem auger drilling techniques in accordance with NC DENR and LANTDIV requirements. A Standard Penetration Test (SPT) split spoon soil sample will be collected at 5-foot intervals. An OHM Hydrogeologist will be on-site during well installation to provide oversight. OHM personnel and drilling crews will be OSHA Health and Safety trained in accordance with CFR 1910.120.

6.0 *TRANSPORTATION AND DISPOSAL PLAN*

This Transportation and Disposal Plan (TDP) was prepared for use during remedial action activities at OU 12 (Site 3). The TDP objective is to specify methods and procedures to be implemented by OHM to ensure that wastes generated during site remediation activities will be transported, stored, treated, and disposed of in full compliance with applicable federal, state, and local rules and regulations.

6.1 CHARATERIZATION OF WASTE STREAMS

During remedial activities, OHM will generate various types of Remedial Derived Wastes (RDW) which will require off-site disposal. These materials are outlined in Table 6.1. OHM will complete characterization and disposal analysis of the waste materials generated from the remedial activities. OHM will collect samples in accordance with the Sampling and Analysis Plan and perform appropriate characterization and disposal analysis of the wastes described in Table 6.1 during the course of this project.

Table 6.1
Remedial Activity Derived Wastes

Waste	Description	Quantity	Disposal Method
PPE	Personal protective equipment (PPE) generated during on-site remedial activities.	1 drum	CERCLA approved, RCRA Subtitle D Landfill
Decon Water and Fluids	Decontamination water/fluids from equipment clean up and sampling.	250 gallons	Permitted Industrial Wastewater Treatment Plant
Concrete	Demolished slab over OU 12 (Site 3) excavation area	18 cubic yards	Base Landfill for Construction Debris
Contaminated Soil	Soil from remediation at OU 12 (Site 3)	2,500 tons	Base Landfill or Offsite CERCLA approved, RCRA Subtitle D Landfill

6.2 WASTE DISPOSAL APPROVAL

OHM will assign a T&D Coordinator for this project who will report to the Project Manager as a single point-of-contact for all waste management activities. The individual assigned to this project will be familiar with all the applicable portions of RCRA, CERCLA, and SARA regulations, especially 40 CFR 261 (Identification and Listing of Hazardous Wastes). In addition this individual will be familiar with the State of North Carolina regulations related to hazardous and solid waste treatment, storage, disposal, and transportation. This individual will obtain pre-approval from the Subtitle D Landfill to allow direct load out of excavated soil. The T&D Coordinator will also be responsible for preparing documentation to be sent to the selected disposal facility and coordinating disposal approvals.

The T&D Coordinator, in consultation with the Project Manager and procurement personnel, have reviewed potential vendors to pre-qualify transportation and disposal companies based on:

- Notice of violation status
- Ability to handle the wastes identified
- Cost effectiveness of the available transportation and disposal options
- Past experience
- SB and SDB contract goals

At this time OHM has identified the following qualified Vendors to provide transportation and disposal of non-hazardous Remedial Derived Waste from this Delivery Order:

Disposal and Transportation

- Base Landfill, Camp Lejeune, North Carolina
- Waste Management, Kernersvile, North Carolina
- Browning-Ferris Industries, Charlotte, North Carolina
- Addington Environmental, Greensboro, North Carolina
- Morton Trucking, Jacksonville, North Carolina
- Hilco Trucking, Willmington, North Carolina
- Adams Trucking, Jacksonville, North Carolina

All bids will be obtained based on a written solicitation and all bid responses will be in writing. All bids will be made in conjunction with OHM's procurement policies. A condition of OHM's purchase order will be that the selected vendors must provide OHM with addresses, the name of a single point of contact, EPA ID numbers, permit verification, NOV status, and any other qualifying data necessary. The NTR will be notified once a facility has been selected for disposal of the soil.

6.3 PREPARATION OF REQUIRED DOCUMENTATION

OHM will prepare or oversee the preparation of all paperwork associated with off-site disposal for review and signature by LANTDIV and Camp Lejeune representatives. This will include bill of lading or non-hazardous manifest. The selected Vendor(s) will be required to provide all manifests, and other shipping paperwork. A completed example of all manifests, and other shipping paperwork will be provided for OHM's review and approval at least one week in advance of the scheduled start of shipments. After these documents are reviewed by OHM, they will be provided to the Navy's representative for review and signature. OHM's on-site personnel will receive final copies of all labels, manifests, LDR forms and other shipping paperwork at least five days in advance of the scheduled start of shipments.

The disposal Vendors will provide written verification that the proposed disposal site is permitted to accept the contaminated materials generated from the site. A written verification that all vehicles and containers were decontaminated prior to leaving the disposal facility will be provided within three days of receipt of the waste material. A written verification that wastes were actually delivered to the disposal facility will be provided within seven days of receipt of waste materials.

If soil is to be disposed of outside the quarantine area for imported fire ants, it will be accompanied by a valid inspection certificate issued by an officer of the Plant Protection and Quarantine Program of the U.S. Department of Agriculture.

6.4 WASTE PACKAGING

OHM plans to excavate and load all soils directly into end-dumps. This will be a continuous operation and wastes will be transported directly to the disposal facility at that time. No provision will be made for on-site stockpiles or on-site storage for roll-offs or dumps.

Non-hazardous materials and trash will be accumulated on-site until sufficient quantities are available for shipment of a full load (80 drums or 20-30 yd^3). OHM will conduct weekly inspections of the waste storage areas. All temporary storage will be in compliance with the applicable North Carolina regulations.

6.5 TRANSPORTATION AND DISPOSAL

The T&D Coordinator/Site Supervisor will contact the selected vendor and schedule waste pick-ups in a timely manner to coordinate with the project schedule. Prior to shipment of wastes, OHM's on-site personnel, in conjunction with the T&D Coordinator, will complete a Waste Disposal Activities Checklist. This checklist is to be completed for each waste shipment leaving the site. A copy of the completed form will be provided to the NTR prior to waste transportation and with the Closeout Report.

OHM will maintain chronological organized files of weight tickets, manifest copies, and other shipping paperwork for each shipment. OHM will also maintain a database of all pertinent information regarding each off-site shipment. Copies of the manifest files and database printouts will be provided to the LANTDIV and Camp Lejeune representatives upon request and at the completion of the project.

7.0 *DEMOBILIZATION AND CLOSEOUT REPORT*

All equipment, support trailers and personnel will be demobilized from the project site. A Contractor Closeout Report will be completed and submitted for review and comment. The Contractor Closeout Report will include the following:

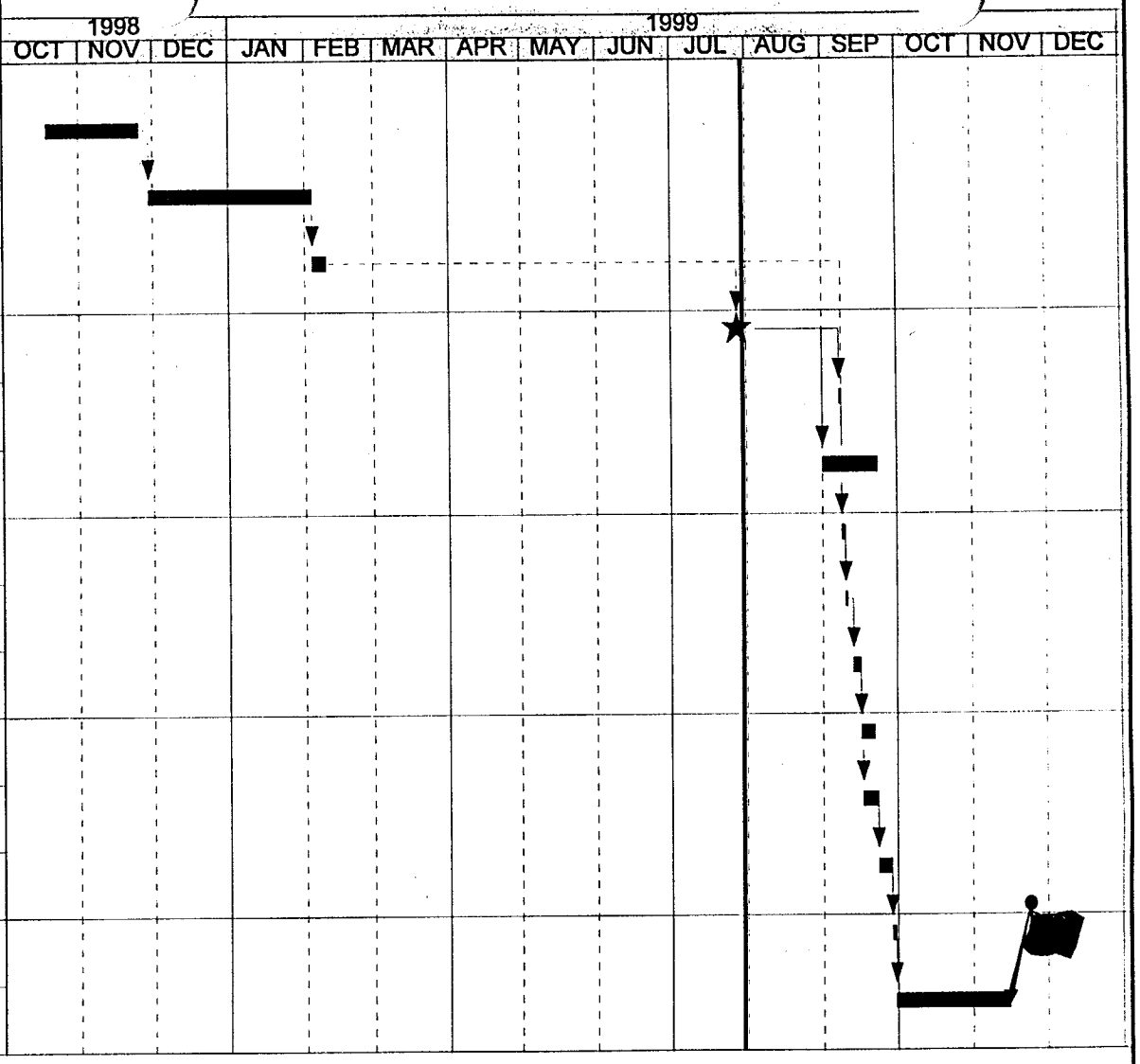
- Summary of removal action
- Final Health and Safety Report
- Field and laboratory analytical results
- Contaminated soil transportation and disposal documentation, including manifests
- "As-built" drawings including a final survey record drawings showing limits of excavation
- Corrective actions taken, if required
- Problems encountered and resolved
- Lessons learned and recommendations for inclusion in future similar projects
- Summary of Record documents
- Field changes and contract modifications
- Final documents
- Data validation results
- QC Summary Report
- Final Cost Data
- Photographs

8.0 PROJECT SCHEDULE

A project schedule for implementation of remedial activities described in this work plan at OU 12 (Site 3) follows on the next page. Primary tasks for this delivery order include plan preparation and approval, mobilization, excavation, disposal, backfill and site restoration work.

Excav PAH Soils

Activity ID	Activity Description	Orig Dur	%	Early Start	Early Finish
2000	Plans Preparation	28	100	19OCT98A	25NOV98A
2010	Plans Approval	19	100	30NOV98A	03FEB99A
2020	Plans Revision	7	100	04FEB99A	09FEB99A
2025	ROD Signing	0	100	28JUL99A	
2035	Pre-Construction Meeting	1	0	08SEP99	08SEP99
2030	Procurement	16	0	01SEP99	22SEP99
2040	Mobilization	1	0	09SEP99	09SEP99
2050	Clear & Site Set-Up	1	0	10SEP99	10SEP99
2060	Excavate Overburden	3	0	13SEP99	15SEP99
2070	Excav. Contaminated Soil & Transport to landfill	4	0	16SEP99	21SEP99
2080	Confirmation Sampling	4	0	17SEP99	22SEP99
2090	Backfill	4	0	23SEP99	28SEP99
2100	Site Restoration	1	0	29SEP99	29SEP99
2120	Closure Report	33	0	30SEP99	15NOV99



Project Start 17JUL97
Project Finish 15NOV99
Data Date 30JUL99
Run Date 25AUG99

Early Bar
Progress Bar
Critical Activity

100C

Sheet 1 of 1

OHM Remediation Services Corp.
LANTDIV Site 3 OU-12 DO # 100
Project 18319

9.0 REFERENCES

Baker Environmental, Inc. Final Remedial Investigation Report, Operable Unit No. 12 (Site 3), CTO-0274, July 1996.

Baker Environmental, Inc. Final Feasibility Study for Operable Unit No. 12 (Site 3), CTO-0274, August 1996.

Baker Environmental, Inc. Final Proposal Remedial Action Plan, Operable Unit No. 12 (Site 3), CTO-0274, November 1996.

Baker Environmental, Inc. Final Record of Decision, Operable Unit No. 12 (Site 3), CTO-0274, January 1997, (Signed April 3, 1997)

Baker Environmental, Inc. Statement of Work (Specification section 01010, General Paragraphs), Operable Unit No. 12 (Site 3), CTO-0368, June 1997.

Baker Environmental, Inc. Draft Final 100% Design Package Operable Unit No. 12 (Site 3), CTO-0368, April 1998.

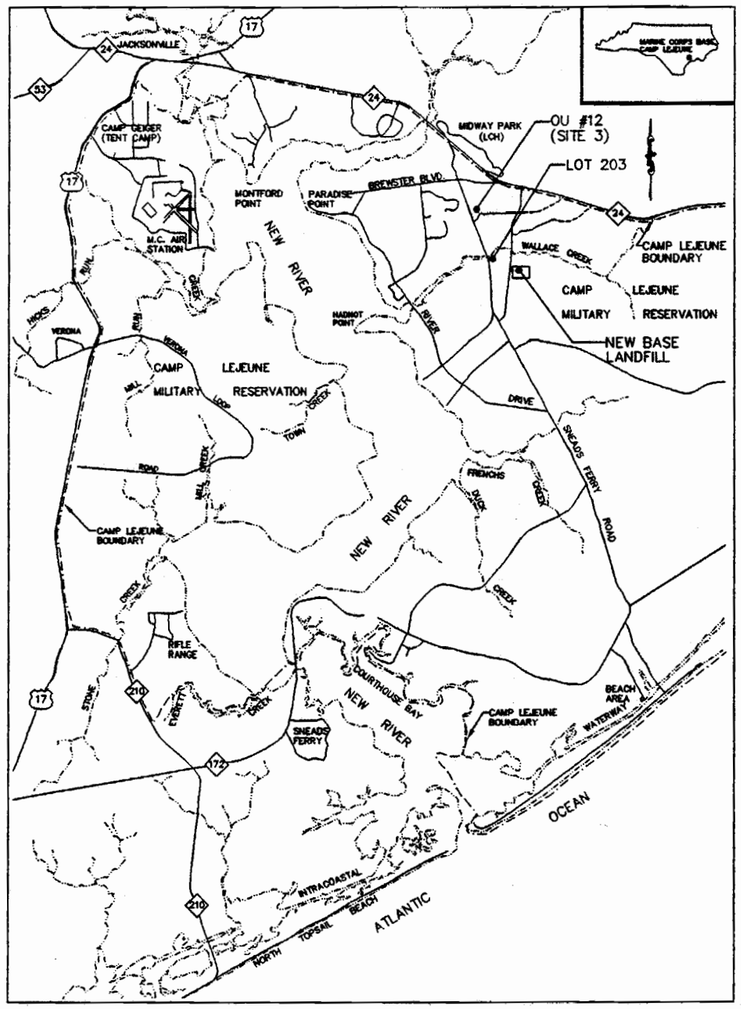
Baker Environmental, Inc. Draft Amendment to Record of Decision, Operable Unit No. 12 (Site 3), CTO-0274, September 1998.

OHM Remediation Services, Corp. Proposal and Cost Estimate, Operable Unit No. 12 (Site 3), Delivery Order No. 0100, August 1997.

OHM Remediation Services, Corp. Bench-Scale Treatability Study Report, Operable Unit No. 12 (Site 3), Delivery Order No. 0100, March 1998.

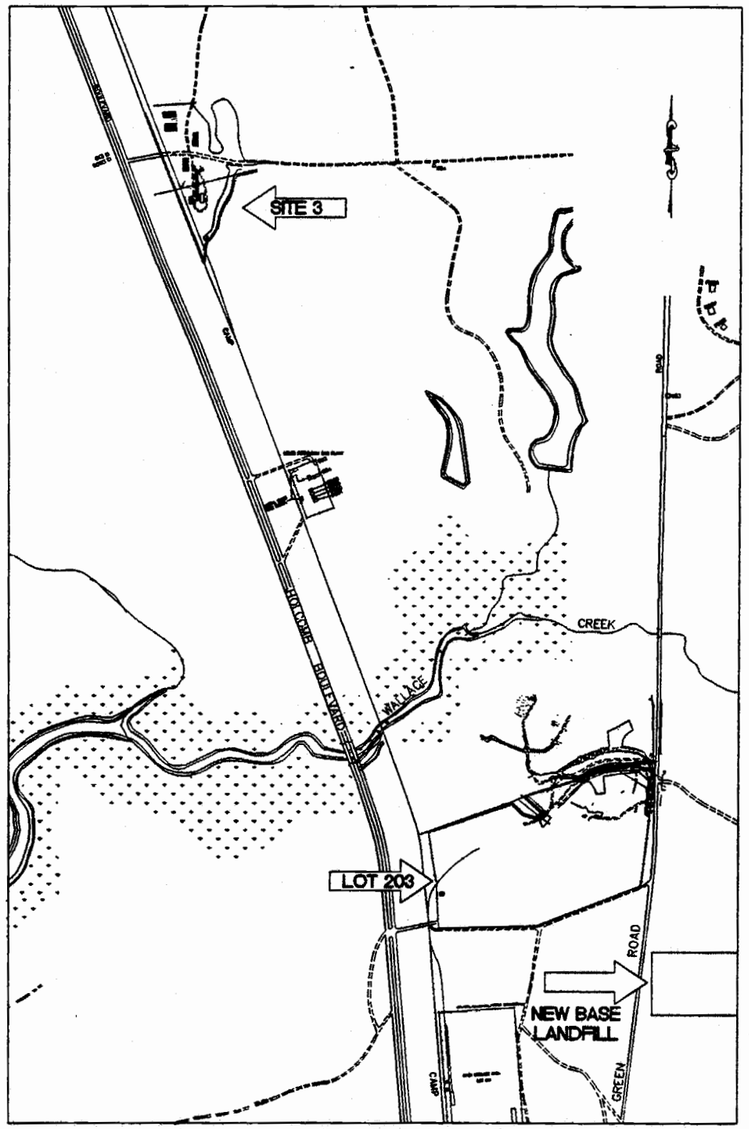
02331AABIZ

REMEDIATION OF PAH-CONTAMINATED SOIL
OPERABLE UNIT NO. 12 (SITE 3)
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



VICINITY MAP

1"= 1.5 MILES 0 1.5 3 4.5 6 7.5



LOCATION MAP

1"= 600' 0' 600' 1200' 1800' 2400' 3000'

ABBREVIATIONS

E	EAST	N	NORTH
EL.	ELEVATION	NAD	NORTH AMERICAN DATUM
'	FEET		
"	INCHES	NC	NORTH CAROLINA
L	LEFT	W	WEST
MCB	MARINE CORPS BASE		

GENERAL NOTES

1. MAPPING WAS PREPARED BY: 1.) W.K. DICKSON & CO., INC., OF RALEIGH, NORTH CAROLINA, DATED JANUARY, 1995.
2. ELEVATIONS SHOWN ARE IN FEET AND ARE BASED ON SEA LEVEL, NATIONAL VERTICAL GEODETIC DATUM 1929. VERTICAL CONTROL MONUMENT USED WAS A-32, ELEVATION = 31.93.
3. HORIZONTAL CONTROL WAS ESTABLISHED USING CONTROL MONUMENT A-32. A-32 HAS GRID COORDINATES OF X(E) = 2,498,390.690, Y(N) = 356,379.133 .
4. GRID IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM (SOUTH ZONE NAD 83).

SOURCE OF FIGURE: BAKER ENVIRONMENTAL INC., 4/98

OHM Remediation Services Corp.
Norcross, Georgia
A Subsidiary of OHM Corporation

SUBMITTED: _____ PROJECT MANAGER: DATE: _____
APPROVED: _____ SR. PROJECT ENGINEER: DATE: _____
APPROVED: _____ DEPT. MANAGER: DATE: _____

AT FULL SCALE (IF NOT 1"-SCALE ACCORDINGLY)
CADD FILE: _____
DRAWN: L. SHULMAN
DESIGNED: R. BOYD
CHECKED: J. DUNN
CHECKED: _____

REVISIONS

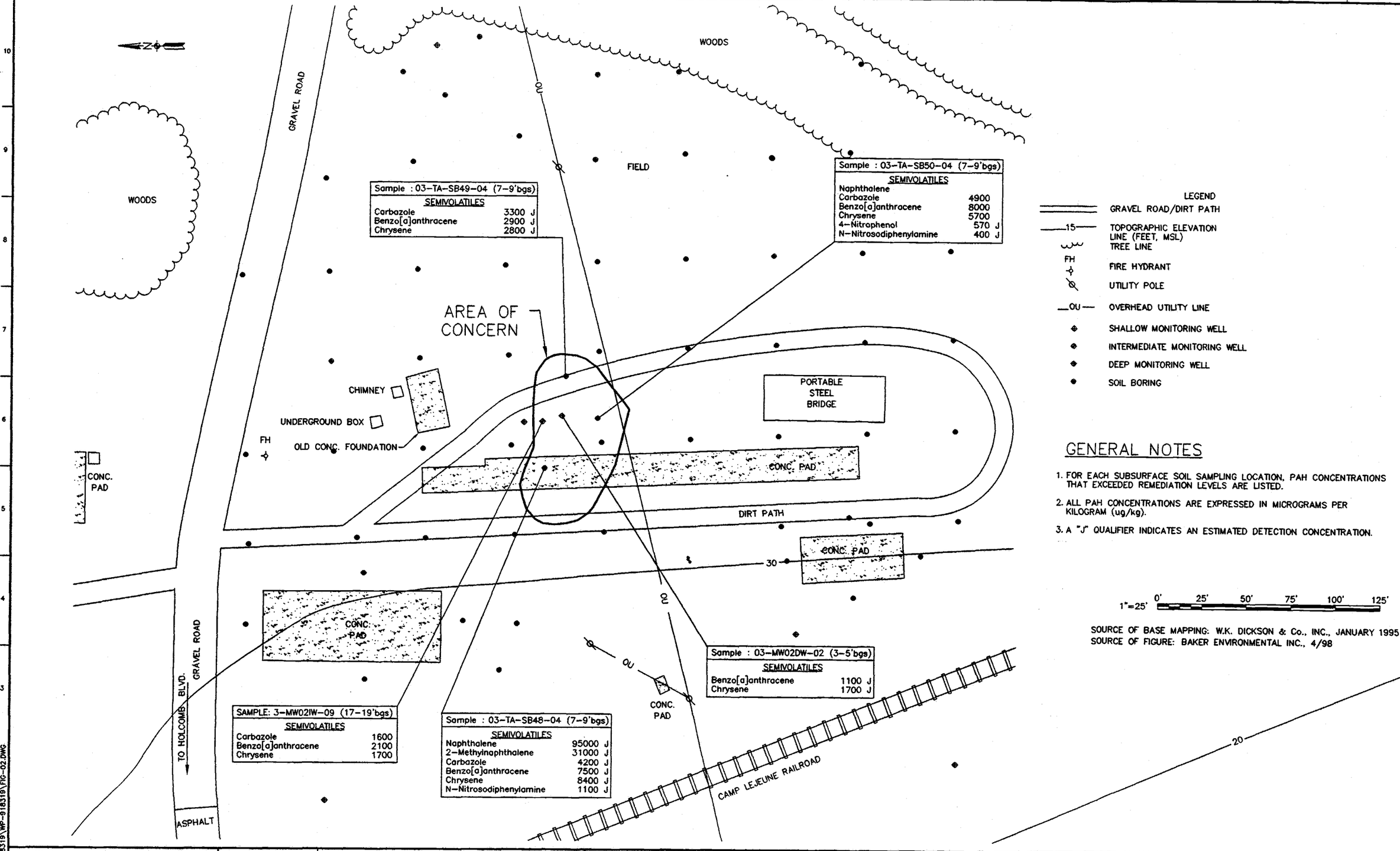
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION — NORFOLK, VIRGINIA
CONTRACT N62470-93-D-3032 — DELIVERY ORDER NO. 0100
OHM PROJECT No. 918319 — MARINE CORPS, CAMP LEJEUNE, N.C.

FIGURE 1
OU #12 (SITE) - REMEDIATION OF PAH-CONTAMINATED SOIL SITE LOCATION MAP

DRAWING NUMBER:
SHEET NUMBER: of
DATE: 11/13/98

G:\LANTDIV\LEJEUNE\918319\WP-918319\FIG-01.DWG



GENERAL NOTES

1. FOR EACH SUBSURFACE SOIL SAMPLING LOCATION, PAH CONCENTRATIONS THAT EXCEEDED REMEDIATION LEVELS ARE LISTED.
2. ALL PAH CONCENTRATIONS ARE EXPRESSED IN MICROGRAMS PER KILOGRAM (ug/kg).
3. A "J" QUALIFIER INDICATES AN ESTIMATED DETECTION CONCENTRATION.

SOURCE OF BASE MAPPING: W.K. DICKSON & Co., INC., JANUARY 1995
SOURCE OF FIGURE: BAKER ENVIRONMENTAL INC., 4/98

OHM Remediation Services Corp.
Norcross, Georgia
A Subsidiary of OHM Corporation

SUBMITTED: _____ PROJECT MANAGER: _____ DATE: _____
APPROVED: _____ SR. PROJECT ENGINEER: _____ DATE: _____
APPROVED: _____ DEPT. MANAGER _____ DATE: _____

AT FULL SCALE (IF NOT 1"=BONE ACCORDINGLY)
CADD FILE: _____
DRAWN: L. SHULMAN
DESIGNED: R. BOYD
CHECKED: J. DUNN
CHECKED: _____

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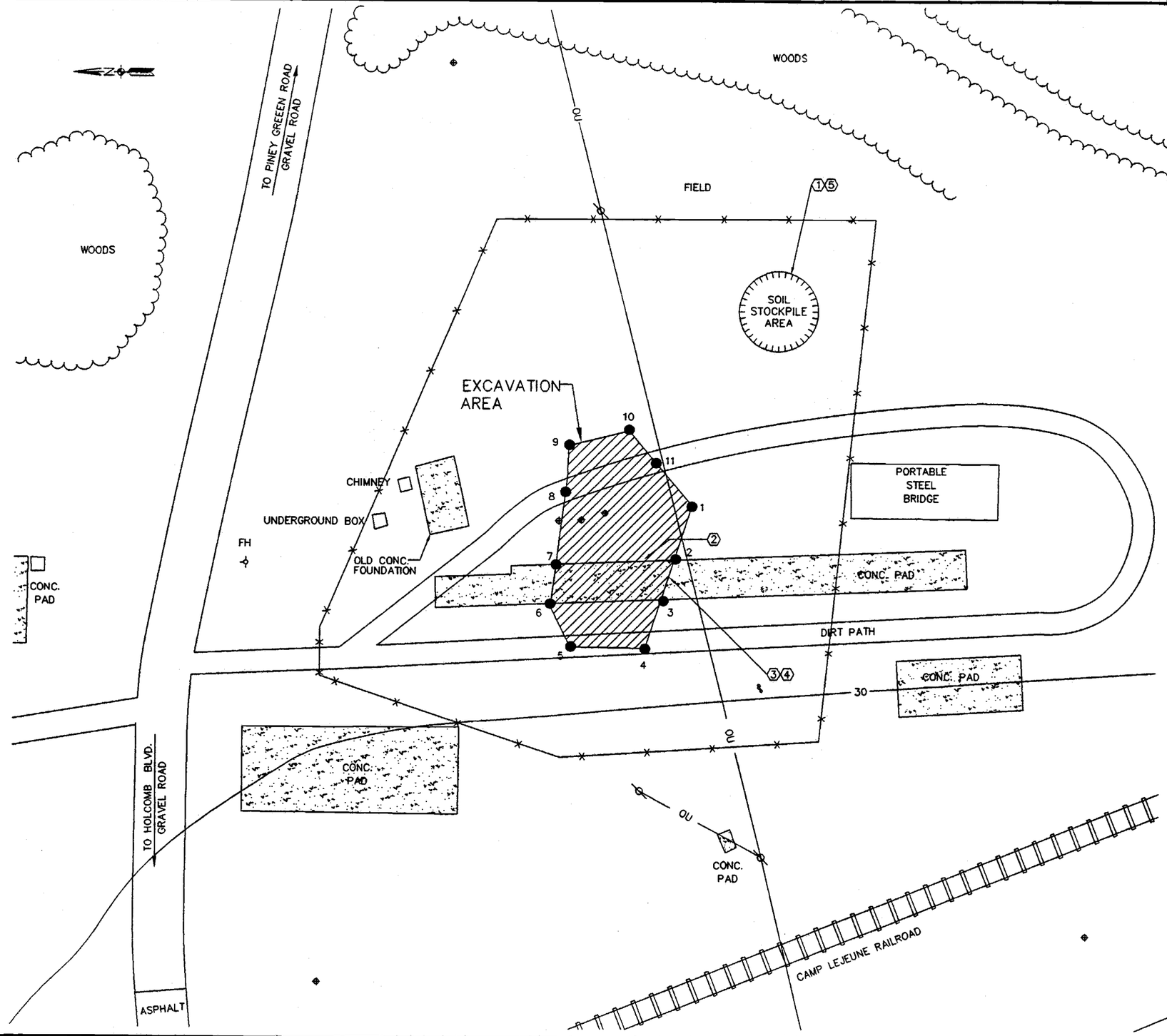
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINA
CONTRACT N62470-93-D-3032 DELIVERY ORDER NO. 0100
OHM PROJECT No. 918319 MARINE CORPS, CAMP LEJEUNE, N.C.

FIGURE 2
OU #12 (SITE) - REMEDIATION OF PAH-CONTAMINATED SOIL SITE 3 PLAN AND SOIL CONTAMINANT LEVELS

DRAWING NUMBER:
SHEET NUMBER: of
DATE: 11/13/98

G:\LANTDIV\LEJEUNE\918319\WP-918319\FIG-02.DWG



LEGEND

- GRAVEL ROAD/DIRT PATH
- 15 — TOPOGRAPHIC ELEVATION LINE (FEET, MSL)
- TREE LINE
- FH FIRE HYDRANT
- UTILITY POLE
- —OU— OVERHEAD UTILITY LINE
- CONSTRUCTION SAFETY FENCE
- EXCAVATION AREA
- CONCRETE REMOVAL AREA
- SHALLOW MONITORING WELL
- INTERMEDIATE MONITORING WELL
- DEEP MONITORING WELL

WORK NOTES

1. THE SOIL STOCKPILE AREA WILL BE CONSTRUCTED IN THIS GENERAL LOCATION. OHM WILL FIELD ADJUST SIZE, SHAPE, AND DESIGN OF THE AREA TO ACCOMMODATE THE WORK.
2. THE PORTION OF THE CONCRETE PAD WITHIN THE AREA TO BE EXCAVATED WILL BE REMOVED AND DISPOSED OF AT BASE LANDFILL.
3. THE NON-CONTAMINATED SOIL WILL BE EXCAVATED TO THE HORIZONTAL LIMITS INDICATED AND TO A DEPTH OF THREE FEET. THIS SOIL WILL BE STOCKPILED ON-SITE.
4. THE PAH-CONTAMINATED SOIL FROM THREE FEET BELOW GROUND SURFACE TO NINE FEET BELOW GROUND SURFACE, OR UNTIL JUST ABOVE THE WATER TABLE WILL BE EXCAVATED AND TRANSPORTED TO A DISPOSAL FACILITY.
5. EROSION CONTROL BARRIERS/FENCES WILL BE ERECTED AS NEEDED TO CONTROL RUN-ON TO AND RUN-OFF FROM THE EXCAVATION AND SOIL STOCKPILE. SEE FIGURE 4 FOR SILT FENCE AND STRAW SILT BARRIER DETAILS.

COORDINATES FOR EXCAVATION AREA		
PT. #	NORTHING	EASTING
1	352,789.0878	2,500,066.0634
2	352,796.7394	2,500,041.5583
3	352,802.5545	2,500,023.1795
4	352,810.3261	2,500,000.9504
5	352,844.9298	2,500,001.4178
6	352,853.6666	2,500,021.0353
7	352,851.2181	2,500,039.4141
8	352,847.2394	2,500,072.4960
9	352,845.6909	2,500,093.5944
10	352,818.0417	2,500,100.3994
11	352,805.6151	2,500,085.9738

1"=25' 0' 25' 50' 75' 100' 125'

SOURCE OF BASE MAPPING: W.K. DICKSON & Co., INC., JANUARY 1995

G:\LANTDIV\LEJEUNE\918319\WP-918319\FIG-03.DWG

OHM Remediation Services Corp.
Norcross, Georgia
A Subsidiary of OHM Corporation

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APPROVED: _____ SR. PROJECT ENGINEER: DATE: _____
APPROVED: _____ DEPT. MANAGER: DATE: _____

AT FULL SCALE (IF NOT 1"=SCALE ACCORDINGLY)
CADD FILE: _____
DRAWN: L. SHULMAN
DESIGNED: R. BOYD
CHECKED: J. DUNN
CHECKED: _____

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ZONE	REV.	DESCRIPTION	BY	DATE	APP.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC DIVISION

NAVAL STATION NORFOLK, VIRGINIA

CONTRACT N62470-93-D-3032 DELIVERY ORDER NO. 0100

OHM PROJECT No. 918319 MARINE CORPS, CAMP LEJEUNE, N.C.

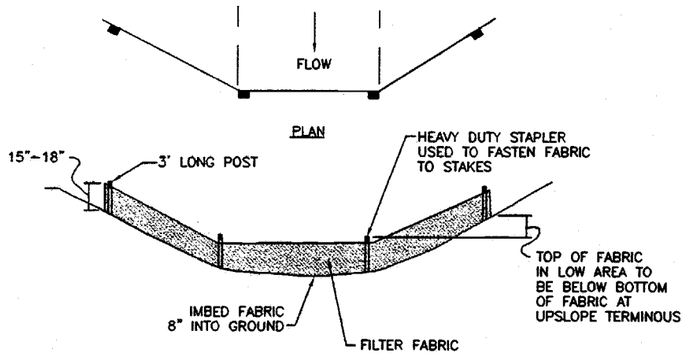
FIGURE 3

OU #12 (SITE) - REMEDIATION OF PAH-CONTAMINATED SOIL EXCAVATION PLAN

DRAWING NUMBER:

SHEET NUMBER: of

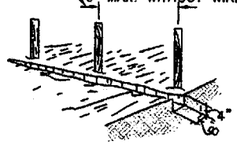
DATE: 11/13/98



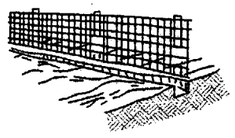
SILT FENCE CONSTRUCTION

NOT TO SCALE

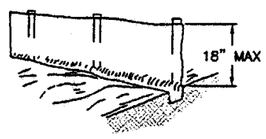
1. SET POSTS AND EXCAVATE A 8" X 4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.



2. STAPLE OR ATTACH FENCING TO THE UPSLOPE SIDE OF POSTS. EXTEND WIRE 6" INTO TRENCH.

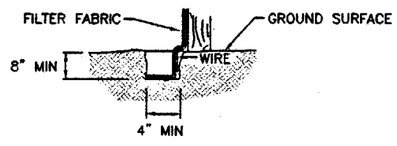


3. ATTACH THE FILTER FABRIC TO UPHILL SIDE OFTHE WIRE FENCE AND EXTEND IT INTO THE TRENCH.



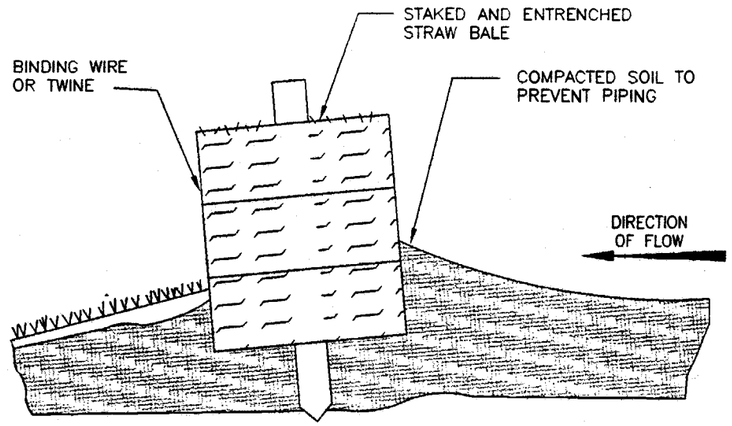
4. BACKFILL AND COMPACT THE EXCAVATED SOIL.

EXTENSION OF FABRIC AND WIRE INTO THE TRENCH.

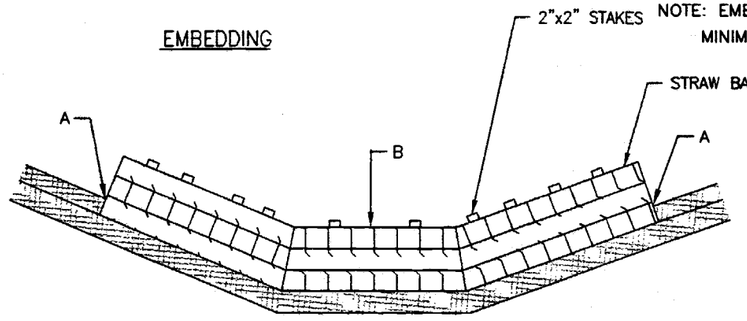


DETAIL – SILT FENCE

NOT TO SCALE



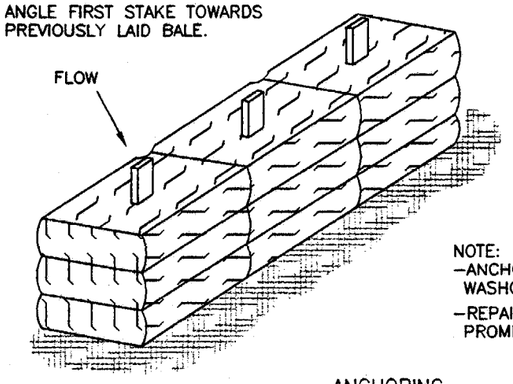
EMBEDDING



POINT "A" MUST BE HIGHER THAN POINT "B".

PLACEMENT IN DRAINAGE WAY

ANGLE FIRST STAKE TOWARDS PREVIOUSLY LAID BALE.



2"x2" STAKES EMBEDED 1'-6" TO 2'-0" IN GROUND.

NOTE:
-ANCHOR AND EMBED INTO SOIL TO PREVENT WASHOUT OR WATER WORKING UNDER BARRIER.
-REPAIR OR REPLACEMENT MUST BE MADE PROMPTLY AS NEEDED.

ANCHORING

STRAW SILT BARRIER

NOT TO SCALE

OHM Remediation Services Corp. Norcross, Georgia A Subsidiary of OHM Corporation	AT FULL SCALE (IF NOT 1"-SCALE ACCORDINGLY)	REVISIONS					
SUBMITTED: _____ PROJECT MANAGER: DATE: _____	CADD FILE: _____	ZONE	REV.	DESCRIPTION	BY	DATE	APP.
APPROVED: _____ SR. PROJECT ENGINEER DATE: _____	DRAWN: L. SHULMAN						
APPROVED: _____ DEPT. MANAGER DATE: _____	DESIGNED: R. BOYD						
	CHECKED: J. DUNN						
	CHECKED: _____						

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND	DRAWING NUMBER:
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NAVAL STATION — NORFOLK, VIRGINIA	SHEET NUMBER: of
CONTRACT N62470-93-D-3032 — DELIVERY ORDER NO. 0100	DATE: 11/19/98
OHM PROJECT No. 918319 — MARINE CORPS, CAMP LEJEUNE, N.C.	

FIGURE 4

SILT FENCE DETAIL AND STRAW SILT BARRIER

G:\LANTDIV\LEJEUNE\918319\WP-918319\FIG-04.DWG

APPENDIX A

SITE SPECIFIC HEALTH AND SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN
OPERABLE UNIT NO. 12 (SITE 3)
REMEDIATION OF PAH CONTAMINATED SOIL
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032

Atlantic Division
Naval Facilities Engineering Command
6506 Hampton Boulevard
Building A (South East Wing) 3rd Floor
Norfolk, VA 23508

Prepared by:

OHM Remediation Services Corp.
5445 Triangle Parkway, Suite 400
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Reviewed by:

James A. Dunn, Jr., P.E.
Senior Project Manager

for Bob Brooks, CIH
LANTDIV Health and Safety Director

Roland Moreau, P.E.
Program Manager

August 1999
Delivery Order No. 100
OHM Project No. 918319

TABLE OF CONTENTS

1.0 INTRODUCTION ***1***

1.1 SITE HISTORY 1

1.2 SCOPE OF WORK 2

2.0 KEY PERSONNEL AND MANAGEMENT ***1***

2.1 PROJECT MANAGER 1

2.2 SITE SUPERVISOR 1

2.3 SITE SAFETY OFFICER 1

2.4 CERTIFIED INDUSTRIAL HYGIENIST 2

2.5 EMPLOYEE SAFETY RESPONSIBILITY 2

2.6 KEY SAFETY PERSONNEL 2

3.0 JOB HAZARD ANALYSIS ***1***

3.1 CHEMICAL HAZARDS 1

3.1.1 Poly-nucleated hydrocarbons (PNA PAH) 2

3.1.2 Petroleum Hydrocarbons Products 2

3.1.2.1 Gasoline Threshold Limit Value - 350 ppm 2

3.1.2.2 Ethyl Benzene Permissible Exposure limit – 100 ppm 2

3.1.2.3 Xylene Permissible Exposure Limit – 100 ppm 2

3.1.2.4 Toluene Threshold Limit Value – 400 ppm 4

3.2 PHYSICAL HAZARDS 4

3.3 ENVIRONMENTAL HAZARDS 7

3.3.1 Heat Stress 7

3.3.2 Exposure to Cold 9

3.3.3 Project Hazard Communication 10

3.3.4 Noise 11

3.4 TASK-SPECIFIC RISK ASSESSMENT/ACTIVITY HAZARD ANALYSIS 12

4.0 WORK AND SUPPORT AREAS ***1***

4.1 EXCLUSION ZONE (EZ) 1

4.2 CONTAMINATION REDUCTION ZONE (CRZ) 1

4.3 SUPPORT ZONE (SZ) 1

4.4 SITE CONTROL LOG 2

4.5 GENERAL 2

5.0 PROTECTIVE EQUIPMENT ***1***

5.1 ANTICIPATED PROTECTION LEVELS 1

5.2 PROTECTION LEVEL DESCRIPTIONS 2

5.2.1 Level D 2

5.2.2 Modified Level D 2

5.2.3 Level C 2

5.3 AIR-PURIFYING RESPIRATORS 3

TABLE OF CONTENTS (cont.)

5.4 RESPIRATOR CARTRIDGES 3
5.5 CARTRIDGE CHANGES 3
5.6 INSPECTION AND CLEANING 3
5.7 FIT TESTING 4
5.8 FACIAL HAIR 4
5.9 CORRECTIVE LENSES 4
5.10 CONTACT LENSES 4
5.11 MEDICAL CERTIFICATION 4
5.12 SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM 4

6.0 DECONTAMINATION PROCEDURES 1
6.1 PERSONNEL DECONTAMINATION 1
6.1.1 Suspected Contamination 1
6.1.2 Personal Hygiene 2
6.2 EQUIPMENT DECONTAMINATION 2
6.3 DISPOSAL 2

7.0 AIR MONITORING 1
7.1 LOWER EXPLOSIVE LIMIT/OXYGEN (LEL/O2) METER 1
7.2 PHOTOIONIZATION DETECTOR (PID) 1
7.3 REAL-TIME AEROSOL MONITOR (MINIRAM) 2
7.4 AIR SAMPLING AND ANALYSIS 2
7.5 AIR MONITORING LOG 3
7.6 CALIBRATION REQUIREMENTS 3
7.7 AIR MONITORING RESULTS 3

8.0 EMERGENCY RESPONSE AND CONTINGENCY PLAN 1
8.1 PRE-EMERGENCY PLANNING 1
8.2 EMERGENCY RECOGNITION AND PREVENTION 2
8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS 5
8.3.1 Responsibilities and Duties 5
8.3.2 On-site Emergency Coordinator Duties 5
8.4 SAFE DISTANCES AND PLACES OF REFUGE 7
8.5 EVACUATION ROUTES AND PROCEDURES 9
8.5.1 Evacuation Signals and Routes 9
8.5.2 Evacuation Procedures 9
8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT 10
8.6.1 Notification Procedures 11
8.6.2 Procedure for Containing/Collecting Spills 11
8.6.3 Emergency Response Equipment 13
8.6.4 Personal Protective Equipment 13
8.6.5 Emergency Spill Response Clean-Up Materials and Equipment 14

TABLE OF CONTENTS (cont.)

8.7 EMERGENCY CONTINGENCY PLAN 15
8.7.1 Medical Emergency Contingency Measures 15
8.7.1.1 Response 15
8.7.1.2 Notification 17
8.7.1.3 Directions To Hospital 17
8.7.2 Fire Contingency Measures 18
8.7.3 Hazardous Weather Contingency Measures 19
8.7.3.1 Response 19
8.7.3.2 Notification 19
8.7.4 Spill/Release Contingency Measures 19

9.0 TRAINING REQUIREMENTS 1

10.0 MEDICAL SURVEILLANCE PROGRAM 1
10.1 EXAMINATION SCHEDULE 1

TABLES

TABLE 8.1 Emergency Telephone Numbers
TABLE 10.1 Worker Medical Plan

APPENDICES

APPENDIX A Health and Safety Certification
APPENDIX B OHM Hazard Communication Program
APPENDIX C Site Material Safety Data Sheets
APPENDIX D Specific OHM Health and Safety Procedures
APPENDIX E Health and Safety Forms

1.0 INTRODUCTION

This Site-Specific Health and Safety Plan (SHSP) has been developed for United States Navy, LANTDIV, for Remedial activities at Operable Unit 12 (Site 3), the Old Creosote Plant, MCB Camp Lejuene, North Carolina. This work will be executed per the requirements stated in the Delivery Orders under Contract No. N62470-93-D-3032.

This SHSP documents the policies and procedures which protect workers and the public from potential hazards posed by work at this site. OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of zero accidents for all projects. All projects will be conducted in a manner which minimizes the probability of injury, accident, or incident occurrence. This SHSP is a key element in the proper planning of project work which is necessary to assure the goal of zero accidents. The Health and Safety Certification (*Appendix A*) will be signed by all who actively participate at this project.

Although this plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials with approval from the project CIH.

This plan has been prepared in accordance with OSHA's "Hazardous Waste Operations and Emergency Response" standard contained in 29 CFR 1910.120 and the U. S. Army Corps of Engineers's (USACE's) Safety and Health Requirements Manual (COE EM-385-1-1, September 1996).

1.1 SITE HISTORY

The Old Creosote Plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Base railroad. Reportedly, an onsite sawmill was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment process used is not known, records show that creosote was stored for reuse in a railroad tank car on-site. Refer to work plan for site description.

1.2 SCOPE OF WORK

OHM will be mobilizing to the site to perform remedial actions consisting of excavation and stockpiling, excavation and direct loading, verification sampling and backfilling operations. The following tasks will be performed during remedial actions at the site:

Task 1:	**Mobilization and site preparation**
Task 2:	**Surveying**
Task 3:	**Clearing and grubbing**
Task 4:	**Demolish and stage concrete slab**
Task 5:	**Non-Contaminated soil excavation, and stockpiling**
Task 6:	**Contaminated soil excavation and direct loading**
Task 7:	**Verification sampling**
Task 8:	**Backfill, grade and compact**
Task 9:	**Decontaminate equipment**
Task 10:	**Site restoration**
Task 11:	**Abandon/reinstall monitoring wells**
Task 12:	**Demobilization**

These activities have been analyzed for potential hazards for which hazard control measures are provided in Section 3.4 Activity Hazard Analysis.

2.0 *KEY PERSONNEL AND MANAGEMENT*

The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the SHSP.

2.1 PROJECT MANAGER

The PM has the overall responsibility for the project and to assure that the goals of the construction remedial action are attained in a manner consistent with the SHSP requirements. The PM will coordinate with the SS and the SSO to assure that the remedial action goals are completed in a manner consistent with the SHSP. The PM will identify contacts and telephone numbers, with assistance from LANTDIV, of local health care providers, the NOSC/NOSCDR, the LEPC and other agencies that may be asked to provide emergency support during project activities. The PM will conduct a monthly health and safety audit of the project using the Management Health and Safety Report Form.

2.2 SITE SUPERVISOR

The SS is responsible for field implementation of the SHSP. The SS will coordinate with the SSO to establish communications with local health care providers, the NOSC/NOSCDR, the LEPC and other outside organizations and agencies that may be asked to provide emergency support during project activities. The SS will be the main contact in any on-site emergency situation. The SS will conduct periodic inspection of the work site to confirm compliance with all health and safety requirements. The SS is also responsible for coordinating remedial actions for all deficiencies and for enforcing the OHM "Cardinal Safety Rules" (included in *Appendix E*) and the site specific health and safety procedures (included in *Appendix B*).

2.3 SITE SAFETY OFFICER

The SSO has the responsibility for administering the SHSP relative to site activities, and will be in the field full-time while site activities are in progress. The SSO's primary operational responsibilities include personal and environmental monitoring, coordination of job safety analyses, personal protective equipment maintenance, and assignment of protection levels. The SSO will direct all field activities involved with safety and is authorized to stop work when an imminent health or safety risk exists. The SSO is responsible for assuring that all On-Site Personnel understand all safety requirements.

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2.4 CERTIFIED INDUSTRIAL HYGIENIST

The CIH is responsible for the contents of the SHSP and ensures that the SHSP complies with all federal, state and local health and safety requirements. If necessary, the CIH can modify specific aspects of the SHSP to adjust for on-site changes that affect safety. The CIH will coordinate with the SSO on all modifications to the SHSP and will be available for consultation when required. The CIH will not necessarily be on site during OHM activities; however, he may perform site safety audits to confirm field compliance with the SHSP.

2.5 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in OHM's Health and Safety Procedures Manual, with particular emphasis on the OHM "Cardinal Safety Rules." which will be maintained on-site by the SSO. Specific health and safety procedures applicable to this project are provided in *Appendix D* of this plan.

2.6 KEY SAFETY PERSONNEL

The following individuals share responsibilities for health and safety at the site.

Project Manager	**Jim Dunn** **(770) 663-1433 Office** **(800) 999-6710 PIN 996-8061 Pager**
Site Supervisor	**Randy Smith** **(910) 451-2390 Office** **(910) 346-7110 Pager**
Site Safety Officer	**Mark Martin** **(910) 451-2390 Office**
Program Manager for LANTDIV	**John Franz, P.E.** **(757) 363-76190**

SR Health and Safety Director/Project CIH	**Bob Brooks, CIH (609) 584-8900 Office**

3.0 JOB HAZARD ANALYSIS

This section outlines the potential chemical and physical hazards which workers may be exposed to during work on this project. Section 3.1 lists significant contaminants identified at the site and their respective published occupational exposure limits. The OSHA permissible exposure limits (PELs) and the American Conference of Governmental Industrial Hygentist (ACGIH) threshold limit values (TLVs) were reviewed for these contaminants, evaluated, and the more stringent value of the two selected as exposure guidelines. An Material Safety Data Sheet (MSDS) list is included in *Appendix C.*

3.1 CHEMICAL HAZARDS

Previous investigation have identified Polyaromatic hydrocarbons (PAH's) in surface and subsurface soil at the old creosote plant. The following are the PAH's identified and their maximum concentrations:

- Dibenzofuran @ 36 mg/kg
- Benzo(a)anthracene @ 8.3 mg/kg
- Benzo(b)flouranthene @ 9.0 mg/kg
- Benzo(a)pyrene @ 8.7 mg/kg
- Indeno(1,2,3-cd)pyrene @ 6.8 mg/kg
- Dibenzo(a,h)anthracene @ 2.9 mg/kg

The main chemical hazards posed by remedial actions is inhalation and ingestion of PAH contaminated soils. However, the potential hazard posed by PAH contaminated soil is low based on the low concentration of PAH's identified in soil at the old creosote plant. Also ground water is contaminated with PAH's and petroleum hydrocarbon products, namely volatile organics (VOC's) ethylbenzene, xylene and toluene. A potential VOC exposure could occur when groundwater is present during excavation operations.

3.1.1 Poly-nucleated hydrocarbons (PNA PAH)

Permissible Exposure Limit – 0.2 mg/m3 (as coal tar pitch)

PNA products can cause dry skin, irritation, anesthetic effects, loss of coordination, central nervous system depression, and death. Overexposure may cause an exaggerated sense of well being, excitement, headache, dizziness, incoherent speech, narcosis, central nervous

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Permissible Exposure Limit – 0.2 mg/m3 (as coal tar pitch)

PNA products can cause dry skin, irritation, anesthetic effects, loss of coordination, central nervous system depression, and death. Overexposure may cause an exaggerated sense of well being, excitement, headache, dizziness, incoherent speech, narcosis, central nervous system stimulation and then depression, respiratory paralysis, respiratory irritation, vomiting, skin and lung cancer, and death.

3.1.2 Petroleum Hydrocarbons Products

Petroleum products can cause dry skin, irritation, anesthetic effects, loss of coordination, central nervous system depression, and death. Overexposure may cause an exaggerated sense of well being, excitement, headache, dizziness, incoherent speech, narcosis, central nervous system stimulation and then depression, respiratory paralysis, respiratory irritation, vomiting, skin cancer, and death. Fuels have been associated with skin and kidney cancer.

3.1.2.1 Gasoline Threshold Limit Value - 350 ppm

Gasoline is a clear, colorless (dye may be added for color), flammable liquid with an aromatic odor. It will form flammable mixtures with air at -45°F. Vapors are heavier than air with a vapor density of 3 to 4 (air = 1), and the liquid is lighter than water with a specific gravity of 0.72 to 0.76 (water = 1). It is extremely flammable and vapors can travel great distances to an ignition source and flash back to the source.

3.1.2.2 Ethyl Benzene Permissible Exposure limit – 100 ppm

Ethyl Benzene overexposure may cause irritation of the eyes, respiratory tract, and skin, dermatitis, headache, dizziness, fatigue, incoordination, central nervous system depression, coma, and death from respiratory center paralysis. Liquid splashed in the eyes may cause irritation and damage.

Ethyl Benzene is a clear, colorless, flammable liquid with an aromatic odor. It will form flammable mixtures with air at 64°F. Vapors are heavier than air with a vapor density of 3.7 (air = 1) and the liquid is lighter than water with a specific gravity of 0.86 (water = 1).

3.1.2.3 Xylene Permissible Exposure Limit – 100 ppm

Xylene overexposure may cause irritation of the eyes, respiratory tract, and skin; dermatitis, headache, dizziness, fatigue, incoordination, liver and kidney damage, central nervous system depression, coma, and death. Liquid splashed in the eyes may cause irritation and damage.

Xylene is a clear, colorless, flammable liquid with an aromatic odor. It will form flammable mixtures with air at 81°F. Vapors are heavier than air with a vapor density of 3.7 (air = 1) and the liquid is greater than water with a specific gravity of 0.86 (water = 1).

3.1.2.4 Toluene Threshold Limit Value – 400 ppm

Toluene overexposure may cause irritation of the eyes, respiratory tract, and skin, headache, dermatitis, dizziness, fatigue, incoordination, central nervous system depression, coma, and death. Liquid splashed in the eyes may cause irritation and damage.

Toluene is a clear, colorless, flammable liquid with an aromatic odor. It will form flammable mixtures with air at 53°F. Vapors are heavier than air with a vapor density of 3.14 (air = 1) and the liquid is lighter than water with a specific gravity of 0.78 (water = 1.1).

3.2 PHYSICAL HAZARDS

To minimize physical hazards, OHM has developed standard safety protocols which will be followed at all times. Failure to follow safety protocols will result in expulsion of an employee from the site and appropriate disciplinary actions.

The SS and SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Hard hats, safety glasses, and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. The Health and Safety Procedures Manual for LANTDIV will be maintained at the project site as a reference document.

The following sections are typical safety hazards that may occur at project site along with relevant hazard control procedures.

- **Heavy and Bulky Loads**

  Intelligent thought shall be exercised before heavy and bulky loads are lifted or handled manually by personnel. Mechanical equipment such as fork-lifts, wheel barrows, hand-trucks, loaders, and cranes shall be utilized when possible and needed. **Note: Back injuries are real, debilitating, unproductive, and costly to both employees and employers, and sometime permanent. Back injury prevention must be given high priority on all project sites. If you think the**

load you are about to lift is too heavy or bulky, it probably is! Get help or utilize mechanical equipment.

- **High Pressure Washing**

  Washing or cleaning certain pieces of equipment may require the use of high pressure washers, referred to as lasers. These devices can be hazardous if not used properly. Specific laser safety instructions are provided in Procedure No. 30. The following protective equipment will be worn: safety shoes or boots, metal foot and shin guards, goggles and face shield, hard hat, heavy-duty PVC rain suit, and heavy chemical resistant gloves. Only trained personnel will operate the high pressure washer. The operator must have an assistant to move the hose and back-up the operator. Other personnel must remain a minimum of 25 feet from the area. The equipment cannot be altered (trigger shall never be tied down). Operator should be changed every hour. Hydroblasting lacerations are serious and must be reported.

- **Small Quantity Flammable Liquids**

  Small quantities of flammable liquids will be stored in "safety" cans and labeled according to contents.

- **Electrical Hazards**

  Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact or sever them during site operations. Electrical equipment used on-site may also pose a hazard to workers. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight, and corrosion-resistant connecting cables will be used on-site. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. To eliminate this hazard, weather conditions will be monitored and work will be suspended during electrical storms. An additional electrical hazard involves capacitors that may retain a charge. All such items will be properly grounded before handling. OSHA's standard 29 CFR Part 1910.137 describes clothing and equipment for protection against electrical hazards.

  Electrical devices and equipment must be de-energized prior to working near them. All extension cords must be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical

circuits must be protected with ground fault interrupters. Only qualified electricians are authorized to work on electrical circuits.

- **Slip/Trip/Fall Hazards**
  Some areas may have wet surfaces which will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with fall hazards. Use of handrails when climbing stairs will be enforced, and handrails will remain secure until the support itself is removed and lowered to ground level. Good housekeeping practices are essential to minimize trip hazards. Safety belts or harnesses will be required by personnel working four feet or more above surfaces, including manlifts.

  The work area shall be kept clean and orderly. Tools and debris must be picked up and placed in the proper place to prevent a tripping hazard. Walkways and grating shall be kept in good condition. Spills will be cleaned up immediately. Personnel shall not walk or climb on piping, valves, fittings, or any other equipment not designed as walking surfaces.

- **Ground Personnel**
  All ground personnel should be constantly aware of the possibility of slips, trips, and falls due to poor and possibly slippery footing in the work areas. Before crossing either in front of or behind a piece of heavy equipment, ground personnel will signal the equipment operator and receive confirmation before moving.

- **Head and Back Injuries**
  As minimum requirements, hard hats and safety glasses will be donned prior to performing any site activities. This requirement will prevent minor injuries caused by bumping one's head while working around and under piping and other process related structures. At the daily safety meeting, personnel are instructed in proper lifting techniques and reminded not to lift heavy items without assistance.

- **Falling Objects**
  OHM believes that the dismantlement process as well as other remediation processes can be accomplished without any object, regardless of size, free falling to the ground. All support structures will be slowly lowered to the ground using a grapple and/or skip bucket. No personnel shall work under this equipment at any time. The SSO will ensure that an adequate area is clear of personnel while the equipment is in operation.

- **Equipment and Hand Tools**
  All hand tools and power tools shall be in good repair and will be used only for the task for which they were designed. All damaged tools will be tagged "Out of Service." All tools will be kept clean. Sharp tools shall not be carried in pockets. When working, overhead tools will be placed in a holding receptacle or secured when not in use. Tools cannot be thrown or dropped from heights. Only non-sparking tools will be used in flammable or explosive atmospheres. Cheater pipes will not be used.

- **Ladders**
  Access to high places will be obtained by using approved ladders and stairs in accordance with ANSI 14.1-3. Ladders will be used for access to and from the excavation.

3.3 ENVIRONMENTAL HAZARDS

Environmental factors such as weather, wild animals, insects, and irritant plants pose a hazard when performing outdoor work. The SSO and SS will take all necessary measures to alleviate these hazards should they arise.

3.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing result in the potential for heat stress. Heat stress disorders include:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stress prevention is outlined in procedure No. 22 of the OHM Corp. Health and Safety Procedures Manual. This information will be reviewed during safety meetings. Workers will be encouraged to increase consumption of water and electrolyte containing beverages (e.g., Gatorade).

The following is a summary of the signs and symptoms of heat stress disorders.

- Heat rash – characteristic rash which may develop on the skin in areas which may be chapped by clothing. Frequent clothing changes help to prevent chapping from contact with wet clothes.

- Heat cramps – caused by heavy sweating and inadequate electrolyte replacement. Provide frequent breaks with fluid replacement. Cramps are usually relieved when victim is moved to a cool resting place and provided fluids every 15 minutes for approximately 1 hour. Symptoms include:
    - Muscle spasms
    - Pain in the hands, feet, abdomen
- Heat exhaustion – caused by increased stress of various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Immediately remove the victim from the hot environment and provide rest while lying the victim down with feet elevated, and care for shock. Attempt to cool the victim by fanning or applying wet towels. Provide fluid replacement every 15 minutes and refer for medical evaluation if not improved within 30 minutes. Symptoms include:
    - Pale, cool, moist skin
    - Heavy sweating
    - Dizziness
    - Nausea
    - Fainting
- Heat stroke – temperature regulation fails and the body core temperature rises to critical levels. Immediate action must be taken to cool the body. Competent medical care must be obtained immediately since this is a life threatening disorder. Symptoms include:
    - Hot, dry skin, usually red, mottled or cyanotic
    - 104° temperature
    - Confusion, dizziness
    - Loss of consciousness
    - Convulsions
    - Strong, rapid pulse

It is recommended that workers break at least every two hours for 10 to 15 minute rest periods when temperatures rise above 72.5°F and protective clothing is worn. Ambient temperatures will be determined from a Hg/glass thermometer shielded from radiant heat. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat related. The frequency of breaks may need to be increased upon worker recom-

mendation to the SSO and SS. Heat stress can be prevented by assuring an adequate work and rest schedule; guidelines are printed below.

AMBIENT TEMPERATURE	LEVEL D PPE	LEVEL C PPE/ MODIFIED LEVEL D
90° F or above	After 45 minutes of work	After 15 minutes of work
87.5 - 90°F	After 60 minutes of work	After 30 minutes of work
82.5 - 87.5°F	After 90 minutes of work	After 60 minutes of work
77.5 - 82.5°F	After 120 minutes of work	After 90 minutes of work
72.5 - 77.5°F	After 150 minutes of work	After 120 minutes of work

The work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. If the heart rate exceeds 110 beats per minute (BPM) at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, decrease the work period by 1/3. The initial rest period should be at least 10 minutes.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70°F when wearing Level C PPE, or 80°F for site activities performed in Level D. Monitoring will include pulse rate, weight loss, oral temperature and signs and symptoms of heat stress. The employees radial pulse will be monitored for 30 seconds to determine heart rate. When monitored, oral temperatures (OT) will be obtained utilizing a clinical thermometer or equivalent. If the employees' OT exceeds 99.6°F, the work period will be reduced by 1/3. If after this work period, the oral temperature still exceeds 99.6°F, the work period will again be shortened by 1/3. If the employee's OT exceeds 100.6°F, the employee will not be permitted to wear PPE. See Procedure 22 LANTDIV Health and Safety Procedures Manual.

3.3.2 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation. Since wind chill temperature takes into account the potential for loss of body heat through convection, the wind-chill adjusted temperature will be used to evaluate for potential cold stress occurrence.

In cold weather, the potential for frostbite exists, especially in body extremities. Personnel will be instructed to pay particular attention to hands, feet, and any exposed skin when dressing. Personnel will be advised to obtain more clothing if they begin to experience loss of sensation due to cold exposure.

Employees will be encouraged to use the heated shelters on site at regular intervals depending upon the severity of ambient temperatures. When temperatures are less than 20°F (actual or wind chill) workers should break regularly to the heated shelter to warm up (every 45 minutes at a minimum). Since cold weather does cause significant water loss as a result of the dryness of the air, fluid intake will be encouraged to prevent dehydration which directly affects blood volumes and flow to the extremities. Warm, sweet, caffeine-free, nonalcoholic drinks and soup offer the best fluid replacement and provide calorie energy. Symptoms of cold stress, including heavy shivering, excessive fatigue, drowsiness, irritability, or euphoria necessitate immediate return to the shelter.

3.3.3 Project Hazard Communication

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all OHM personnel and OHM subcontractors. OHM's Corporate Hazard Communication Program is included in *Appendix B* for reference. Hazard communication will include the following:

- **Container Labeling**
  OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

- **Material Safety Data Sheets (MSDSs)**
  There will be an MSDS located on site for each hazardous chemical known to be used on site. All MSDSs will be located in *Appendix C* of the SHSP. The site safety plan can be found in the project office trailer.

- **Employee Information and Training**
  Training employees on chemical hazards is accomplished through on ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

At a minimum, OHM and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals
- What the company has done to prevent workers' exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals
- How to read and interpret labels and MSDSs for hazardous substances found on OHM sites
- Emergency spill procedures
- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM and related subcontractor employee will be given information in the same manner as the safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on-site employees.

Refer to *Appendix C* of the site safety plan to find a list of hazardous chemicals anticipated to be brought to the site and the corresponding MSDSs for these chemicals.

3.3.4 Noise

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 dbA (Time Weighted Average) as well as personnel working around heavy equipment. The SSO will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

3.4 TASK-SPECIFIC RISK ASSESSMENT/ACTIVITY HAZARD ANALYSIS

Prior to beginning each major phase of work, an activity hazard analysis (form included in *Appendix E*) will be performed. The analysis will define the activity being performed,

identify the sequence of work, the specific hazards anticipated and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work will not proceed on that project phase until the activity hazard analysis has been accepted by the designated on-site authority, as well as, being discussed with all site personnel, that will perform the activity. The following Task Specific Risk Assessment/Activity Hazard Analysis identifies the major project phases and anticipated hazards and control measures that will be instituted during the execution of the scope of work.

Task 1 – Mobilization and Site Preparation

Principle Steps Establish and post emergency procedures. Review SHSP with all site personnel. Set-up work zones, decontamination facilities, and equipment staging pads. Stage emergency stand-by equipment near EZ access control point. Perform utility clearences.	
Potential Hazards Involved	**Hazard Control Measures**
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Personnel shall drive at posted speed limits or at safe speeds • Follow OHM SOP for Vehicle Safety (No. 2-1)
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Electrical hazards	• Electrical work will be performed by approved electricians only • No electrical work should be done on an energized circuit • Test to ensure circuit is de-energized prior to start • Follow OHM SOP for Lockout/tag-out (No. 6-4) • Electrical hand tools must be grounded or double insulated • Temporary electrical connections must be GFI protected • Follow OHM SOP for Electrical Safety (No. 2-5)
Contact with utilities	• Locate all buried utilities prior to subsurface activities • Maintain 15-ft between heavy equipment and overhead utilities
Portable power tool hazard	• All hand and power tools shall be in good repair • When working overhead, tools not in use will be secured • Do not throw or drop tools from heights • Follow OHM SOP for Equipment and Hand Tools (No. 7-7)

Task 2 – Surveying

Principle Steps Perform non-intrusive survey of excavation areas.	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Exposure to hazardous materials.	• Wear required PPE • Follow this SHSP

Task 3 – Clearing and Grubbing

Principle Steps Use brush hog with tractor or heavy equipment to clear and grub areas to be excavated. Cut trees with chain saws.	
Potential Hazards Involved	**Hazard Control Measures**
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Exposure to hazardous materials.	• Wear required PPE. Wear splash protection as appropriate • Follow this SHSP
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)
Flammable liquids	• Spills will be cleaned up immediately • Approved safety can must be used • No smoking signs are required in storage and fueling areas • Suitable storage area must be designated on temporary job sites • Follow OHM SOP for Solvents and Flammable Liquids (No. 7-9)
Chainsaw cutting hazard	• Provide training and wear chainsaw chap protection and follow the manufacturer's operations manual
Falling trees, limbs, and debris from power mower	• Keep personnel away from tree felling and mowing operations

Task 4 – Demolish and Stage Concrete Slab

Principle Steps Saw-cut concrete slab over areas to be excavated. Break concrete, stage and load with heavy equipment	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Exposure to hazardous materials	• Wear required PPE • Follow this SHSP
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)
Flying debris from hoe-ram	• Maintain clearance of non-essential personnel • Mark safe distances before operations start
Saw-cutting hazard	• Use concrete saw with guards in place and wet methods to control dust emissions • Wear face-shield and hearing protection

Task 5 – Non-contaminated Soil Excavation and Stockpiling

Principle Steps Use heavy equipment to excavate top 3 feet, stockpile, and sample	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Contact with utilities	• Locate all buried utilities prior to subsurface activities • Maintain 15-ft between heavy equipment and overhead utilities
Excavation and stockpiling hazards	• Locate and mark all buried utilities prior to start • Stockpile excavated material greater than 2-ft from edge of excavation • Perform LEL/O2 air monitoring prior to personnel entry when potentially hazardous atmospheres are present • Follow OHM SOP (No. 6-5)
Exposure to hazardous materials	• Wear required PPE • Follow this SHSP
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Personnel shall drive at posted speed limits or at safe speeds • Dump trucks must be equipped with back-up alarms or spotter must be provided • Follow OHM SOP for Vehicle Safety (No. 2-1)
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)

Task 6 – Contaminated Soil Excavation and Direct Loading

Principle Steps Use heavy equipment to excavate contaminated soil from 3 feet to approximately 9 feet depths and direct load into dump trucks.	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Contact with utilities	• Locate all buried utilities prior to subsurface activities • Maintain 15-ft between heavy equipment and overhead utilities
Excavation and cave-in hazards	• Locate and mark all buried utilities prior to start • Stockpile excavated material greater than 2-ft from edge of excavation • A competent person will conduct daily inspections using the OHM Excavation Permit for excavations 4-ft or more in depth • Slope excavations requiring personnel entry 1½ to 1 (H:V) and equal or greater than 5-ft deep • Perform LEL/O2 air monitoring prior to personnel entry when potentially hazardous atmospheres are present • Follow OHM SOP (No. 6-5)
Exposure to hazardous materials	• Wear required PPE • Follow this SHSP
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Personnel shall drive at posted speed limits or at safe speeds • Dump trucks must be equipped with back-up alarms or spotter must be provided • Follow OHM SOP for Vehicle Safety (No. 2-1)
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)

Task 7 – Verification Sampling

Principle Steps Collect soil samples from excavated areas	
Potential Hazards Involved	**Hazard Control Measures**
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Exposure to hazardous materials.	• Wear required PPE. Wear splash protection as appropriate • Follow this SHSP
Heavy equipment traffic	• Equipment operators are responsible for the safety of ground personnel • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Cave-in hazards	• A competent person will conduct daily inspections using the OHM Excavation Permit for excavations 4-ft or more in depth • Slope excavations requiring personnel entry 1½ to 1 (H:V) and equal or greater than 5-ft deep • Perform LEL/O2 air monitoring prior to personnel entry when potentially hazardous atmospheres are present • Follow OHM SOP (No. 6-5)

Task 8 – Backfill, Grade and Compact Excavation

Principle Steps Use heavy equipment to place backfill material in excavation. Compact backfill and grade as directed.	
Potential Hazards Involved	**Hazard Control Measures**
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Contact with overhead utilities	• Maintain 15-ft between heavy equipment and overhead utilities
Cave-in hazards	• A competent person will conduct daily inspections using the OHM Excavation Permit for excavations 4-ft or more in depth • Slope excavations requiring personnel entry 1½ to 1 (H:V) and equal or greater than 5-ft deep • Perform LEL/O2 air monitoring prior to personnel entry when potentially hazardous atmospheres are present • Follow OHM SOP (No. 6-5)
Exposure to hazardous materials	• Wear required PPE. Wear splash protection as appropriate • Follow this SHSP
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Operators shall drive at posted speed limits • Dump trucks must be equipped with back-up alarms or spotter must be provided • Follow OHM SOP for Vehicle Safety (No. 2-1)

Task 9 – Equipment Decontamination

Principle Steps Decontaminate personnel. Decontaminate equipment. Collect and containerize decontamination water.	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Exposure to hazardous materials.	• Wear required PPE. Wear splash protection as appropriate • Follow this SHSP
Spills and splash hazards	• Wear splash protection as necessary to prevent dermal contact • Ensure spill cleanup equipment/material on hand/ready for use • Cleanup spills immediately • Follow this SHSP Section 3 and 5
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)
Pressure washing hazard	• Wear appropriate PPE • Only trained personnel will operate high pressure washer • Do not alter the equipment • Follow OHM SOP for Pressure Washing (No. 7-1)

Task 10 –Site Restoration

Principle Steps Use heavy equipment to place gravel/topsoil and re-seed	
Potential Hazards Involved	**Hazard Control Measures**
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Personnel shall drive at posted speed limits or at safe speeds • Dump trucks must be equipped with back-up alarms or spotter must be provided • Follow OHM SOP for Vehicle Safety (No. 2-1)

Task 11 – Abandon and Re-install Monitoring Wells

Principle Steps Set-up and inspect drill rig. Pump grout into well to abandon in-place. Drill bore-holes, place casing for re-installing wells and develop well.	
Potential Hazards Involved	**Hazard Control Measures**
Heavy lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Heavy equipment must have fully functioning safety devices • Equipment operators are responsible for the safety of ground personnel • Do not suspend or swing load overhead of ground personnel • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • To approach equipment, make eye contact/signal operator to cease activity and wait for operator acknowledgment • Follow OHM SOP for Equipment Inspection (No. 2-7)
Contact with utilities	• Locate all buried utilities prior to subsurface activities • Maintain 15-ft between heavy equipment and overhead utilities
Exposure to hazardous materials	• Wear required PPE. Wear splash protection as appropriate • Follow this SHSP • Follow MSDS for grout
Drill rig equipment	• Inspect drill rig prior to use • Equipment must have fully functioning safety devices • Stage emergency equipment near operations area • Stay clear of rotating equipment • Wear close fitting clothes • Use wetting agents as necessary for dust suppression • Follow OHM SOP for Well Drilling, (No. 6-8)
Noise	• Personnel will wear hearing protection above 85 decibels • Post warning signs in high noise level areas • Follow SOP for Hearing Conservation Program (No. 3-3)

Task 12 - Demobilization

Principle Steps Remove work zone fencing and decontamination facilities. Properly segregate and dispose of accumulated trash and PPE. Load and secure equipment and material to prevent shifting during transport.	
Potential Hazards Involved	**Hazard Control Measures**
Vehicle operating hazards	• Operators are responsible for the safe and legal operation of vehicles • Seat belt use is mandatory for operator and passengers • Personnel shall drive at posted speed limits or at safe speeds • Follow OHM SOP for Vehicle Safety (No. 2-1)
Manual lifting / material handling hazards	• Make certain the load can be lifted safely • Do not lift more than 60 pounds • Use proper lifting techniques. Bend knees. Do not lift & twist • Follow OHM SOP for Personnel Lifting Safety (No. 2-3)
Slips, trips, and falls	• Maintain good housekeeping • Pick up tools and debris • Clean up spills immediately • Walk or climb only on equipment surfaces designed for personnel access • Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Heavy equipment traffic and use	• Equipment operators are responsible for the safety of ground personnel • To approach equipment, make eye contact/signal operator to cease activity • Do not carry or lift personnel except in an approved safety platform • Personnel shall be cognizant of the boom swing area and stay clear • Do not suspend or swing load overhead of ground personnel. • Heavy equipment must have fully functioning safety devices • Follow OHM SOP for Equipment Inspection (No. 2-7)
Electrical hazards	• Electrical work will be performed by approved electricians only • No electrical work should be done on an energized circuit • Test to ensure circuit is de-energized prior to start • Follow OHM SOP for Lockout/tag-out (No. 6-4) • Electrical hand tools must be grounded or double insulated • Temporary electrical connections must be GFI protected • Follow OHM SOP for Electrical Safety (No. 2-5)
Contact with utilities	• Locate all buried utilities prior to subsurface activities • Maintain 15-ft between heavy equipment and overhead utilities
Portable power tool hazard	• All hand and power tools shall be in good repair • When working overhead, tools not in use will be secured • Do not throw or drop tools from heights • Follow OHM SOP for Equipment and Hand Tools (No. 7-7)

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment will be clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities". Each work area will be divided into three zones as follows:

- An Exclusion or "hot" Zone (EZ)
- A Contamination Reduction Zone (CRZ)
- A Support Zone (SZ)

4.1 EXCLUSION ZONE (EZ)

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone.

4.2 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ or transition zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ.

4.3 SUPPORT ZONE (SZ)

The SZ serves as a clean control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment or clothing will not be allowed in the SZ. The support facilities should be located upwind of site activities. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the SSO and the SS to ensure proper safety protocols are followed.

4.4 SITE CONTROL LOG

A log of all personnel visiting, entering or working on the site shall be maintained in the main office trailer location. The log will record the date, name, company or agency, and time entering or exiting the site.

No visitor will be allowed in the EZ without showing proof of training and medical certification. Visitors will supply their own boots and respiratory equipment, if required. Visitors will attend a site orientation given by the SSO and sign the SHSP.

4.5 GENERAL

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the site.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZ.
- All personnel exiting the exclusion zone or the contamination reduction zone, must at a minimum, thoroughly wash their face and hands.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance. All personnel will be aware of dangerous situations that may develop.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with the safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

5.0 *PROTECTIVE EQUIPMENT*

This section addresses the various levels of personal protective equipment (PPE) which are or may be required at this job site. OHM personnel are trained in the use of all PPE utilized.

5.1 ANTICIPATED PROTECTION LEVELS

Task	Description	Protection Level
Task 1	**Mobilization and site preparation**	**D**
Task 2	**Surveying**	**Modified D with tyvek**
Task 3	**Clearing and grubbing** **Chain saw operations**	**Modified D with Tyvek** **Modified D/C with Tyvek, facesheild, hearing protection and chaps**
Task 4	**Demolish and stage concrete slab** **Demolition/saw-cutting operations**	**Modified D/C with Tyvek** **Modified D/C with Tyvek, facesheild and hearing protection**
Task 5	**Non-contaminated soil excavation, stockpiling and sampling**	**Modified D/C with Tyvek**
Task 6	**Contaminated soil excavation and direct loading** **Truck drivers remaining in truck when loading**	**Modified D/C with Tyvek** **D**
Task 7	**Verification sampling**	**Modified D with tyveks**
Task 8	**Backfill, grade and compact** **Backfill and compact first lift** **Backfill remaining lifts, compact and grade**	 **Modified D with Tyvek** **D**
Task 9	**Equipment decontamination**	**C with PE Tyvek, face-shield, and hearing protection**
Task 10	**Site restoration**	**D**
Task 11	**Abandon/reinstall monitoring wells** **Grout pumping and developing wells**	**Modified D with tyvek** **Modified D with tyvek and faceshield**
Task 12	**Demobilization**	**D**

Hearing protection will be required for all personnel whenever the noise level is above 85 dBa.

5.2 PROTECTION LEVEL DESCRIPTIONS

This sections lists the minimum requirements for each protection level. Modification to these requirements will be noted above.

5.2.1 Level D

Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Work clothing as prescribed by weather

5.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC overboots
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges]

5.2.3 Level C

Level C consists of the following:

- Full-face air-purifying respirator with appropriate cartridges
- Hooded Tyvek Coveralls [Polyethylene- or saran-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges]
- Hard hat
- Steel-toed work boots

- Nitrile, neoprene, latex or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)

5.3 AIR-PURIFYING RESPIRATORS

A NIOSH-approved full-face respirator with appropriate air-purifying cartridges will be used for Level C work.

5.4 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with air-purifying cartridges approved for the following contaminants.

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m^3
- Asbestos-containing dusts and mists
- Radionuclides

5.5 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily, or more frequently if personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property. Cartridges will be labeled with the date service began.

5.6 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.7 FIT TESTING

All personnel required to wear an air-purifying respirator as part of their employment will be fit-tested at the time of assignment and a minimum of annually thereafter. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.8 FACIAL HAIR

Personnel who have facial hair which interferes with the respirator's sealing surface will not be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.9 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.10 CONTACT LENSES

Contact lenses will not be worn with any type of respirator.

5.11 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.12 SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

The primary objective of respiratory protection is to prevent employee exposure to atmospheric contamination. When engineering measures to control contamination are not feasible, or while they are being implemented, personal respiratory protective devices will be used.

The criteria for determining respirator need have been evaluated based on the site contaminants and expected levels of protection are outlined in Section 5.1. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (Section 7.0). All respirator users are OSHA trained in proper respirator use and maintenance. The SS and SSO will observe workers during respirator use for signs of stress. The SS, CIH, and SSO will also evaluate this SHSP periodically to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the general decontamination procedure. The specific stages will vary depending on the work area, the task, the protection level, etc..

- Go to end of EZ
- Wash outer boots and gloves in detergent solution
- Rinse outer boots and gloves in water
- Remove outer boots and let dry
- Remove outer gloves and let dry
- Cross into CRZ
- Remove SCBA or hip pack (Level B)
- Remove first pair sample gloves
- Remove outer saran or tyvek
- Remove and wash respirator
- Rinse respirator and hang to dry
- Remove second pair sample gloves and discard

6.1.1 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided as determined by the degree of injury.

6.1.2 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face. Also, eye wash facilities and emergency showers will be provided at personnel decontamination facilities and at the water treatment system where hazardous chemicals are handled.

6.2 EQUIPMENT DECONTAMINATION

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSO.

6.3 DISPOSAL

All decontamination liquids and disposable clothing will be collected, containerized and treated as contaminated waste, unless determined otherwise by accepted testing methods. Wastes will be disposed of according to state and federal regulations.

7.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following air monitoring efforts will be used at this site. Additional air monitoring may be conducted at the discretion of the SSO.

The following chart describes the air monitoring required and appropriate action levels.

Monitoring Device	Monitoring Frequency	Action Level	Action
LEL/O_2 meters (work area)	**At start-up, four times daily, when excavating**	**> 10% LEL** **< 20.8%O_2**	**Stop operations; allow vapors to vent < 10% before continuing**
PID/OVA (Breathing Zone)	**At start-up, four times daily for Tasks 4 through 6**	**> 5 ppm for 5 min.** **> 50 ppm for 5 min.**	**Upgrade to Level C** **Shutdown operations, allow vapors to dissipate to < 5 ppm before continuing**
Mini-RAM Dust Meter (Breathing Zone)	**At start-up and four times daily for Tasks 4 through 6**	**> 3.0 mg/m3 for 5 min.**	**Level C**

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN (LEL/O2) METER

Prior to entering a confined space area or performing hot work involving welding, cutting, or other high heat producing operations where flammable or combustible vapors may be present, LEL/O_2 measurements will be taken.

7.2 PHOTOIONIZATION DETECTOR (PID)

A PID will be used to monitor total ionizable organic content of the ambient air. A PID will prove useful as a direct reading instrument to aid in determining if respiratory protection needs to be upgraded and to define the EZ.

For known contaminants only, to determine a protection level from PID data, the SSO will multiply the TLV of the known compound by 25. This will be the limit for Level C protection for that compound. If PID readings exceed 25 times the TLV, Level B protection will be required. Also, regardless of the TLV, a PID reading of 1,000 ppm or more will indicate that the GMC-H cartridges may become overloaded and will necessitate Level B protection. (Note: PID readings do not always indicate the actual air concentration of a compound. Consult the manual, HNU, or the CIH for clarification.).

The SSO will take measurements before operations begin in an area to determine the amount of organic compounds naturally occurring in the air. This is referred to as a background level.

Levels of volatile organic compounds (VOCs) will be measured in the air at active work sites once every hour and at the support zone once every hour when levels are detected above background in the exclusion zone. If levels exceed background at any time in the support zone, work in the exclusion zone will cease and corrective actions will be taken (e.g., cover soil with polyethylene sheeting). Work will not resume until levels reach background in the support zone.

7.3 REAL-TIME AEROSOL MONITOR (MINIRAM)

A real-time aerosol monitor (miniram) will be used to measure airborne particulate in personnel breathing zones and site work area locations. A breathing zone action level has been specified that requires upgrading to Level C protection based on sustained (5-minute average) miniram results. **This action level is 3.0 mg/m3, which is the TLV for respirable dust not otherwise classified.** The miniram will be used to monitor personnel breathing zone when wearing Modified Level D protection and to determine when an upgrade to Level C is warranted.

7.4 AIR SAMPLING AND ANALYSIS

Additional personal air samples will be collected in personnel breathing zones if the direct reading instruments indicate exposure in order to document that the appropriate level of protection was worn during remedial actions on-site. Air samples will be collected on personnel with the greatest potential for exposure during each major project phase.

7.5 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include all information identified in Procedure 5-2 of the ER Safety Procedures Manual. The Project CIH will periodically review this data.

7.6 CALIBRATION REQUIREMENTS

The PID, LEL/O_2 meter, Miniram and sampling pumps required with fixed-media air sampling will be calibrated daily, prior to and after each use. A separate log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

7.7 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 *EMERGENCY RESPONSE AND CONTINGENCY PLAN*

8.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the site, OHM will plan for possible emergency situations and have available adequate supplies and manpower to respond. The PM will coordinate this plan with the NOSC/NOSCDR prior to commencing work. In addition, site personnel will receive training during the site orientation concerning proper emergency response procedures. This training will include review of the elements of this plan and all action procedures described herein.

The following situations would warrant implementation of the Emergency Response and Contingency Plan (ERCP):

Fire/Explosion	• The potential for human injury exists • Toxic fumes or vapors are released • The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions • The use of water and/or chemical fire suppressants could result in contaminated run-off • An imminent danger of explosion exists
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health
Spill or Release of High Temperature Liquid or Vapor	• The spill can be contained on site, but the potential exists for ground-water contamination • The spill cannot be contained on site, resulting in off-site soil contamination and/or ground-water or surface water pollution • The spill quantity is greater than the reportable quantity limit for the material
Natural Disaster	• A rain storm exceeds the flash flood level • The facility is in a projected tornado path or a tornado has damaged facility property • Severe wind gusts are forecasted or have occurred and have caused damage to the facility
Medical Emergency	• Overexposure to hazardous materials • Trauma injuries (broken bones, severe lacerations/bleeding, burns) • Eye/skin contact with hazardous materials • Loss of consciousness • Heat stress (Heat stroke) • Cold stress (Hypothermia) • Heart attack • Respiratory failure • Allergic reaction

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.
- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel required to respond.
- It will be the responsibility of the emergency coordinator to brief the on-site response team on anticipated hazards at the site. The emergency coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Planning Committee (LEPC) in compliance with SARA Title III requirements.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be two-way radios. Air horns may be used to alert personnel of emergency conditions. A telephone will be located at the command post to summon assistance in an emergency.

Primary communication with local responders in the event of an emergency will be accomplished using commercial telephone lines.

8.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the SS and SSO, through daily site inspections and employee feedback (Safety Observation Program, daily safety meetings, and activity hazard analyses) to recognize and identify all hazards that are found at the site. These may include:

Chemical Hazards	• Materials at the site • Materials brought to the site
Physical Hazards	• Fire/explosion • Slip/trip/fall • Electrocution • Confined space • IDLH atmospheres • Excessive noise
Mechanical Hazards	• Heavy equipment • Stored energy system • Pinch points • Electrical equipment • Vehicle traffic
Environmental Hazards	• Electrical Storms • High winds • Heavy Rain/Snow • Temperature Extremes (Heat/Cold Stress) • Poisonous Plants/Animals

Once a hazard has been recognized, the SS and/or the SSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Lockout/tagout
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all OHM standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

Table 8.1 Emergency Telephone Numbers	
Local Agencies - All services	
Police Department	911 (on-base) (910) 451-3855 (off-base)
Fire Department	911 (on-base)
Ambulance	911 (on-base) (910) 455-9119 (off-base)
Hospital	
Onslow County Hospital (off-base)	(910) 577-2240 (off-base)
USMC Base Hospital (on base)	(910) 450-4840 (on-base)
NOSC/NOSCDR	(904) 772-5216
Regional Poison Control Center	800-672-1697
State Agencies	
State Highway Patrol	800-441-6127
Federal Agencies	
EPA Region Branch Response Center	(404) 347-3931
National Response Center	800-424-8802
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24 HR)
Navy ROICC / NTR	
National Response Center	800-424-8802
Project Manager - Jim Dunn	(770) 663-1433
Director, Health and Safety - Bob Brooks, CIH	(609) 584-8905
OHM (24 hour)	800-537-9540

Note: Additional Phone Numbers in Section 2.0 this SHSP

8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this site is the Site Supervisor. In the event an emergency occurs and the emergency coordinator is not on-site, the Site Safety Officer or the highest ranking employee on site will serve as the emergency coordinator until he arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The emergency coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

8.3.1 Responsibilities and Duties

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. OHM will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required. OHM will defer to the local Fire Department chief to assume the role of Incident Commander upon arriving on site. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

8.3.2 On-site Emergency Coordinator Duties

The on-site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site. While

operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where appropriate.

- Notify the NOSC/NOSCDR if outside emergency response help is necessary to control the incident. Table 8.1 provides telephone numbers for emergency assistance.
- Direct on-site personnel to control the incident until, if necessary, outside help arrives.
- Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify Base Fire Department.
- Notify LANTDIV ROICC
- Notify OHM Project Manager
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the emergency coordinator should immediately determine whether evacuation of area outside of the site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required (as determined by the NOSC/NOSCDR), notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.
- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Administrator's telephone number is included in the Emergency Contacts (Table 8.1).
- Record time, date, and details of the incident, and submit a written report to the USEPA Regional Administrator. Report is due to USEPA within 15 days of the incident.
- Perform post incident evaluation and response critique and submit a written report to the Regional Health and Safety Director within 30 days of the incident conclusion.

8.4 SAFE DISTANCES AND PLACES OF REFUGE

The emergency coordinator for all activities will be the SS. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity) workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50-ft in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons) workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by their foremen and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 8.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the crew trailers, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

8.5 EVACUATION ROUTES AND PROCEDURES

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

8.5.1 Evacuation Signals and Routes

Two-way radio communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Each crew supervisor will have a two-way radio. A base station will be installed in the OHM office trailer to monitor for emergencies. Total site evacuation will be initiated only by the emergency coordinator; however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area. Signs inside buildings will be posted on walls or other structural element of a building. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.

8.5.2 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.

- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by reentry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 8.1 provide a quick reference guide to follow in the event of a major spill.

8.6.1 Notification Procedures

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site emergency coordinator.

The on-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

8.6.2 Procedure for Containing/Collecting Spills

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture, an initial isolation of at least 100-ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50-ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire) and its release (due to high vapor pressures under ambient

conditions), further evacuation will be enforced. In general an area at least 500-ft wide and 1,000-ft long will be evacuated downwind if volatile materials are spilled (Consult the DOT Emergency Response Guide for isolation distances for listed hazardous materials).

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-site emergency coordinator will inform the proper agencies in the event this is necessary (refer to Table 8.1).

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), OHM's practice is to report a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or TSCA. OHM also follows the same practice for any substances not listed in the Acts noted above but which can be classified as a hazardous waste under RCRA.

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.

- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

8.6.3 Emergency Response Equipment

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses:

- ABC type fire extinguisher
- First-aid kit, industrial size
- Eyewash/safety shower (this equipment will be in conformance with ANSI Z358.1-1990).
- Emergency oxygen unit
- Emergency signal horn
- Self contained breathing apparatus (two)
- Stretcher/backboard

In addition to the equipment listed above, OHM maintains direct reading instrumentation that may be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the SSO or other specially trained personnel. This equipment will be stored, charged and ready for immediate use in evaluating hazardous chemical concentrations. The equipment will be located at the OHM office trailer.

EQUIPMENT NAME	*APPLICATION*
Portable H-NU Photoionization Meter	Measures selected inorganic and organic chemical concentrations
MSA Oxygen and Combustible Gas Meter	Measures oxygen and combustible gas levels
Draeger Detector Tubes	Assorted detector tubes to measure specific chemical concentrations

8.6.4 Personal Protective Equipment

A supply of two (minimum) SCBAs will be located in the support zone for use in emergency response to hazardous materials releases. They will be inspected at least monthly, according

to OSHA requirements. In addition, all emergency response personnel will have respirators available for use with cartridge selection determined by the Site Safety Officer based on the results of direct reading instruments. Emergency response personnel will also be provided with protective clothing as warranted by the nature of the hazardous material and as directed by the SSO. All OHM personnel who may be expected to wear SCBAs are trained at assignment and annually thereafter on the proper use and maintenance of SCBAs and airline respirators.

8.6.5 Emergency Spill Response Clean-Up Materials and Equipment

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be inventoried and inspected, visually, on a weekly basis.

The materials listed below will be kept on-site for spill control, depending on the types of hazardous materials present on-site. The majority of this material will be located in the support zone, in a supply trailer or storage area. Small amounts will be placed on pallets and located in the active work areas.

- Sand or clay to solidify/absorb liquid spills.
- Lime (calcium oxide), soda ash (sodium carbonate), or baking soda (sodium bicarbonate) for neutralizing acid (pH <7) spills.
- Activated charcoal (carbon) to adsorb organic solvents (hydrocarbons) and to reduce flammable vapors.
- Citric acid for neutralizing caustic (pH >7) spills.
- Vapor-suppressing foam, if required by the Client, for controlling the release of volatile organic compounds (VOCs).
- Appropriate solvents (e.g. CITRIKLEEN), for decontamination of structures or equipment.

The following equipment will be kept on-site and dedicated for spill cleanup:

- Plastic shovels for recovering corrosive and flammable materials.
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers.
- Sorbent sheets (diapers) for absorbing liquid spills.

- Overpack drums for containerizing leaking drums.
- 55-gallon open-top drums for containerization of waste materials.

*NOTE: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labeled, and disposed of off-site.

8.7 EMERGENCY CONTINGENCY PLAN

This section of the ERCP details the contingency measures OHM will take to prepare for and respond to fires, explosions, spills and releases of hazardous materials, hazardous weather, and medical emergencies.

8.7.1 Medical Emergency Contingency Measures

The procedures listed below will be used to respond to medical emergencies. The SSO will contact the local hospital and inform them of the site hazards and potential emergency situations. A minimum of two First-Aid/CPR trained personnel will be maintained on site. All OHM First Aid and CPR Responders have received training as required by 29 CFR 1910.1030 Bloodborne Pathogen Standard. A copy of the OHM exposure control plan may be obtained from the Site Safety Officer or Regional Health and Safety Director.

8.7.1.1 Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The crew foreman will be summoned.

The crew foreman will immediately make radio contact with the on-site emergency coordinator to alert him of a medical emergency situation. The foreman will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The Emergency Coordinator will notify the SSO. The following actions will then be taken depending on the severity of the incident:

Life-Threatening Incident

If an apparent life-threatening condition exists, the crew foreman will inform the emergency coordinator by radio and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have them quickly taken to the victim. Any injury within the EZ will be evacuated by OHM personnel to a clean area for treatment by EMS personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and site orientation.

Non Life-Threatening Incident

If it is determined that no threat to life is present, the SSO will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

> *NOTE: The area surrounding an accident site must not be disturbed until the scene has been cleared by the SSO.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving First-Aid. For others, decontamination may aggravate the injury or delay life-saving First-Aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.

- Alert emergency and off-site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident and chemical safety information (e.g. MSDS) with the affected person.

All injuries, no matter how small, will be reported to the SSO or the Site Supervisor. An accident/injury/illness report will be completely and properly filled out and submitted to the Regional Health and Safety Director/Project CIH, in accordance with OHM's reporting procedures.

A list of emergency telephone numbers is given in Table 8.1.

8.7.1.2 Notification

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- On-site Emergency Coordinator
- Workers in the affected areas
- Client Representative

8.7.1.3 Directions To Hospital

Written directions to the hospital and a map will be posted in all trailers in the staging area. Directions to the hospital are as follows:

ON-BASE:

1. From the site, proceed to Holcomb Blvd. and turn north.
2. Proceed north on Holcomb Blvd. and turn left on Brewster Street.
3. Base hospital is approximately ½ mile ahead on right.
4. Follow signs to the emergency room entrance.

OFF-BASE

1. From the site, proceed to Holcomb Blvd. and turn north.
2. Proceed north on Holcomb Blvd. and exit MCB Camp Lejeune through the main gate.
3. Follow Highway 24 west (approximately 2.4 miles) to Western Blvd. and turn right (north).

4. Continue on Western Blvd. (approximately 1.5 miles) to the first stoplight and the hospital is on the left side of the street.
5. Follow signs to the emergency room entrance.

A map depicting the route to the Onslow County Memorial Hospital and the Base Naval Hospital will be posted in each trailer.

8.7.2 Fire Contingency Measures

OHM personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for explosivity before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify their supervisor who will then contact the emergency coordinator by radio. The emergency coordinator will activate the emergency air horns and contact the local Fire Department.

- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

8.7.3 Hazardous Weather Contingency Measures

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains/Snow
- High Winds

8.7.3.1 Response

- Excavation/soil stock piles will be covered with plastic liner.
- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge, initially crew trailers. The emergency coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police and other agencies.

8.7.3.2 Notification

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- OHM employees and subcontractors
- Client Representative
- Local Civil Defense Organization

8.7.4 Spill/Release Contingency Measures

In the event of release or spill of a hazardous material the following measures will be taken.

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First-Aid and/or decontamination procedures will be implemented as appropriate.

First-Aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug.

Utilizing radio communications, the emergency coordinator will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the emergency coordinator and SSO to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-site personnel and off-site agencies. The emergency coordinator will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth
- Digging a sump, installing a polyethylene liner and diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the LANTDIV ROICC of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake
- Clay absorbent
- Polyethylene liner

- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The major supply of material and equipment will be located in the Support Zone. Smaller supplies will be kept at active work locations. The emergency coordinator will inspect the spill site to determine that the spill has been cleaned up to the satisfaction of the ROICC. If necessary, soil, water, or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The emergency coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The emergency coordinator will review the cause with the ROICC and obtain his concurrence with the remedial action plan.

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training covers all forms of personal protective equipment, toxicological effects of various chemicals, hazard communication, bloodborne pathogens, handling of unknown tanks and drums confined-space entry procedures, and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120. In addition, all employees receive annual 8-hour refresher training and three day on-site training under a trained experienced supervisor. Supervisory personnel receive an additional 8-hour training in handling hazardous waste operations. Copies of certification of this training will be maintained on-site for all workers assigned to this project.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Health and Safety Plan Certification in *Appendix A.*

10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and OHM's occupational health physician. Other medical consultants are retained when additional expertise is required. Medical certification for all site workers assigned to the project will be maintained on-site.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120 (f).

Table 10.1
Worker Medical Profile

Item	Initial	Annual
Medical History	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Tests	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem. (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X (based on age)

Specific Tests (as required): None

10.1 EXAMINATION SCHEDULE

Employees are examined initially upon start of employment, annually thereafter, and may be examined upon termination of employment. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the Client, the CIH, SSO, or OHM occupational physician after known or suspected exposure to toxic or hazardous materials
- At the discretion of the OHM occupational physician

All nonscheduled medical examinations will include, as a minimum, all items specified above for periodic surveillance examination, with the exception of the chest x-ray, which will be conducted at the discretion of the occupational physician performing the examination.

APPENDIX A

SITE SPECIFIC HEALTH AND SAFETY PLAN CERTIFICATION

HEALTH AND SAFETY PLAN CERTIFICATION

By signing this document, I am stating that I have read and understand the Site Specific Health and Safety Plan for OHM Remediation Services Corp. personnel and visitors entering the site.

REPRESENTING	NAME (PRINT)	SIGNATURE	DATE

APPENDIX B

OHM HAZARD COMMUNICATION PROGRAM

APPENDIX B - OHM HAZARD COMMUNICATION PROGRAM

1.0 GENERAL

The following written hazard communication program has been established for OHM. Remediation Services Corporation, a member of The IT Group (OHM). The purpose of this program is to transmit information about the various Chemical hazards in the work place to the workers using various media. The transmittal of information will be accomplished by means of a comprehensive hazard communication program, which will include container labeling and other forms of warning, material safety data sheets, and employee training in accordance with 29 CFR 1910.1200 and 29 CFR 1926.59.

The program will be available in corporate and regional Health and Safety Departments for reviews by all employees. It will also be available in the corporate library and clearly marked "Employee Right-to-Know" stations located within each individual shop and on each job site. OHM will accomplish the hazard communication requirements through formal safety training, departmental safety meetings, and job site safety meetings.

2.0 RESPONSIBILITIES

Purpose

Overall responsibility rests with all corporate officers of OHM. A brief outline of responsibilities for those persons directly involved with the program will follow. These responsibilities are not all inclusive, but are designed to give guidance in initial and long-term program development since each area is different. These responsibilities may vary.

Scope

This program is intended to cover those employees who are directly involved with the handling of hazardous materials or supervision of those activities.

2.1 HEALTH AND SAFETY DEPARTMENT RESPONSIBILITIES

1. Review operations with supervisors to determine what tasks require hazard communication training.
2. Advise supervisory people as to which materials may need to be considered hazardous initially and eventually to ensure that hazard task determination is being done according to the written policy.

3. Follow up through safety meetings and safety audits to ensure that supervisors are carrying out prescribed company policy.
4. Notify supervisors of any operating changes affecting the hazardous materials being used.
5. Periodically audit the Hazard Communication Program's progress. Initially, this should be done biweekly, but later the audit may be done on a monthly or quarterly basis.

2.2 TRAINING DEPARTMENT RESPONSIBILITIES

1. Ensure that up-to-date records are maintained on training of all employees required to handle hazardous materials. The supervisor should keep copies of these records and should also send copies of the initial training to the corporate training secretary for the training file.
2. Educate personnel upon initial training to the requirements of the Hazard Communication Standard.

2.3 SUPERVISOR RESPONSIBILITIES

1. Identify jobs requiring the use of hazardous chemicals and provide lists of those jobs and chemicals to the Health and Safety Department.
2. Provide the training required by the Hazard Communication Standard and document training of employees in the safe handling of hazardous materials.
3. Inspect engineering controls and personal protective equipment before each use. Health and Safety Personnel can help determine a suitable inspection plan for each application as needed.
4. Make daily surveys of the work area to ensure that safe practices are being followed. Advise employees of unsafe work practices on the first occasion and consider further violations as disciplinary violations.
5. Ensure required labeling practices are being followed. Labeling should be affixed to the container when it arrives. If the contents are transferred to another container, then all label information (manufacturer, product name, and product number) must also be affixed to the new container, so that all containers of the material, regardless of size, are labeled.

6. Enforce all applicable safety and health standards through periodic audits.
7. Before ordering a material, determine if a Material Safety Data Sheet exist on file. Request an MSDS for any material without one.
8. Send all new MSDSs to the Health and Safety Department after making a copy for the "Employee Right-to-Know" file.

2.4 EMPLOYEE RESPONSIBILITIES

1. Obey established safety rules and regulations
2. Use all safety procedures and personnel protective equipment as required by company procedures
3. Notify supervisor of the following:
   a. Any symptoms or unusual effects that may be related to the use of hazardous chemicals.
   b. Any missing or unreadable labels on containers.
   c. Missing, damaged, or malfunctioning safety equipment.
4. Use approved labels on containers; do not remove labels (labels will be located in the warehouse).
5. Do not use unapproved containers for hazardous materials (are materials and containers compatible?).
6. Know where emergency equipment and First-Aid supplies are located before considering a possibly dangerous task.
7. Know location of Material Safety Data Sheets (MSDSs). These will be located in the "Employee Right-to-Know" station for the respective shop/job site.
8. Know what you are expected to do in case of an emergency. Before the commencement of any task emergency considerations shall be made.

2.5 SHIPPING/RECEIVING PERSONNEL RESPONSIBILITIES

1. Ensure MSDS are received with initial shipment of a hazardous material; if not, contact purchasing to request the appropriate MSDS and also call the Health and Safety Department to determine if there is an MSDS available until the requested MSDS arrives.

2. Ensure labels are affixed to all containers.
3. Store hazardous materials in designated locations.
4. Use proper personal protective equipment when handling hazardous materials.
5. Report damaged containers or spills to the appropriate Health and Safely Department immediately.
6. Request an MSDS from the manufacturer for any hazardous material that arrives in Findlay from a job. Also, a MSDS shall accompany any hazardous material that is sent to a job.

3.0 HAZARD DETERMINATION

OHM will rely on Material Safety Data Sheets from hazardous chemical supplier to meet hazard determination requirements. Other relevant data from laboratory analyses, chemical reference materials, and chemical manufacturers', written evaluation procedures will be utilized when warranted. No other method shall be used to determine chemical hazard unless approved by the Health and Safety Department.

4.0 LABELING

The shipping and receiving supervisors will be responsible for seeing that all containers arriving at OHM are properly and clearly labeled. Shipping and receiving supervisors shall also check all labels for chemical identity and appropriate hazard warnings. If the hazardous chemical is regulated by OSHA in a substance specific health standard, the supervisor or department manager shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard. Any container that is not labeled shall be immediately labeled correctly after initial discovery.

Each supervisor or department manager shall be responsible for seeing that all portable containers used in their work area are properly labeled with chemical identity and hazard warning.

Supervisors or department managers shall also ensure that labels on hazardous chemical containers are not removed or defaced unless the container is immediately marked with the required information and that all labels are legible in English and prominently displayed on the container or readily available in the work area throughout each shift.

If any container is found and the contents cannot be identified the supervisor or manager shall be contacted immediately. When proper identification is made a label shall be affixed to the container immediately. If it is discovered that no MSDS is available, the manufacturer and the Health and Safety Department shall be contacted to assist in locating the proper MSDS. If there is no way to identify the material in the container, the container should be set aside, away from all personnel until it can be tested by the Health and Safety Department or laboratory personnel. Supervisors and managers shall communicate their findings or awareness of such containers to all personnel in the area and to those who enter later.

5.0 MATERIAL SAFETY DATA SHEETS (MSDS)

Each supervisor or department manager at OHM will be responsible for maintaining a current MSDS relevant to the hazardous chemicals used in their area. The Health and Safety Department will be responsible for compiling the master MSDS file for the facility and aiding all shops/job sites with the completion and maintenance of their respective MSDS files.

All MSDSs will be readily available for review by all employees during each work shift. Each shop/job site will designate a clearly marked "Employee Right-to-Know" station where employees can immediately obtain a MSDS and the required information in an emergency.

Although manufacturers are required to provide employers with MSDSs on an initial chemical shipment, OHM purchasing agents (and supervisors purchasing their own material) shall request MSDSs and updates to MSDSs on all purchase orders. Supervisors and department managers that are without proper MSDSs shall be responsible for requesting this information from manufacturers for chemicals. A file of follow-up letters shall be maintained for all hazardous chemical shipments received without MSDSs.

6.0 EMPLOYEE INFORMATION AND TRAINING

It is the responsibility of the supervisor in charge of each employee to ensure that the employee is properly trained. Training employees on chemical hazards and chemical handling is accomplished at the time of initial employment at OHM, whenever a new chemical (or physical) hazard is introduced into the work area, and through ongoing formal and informal training programs. Additionally, chemical hazards are communicated to employees through daily, morning, shop specific safety meetings, which shall be documented

according to topic, major points discussed, and names of those attending (attendance is mandatory). Also, biweekly hazardous chemical safety meetings will be prepared by the Health and Safety Department using similar documentation for shop areas. Attendance is mandatory for these meetings also. Documentation for shop safety meetings will be available in the respective "Employee Right-to-Know" stations and biweekly safety meeting documentation will be available in the Health and Safety Department to all employees for further referencing and questioning. Records of all formal training conducted at OHM are coordinated and maintained by the Training Department secretary.

At a minimum, OHM will inform employees on the following:

- The requirements of 29 CFR 1910.1200--Hazard Communication--Evaluating the potential hazards of chemicals and communication of information concerning hazards and appropriate protective measures to employees. This is accomplished in several different ways including, but no limited to, 40-hour OSHA Hazardous Waste Worker Training (29 CFR 1910.120), shop safety meetings, job site safety meetings, Health and Safety Department safety meetings, and formal and informal training about specific chemical hazards.
- The location and availability of the written hazard communication program, list of hazardous chemicals, and MSDS sheets Notices will be periodically posted on the employee bulletin boards providing the location of the above material.
- Any operations in their work area where hazardous chemicals are present.
- What the company has done to lessen or prevent workers' exposure to these chemicals.

Employee training shall include at least:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (monitoring instruments, visual appearance or odor), and acute and chronic health effects.
- The physical and health hazards of chemicals in the work area (accomplished through periodic physical and chemical hazard awareness sessions developed by the Health and Safety Department). These sessions shall serve as chemical hazards refreshers.
- The methods of preventing exposure to hazardous chemicals including the measures OHM has taken to protect the employees.

- Procedures to follow if OHM employees are exposed to hazardous chemicals (location of nearest phone, emergency eyewash, and shower will be included). These discussions shall include proper operating procedures for all emergency equipment.
- The details of the hazard communication program developed by OHM, including an explanation of the labeling system and the Material Safety Data Sheets, and how employees can obtain and use the appropriate hazard information.
- Standard operating procedures within each respective shop. OHM company policy determines what is considered standard operating procedures.
- Procedures for workers involved in non-routine tasks.

Each supervisor or department manager shall ensure that the above training is emphasized to OHM employees. The Health and Safety Department will ensure that each shop, department, and job site is properly informing and training all employees through daily group meetings and individual discussions. Whenever a new hazardous chemical is placed into use, the supervisor or department manager shall inform the employees of the hazards which that chemical may pose. The supervisor or manager shall also be responsible for obtaining and making available a MSDS for the new chemical.

7.0 HAZARDOUS NON-ROUTINE TASKS

Occasionally, employees at OHM are required to perform tasks which are considered to be non-routine. All tasks considered to be non-routine shall be carefully discussed among the supervisor and those performing the task. This safety briefing shall include all possible hazards that may be encountered while completing the task, including:

- Hazard recognition
- Chemicals involved and their hazardous properties
- Physical hazards
- Methods of avoiding all hazards (technical instruments, proper personal protective equipment, etc.)

The following is list of some of the non-routine tasks which may occur at OHM together with some information needed to complete the tasks safely.

- Confined Space Entry
  - Obtain confined space entry procedure/permit from Health and Safety Department and follow all protocol before beginning task. Complete and have supervisor sign permit before any work begins.
  - Monitor atmosphere with explosimeter, oxygen meter, and any toxic gas meter as may be appropriate.
  - Discuss specific chemical hazards.
  - Discuss protective/safety measures the employee can take (e.g., Personal protective equipment and engineering controls, use of life lines, lock-out/tagout procedures, etc).
  - Measures the company has taken to lessen the hazards including ventilation, respirator, presence of another employee, and emergency procedures.
- Excavation, Trenching, and Shoring
  - Obtain guidelines from Health and Safety Department before beginning task.
  - Comply with all requirements set forth for this activity in 29 CFR Subpart P (excavating, trenching, shoring).
  - Discuss specific chemical hazards.
  - Follow confined space entry procedure above if trench is above shoulder height.
  - Discuss protective/safety measures the employee can take.
  - Review appropriate accident prevention steps.
- Decontamination of Equipment
  - Determine possible contaminants and the hazards associated with them.
  - Determine personal protection needed by contacting the Health and Safety Department.
  - Alert all personnel in areas of contamination and decontamination
  - Contain and secure all contaminated materials and decontamination materials.

- Contact the Health and Safety Department for proper disposal.

It is company policy that no OHM employee will begin work on any non-routine task without first receiving a safety briefing from their supervisor or a Health and Safety Department representative.

8.0 INFORMING CONTRACTORS

- Hazardous chemicals to which they may be exposed while performing a task including the following:
  - Chemical properties
  - Physical properties
  - Acute/Chronic health effects
- Location of "Employee Right-to Know" station which includes the following:
  - MSDS for work area
  - Hazard Communication Program
  - Other relevant safety material
- Precautionary measures to be taken to protect employees from chemical and physical hazards.
- Location of nearest emergency equipment (fire extinguisher, eyewash, shower, phone, first-aid kit, etc.).
- Procedures to follow in the event of employee exposure.
- Steps OHM has taken to reduce the risk of exposure to physical and chemical hazards including the following:
  - Safety meetings
  - Hazard Communication Program
  - Proper storage and labeling of hazardous chemicals
  - Health and Safety Department shop audits
- The methods used to label all hazardous chemicals.

The Health and Safety Department shall offer assistance in providing the above information to contractors working at OHM. On initial visit by a contractor to OHM, a "Contractor Right-to-Know" release form shall be completed. This form will state that the above information has been communicated to the perspective contractor.

APPENDIX C

MATERIAL SAFETY DATA SHEETS

Gasoline
Diesel
Jet Fuel
Kerosene
Anti-fog
Bleach
Diesel fuel
Fire extinguishers
Gasoline
Grease
Hydraulic Oil
Isobutylene (calibration gas)
Isopropyl alcohol
Liquid detergent
Motor oil
Oil (hydraulic)
Pentane (calibration gas)
Starting fluid
WD-40

APPENDIX D

SPECIFIC OHM HEALTH AND SAFETY PROCEDURES

SOP No. 2-1 Vehicle Safety
SOP No. 2-3 Personal Lifting Safety
SOP No. 2-4 Slip, Trip, Fall Prevention
SOP No. 2-5 Electrical Safety
SOP No. 2-7 Equipment Inspection
SOP No. 3-4 Heat Stress Prevention
SOP No. 4-2 Respiratory Protection
SOP No. 5-4 Decontamination
SOP No. 6-4 Lockout/Tagout/Try
SOP No. 6-5 Excavation
SOP No. 6-7 Demolition
SOP No. 6-8 Well Drilling
SOP No. 7-1 High Pressure Washers
SOP No. 7-7 Equipment and Hand Tools
SOP No. 7-11 Buried Utility Location and Associated Subsurface Field Activities
SOP No. 7-14 Equipment Operator Qualification

APPENDIX E

HEALTH AND SAFETY FORMS

Accident/Injury/Illness Report Form
Accident/Injury/Illness Status Report Form
First Aid Log
OHM Safety Rules
Daily Safety Meeting Log
Instrument Calibration Logs (LEL/PID)
Air Monitoring Instrument (Direct Reading) Logs
Heavy Equipment Inspection Forms
Fire Extinguisher Checklist/Inventory Form
Project Site Safety Inspection Checklist (weekly)
SSO Daily Report
Activity Hazard Analysis

APPENDIX B

QUALITY CONTROL PLAN

QUALITY CONTROL PLAN
OPERABLE UNIT NO. 12 (SITE 3)
REMEDIATION OF PAH CONTAMINATED SOIL
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032

Atlantic Division
Naval Facilities Engineering Command
6500 Hampton Boulevard
Building A (South East Wing) 3rd Floor
Norfolk, VA 23508

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August, 1999
Delivery Order No. 100
OHM Project No. 918319

TABLE OF CONTENTS

STATEMENT OF QC PROGRAM 1

1.0 QUALITY CONTROL ORGANIZATION 2

2.0 IDENTIFICATION OF PERSONNEL ASSIGNED TO THE QC ORGANIZATION 2

3.0 APPOINTMENT LETTERS 2

4.0 OUTSIDE ORGANIZATIONS 2

5.0 INITIAL SUBMITTAL REGISTER & REVIEWERS 2

5.1 Submittal Register 2

5.2 Personnel Authorized to Review and Certify Submittals 2

6.0 TESTING LABORATORY ACCREDITATION 3

7.0 TESTING PLAN AND LOG 3

8.0 QUALITY CONTROL INSPECTION PLAN 3

9.0 PERSONNEL MATRIX 3

FIGURES

I-1 QC Organizational Chart

II-1 Site QC Manager/Representative Resume

III-1 Site QC Manager/Representative Letter of Appointment

EXHIBITS

IV-1 Approved Consultant and Subcontractor List

V-1 Submittal Register

V-2 List of Personnel Authorized to Review and Certify Submittals

VII-1 Test Plan and Log

VIII-1 Quality Control Inspection Plan

IX-1 Personnel Matrix

STATEMENT OF QC PROGRAM

OHM Remediation Services Corporation (OHM), a member of the IT Group, will provide and maintain an effective Quality Control (QC) Program. This program will be performed in accordance with the approved Program Quality Control Plan (PQCP) developed specifically to be responsive to the contract specification, Contract No. N62470-93-D-3032, Atlantic Division, Naval Facilities Engineering Command and to the Delivery Order (DO) specification(s) made applicable to each project, task or work activity. OHM will perform the inspections and tests required to ensure that materials, workmanship, and construction conform to drawings, specifications, and contract requirements.

Note to Employees

Quality control should not be considered a person or an organization of personnel, but a concept to perform in such a manner that the end product of our efforts meet established criterion, the customer=s needs. The quality control individual or group cannot inspect quality into the final product, but only inspect and document the results of our efforts. The only people that can build quality into the product are the individuals performing the task of producing the end product.

All employees should note that the documentation requirements of OHM procedures, plans, and the delivery order specifications are considered equally as important as the end product itself. When it is stated that the documentation will be approved prior to the start of work, this is exactly what is intended. To eliminate problems in this area requires careful planing and execution by everyone.

We would do well to remember that our livelihood depends on how well we satisfy our customer. To accomplish this requires teamwork and attention to detail by all employees and contractors.

1.0 QUALITY CONTROL ORGANIZATION

The QC organization is depicted in the Organizational Chart, Figure I-1.

2.0 IDENTIFICATION OF PERSONNEL ASSIGNED TO THE QC ORGANIZATION

Figure II-1 provides the resume of the Site QC Manager/Representative. The resumes of any additional QC staff members will be submitted to the CO for approval prior to assignment. This action will be performed in accordance with the contract specification Section C, Part 6.5.

3.0 APPOINTMENT LETTERS

The Site QC Manager/Representative appointment letter is provided as Figure III-1. Similar letters will be provided when necessary to describe the duties and authorities of personnel assigned to the position of Alternate or Assistant QC Manager.

4.0 OUTSIDE ORGANIZATIONS

A list of outside organizations such as architectural and consulting engineering firms, and subcontractors employed by OHM for work under this task or delivery order is provided in Exhibit IV-1. This list provides each firm's name and address and a description of the services each firm will provide. This list will be maintained current and will be available for review.

5.0 INITIAL SUBMITTAL REGISTER & REVIEWER

5.1 Submittal Register

The Submittal Register is provided as Exhibit V-1.

5.2 Personnel Authorized to Review and Certify Submittals

Personnel authorized to review and certify submittals other than the Site QC Manager/Representative are identified on Exhibit V-2. Any additional personnel assigned to perform submittal review and certification must be approved by the CO, prior to performance.

6.0 TESTING LABORATORY ACCREDITATION

Testing laboratory accreditation requirements are addressed in the contract specification Section C, Part 6.12.

7.0 TESTING PLAN & LOG PREPARATION

A Testing Plan and Log has been prepared for this DO and is provided as Exhibit VII-1.

8.0 QUALITY CONTROL INSPECTION PLAN

The Quality Control Inspection Plan, Exhibit VIII-1, lists each specification section and definable feature of work with provisions for recording the corresponding checklist/report for each phase of the three-phase control process. As each control phase is satisfactorily preformed, the Site QC Manager/Representative will record the corresponding checklist/report number.

Note: A definable feature of work is a task, which is separate and district from other tasks and requires separate control procedures.

This list has been prepared and maintained in accordance with the contract specification Section C, Part 6.7 and will be agreed upon during the Coordination and Mutual Understanding Meeting. The list will be keyed to the construction schedule. Each preparatory, initial and follow-up phase checklist/report will reflect the construction activity number derived from the construction schedule, and will reference the procedures followed for each control phase.

9.0 PERSONNEL MATRIX

The Site QC Manager/Representative will prepare and maintain the personnel matrix, Exhibit IX-1, showing each section of the DO specification with identification of who will review and approve submittals, who will perform and document the three phases of control, and who will perform and document testing. This matrix should be completed as much as possible prior to and during site mobilization. The matrix will be maintained current by the Site QC Manager/Representative and will be available for review.

FIGURE 1

QC ORGANIZATIONAL CHART
OHM REMEDIATION SERVICES CORP.
DELIVERY ORDER NO. 100

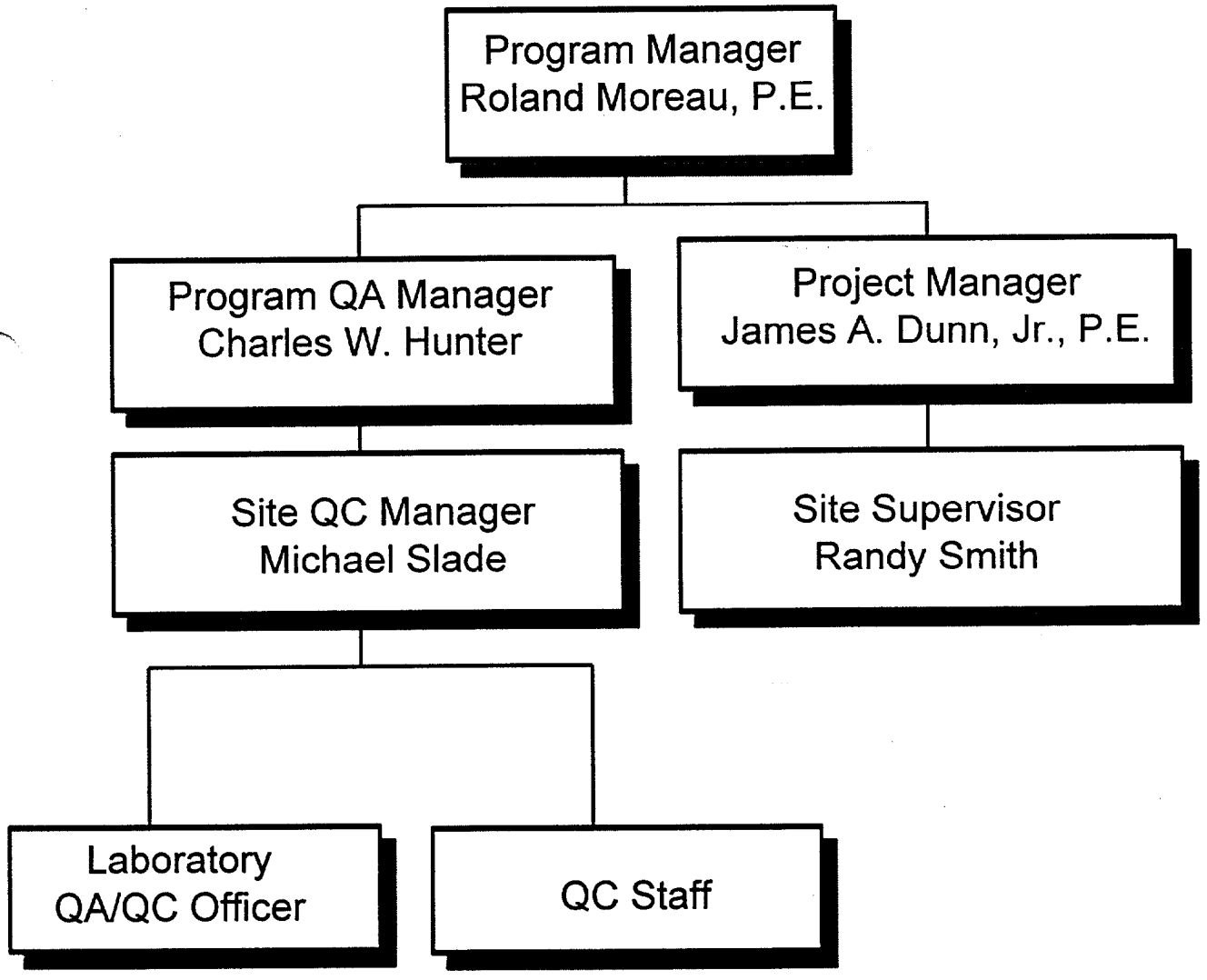

Figure II-1
Site QC Manager/Representative Resume

Figure II-1
Site QC Manager/Representative Resume

OHM Remediation Services Corp.
A member of The IT Group

ENVIRONMENTAL ENGINEER

MICHAEL A. SLADE

As an Environmental Engineer, Mr. Slade is responsible for administering quality assurance/quality control procedures at project sites, ensuring the work performed meets job specifications; documenting and reporting on-site activities; providing field surveys; procuring materials; and assisting the project manager in various job related tasks.

Prior to becoming an Environmental Engineer, Mr. Slade served as a Senior Technologist for OHM's Northern Region Field Analytical Services Group. His responsibilities included sampling and documentation of all environmental matrices, including containerized wastes, soil, water, and air. He is proficient in the use of field instrumentation such as LEL/O_2 and PID meters. He was also responsible for shipping paper work and management of samples into subcontract laboratories.

Experience

Time Period: July 1996 to Present **Employer:** OHM Remediation Services Corp.

- Serves as Field Engineer/Quality Control Manager for the remedial action at the Q Area Drum Storage Yard (QADSY), Norfolk Naval Base, Norfolk, Virginia. This project is being performed under OHM's Department of the Navy Multi-Contaminant RAC contract. VOCs had seeped through the ground from the leaking drums and entered the groundwater aquifer system. Mr. Slade is responsible for engineering calculations and engineering controls; procuring materials; and overseeing the quality control program, which entails ensuring that the AS/SVE system design conforms with the specifications. The pilot tests conducted in November 1996 have confirmed that the AS/SVE system will provide cost-effective extraction and treatment for the VOCs and provided data for final design of full scale system. To enhance project cost-effectiveness, the wells that were installed for the pilot test will be incorporated into the full scale design and operation.

  OHM started the construction of the permanent full-scale system in November 1997. Two systems are being constructed, each consisting of a series of air sparge and vapor extraction wells. The wells are manifolded to a common header and piped to the respective treatment system. An air compressor and blower are scheduled to be installed at a newly constructed treatment building. System startup is scheduled for April 1998. OHM will provide O&M services for a six-month period following system startup.

- Served as Field Engineer for the installation of a carbon air stripper to dissipate VOCs in groundwater for a Department of the Navy LANTDIV project at Army Adelphi Research Laboratories in Adelphi, Maryland. Under a rapid response request from Engineering Field Activity Chesapeake, OHM installed an air stripper to treat the effluent from a TCE and PCE release that was exceeding a NPDES discharge criteria. OHM prepared the 100% design from the A&E's 35% design in a three week period. OHM drop shipped a prefabricated treatment building containing the air stripper and appartenses. Mr. Slade reviewed the system design and specifications, and ensured that the system operation met quality standards.

- Served as the sample technologist for a USEPA Region II ERCS project at the Li Tungsten site in Glen Cove, New York. The project involved: excavating approximately 230 ASTs; sampling the tanks and analyzing them for disposal parameters; performing selective demolition of structurally contaminated buildings; bulking and treating

stormwater, and discharging the water to the local POTW; and bulking compatible tanks and shipping them for disposal. Mr. Slade performed hazardous categorization of tanks, drums, vats, and other containers.

- Served as the sample technologist for a USEPA Region I ERCS project at the Coronet Leather Finishing site in Georgetown, Massachusetts. The project involved the excavation and disposal of approximately 800 cubic yards of lead contaminated soil; and the sampling, hazcatting, repacking, loading, and shipping of drums that were located inside the plant. Mr. Slade's project responsibilities included: developing sampling plans; developing the staging area for the drums to be sampled; developing the sampling protocol; sampling 200 55-gallon drums and 200 five gallon drums; and generating the necessary paperwork for the unknown agent to be categorized.

- Served as the sample technologist for a U.S. Army Corps of Engineers project at the Havertown Superfund site in Havertown, Pennsylvania. The project involves the off-site disposal of approximately 3,000 tons of hazardous waste material, and the off-site disposal of non-hazardous material (i.e., building debris). Mr. Slade's project responsibilities included: determining the amount of hazardous waste that needed to be removed; coordinating the transportation and disposal of the hazardous waste; and creating daily spreadsheets of manifests that were generated for yard waste.

- Served as a sample technologist for two delivery order projects, under OHM's contract with the Air Force Center for Environmental Excellence (AFCEE), at Plattsburgh Air Force Base in Plattsburgh, New York. The two delivery order projects involved various remedial technologies, including underground storage tank cleaning and removal, bioremediating jet fuel contaminated soil, soil vapor extraction, and groundwater remediation. Mr. Slade's project responsibilities included head space sampling, split spoon sampling, composite sampling, grab sampling, and shipping various matrices for on-site and off-site analysis.

Time Period: 1994 to 1996 **Employer:** Handex Recovery, Inc.
Position held: Sample Technologist/Hydrogeologist

Sample Technologist/Hydrogeologist — Mr. Slade was responsible for the design, installation/construction, and operation maintenance of a free product recovery groundwater treatment system at a Sun Company Terminal in Pennsylvania. The recovery system consisted of 20 monitoring wells, six recovery wells, and a remediation system, which included an air stripper and vapor and liquid phase GAC units. The groundwater was contaminated with gasoline and petroleum hydrocarbons, and approximately 125 gallons per minute was recovered. Mr. Slade's project responsibilities included reviewing the initial design and the design package (which was prepared by another contractor); preparing, reviewing, and implementing the work plan, environmental protection plan, quality control plan, sampling and analysis plan, and health and safety plan; supervising the final design of the recovery system; and preparing subcontractor bid packages. The project resulted in 95% recovery of product.

Time Period: 1991 to 1993 **Employer:** Crane Cortec
Position held: Computer Programmer/Supervisor

Computer Programmer/Second Shift Supervisor — Supervised and scheduled staff of 14 personnel who manufactured fiberglass reinforced panels. Supervised quality control, maintenance, and shipping departments. Managed transfer of Title III chemicals between departments, reviewed MSDS sheets and permits, and served as assistant safety supervisor. Other responsibilities included:

- Generated saw instructions for client specifications. Worked on IBM 487 computer aided design and drafting (CADD), with algebraic calculations. Clients included U-Haul, Ryder, Penske, and other major trucking companies in North America.

- Designed sound barrier for Ohio Department of Transportation, for a highway running through residential areas.

Manufacturing of panel's work delineation included building of panel boards and mixture of chemicals, which included mylar, resin, tedlar, coating, then processed into 60 foot over tables, which was cured out for quality control and quality assurance team. This was checked for defects and customer specifications +/- 1/8 inch. All operations were performed in accordance with OSHA, USEPA regulations, and approval of department health and safety officer. Other

responsibilities included work with maintenance and repair for mechanical and electrical repair of equipment and machinery.

Time Period: 1988 to 1992 **Employer:** United States Army
Position held: First Lieutenant

First Lieutenant— Managed a motor pool using a staff of 60 personnel. He was responsible for component and engine rebuilding. Reviewed inspection reports of all vehicles, and approved all inspections. Supervised service, recovery, and engineering departments.

Executive Officer of Company Operations and Maintenance - Trained in RAD, nuclear and biological chemicals, and explosives. Served in the capacity of Combat Engineer, for building and demolishing bridges. Served in Operation Desert Storm as a Logistics Officer, and served with other combat engineers in Saudi Arabia.

Time Period: 1987 to 1988 **Employer:** Elano Corporation
Position held: Design Engineer

Design Engineer — Designed and modified fuel systems for General Electric aircraft engines. Labeled and transferred chemicals containing hazardous waste and other materials according to EPA regulations.

Time Period: 1983 to 1987 **Employer:** Pennsylvania Naval Shipyards
Position held: Engineering Intern

Engineering Intern — Completed full four-year engineering internship at Naval Ship Engineering System Facility (NAVSSES). Performed motion studies, heat loads, and calculations on structures of newly renovated buildings for $3.5 million government contract. Assisted with pipeline installation and testing of materials for structural weakness. Responsible for vertical transportation. Verified blueprint specifications.

Academic Background

B.S., Industrial Engineering, Central State University, Ohio, 1987.
A.S., Electronics, DeVry Institute of Technology, Columbus, Ohio 1992.

Specialized Training

OSHA 40-Hour Health and Safety Training
OSHA 48-Hour HAZMAT Training
OSHA 8-Hour Refresher Training
NIOSH 48-Hour Safety and Health Course
8-Hour Radiation Worker Training
U.S. Army Corps of Engineers, Construction Quality Management Course Cert. 1997
Chemical, Biological, and Nuclear Weapons Training Course, U.S. Army Professional Development
Blister Training Course, U.S. Army Professional Development
MRU Certification

Figure III-1

August 1999

Michael A. Slade
IT/OHM Remediation Services Corporation
200 Horizon Center Blvd.
Trenton, NJ 08691-1904

RE: Site Manager – Remediation at PAH Contaminated Soils, Operable Unit No. 12, Site 3, Camp Lejeune, NC.
Contract No. N62470-93-D-3032
Delivery, Order 0100

Dear Mr. Slade:

This letter will serve as your appointment as the Site Quality Control Manager on the referenced project and will also clarify your duties and authority in this position. In this position, you will be authorized to use available resources to satisfy all applicable requirements of the Program and Delivery Order Quality Control Plans.

This authorization specifically gives you the authority to direct removal and replacement or correction; of nonconforming materials or work and stop work authority when continuation would be unsafe to personnel, harmful to the environment, or result in a significant degradation of quality.

You will be expected to work closely with the Project Manager, Site Supervisor, and other project personnel, but you will not be directly responsible to anyone but myself for resolution of quality issues when working in the capacity of Quality Control Manager.

If you have any questions in this matter, please call me at (609) 584-6840.

Sincerely,

Charles W. Hunter
Program QC Manager
LANTDIV RAC Program

EXHIBIT IV-1

APPROVED CONSULTANT & SUBCONTRACTOR LIST

COMPANY NAME & ADDRESS	DESCRIPTION OF SERVICES PROVIDED:
TBD	Surveyor
	Waste Transportation – Nonhaz, Solid Waste
	Waste Transportation – Nonhaz Liquid
	Disposal Facility – Nonhaz, Solid Waste
	Disposal Facility – Nonhaz, Liquid
	Hydroseeder/Drillseeder
	Chemical Analytical Laboratory

EXHIBIT V-1
SUBMITTAL REGISTER

Delivery Order 0100
Contract No. N62470-93-D-3032

Project Number: 918319
Project Title: Site 3 - PAH Contaminated Soil Remedial Action Location: Camp Lejeune

Contractor: OHM Remediation Services Corp.

Submittal No.	Spec Section No.	SD No., and Type of Submittal Material or Product	Spec Para No.	Classification Approval by Contracting Officer *	Government or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Contractor Action			Approving Authority Action				Contractor	Remarks
								Action Code	Date of Action	Date Forward to Approved Authority/ Date Received From Contractor	Date Forwarded to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approved Authority	
(a)	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
	N/A	**SD-08 Statements**	N/A													
		Work Plan			G											
		Environmental Protection Plan			G		8/24/99									
		Field Sampling & Analysis Plan			G		INWP									
		Site Health & Safety Plan			G		INWP									
		Site QC Plan			G		INWP									
		Submittal Register					INWP									
		Environmental Conditions Report			G		INWP									
		Erosion & Sediment Control Plan			G		INWP									
		SD-09 Reports														
		Pre-construction Meeting Minutes					9/99									
		Coordination & Mutual Understanding Meeting Minutes					9/99									
		Monthly Reports & Schedule					Mnthly									
		SD-13 Certifications														
		Shipment Manifest					CR									
		Delivery Certificates					CR									
		Laboratory Qualifications (analytical/material testing)					CR									
		Clean Soil (Borrow)					CR									
		SD-12 Field Test Reports														
		Confirmation Sampling					CR									
		Waste Charaterization Sampling					CR									
		SD-18 Records														
		As-Builts					CR									
		Contractor's Closeout Report			G		12/99									

*Navy Notes:
Approved By:
G: Contracting Officer
Blank: CQC Manager

Action Codes: (Others may be prescribed by Transmittal Form)
NR: Not Reviewed
A: Approved
AN: Approved as Noted
RR: Disapproved; Revise and Resubmit

EXHIBIT V-2

LIST OF PERSONNEL AUTHORIZED TO REVIEW & CERTIFY SUBMITTALS

SPECIFICATION SECTION:	SUBMITTAL TYPE:	AUTHORIZED PERSONNEL:
N/A	All	James A. Dunn, Jr. Randy E. Smith Tom McCrory, Technical Manager
		Michael Slade, Site QC Manager

EXHIBIT VII-1

TESTING PLAN AND LOG

CONTRACT NUMBER N62470-93-D-3032	PROJECT TITLE & LOCATION SITE 3 – PAH CONTAMINATED SOIL REMEDIAL ACTION	CONTRACTOR OHM REMEDIATION SERVICES CORP.

SPECIFICATION SECTION AND PARAGRAPH NUMBER	ITEM OF WORK	TEST REQUIRED	ACCREDITED /APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		FREQUENCY	DATE COMPLETE	DATE FORWARDED TO CONTR. OFF	REMARKS
			YES	NO			ON SITE	OFF SITE				
Section 01010 Paragraph 1.5		Confirmation Sampling										

EXHIBIT VIII-1
QUALITY CONTROL INSPECTION PLAN
Site 3 – PAH Contaminated Soil Remedial Action
Camp Lejeune, North Carolina
Delivery Order No. 0100

Specification Section	Definable Feature of Work	Activity Number*	Control Check Verification		
			Preparatory Phase Checklist/Report No.	Initial Phase Checklist/Report No.	Follow-up Phase Checklist/Report No.
01010	1. Mobilization and Site setup				
01010	2. Excavation of Contaminated Soils				
01010	3. Confirmation Sampling				
01010	4. Site Restoration				

* Include schedule date if a CPM network is invoked.

EXHIBIT IX-1

PERSONNEL MATRIX

SPECIFICATION SECTION:	SUBMITTALS REVIEWED BY:	THREE PHASE PERFORMED BY:	TESTING PERFORMED BY:
N/A	Site QC Manager	Site QC Manager	Site QC Manager

APPENDIX C

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS PLAN
OPERABLE UNIT NO. 12 (SITE 3)
REMEDIATION OF PAH CONTAMINATED SOIL
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032

Atlantic Division
Naval Facilities Engineering Command
6506 Hampton Boulevard
Building A (South East Wing) 3rd Floor
Norfolk, VA 23508

Prepared by:

OHM Remediation Services Corp.
11560 Great Oaks Way, Suite 500
Alpharetta, GA 30022-2424

Reviewed by:

James A. Dunn, Jr., P.E.
Project Manager

Terence A. Whitt
Manager of Field Analytical Services

Roland Moreau, P.E.
Program Manager

August 1999
Delivery Order 100
OHM Project No. 918319

TABLE OF CONTENTS

1.0 INTRODUCTION..... 1-1

2.0 PROJECT MANAGEMENT..... 2-1
2.1 Project Objective and Scope of Work..... 2-1
2.2 Description of Contaminants Present..... 2-1
2.3 Project Task Descriptions..... 2-2
2.4 Project Organization..... 2-2
2.5 Data Quality Objectives For Measurement Data..... 2-7

3.0 SAMPLING..... 3-1
3.1 Sampling Methods and Procedures..... 3-1
3.1.1 Stockpile Samples..... 3-1
3.1.2 Excavation Confirmation Samples..... 3-1
3.1.3 Contractor Generated Waste Samples..... 3-2
3.2 Sample Identification..... 3-2
3.3 Sample Preservation and Holding Times..... 3-3
3.4 Field QC Samples..... 3-3
3.5 Decontamination..... 3-5
3.6 Cross-Contamination Minimization..... 3-6
3.7 Sample Log Book..... 3-6
3.8 Sample Labels..... 3-9
3.9 Custody Seals..... 3-9
3.10 Chain-of-Custody Procedures..... 3-9
3.11 Packaging, Handling, and, Shipment of Samples..... 3-11

4.0 DATA ACQUISITION..... 4-1
4.1 Analytical Method Requirements..... 4-1
4.2 Quality Control Requirements..... 4-1
4.3 Instrument Testing Inspection , and Maintenance..... 4-1
4.4 Instrument Calibration..... 4-1

5.0 DATA MANAGEMENT..... 5-1
5.1 Laboratory Data Reduction..... 5-1
5.2 Laboratory Data Validation..... 5-1
5.3 Project Data Review..... 5-3
5.4 Data Reporting..... 5-4
5.5 Data Storage and Archive..... 5-5

6.0 DATA ASSESSMENT PROCEDURES..... 6-1
6.1 Accuracy..... 6-1
6.1.1 Recovery Control..... 6-2
6.2 Precision..... 6-3
6.3 Completeness..... 6-3

TABLE OF CONTENTS (cont.)

6.4 Criteria For Rejection of Outlying Measurements 6-4
6.5 Method Detection Limits and Practical Quantitation Limits 6-4
6.6 Laboratory and Field Contamination 6-4

7.0 PERFORMANCE AND SYSTEM AUDITS 7-1
7.1 Field Performance Audits 7-1
7.2 Field System Audits 7-1
7.3 Laboratory Performance Audit 7-2
7.4 Laboratory System Audits 7-3

8.0 CORRECTIVE ACTION 8-1
8.1 Corrective Action Report 8-2
8.2 Quality Assurance Report 8-2

TABLES

Table 2.1 Site Soil Remediation Goals

APPENDICES

APPENDIX A Table A-1
Table A-2 Project Quality Control Objectives

APPENDIX B Custody Seal
Chain-of-Custody Label
OHM Shipping Label
Shipping Instructions for Sending Samples to the Laboratory

APPENDIX C SOPs
QP-650 (Standard Analytical Data Deliverable Requirements)

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents, in specific terms, the policies, organization, functions, and Quality Assurance/Quality Control (QA/QC) requirements designed to achieve the data quality goals for the soil remediation at Operable Unit (OU) 12 (Site 3). This work will be performed under Delivery Order 100 of Contract Number N62470-93-D-3032 for the Navy Atlantic Division (LANTDIV) at the Marine Corps Base, Camp Lejeune, North Carolina.

This SAP integrates the required components of a generic Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP). This document shall be implemented by the Project Manager, Project QC Manager, Project Chemist, Field Chemist/Scientist, and Sample Technicians. Any field changes shall be approved by the Navy's Technical Representative (NTR), OHM Project Manager, and OHM Project Chemist. These changes shall be documented by the Field Chemist/Scientist and distributed to the appropriate persons as amendments to the SAP.

2.0 *PROJECT MANAGEMENT*

2.1 PROJECT OBJECTIVE AND SCOPE OF WORK

The scope of work for Delivery Order No.100 for OU 12 (Site 3) is to excavate Polynuclear Aromatic Hydrocarbon (PAH) contamination from the site. The subsurface soils at the site contain PAH concentrations above federal soil screening levels established to protect groundwater. The removal of the source area will prevent leaching of the PAH contamination into the groundwater.

2.2 DESCRIPTION OF CONTAMINANTS PRESENT

A creosote plant reportedly treated lumber during the construction of the base railroad from 1951 to 1952. Investigations conducted at the site included soil, groundwater, and sediment samples. In general, these investigations indicated that the most frequently detected organic compounds were PAHs. The PAH compounds detected at the site were probably associated with the creosote operations from the wood treatment facility, since creosote is comprised of PAH compounds. Table 2.1 lists the soil remediation levels and compounds of concern for this site.

Table 2.1
Site Soil Remediation Goals

Contaminant of Concern	RL (ug/kg)	Basis of Goal
Naphthalene	584	NC DENR
2-Methylnaphthalene	4,900	NC DENR
Carbazole	273	NC DENR
Benzo(a)anthracene	343	NC DENR
Chrysene	1,000	SSL
2-Methylphenol	1,050	NC DENR
4-Methylphenol	17.4	NC DENR
Acenaphthene	8,160	NC DENR
Phenol	1,750	NC DENR

Notes:
RL = Remediation Level
SSL = USEPA Region III Soil Screening Level
NC DENR = North Carolina Department of Environment and Natural Resources Soil to Groundwater (S3:G1)

2.3 PROJECT TASK DESCRIPTIONS

The following tasks will be performed in support of the remedial actions OU 12 (Site 3) at MCB Camp Lejeune, North Carolina:

- Excavate the top 3 feet from the designated area and stockpile
- Test the stockpiled material for possible backfill use
- Excavate the contaminated material
- Sample and analyze the excavation floor and walls to verify contaminated material has been removed to the remediation levels
- Re-excavate and re-sample if required
- Dispose of the contaminated material
- Sample backfill material and determine suitability of the material
- Backfill excavation
- Validate the acquired data for usability determination

2.4 PROJECT ORGANIZATION

The Project Manager is the primary focal point for control of the project activities. The Project Manager will be supported by the QA Management team, which will provide reviews, guidance, and technical advice on project execution issues. Members of this staff will be on an "as-needed" basis to assist in smooth project execution. The Project Manager will be supported by the project team consisting of a supervisory, health and safety, technical, and QA/QC staff to ensure that the project is safely executed in compliance with applicable laws, regulations, statutes, and industry codes. Individuals of the project team are responsible for fulfilling appropriate portions of the project QA program, in accordance with assignments made by the Project Manager. The Project Manager is responsible for satisfactory completion of the project QA program. The Project Manager may assign specific responsibilities to other members of the project staff. An organizational chart of the project team is presented in Quality Control Plan.

The responsibilities of the key members in the project organization are:

Project Manager - James A. Dunn, Jr., P.E.

The Project Manager is responsible for the overall direction of this project executed under his supervision. He provides the managerial administrative skills to ensure that resource allocations, planning, execution, and reporting meet contract requirements. He is ultimately accountable for all work activities undertaken on this project. The global quality-related responsibilities of the Project Manager can include, but are not limited to, the following:

- Organization of the project staff and assignment of responsibilities
- Understanding of contract and scope of work for a specific project
- Communication to the project staff regarding client requirements and QA practices
- Identification, documentation, and notification to the client and project staff and QA personnel of changes in the scope of work, project documentation and activities
- Supervision of preparation and approval of project-specific procedures, work plans, and QA project plans
- Approval of project design bases, design parameters, drawings, and reports
- Approval of project remedial action/construction methodologies
- Dissemination of project-related information from the client such as design bases, input parameters, and drawings
- Liaison for communications with the client and subcontractors. Liaison between the project staff and other internal groups
- Decision of whether or not drawings require independent review
- Investigation of nonconformances, notification of QA personnel, and implementation of corrective actions
- Determination of the effect of nonconformances on the project and the appropriateness for reporting such items to the client, and providing appropriate documentation for reporting
- Determination that changes, revisions, and rework are subject to the same QC requirements as the original work

- Approve and sign outgoing correspondence
- Custodian of all project related documents

Some of these responsibilities may be assigned by the Project Manager to the Site Supervisor, who will remain on site throughout the project field activities.

Site Supervisor – Randy Smith

The Site Supervisor is responsible for the day-to-day management of this specific delivery order. He will ensure sufficient resource allocations to maintain project schedule and budget. He will provide daily feedback to the project manager on project progress, issues requiring resolution, etc.. The quality-related responsibilities of the Site Supervisor include, but are not limited to, the following:

- Notification to the project manager if the project cannot be completed with regard to quality, schedule, or cost
- Oversight and control of subcontractor services
- Liaison for communications with OHM project staff and other internal groups as well as with the NTR and on-site inspector
- Supervision of day-to-day site activities in accordance with project and program requirements
- Preparing the Contractor Production Report
- Preparing the Quality Control Reports
- Initiating corrective actions for non-conformance identified on-site

Project Chemical QA Officer – Dorothy Small

The Chemical QA Officer is responsible for implementing the project chemical QA program. She is responsible for informing the Project Manager of any site-specific QA issues. Her responsibilities include, but is not limited to, the following:

- Reviewing subcontractor's QA Manuals and/or Laboratory Quality Management Plans (LQMPs) and if possible, performing audits on the labs
- Certifying the level of QA that has been achieved during the generation of

- Certifying the level of QA that has been achieved during the generation of analytical data
- Initiating and overseeing all audit functions
- Stopping work if quality objectives are not being met
- Initiating investigations for nonconformances, identifying appropriate corrective actions, and performing follow-up audits to ensure that the corrective actions were successful

Project Chemist – Terence A. Whitt

The Project Chemist is responsible for implementing the project plans and ensuring that the quality assurance and data quality objectives are being met for the project. He is also responsible for informing the Chemical QA Officer of any site-specific problems and for coordinating QA efforts with the contracted laboratory. His specific responsibilities include, but are not limited to, the following:

- Determining if the project and data quality objectives are being met
- Evaluating chemical data for technical validity and ensuring adherence to published guidelines
- Analyzing and interpreting all subcontracted technical and laboratory results
- Implementing QA/QC procedures
- Assuring the continuity of chain-of-custody evidence
- Working with the QC Engineer to compile and submit required QA Reports (QARs)
- Compiling, revising, updating, and submitting SAPs
- Implementing corrective actions as required by the QC Engineer or Chemical QC Officer
- Ongoing QA/QC training of new and current personnel
- Reviewing laboratory invoices for completeness and accuracy

Laboratory Coordinator –Dorothy Small

The Laboratory Coordinator is responsible for procuring a certified laboratory based on the requirements needed for the project. Her responsibilities include, but are not limited to, the following:

- Selection of qualified laboratories and control of laboratory services requests.
- Assist coordination of laboratory with field sample shipments.
- Management of laboratory data in conjunction with the Project and Field Chemist.
- Liaison between the field and the laboratories when changes are required in the SAP and purchase orders.

Field Chemist –Mark Martin

The Field Chemist will:

- Implement the SAP and designated QA/QC procedures
- Oversee all field sampling activities
- Report all QC data to the project chemist for review
- Implement corrective actions as required by the project chemist
- Perform on-site screening and analyses of samples, if needed
- Fill out sample tracking forms and related analytical and QC forms and logbooks
- Ensuring that the samples are handled, packaged, and shipped according to the SAP
- Ensuring that the laboratory supplies the sample containers, shipping supplies, chain-of-custody records, and the required QC samples (i.e., trip blanks)

Sample Technician – Mark Martin(Field Chemist)

The Sample Technician will be responsible for:

- Carrying out all sampling in accordance with approved procedures and methodologies as defined in the SAP
- Generating field blanks, equipment rinsate blanks, and acquiring field duplicate samples as required by the SAP

- Completing sampling logbooks, sampling forms, labels, custody seals, and chain-of-custody forms and other paperwork as required by the SAP
- Packaging and Shipping of samples to appropriate laboratories

2.5 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

Data generated from those tasks described in Section 2 will be used to assess the effectiveness of the treatment system, and to identify and assess the need for continued treatment or select other alternatives. Project specific quality objectives are listed in *Appendix A*, Table A-2. These include the quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated.

A Naval Facilities Engineering Service Center (NFESC) certified or US Army Corps of Engineers-Missouri River Division (USACE-MRD) approved laboratory will be used for all sample analyses. The laboratory will also be North Carolina approved. A copy of the laboratory's QA Manual, statement of qualifications, and appropriate certificates of approval are kept on file in OHM's Norcross office and are available upon request from the NTR, LANTDIV, or other regulatory agencies. A copy of the approved Sampling and Analysis Plan will be forwarded to the laboratory selected to perform chemical analysis of the samples.

All off-site samples will meet OHM's minimum requirement for the QA/QC as specified in OHM QP-650. A copy of OP-650 is included in *Appendix C.* If disposal analysis is required no duplicates or rinsate blanks will be collected. All sampling and analytical activities will be in accordance with federal, state, and local regulations. A summary of the field QC sampling requirements is shown in Table A-1 in *Appendix A.*

Data evaluation will be performed by the project chemist on all data before it is used. Third party data validation will not be performed on the final data. Data evaluation results will be provided in the project close-out report.

3.0 SAMPLING

3.1 SAMPLING METHODS AND PROCEDURES

The following sections describe sampling locations, frequencies, sample matrices, and measurements of parameters of interest. Tables A-1 "Sampling and Analytical Summary" in *Appendix A* summarizes the sampling required for this project. The semivolital analysis can be performed by CLP or SW-846 methods depending on the laboratory's abilities in obtaining the project remediation levels with either method.

3.1.1 Stockpile Samples

The top 3 feet of the area to be excavated will be stockpiled. This material will be sampled and analyzed for the contaminants of concern (see Table 2.1). If the contamination is below the soil remediation levels, then this material can be used as backfill without any additional analysis.

A composite comprised of 6 grab samples will be collected from the stockpile with a stainless steel (SS) spoon. These 6 grab samples will be mixed in a SS bowl using the quartering method of mixing. One 8-ounce jar with a Teflon cap liner will be filled with the composite material. The sample will be labeled, and stored at 4°C before packaging for shipment to the off-site laboratory.

3.1.2 Excavation Confirmation Samples

A confirmation sample, which is a composite of five grab samples, will be collected for every 50 linear feet of excavation wall and every 500 square feet of the excavation floor. Grab samples from areas showing evidence of contamination such as soil staining, will be included in the composite samples. If ground water is encountered bottom confirmation samples will not be required. These samples will be analyzed for the contaminants of concern. If the contamination is below the remediation levels, then the area represented by the sample has met the remediation goals. If the levels are higher than the remediation goals, then additional excavation and sampling may be required. Excavation will stop at the groundwater level even if the remediation goals have not been achieved.

Grab samples will be collected from the floor or sidewall as required with a stainless steel (SS) spoon or auger. The 5 grab samples per composite sample will be mixed in a SS bowl using the quartering method of mixing. Due to the depth of the excavation, the sampling will be conducted from outside the excavation. The sampling spoons or augers will require

extensions to reach the sample points. The top few inches will be collected for the sample at each location. One 8-ounce jar with a Teflon cap liner will be filled for each composite sample. The sample will be labeled, and stored at 4°C before packaging for shipment to the off-site laboratory.

3.1.3 Contractor Generated Waste Samples

A sample may be required from the PPE wastes for disposal analysis. If samples are required, Table A-1 in *Appendix A* lists the required analysis for disposal of these materials. The Norcross T & D coordinator will be consulted before sampling these materials to verify the required analysis. Depending on the disposal facility, additional analysis may be required.

The sample of the drummed PPE waste will be collected using a knife and/or scissors. Each of the jars listed in Table A-1 will be filled with the material, cooled to 4°C, and sent to the off-site laboratory for full TCLP and RCI analysis.

3.2 SAMPLE IDENTIFICATION

The samples collected on-site will be provided with a unique sample designation. The number will serve to identify the site, location, and specific sample identification number. The sample designation format will be as follows:

CLJ-XXX-NNN-DD

where:

CLJ = Camp Lejeune

XXX= Delivery Order for the project (100)

NNN = Sequential number starting at 001, including QC samples such as field blank, equipment blanks, duplicates etc. (Note: Prior sampling has been performed on this Delivery Order so that the next sequential number will be used)

DD = Matrix identifier and QC identifier

e.g. FS for floor sample
SW for sidewall sample
DS for Disposal Soils
SP for stockpile sample

Other representative designations may be used as needed based on field conditions.

If sample is a field QC sample, the following designations will be added as a suffix:

FB - Field Blank (numbered sequentially such as FB01, FB02 etc)
RB- Equipment Rinsate Blank (numbered sequentially such as RB01, RB02 etc.)
(Duplicates will not be identified to the laboratory)

Sample location information will be included in the sample description area of the COC. Sample sequential numbers are not to be duplicated. Duplicate samples will be sent to the off-site laboratory blind. The latest OHM COC has been designed so that the cross-reference of the duplicate to the original sample can be included on the last page of the COC that does not go to the laboratory.

3.3 SAMPLE PRESERVATION AND HOLDING TIMES

Samples collected for off-site analyses will be sent to the laboratory within 24 hours after collection to ensure that the most reliable and accurate answers will be obtained as a result of the analysis. The holding time begins from the date and time of collection in the field.

All environmental and treatment system samples, except for aqueous samples for metals, will be preserved to a temperature of 4°C prior to shipment to the analytical laboratory, using ice or refrigeration. This temperature should be maintained during shipment by placing ice in leak-proof containers, and placing it above and below the sample containers. Other sample preservation requirements and holding times applicable to the sample matrix and analyses are listed in *Appendix A*, Table A-1.

3.4 FIELD QC SAMPLES

The appropriate number of field QC samples, as specified in the NFESC, 1996 document will be collected during this project. These samples will include field blanks, equipment rinsate blanks and field duplicate samples. These samples will be collected at the following frequencies and analyzed for the parameters listed in *Appendix A*, Table A-1:

Field Blanks (Ambient Blanks)

Field blanks, sometimes referred to as ambient blanks, are samples of contaminant-free media (reagent grade water) witch are prepared at the site and handled in the field in the same manner as all other field samples. Field blanks are collected during the course of field sampling and, to the extent possible, in the actual sampling locations. Field blanks are

collected by placing contaminant-free medium (reagent grade water) in the same type of container as field sample. Field blanks are preserved and stored in the same manner as field samples. At a minimum, one field blank per contiguous site from each sampling event is collected and is analyzed for those interfering contaminants that could potentially be present in ambient air at the sampling site. Approximate number of field blank samples planned to be collected is presented in *Appendix A*, Table A-1.

Equipment Rinsate Blank

Equipment rinsate blanks are the final analyte-free water rinse from equipment cleaning collected daily for each matrix sampled. An equipment rinsate blank is collected in the same type of sample containers, and in all other ways is handled in the same manner as other field samples. The equipment rinsate blank must be collected during the sampling event (after collection of at least one field sample) after the sampling equipment has been decontaminated and prior to collection of the next field sample.

All equipment that comes into contact with field samples must be decontaminated prior to use. The use of disposable equipment is acceptable, but does not obviate the requirement for decontamination prior to use, or the requirement for collection of equipment rinsate blanks. Equipment rinsate blanks for disposable equipment are collected by passing contaminant-free medium through or over the decontaminated equipment. One equipment rinsate blank is collected per day, per sampling event for each matrix sampled that day. Equipment rinsates are analyzed for the same parameters as the sample collected that day. Approximate number of equipment blank samples planned to be collected is presented in Table A-1, *Appendix A*.

Field Duplicate

Duplicates for soil samples are collected, homogenized, and split. All samples except volatiles are homogenized and split. Volatiles are not mixed, but select segments of soil are taken from the length of the core and placed in 4-oz glass jars. The duplicates for water samples are collected simultaneously. Field duplicates must be collected at a frequency of one sample per day per matrix or 10% of the field samples per matrix. All the duplicates should be sent to the primary laboratory responsible for analysis, along with the samples. Approximate number of field duplicates planned to be collected are presented in Table A-1, *Appendix A*. Duplicates will be sent to the off-site laboratory blind.

Trip Blank

Trip blanks are defined as samples, which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile samples. One trip blank should accompany each cooler containing aqueous and non-aqueous volatile samples, should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for volatile organic compounds and may not be required for this project if disposal samples are not taken. Approximate number of trip blank samples planned to be analyzed is presented in Table A-1, *Appendix A*.

3.5 DECONTAMINATION

All sampling equipment (hand augers, spoons, stainless steel/glass mixing bowls, etc.) will be decontaminated before sampling commences, between each sample location, and prior to leaving the site. The procedures for decontamination of equipment according to NEESA 20.2-047B are as follows:

- Remove gross contamination by scraping or brushing.
- Clean with tap water and phosphate-free laboratory detergent (liquinox), using a stiff brush to remove all surface contaminants.
- Rinse thoroughly with tap water.
- Rinse with 1:1 nitric acid (HNO3) metals grade (only if samples are to be analyzed for metals).
- Rinse thoroughly with tap water.
- Rinse thoroughly with deionized/distilled water.
- Rinse twice with reagent grade isopropanol or methanol.
- Rinse thoroughly with organic-free water and allow to air dry. (Do not rinse with deionized/distilled water. If organic-free water is not available, allow equipment to air dry.)
- Wrap equipment with aluminum foil prior to storage or transportation to sample locations.

Decontamination fluids will be collected in properly labeled 55-gallon drums, and staged in a secure area until final disposal unless other arrangements are made.

3.6 CROSS-CONTAMINATION MINIMIZATION

Cross-contamination is the introduction of contaminants into the sample through the sampling and/or sample-handling procedures. It can cause an otherwise representative sample to become non-representative. The most important means of minimizing cross-contamination are as follows:

- Sampling expendables, i.e., sample gloves, pipettes, string, dip jars, etc., must not be reused. Used expendables should be labeled so they are not confused with non-contaminated trash.
- Minimum contact should be made between the sampler and the sample medium. For example, a sampler should not touch the sample during while loading the sample in the container.
- Sample collection activities should proceed progressively from the least contaminated area to the most contaminated area.
- Sampling equipment should be constructed of Teflon, stainless steel, or glass that has been properly precleaned for collecting samples. Equipment constructed of plastic or PVC should not be used to collect samples for trace organic analyses.
- Any tools used in sampling must be carefully decontaminated prior to first use and after each use.
- Activities that could contaminate samples are prohibited in the sample handling and preparation area. These activities and the possible contaminants include:

Activity	*Possible Contaminants*
Smoking	Poly Aromatic Hydrocarbons
Spraying for insects	Pesticides, oils, solvents
Spraying for weeds	Herbicides, oils, solvents
Refueling	BTEX, hydrocarbons

3.7 SAMPLE LOG BOOK

It is necessary for the sampling crew to maintain daily field notes. Items that must be included are sampling protocol, any changes to the procedures, meetings, instructions, safety precautions, personnel protection, and activities pertaining to the samples. The person taking notes must be knowledgeable enough about these activities to know which details are important.

Repetition of information recorded in other permanent logs should be avoided, but enough should be recorded to present a clear and accurate picture of technical activities. At a later date, should a question arise concerning a specific event or a procedure used, it will be answered from these notes. The following information should be logged into the logbooks and/or database:

- Date and time of sampling
- Sample number, locations, type, matrices, volumes, sample ID and descriptions, type and number of sample containers, names and signatures of individuals performing sampling tasks, Chain-Of-Custody (COC) and air bill numbers, preservatives, and date samples were sent
- Name of laboratories and contacts to which the samples were sent, turn around time (TAT) requested, and data results, when possible
- Termination of a sample point or parameter and reasons
- Unusual appearance or odor of a sample
- Measurements, volume of flow, temperature, and weather conditions
- Additional samples and reasons for collecting them
- Levels of protection used (with justification)
- Meetings and telephone conversations held with LANTDIV, NTR, regulatory agencies, Project Manager, or Supervisor
- Details concerning any samples split with another agency
- Details of QC samples collected

These notes must be dated and signed (each page) for validity. All logbooks will be bound and pre-numbered. All log book entries will be made with indelible ink and legibly written. The language will be factual and objective. No erasures will be permitted. If an incorrect entry is made, the error will be crossed out with a single strike mark, initialed, and dated. When audits are performed, the auditor's remarks and decisions must also appear in these notes. These audits should be followed up by written report submitted by the auditor, including opinions and conclusions. A copy of this report should be placed in the project file and one copy kept in the sampling file for easy reference. This information will also be entered in to the data base program that has been prepared for the site. It will be entered daily by the field chemist or sample technician. This person will be the point of contact for

all sampling and analytical information. Report outputs from the database are an acceptable substitute for the sample logbook.

3.8 SAMPLE LABELS

A sample label will identify any samples placed into a sample container. Sample label will identify the following information:

- PROJECT NUMBER
- DATE - Month, day, year
- TIME - Military time
- SAMPLE NUMBER - See Section 3.2 for designations
- SAMPLE DESCRIPTION
- SAMPLER - Sampler's name
- PRESERVATIVES
- ANALYSIS REQUIRED - See *Appendix A*, Table A-1

The information described above should be printed neatly using an indelible marker. After the sample is taken and the label is securely attached, the sample is logged into the sample logbook. An example of a sample label is presented in *Appendix B*.

3.9 CUSTODY SEALS

Custody seals are narrow strips of adhesive tape of glass fiber used to demonstrate that no tampering has occurred. They may be used on sampling equipment, sample transport containers, and individual sample containers. They should be signed and dated by the sampler and placed from one side, across the top, and to the other side of the sample container or across the openings of the sample transport containers. An example custody seal is presented in *Appendix B*.

3.10 CHAIN-OF-CUSTODY PROCEDURES

In order to generate legally defensible data of the samples collected throughout the project, the possession of samples must be traceable from the time the samples are collected until

they are introduced as evidence in legal proceedings. To maintain and document sample possession, chain-of-custody (COC) procedures are followed as described below:

A sample is under your custody if:

- It is in your actual possession, or
- It is in your view, after being in your physical possession, or
- It was in your physical possession and then you locked it up to prevent tampering, or
- It is in a designated secure area

An example of a COC form is presented in *Appendix B*. The following information is required on the COC:

- Project Name
- Project Location - City and State in which the project site is located
- Project Number
- Project Contact - OHM employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results are given (Project Manager, Site Supervisor, or Project Chemist)
- Site Telephone Number - The telephone number of on-site office trailer or number where person responsible for samples can be contacted
- Sample Date - Month, Day, Year
- Sample Time - Military time
- Sample Identification - Sample number and location
- Sample Type - Designation of sample as grab or composite
- Sample Description - Sample matrix, and a brief description of the sampling location
- Sample Preservation - Preservatives used

- Analytical Parameters Requested - Analytical parameter, method numbers, and specific compounds of interest, if applicable
- Airbill Number
- Laboratory - Laboratory where samples are to be sent
- Laboratory Phone - Telephone number of laboratory
- Laboratory Contact - Contact person for laboratory
- Relinquished By - Signature of sender (OHM)
- Date Relinquished - Date samples were relinquished
- Accepted By - Signature of acceptor
- Date Received - Date samples were accepted
- Turnaround Time - Turnaround times requested or date the results are required from the lab
- Sampler's Signature - Signature of sampler

The COC will be sealed in a ziploc bag and taped in place on the underside of the top of the sample transport container (cooler).

3.11 PACKAGING, HANDLING, AND SHIPMENT OF SAMPLES

Samples will be packaged as to minimize shifting of the samples during shipment. An absorbent, such as vermiculite or kitty litter, will be placed at the bottom of the shipment container in order to absorb any liquids in the event of sample breakage. All samples will be individually placed into appropriately sized ziploc bags and sealed.

Samples, which must be kept at 4°C, will be shipped on ice in insulated containers. Ice will be placed in a container such as a ziploc bag and sealed so that water will not fill the shipping container as the ice melts. The ice will be double bagged to insure the ice does not leak.

Samples will be shipped via an overnight shipping agency to the appropriate laboratory. IATA regulations will be followed as they are more applicable to OHM's method of sample shipment. Instructions for filling out shipment documentation are included in *Appendix B*. These instructions are for shipping samples with unknown or limited hazards. All information will be entered as directed. No changes or substitutions to these instructions will

be made irrespective of their significance. A copy of the OHM sample shipping label is included in *Appendix B*.

4.0 DATA ACQUISITION

4.1 ANALYTICAL METHOD REQUIREMENTS

Analytical requirements for this project are listed in *Appendix A*, Table A-1. All samples will be analyzed according to USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods whenever possible. CLP SOW (latest reversion) methods may be required to meet the remediation levels. Alternative methods of analysis from other sources (ASTM, NIOSH, Standard Methods, etc.) may also be used.

4.2 QUALITY CONTROL REQUIREMENTS

Project Quality Control (PQC) requirements for precision, accuracy, completeness, and quantitation limits are listed in *Appendix A*, Table A-2. PQC procedures and acceptance limits must be met as specified in the individual methods. In addition, the laboratory must meet the specification and requirements as described in the NFESC, 1996 document.

4.3 INSTRUMENT TESTING, INSPECTION, AND MAINTENANCE

Proper maintenance is critical to the performance of minimization of downtime of all equipment, whether it be for measurement or support. Inspection will be performed, at a minimum, prior to use of the instruments. Preventive maintenance will be performed as recommended by the manufacturer of the respective equipment. All routine maintenance and major repairs performed on field screening or analytical equipment will be recorded in bound maintenance logbooks that have been specifically designated for that instrument. Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent use, or will be tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated or completely replaced.

4.4 INSTRUMENT CALIBRATION

All calibrations on field instruments will be performed, as a minimum, on a daily basis. Every calibration will be recorded in the maintenance logbook for each instrument. Quality control check standards from a separate source will be used to check initial calibration, and acceptance and rejection criteria.

Monitoring instruments, such as the OVA or FID, O2/LEL meter, Monitox, etc. will be calibrated as specified in the SHSP. Off-site analytical instruments will be calibrated according to the method specifications and the laboratory's QA Manual.

5.0 DATA MANAGEMENT

Data management is the system by which data is reduced, reviewed, validated, reported, distributed, and finally archived. The criteria in this system are designed to meet the project objectives.

5.1 LABORATORY DATA REDUCTION

Data reduction includes the identifications and calculations necessary to convert the raw instrument readings to the final reported compounds and their respective concentrations.

Responsibilities of Analyst

Each analyst is responsible for converting raw data into reportable values. These specific duties include:

- Proper identification of the analyte
- Generation of calculations
- Checking associated calibrations to ensure support of data
- Associated QA/QC checks are supportive of data
- Associated documentation is complete and accurate in respective log books
- Associated chromatograms and strip chart recordings are labeled with data, instrument number, run parameters and analyst

5.2 LABORATORY DATA VALIDATION

All data generated for the project within the laboratory will be extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and three levels of review.

The analyst who generates the raw data has the prime responsibility for the correctness and completeness of the data. All data generated and reduced will follow protocols specified in the laboratory SOP. Each analyst reviews the quality of his work based on an established set of guidelines. The guidelines are:

- Sample preparation information is correct and complete
- Analysis information is correct and complete
- The appropriate Standard Operating Procedures have been followed
- Analytical results are correct and complete
- Analysis is performed within prescribed holding times.
- QC sample results are within established control limits
- Blank sample results are within appropriate QC limits
- Special sample preparation and analytical requirements have been met
- Documentation is complete
- The section supervisor or data review specialist performs the next level of review

The review is structured to ensure that:

- Calibration data are scientifically sound, appropriate to method, and completely documented
- QC results are within established limits
- Reporting units are consistent with the method and the matrix
- Quantitative results are correct
- Data results are consistent with information on the COC
- Documentation is complete
- The data is ready for incorporation into a final report
- The data package is complete and ready for data archive

The second level of review is structured to ensure all calibration data and QC sample results are reviewed and all of the analytical results from 10 percent of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If problems exist, an additional 10 percent is reviewed, the process continues until no errors are found or the package has been reviewed in its entirety.

The final level of review by the laboratory comes from the program administrator or laboratory QA Officer. He or she reviews the report to ensure that the data meets the overall objectives of the project.

Once the data has been validated, it is ready for report production. The report will contain:

- Description of sample types
- Tests performed, problems encountered during testing
- Dates sampled
- Date received
- Date extracted
- Date analyzed
- Analytical results
- Reportable limits
- QC information: percent recovery, relative percent difference, control limits, blanks analyses, matrix spikes, and other additional special QC information
- Qualifiers for data falling outside of QC limits
- Methodology
- Name of the analyst
- Signature of laboratory representative
- Dual column confirmation results
- Calibrations (when requested)
- Instrument performance checks (when requested)
- QC Batch number

The report from the laboratory will be paginated and will also include a copy of the original COC for the samples analyzed.

5.3 PROJECT DATA REVIEW

Project Chemist Data Review Responsibilities

The Project Chemist is responsible for initial review of the data from the laboratory. This review includes:

- Verifying that all requested data are reported

- Verifying that samples are analyzed according to the contract specified method
- Verifying that all analytes requested are reported
- Verifying that holding times are not exceeded
- Verifying that matrix spike, matrix spike duplicate, and surrogate recoveries fall within the laboratory's acceptance criteria
- Reviewing blank data for contamination
- Reviewing field quality control results for inconsistencies
- Verifying that the data generated meet the project Data Quality Objectives specified in the SAP

The Project Chemist is responsible for informing the Project Manager and Project Chemical QA/QC Officer of any laboratory and/or sampling deficiencies or issues. These issues and subsequent decisions will be documented on the data evaluation report produced by the Project Chemist for each data package.

Project QC Engineer Data Review Responsibilities

The Project QC Engineer is responsible for interfacing with the Project Chemist, Project Manager, and the laboratory's QA Officer to resolve any QA/QC issues affecting the data. He or she is also responsible for finalizing any QA/QC issues with the laboratory and/or the project chemist. This includes obtaining a corrective action from the parties involved.

5.4 DATA REPORTING

The preliminary data will be faxed to the Project Chemist. This data may or may not have undergone the full laboratory review process and may contain errors and discrepancies. Prior to the use of data results for any decisions, the data will be reviewed by the Project Chemist and assessed against the project goals and data quality objectives. A copy of the preliminary data, including review comments from the Project Chemist will be submitted to the site and/or the Project Manager.

The hard and final copy data will be evaluated by the Project Chemist and assessed against the preliminary data, project goals and data quality objectives. Any errors, discrepancies, and nonconformances will be brought to the laboratory's and Project Manager's attention.

When QA issues have been satisfactorily settled and data evaluation has been completed, the Project Manager may release the data to the client and/or regulating agencies.

5.5 DATA STORAGE AND ARCHIVE

After OHM has completed its work for the project, all documents generated will be assembled in the project file. Individuals may retain clean (no handwritten comments) copies of documents for their personal files but only after personally verifying that the original or similar copy is in the project file. The project manager/supervisor is responsible for ensuring the collection, assembly, and inventory of all documents relative to the project at the time the objectives are met. The file then becomes accountable. Any records leaving the file must be signed out.

When a contractor has completed the project objectives, all file documents are reviewed and submitted to the central file. The project file contains the following document classes:

- Project logbooks
- Drum logs and other forms
- Sample identification documents
- Chain-of-custody records
- Analytical logbooks, laboratory data, calculations, graphs, etc.
- Correspondence
  - Inter-office
  - Client
  - Regulating agencies
  - Record of confidential material
- Report notes, calculations, drafts
- References, literature
- Sample (on-hand) inventory
- Check-out logs
- Litigation documents

- Miscellaneous – photographs, maps, drawings, etc.

Once deposited in the file, documents must be checked out. The final report is usually generated by use of computer. A back-up copy of the report on diskette is filed along with the project file. The original report remains in the hard drive of the computer until such a time is required to download it on a diskette. This diskette is also archived. All information under the corresponding project number is maintained in the archive system for five years. All archives are accessed by the archives file master list which is maintained in a separate location from the archives.

6.0 *DATA ASSESSMENT PROCEDURES*

Reliability in analytical determination is maintained through strict adherence to quality control procedures. Procedures are designed to control both the accuracy and precision of analytical results. For the validation of the data, a known method spike is routinely analyzed to ensure the accuracy of results. The procedure is to run the standard QA/QC and sample analysis with each lot of samples sent to the laboratory. If more than ten individual analyses are made, additional standards will be analyzed at a rate of one standard per ten analyses. Some procedures call for the use of either a surrogate spike or the standard addition of a known quantity of the analyte to a split of the sample being analyzed.

Control charts will be prepared using an estimate of the spike recovery obtained from the literature or determined by repeated analyses run in the laboratory. Each time the analyst runs a method spike, the results is entered on the control table. If a standard addition technique is used, a plot of instrument response versus added analyte concentration is made in order to determine analyte concentration in the original sample. These are further explained in the laboratory's QAM.

Replicate analyses will be performed on at least 10 percent of the samples processed by the laboratory. A record of the precision of most analyses is kept by calculating and plotting the Industrial Statistic I (which is equivalent to the coefficient of variation). Blanks are also run with each batch of samples or individual sample analyzed regardless of the level of certification of the data.

The purpose of spikes, blanks, and replicates is to provide a sound scientific basis from which the degree of certification of the resultant data can be objectively concluded. These are not management decisions, but follow naturally from the results of the above QC procedures.

6.1 ACCURACY

Data accuracy is a reflection of the efficiency of the analytical procedure. It is determined by use of spiked samples and standard reference materials or laboratory control samples performed at the rate of one set every 20 samples. A control chart is generated using historical laboratory data where warning and control limits are established to assess data accuracy.

The accuracy (check standards) samples will have concentration values of the midDuring analysis, a minimum of 10 percent of samples are accuracy samples. The accuracy samples are staggered through the analysis, not placed one after another. After a minimum of seven accuracy samples are analyzed, the percent recovery is calculated for each sample.

The accuracy criteria is determined by calculating the standard deviation of seven or more percent recovery values and setting the upper and lower control limits using the following equations:

Upper control limit = p + 3 SD
Lower control limit = p - 3 SD

Where:
p = Average percent recovery
SD = Standard deviation

After the standard deviation, for the seven or more samples has been calculated, the accuracy control limits are generated and are then used to determine if the analysis is out of control. This is done by checking the results against the control limits. If any values are above the upper control limit or below the lower control limit, all sample results after the last qualifying accuracy sample must be repeated or discarded. If seven consecutive values fall below the lower control limit, new limits are calculated using the new accuracy check values. If the values fall between the upper and lower limits, then conditions are reported as "within limits".

6.1.1 Recovery Control

Recovery control is necessary to determine if the sample matrix is interfering with the constituent being analyzed. A minimum 5 percent of samples will be recovery check samples (matrix spikes). Samples involving different types of matrices will have at least one recovery check sample for each matrix.

Control limits will be determined for each matrix, determining the deviation for seven or more percent recovery values.

6.2 PRECISION

Duplicate and replicate samples analyzed by the laboratory assess the precision of the sampling effort. Control limits for duplicate/replicate Relative Percent Difference (RPD)s are listed in *Appendix A*, Table A-2. Once a sufficient amount of replicate data becomes available, field precision control charts are constructed similar to the laboratory precision charts. For any given concentration, the mean and the standard deviation(s) of the replicates are calculated. Data from each sample set are pooled with the previous sample sets to generate control and warning limits for the next set. Control and warning limits for water samples are set at ± 2s and ± 3s, respectively. Control limits for solid samples are more liberally established due to matrix heterogeneity. Data outside any control limit are subject to QA review.

Precision is based upon the results of the RPDs as calculated from the percent recoveries of the matrix spike and duplicate samples. The control limits for precision is based on historical laboratory data.

MS and MSD samples on a per batch or a minimum frequency of 5 percent are analyzed to assess precision. Duplicate results are compared and the RPD is then determined. The RPD will be entered into the laboratory's data system and will be used to define the precision of the analysis. Minimum limits are listed in *Appendix A*, Table A-2.

6.3 COMPLETENESS

The field supervisor must ensure all sites are sampled for all the specified analyses, that sufficient sample volume has been provided to complete those analyses, and that all of the QA samples have been included with each sample set. The goal for completeness for each sample set shipped to the laboratory is 100 percent. Minimum limits are listed in *Appendix A*, Table A-2.

Completeness is expressed as the percentage of the amount of valid data obtained to the amount of data expected. For a set of data to be considered complete, it must include all QC data verifying its accuracy and precision.

If samples analyzed do not meet all QC requirements in terms of accuracy and precision for any specific parameter, the sample preparation and analysis will be repeated pending adequate volume.

6.4 CRITERIA FOR REJECTION OF OUTLYING MEASUREMENTS

There are many statistical tests for rejection of outlying data points obtained from a set of measurements from a single population. A test recommended in "Statistical Manual of the Associate of Official Analytical Chemists," 2nd Edition, W. J. Youden and E. H. Steiner, 1975, pg. 86, is the Dixon Test. This test is not dependent on the distribution of the data and can be used for as few as three measurements. A more complete description for this broadly applicable test can be found in the referenced text.

Another reference is the USEPA National Functional Guidelines for Data Validation of Organics and Inorganics. Also, specific programs may have quality objectives with criteria for rejection of outlying measurements.

6.5 METHOD DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

Method detection limits (MDLs) must be established by the laboratory. This should, at a minimum, be established on a yearly basis. MDL is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero.

Practical quantitation limit (PQL) is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. The PQLs are generally 5-10 times the MDL. The PQL is the most applicable limit of reporting for this program.

6.6 LABORATORY AND FIELD CONTAMINATION

It is not unusual to find the following analytes at trace levels in the samples:

- Methylene chloride
- Acetone
- Freon (1,1,2-trichlorotrifluorethane)
- Bis (2-ethylhexyl)phthalate
- Hexane

- Isopropanol
- 2-Butanone

These are common solvents used in the field and in the laboratory.

In order to fully evaluate data containing trace levels of these contaminants, one must have data from trip blanks, field blanks, equipment blanks, and all applicable laboratory blanks for that batch of samples.

The determination on the use of the data will be made during the Data Validation process.

7.0 PERFORMANCE AND SYSTEM AUDITS

Audit is defined as systematic check to determine the quality of operation of field and laboratory activities. It is comprised of the following:

- Performance audit
- System audits

These include a detailed review of each operating component of the network. Auditing will ultimately assist in determining if each element within a system is functioning appropriately per the QA program requirements.

7.1 FIELD PERFORMANCE AUDITS

Field performance audits are performed on an ongoing basis during the project as field data is generated, reduced, and analyzed. All numerical analyses, including manual calculations are documented. All records of numerical analysis are legible, of reproduction quality, and supporting to complete permit logical reconstruction by a qualified individual other than the originator.

Other indicators of the level of field performance are the analytical results of the blank, duplicate, and replicate samples. Each blank analysis is an indirect audit of effectiveness of measures taken in the field to ensure sample integrity. The results of the field duplicate and replicate analysis is an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

7.2 FIELD SYSTEM AUDITS

System audits of site activities are accomplished by an inspection of all field activities by the Project Chemical QC Officer. This audit is composed of comparisons between current field practices and standard procedures. The following is a list of criteria to be used in the evaluation of field activities:

- Overall level of organization and professionalism
- All activities conducted in accordance with work plan

- All procedures and analyses conducted according to procedures outlined in this document
- Sample collection techniques versus the site sampling and analysis plan
- Level of activity and sample documentation
- Working order of instruments and equipment
- Level of QC conducted by each field team
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding
- Decontamination procedures
- Level of efficiency which each team conducts planned activities at the site
- Sample packaging and shipment

After the audit, any deficiencies are discussed with the field staff, and corrections are identified. If any of these deficiencies might affect the integrity of the samples being collected, the QA Officer informs the field staff immediately, so corrections can be made. The field performance audit will be conducted at the start of the project, one before the end of the project, and as directed by the project manager. OHM will also submit to all requests by regulatory agencies, or other clients for external field systems audits.

7.3 LABORATORY PERFORMANCE AUDIT

The laboratory performance audit verifies the ability of the laboratory to correctly identify and quantitate compounds in blind check samples submitted by an auditing agency. If the laboratory participates in Performance Evaluation (PE) programs such as USEPA WS/WP studies, AIHA, PAT studies, etc., results from these studies will be generally acceptable by OHM. However, during the course of the project, it may be necessary for the Project QA/QC Officer to send PE samples to the laboratory to evaluate specific parameters.

The contracted laboratories will undergo performance audits throughout the project consisting of field QC samples. Occasionally PE samples will be supplied by the client or external organizations which will be spiked with the same analytical parameters that are being investigated on site. External laboratory performance audits by auditing agencies such as the USEPA, USACE-MRD, DOD, NFESC, etc., are not routinely scheduled. However,

OHM and its subcontracted laboratories will submit to any external audit upon request by the USEPA or the Client.

7.4 LABORATORY SYSTEM AUDITS

The laboratory system audit is a review of analytical laboratory operations to verify that the facility has the necessary equipment, staff, and procedures in place to generate acceptable data. It is also to determine that each element within an activity is functioning appropriately and within the guidelines of applicable methodology, approved procedures, and the site QAPP. An on-site inspection is routinely performed by the laboratory's QA Manager and may also be frequently performed by the OHM Project Chemical QA/QC Officer. If the laboratory participates in certification programs, audits performed by the certifying agencies may satisfy the criteria of systems audits for the project.

If the laboratory is in question, a system audit can be directed by the Client and performed by OHM or the Client's Representative. Any recommendations made will be considered for implementation and any corrective actions will be taken to correct any deficiencies found. Project-specific audit reports will be placed in the project files and laboratory audit reports will be kept by the laboratory for future reference.

8.0 CORRECTIVE ACTION

Corrective Actions may be necessary as a result of the following QA activities:

- Field and laboratory performance audits
- Field and laboratory system audits
- Inter-laboratory comparison studies
- Calibration data fall out of specified limits
- Failure to adhere to the CQMP
- Failure to adhere to the site
- Failure to adhere to standard operating procedures and methods
- Data completeness below required limits
- Control limits are exceeded for QC samples

If, during system and performance audits, deficiencies or problems are discovered corrective action will be initiated immediately. The appropriate field and laboratory personnel will be notified immediately and an investigative process will be implemented immediately to find solutions to these issues. The investigative process will consist, but is not limited to, the following:

- Determining when the problem occurred
- Determining which systems were affected by the problem
- Determining the cause of the problem
- Determining a corrective action to eliminate the problem
- Assigning the responsibility for implementing the corrective action
- Implementing the corrective action
- Evaluating the effectiveness of the corrective action
- Investigating alternative corrective actions if the original action was not sufficient in eliminating the problem
- Documenting that the corrective action has eliminated the problem

The Project Chemical QC Officer has the authority to require that all site activities threatened by the problem be stopped or limited until the corrective action has been implemented and satisfactorily verified to eliminate the problem.

Corrective actions may include, but is not limited to:

- Modifications to procedures
- Recalibration of instruments
- Replacement of solvents, reagents, and/or standards
- Additional training of personnel
- Reassignment of personnel

8.1 CORRECTIVE ACTION REPORT

A Corrective Action Report (CAR) is necessary documentation of the investigative process. Depending on the issues, the CAR may be generated by the laboratory or the field personnel. Copies of the CAR will be given to the Project QC Officer and Project Manager, who will distribute it to the client. A copy of the CAR will be placed in the project files for future reference.

The CAR should include, but is not limited to:

- A description of the problem, deficiency, or issue
- Proposed resolutions
- Resulting actions
- Effectiveness of the resolutions
- Personnel responsible for implementation of the corrective actions
- Personnel responsible for monitoring the effectiveness of the actions.

8.2 QUALITY ASSURANCE REPORT

The Project Manager, Project QC Officer, and Project Chemist will converse on a regular basis to review possible and potential problem areas and to ensure that all QA/QC procedures are being carried out. It is important that all data abnormalities be investigated to ensure that

they are not a result of operator or instrument deviation but are a true reflection of the methodology or task function. The project final report will contain a separate section that covers the data quality and validity. At a minimum, the following information will be included in the report:

- Assessment of measurement data precision, accuracy, and completeness
- System and performance audit results
- Significant QA problems and corrective actions implemented
- Copies of documentation such as memos, reports, etc.

The Project QC Officer will be responsible for preparing this report weekly or daily, as well as, monthly written QA reports to OHM QA management. The Regional QA/QC Director will be responsible for reviewing and approving these monthly reports. Verbal reports will be made on a more frequent basis. All reports will be made available to the Project Manager, Client, and regulating agencies. If no project audits were performed and no significant QA/QC problems occurred, a letter stating these facts will be submitted to the referenced parties in lieu of a QA Report.

APPENDIX A

TABLE A-1 SAMPLING AND ANALYTICAL SUMMARY
TABLE A-2 PROJECT QUALITY CONTROL OBJECTIVES

Cam[illegible]ne
OU 12 Site 3
Project No. 918319

TABLE A-1 SAMPLING A[illegible] ANALYTICAL SUMMARY

SAP
Version 1
11/5/98

Sample Location	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Preservatives	Containers
Excavation													
Top 3 Feet of Excavation	Stock Pile	Soil	Once	1	Composite of 5 grabs	SS spoons and bowls	7 days	OHM Max	Semi-volatiles	CLP SOW or 8270C	10d(CLP) 14d(SW846)	Cool 4°C	1ea 8 oz jar
Excavation	Floor and Sidewalls	Soil	Sample every 50 linear ft of sidewalls and every 500 ft^2 of floor	Assuming a100' by 50' excavation 6 sidewalls and 10 floor samples + 2 duplicates	Grabs	SS spoons and bowls	48 hr	OHM Max	Semi-volatiles	CLP SOW or 8270C	10d(CLP) 14d(SW846)	Cool 4°C	1ea 8 oz jar
Field QC	Sampling Equipment	Water	Once every 10 samples	2	Equipment Rinse	SS spoons and bowls	48 hr	OHM Max	Semi-volatiles	CLP SOW or 8270C	5d(CLP) 7d(SW846)	Cool 4°C	1ea 1liter
Disposal													
Contractor Generated Waste Material	PPE	Solid	Once	1	Composite	Knife and/or scissors	7 days	OHM Min	TCLP VOA	1311/8260B	7 days	Cool 4°C	1ea 4 oz jar
									TCLP SVOA	1311/8270C	7 days	Cool 4°C	1ea 8 oz jar
									TCLP Pest	1311/8081A	7 days	Cool 4°C	1ea 8 oz jar
									TCLP Herb	1311/8151A	7 days	Cool 4°C	1ea 8 oz jar
									TCLP Metals	1311/6010B	7 days	Cool 4°C	1ea 8 oz jar
									TCLP Hg	1311/7470A	7 days	Cool 4°C	
									pH	9045C	7 days	Cool 4°C	1ea 8 oz jar
									Ignitability	1010/20	7 days	Cool 4°C	
									Reactivity	Chapter 7.3	7 days	Cool 4°C	
Backfill													
Backfill Material	Borrow Source	Soil	Once	1	Composite of 5 grab samples	SS spoons and bowls	7 days	OHM Min	VOA	8260B	7 days	Cool 4°C	1ea 4 oz jar
									SVOA	8270C	7 days	Cool 4°C	1ea 8 oz jar
									Pest/PCB	8081A/82	7 days	Cool 4°C	1ea 8 oz jar
									Metals	6010B	6 months	Cool 4°C	1ea 8 oz jar
									Hg	7471A	28 days	Cool 4°C	

TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
ORGANOCHLORINE PESTICIDES		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8081A	Aldrin	NS	NS	0.04	3	60-140	20-150	<30	<50	47-116	47-116	<50	<75	95	90
8081A	Alpha BHC	NS	NS	0.03	2	60-141	20-151	<30	<50	81-125	81-125	<50	<75	95	90
8081A	Beta BHC	NS	NS	0.06	4	60-142	20-152	<30	<50	51-123	51-123	<50	<75	95	90
8081A	Delta BHC	NS	NS	0.09	6	60-143	20-153	<30	<50	76-126	76-126	<50	<75	95	90
8081A	Gamma BHC (Lindane)	NS	NS	0.04	3	60-144	20-154	<30	<50	73-120	73-120	<50	<75	95	90
8081A	Chlordane	NS	NS	0.14	9	60-145	20-155	<30	<50	45-119	45-119	<50	<75	95	90
8081A	4,4'-DDD	NS	NS	0.04	3	60-146	20-156	<30	<50	48-136	48-136	<50	<75	95	90
8081A	4,4'-DDE	NS	NS	0.12	8	60-147	20-157	<30	<50	45-139	45-139	<50	<75	95	90
8081A	4,4'-DDT	NS	NS	0.02	10	60-148	20-158	<30	<50	34-143	34-143	<50	<75	95	90
8081A	Dieldrin	NS	NS	0.14	9	60-149	20-159	<30	<50	42-132	42-132	<50	<75	95	90
8081A	Endosulfan I	NS	NS	0.04	3	60-150	20-160	<30	<50	49-143	49-143	<50	<75	95	90
8081A	Endosulfan II	NS	NS	0.66	40	60-151	20-161	<30	<50	78-159	78-159	<50	<75	95	90
8081A	Endosulfan Sulfate	NS	NS	0.06	4	60-152	20-162	<30	<50	46-141	46-141	<50	<75	95	90
8081A	Endrin	NS	NS	0.23	20	60-153	20-163	<30	<50	43-134	43-134	<50	<75	95	90
8081A	Endrin Aldehyde	NS	NS	0.03	2	60-154	20-164	<30	<50	75-150	75-150	<50	<75	95	90
8081A	Heptachlor	NS	NS	0.83	60	60-155	20-165	<30	<50	45-128	45-128	<50	<75	95	90
8081A	Heptachlor Epoxide	NS	NS	1.76	100	60-156	20-166	<30	<50	53-134	53-134	<50	<75	95	90
8081A	Methoxychlor	NS	NS	2.4	200	60-157	20-167	<30	<50	73-142	73-142	<50	<75	95	90
8081A	Toxaphene	NS	NS	1	1000	60-158	20-168	<30	<50	41-126	41-126	<50	<75	95	90
PCB		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	<50	<75	%	%
8082	Arochlor-1016	NS	NS	1	1	40-140	40-150	<30	<50	50-114	50-114	<50	<75	95	90
8082	Arochlor-1221	NS	NS	1	1	40-140	40-150	<30	<50	15-178	15-178	<50	<75	95	90
8082	Arochlor-1232	NS	NS	1	1	40-140	40-150	<30	<50	10-215	10-215	<50	<75	95	90
8082	Arochlor-1242	NS	NS	1	1	40-140	40-150	<30	<50	39-150	39-150	<50	<75	95	90
8082	Arochlor-1248	NS	NS	1	1	40-140	40-150	<30	<50	38-158	38-158	<50	<75	95	90
8082	Arochlor-1254	NS	NS	1	1	40-140	40-150	<30	<50	29-131	29-131	<50	<75	95	90
8082	Arochlor-1260	NS	NS	1	1	40-140	40-150	<30	<50	8-127	8-127	<50	<75	95	90
VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8260B	1,1,1,2-Tetrachloroethane	NS	NS	5.0	15	60-140	20-150	<30	<50	62-108	62-108	<50	<75	95	90
8260B	1,1,1-Trichloroethane	NS	NS	5.0	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,1,2,2-Tetrachloroethane	NS	NS	5.0	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	1,1,2-Trichloroethane	NS	NS	5.0	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90

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TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8260B	1,1-Dichloroethane	NS	NS	5.0	10	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	1,1-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,1-Dichloropropane	NS	NS	5.0	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2,3-Trichlorobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-147	65-147	<50	<75	95	90
8260B	1,2,3-Trichloropropane	NS	NS	16	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2,4-Trichlorobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-145	65-145	<50	<75	95	90
8260B	1,2,4-Trimethylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2-Dichloroethane	NS	NS	5.0	15	60-140	20-150	<30	<50	58-137	58-137	<50	<75	95	90
8260B	1,2-Dichlorobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2-Dibromo-3-chloropropane	NS	NS	13	50	60-140	20-150	<30	<50	49-135	49-135	<50	<75	95	90
8260B	1,2-Dichloropropane	NS	NS	5.0	10	60-140	20-150	<30	<50	60-135	60-135	<50	<75	95	90
8260B	1,2-Ethylene Dibromide	NS	NS	5.0	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,3,5-Trimethylbenzene	NS	NS	5.0	15	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	1,3-Dichlorobenzene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,3-Dichloropropane	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,4-Dichlorobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1-Chlorohexane	NS	NS	5.0	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	2,2-Dichloropropane	NS	NS	17.5	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	2-Chlorotoluene	NS	NS	5.0	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	4-Chlorotoluene	NS	NS	5.0	15	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Benzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromochloromethane	NS	NS	5.0	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	Bromodichloromethane	NS	NS	5.0	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromoform	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromomethane	NS	NS	5.5	25	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	Carbon Tetrachloride	NS	NS	5.0	50	60-140	20-150	<30	<50	52-135	52-135	<50	<75	95	90
8260B	Chlorobenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Chloroethane	NS	NS	5.0	25	60-140	20-150	<30	<50	55-135	55-135	<50	<75	95	90
8260B	Chloroform	NS	NS	5.0	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Chloromethane	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Cis-1,2-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Cis-1,3-Dichloropropene	NS	NS	5.0	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Dibromochloromethane	NS	NS	5.0	15	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	Dibromomethane	NS	NS	5.0	50	60-140	20-150	<30	<50	59-137	59-137	<50	<75	95	90
8260B	Dichlorodifluoromethane	NS	NS	5.0	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Ethylbenzene	NS	NS	5.0	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90

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TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8260B	Hexachlorobutadiene	NS	NS	5.0	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Isopropylbenzene	NS	NS	5.0	40	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	m-Xylene	NS	NS	5.0	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Methylene Chloride	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	n-Butylbenzene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	n-Propylbenzene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Naphthalene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	o-Xylene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	p-Isopropyltoluene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	p-Xylene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Sec-Butylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Styrene	NS	NS	5.0	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Trichloroethylene	NS	NS	5.0	50	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260B	Tert-Butylbenzene	NS	NS	7	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Tetrachloroethylene	NS	NS	7	35	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260B	Toluene	NS	NS	5.5	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Trans-1,2-Dichloroethene	NS	NS	5.0	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Trans-1,3-Dichloropropene	NS	NS	5.0	25	60-140	20-150	<30	<50	56-135	56-135	<50	<75	95	90
8260B	Trichlorofluoromethane	NS	NS	5.0	20	60-140	20-150	<30	<50	57-135	57-135	<50	<75	95	90
8260B	Vinyl Chloride	NS	NS	5.5	45	60-140	20-150	<30	<50	36-144	36-144	<50	<75	95	90
8260B	Dibromofluoromethane (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	Toluene-d8 (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	4-Bromofluorobenzene (surr)	NS	NS	NA	NA	75-1225	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	1,2-Dichloroethane-d4 (surr)	NS	NS	NA	NA	62-139	52-149	NA	NA	NA	NA	NA	NA	95	90
SEMI-VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8270B	1,2,4-Trichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	44-142	34-152	<50	<75	95	90
8270B	1,2-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	42-155	32-135	<50	<75	95	90
8270B	1,3-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	36-125	26-135	<50	<75	95	90
8270B	1,4-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	30-125	25-135	<50	<75	95	90
8270B	2,4-Dinitrotoluene	NS	NS	10	660	60-140	20-150	<30	<50	39-139	29-149	<50	<75	95	90
8270B	2,6-Dinitrotoluene	NS	NS	10	660	60-140	20-150	<30	<50	51-125	41-135	<50	<75	95	90
8270B	2-Chloronaphthalene	NS	NS	10	660	60-140	20-150	<30	<50	60-125	50-135	<50	<75	95	90
8270B	2-Methylnaphthalene	NS	**4900**	10	**660**	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270B	2-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270B	3,3'-Dichlorobenzidine	NS	NS	20	1300	60-140	20-150	<30	<50	29-175	25-175	<50	<75	95	90
8270B	3-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	51-125	41-135	<50	<75	95	90

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TA E A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8270B	4-Bromophenyl-phenyl ether	NS	NS	10	660	60-140	20-150	<30	<50	53-127	43-137	<50	<75	95	90
8270B	4-Chloroaniline	NS	NS	20	1300	60-140	20-150	<30	<50	45-136	35-146	<50	<75	95	90
8270B	4-Chlorophenyl-phenyl ether	NS	NS	10	660	60-140	20-150	<30	<50	51-132	41-142	<50	<75	95	90
8270B	4-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	40-143	30-153	<50	<75	95	90
8270B	Acenaphthylene	NS	NS	10	660	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270B	Acenaphthene	NS	**8160**	10	**660**	60-140	20-150	<30	<50	49-124	39-135	<50	<75	95	90
8270B	Anthracene	NS	NS	10	660	60-140	20-150	<30	<50	45-165	35-175	<50	<75	95	90
8270B	Benzo (a) anthracene	NS	**343**	10	**300**	60-140	20-150	<30	<50	51-133	41-143	<50	<75	95	90
8270B	Benzo (a) pyrene	NS	NS	10	660	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270B	Benzo (b) fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270B	Benzo (g,h,i) perylene	NS	NS	10	660	60-140	20-150	<30	<50	34-149	25-159	<50	<75	95	90
8270B	Benzyl alcohol	NS	NS	20	1300	60-140	20-150	<30	<50	35-125	25-135	<50	<75	95	90
8270B	Bis (2-chloroethoxy) methane	NS	NS	10	660	60-140	20-150	<30	<50	49-125	39-135	<50	<75	95	90
8270B	Bis (2-chloroethyl) ether	NS	NS	10	660	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270B	Bis (2-chloroisopropyl) ether	NS	NS	10	660	60-140	20-150	<30	<50	36-166	26-175	<50	<75	95	90
8270B	Bis (2-ethylhexyl) phthalate	NS	NS	10	660	60-140	20-150	<30	<50	33-129	25-139	<50	<75	95	90
8270B	Butyl benzyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	26-125	25-135	<50	<75	95	90
8270B	Chrysene	NS	**3810**	10	**660**	60-140	20-150	<30	<50	55-133	45-143	<50	<75	95	90
8270B	Di-n-butyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	34-126	25-136	<50	<75	95	90
8270B	Di-n-octyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	38-127	28-137	<50	<75	95	90
8270B	Dibenzo (a,h) anthracene	NS	NS	10	660	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270B	Dibenzofuran	NS	NS	10	660	60-140	20-150	<30	<50	52-125	42-135	<50	<75	95	90
8270B	Diethyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270B	Dimethyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	25-175	25-175	<50	<75	95	90
8270B	Fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270B	Fluorene	NS	NS	10	660	60-140	20-150	<30	<50	48-139	38-149	<50	<75	95	90
8270B	Hexachlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	46-133	36-143	<50	<75	95	90
8270B	Hexachlorobutadiene	NS	NS	10	660	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270B	Hexachlorocyclopentadiene	NS	NS	10	660	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270B	Hexachloroethane	NS	NS	10	660	60-140	20-150	<30	<50	25-153	25-163	<50	<75	95	90
8270B	Indeno (1,2,3-c,d) pyrene	NS	NS	10	660	60-140	20-150	<30	<50	27-160	25-170	<50	<75	95	90
8270B	Isophorone	NS	NS	10	660	60-140	20-150	<30	<50	26-175	25-175	<50	<75	95	90
8270B	N-Nitrosodi-n-propylamine	NS	NS	10	660	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270B	N-Nitrosodiphenylamine	NS	NS	10	660	60-140	20-150	<30	<50	27-125	25-135	<50	<75	95	90
8270B	Naphthalene	NS	**585**	10	**500**	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270B	Nitrobenzene	NS	NS	10	660	60-140	20-150	<30	<50	46-133	36-143	<50	<75	95	90
8270B	Phenanthrene	NS	NS	10	660	60-140	20-150	<30	<50	54-125	44-135	<50	<75	95	90

Notes:
1) SW-846 Methods unless otherwise noted
2) Includes Sediments, Waste, Solids

NS = Not Specified
NA = Not Applicable

TA[illegible]E A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8270B	Pyrene	NS	NS	10	660	60-140	20-150	<30	<50	47-136	37-146	<50	<75	95	90
8270B	2,4,5-Trichlorophenol	NS	NS	50	330	60-140	20-150	<30	<50	25-175	25-175	<50	<75	95	90
8270B	2,4,6-Trichlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	39-128	29-138	<50	<75	95	90
8270B	2,4-Dichlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	46-125	36-135	<50	<75	95	90
8270B	2,4-Dimethylphenol	NS	NS	10	660	60-140	20-150	<30	<50	45-139	35-149	<50	<75	95	90
8270B	2,4-Dinitrophenol	NS	NS	50	3300	60-140	20-150	<30	<50	30-151	25-161	<50	<75	95	90
8270B	2-Chlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270B	2-Methylphenol	NS	**1050**	10	**660**	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270B	2-Nitrophenol	NS	NS	10	660	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270B	4,6-Dinitro-2-methyl phenol	NS	NS	50	3300	60-140	20-150	<30	<50	26-134	25-144	<50	<75	95	90
8270B	4-Chloro-3-methyl phenol	NS	NS	20	1300	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270B	4-Methylphenol	NS	**17.4**	10	**660**	60-140	20-150	<30	<50	33-125	25-135	<50	<75	95	90
8270B	4-Nitrophenol	NS	NS	50	1600	60-140	20-150	<30	<50	25-131	25-141	<50	<75	95	90
8270B	Benzoic acid	NS	NS	50	1600	60-140	20-150	<30	<50	25-162	25-172	<50	<75	95	90
8270B	Pentachlorophenol	NS	NS	50	3300	60-140	20-150	<30	<50	28-136	38-146	<50	<75	95	90
8270B	Phenol	NS	**1750**	10	**660**	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270B	3-Methylphenol	NS	NS	10	660	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270B	Benzo (k) fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	37-123	37-123	<50	<75	95	90
8270B	Carbazole	NS	**273**	10	**250**	60-140	20-150	<30	<50	34-132	34-132	<50	<75	95	90
8270B	p-Chloroaniline	NS	NS	10	660	60-140	20-150	<30	<50	56-107	56-107	<50	<75	95	90
8270B	2,4,6-Tribromophenol					25-134	19-122								
8270B	2-Fluorobiphenyl					43-125	34-135								
8270B	2-Fluorophenol					25-125	25-135								
8270B	Nitrobenzene-d5					32-125	25-135								
8270B	Phenol-d5					25-125	25-135								
8270B	Terphenyl-d14					42-126	32-136								

METALS BY ICP		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
6010	Aluminum	NS	NS	0.5	50	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Antimony	NS	NS	0.4	40	50-150	30-170	<30	<50	81-112	81-112	<50	<75	95	90
6010	Arsenic	NS	NS	0.6	60	50-150	30-170	<30	<50	79-115	79-115	<50	<75	95	90
6010	Barium	NS	NS	0.02	2	50-150	30-170	<30	<50	85-112	85-112	<50	<75	95	90
6010	Beryllium	NS	NS	0.003	0.3	50-150	30-170	<30	<50	83-114	83-114	<50	<75	95	90
6010	Cadmium	NS	NS	0.04	4	50-150	30-170	<30	<50	78-118	78-118	<50	<75	95	90
6010	Calcium	NS	NS	0.1	10	50-150	30-170	<30	<50	84-114	84-114	<50	<75	95	90
6010	Chromium	NS	NS	0.07	7	50-150	30-170	<30	<50	82-115	82-115	<50	<75	95	90

Notes:
1) SW-846 Methods unless otherwise noted
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NA = Not Applicable

TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
6010	Cobalt	NS	NS	0.07	7	50-150	30-170	<30	<50	82-113	82-113	<50	<75	95	90
6010	Copper	NS	NS	0.06	6	50-150	30-170	<30	<50	83-114	83-114	<50	<75	95	90
6010	Iron	NS	NS	0.07	7	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Lead	NS	NS	0.5	50	50-150	30-170	<30	<50	79-116	79-116	<50	<75	95	90
6010	Magnesium	NS	NS	0.3	30	50-150	30-170	<30	<50	84-112	84-112	<50	<75	95	90
6010	Manganese	NS	NS	0.02	2	50-150	30-170	<30	<50	84-114	84-114	<50	<75	95	90
6010	Molybdenum	NS	NS	0.08	8	50-150	30-170	<30	<50	83-113	83-113	<50	<75	95	90
6010	Nickel	NS	NS	0.15	15	50-150	30-170	<30	<50	82-112	82-112	<50	<75	95	90
6010	Potassium	NS	NS	5	500	50-150	30-170	<30	<50	82-114	82-114	<50	<75	95	90
6010	Selenium	NS	NS	0.8	80	50-150	30-170	<30	<50	68-121	68-121	<50	<75	95	90
6010	Silver	NS	NS	0.07	7	50-150	30-170	<30	<50	75-123	75-123	<50	<75	95	90
6010	Sodium	NS	NS	0.3	30	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Thallium	NS	NS	0.4	40	50-150	30-170	<30	<50	80-112	80-112	<50	<75	95	90
6010	Vanadium	NS	NS	0.08	8	50-150	30-170	<30	<50	82-112	82-112	<50	<75	95	90
6010	Zinc	NS	NS	0.02	2	50-150	30-170	<30	<50	82-113	82-113	<50	<75	95	90
METALS BY GFAA		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7421	Lead	NS	NS	0.001	0.1	50-150	30-170	<30	<50	74-124	74-124	<50	<75	95	90

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APPENDIX B

CUSTODY SEAL
CHAIN-OF-CUSTODY RECORD
OHM SHIPPING LABEL
SHIPPING INSTRUCTIONS FOR SENDING SAMPLES TO THE LABORATORY

APPENDIX C

SOPs

QP-650 STANDARD ANALYTICAL DATA DELIVERABLE REQUIREMENTS

APPENDIX D

TREATABILITY TEST REPORT

BENCHSCALE TREATABILITY STUDY REPORT
BIOLOGICAL TREATMENT
OF PAH CONTAMINATED SOILS
OPERABLE UNIT NO. 12 (SITE 3)
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032

Atlantic Division
Naval Facilities Engineering Command
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March 1998
Delivery Order No. 100
OHM Project No. 918319

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

2.0 SAMPLE COLLECTION AND CHARACTERIZATION 2-1

3.0 BENCHSCALE BIOLOGICAL TREATMENT 3-1

4.0 CONCLUSIONS AND RECOMMENDATIONS 4-1

TABLES

TABLE 1	Soil Characterization – Analytical Methods
TABLE 2	Soil Characterization – Analytical Results
TABLE 3	Treatment Criteria for Target Organics
TABLE 4	Treatment Vessel Preparation
TABLE 5	Concentration of Target Organics in the Treatment Cell over Time
TABLE 6	Initial and Final (Day 112) Concentrations Organics and Monitoring Parameters within the Treatment Cell

APPENDICES

APPENDIX A:	C-O-C Record for Sample Collection at Camp Lejeune
APPENDIX B:	Analytical Report – Initial Characterization of Soil
APPENDIX C:	Analytical Results – Biological Monitoring Analyses
APPENDIX D:	Analytical Report – Treatment Cell on Day 0
APPENDIX E:	Analytical Report – Treatment Cell on Day 14
APPENDIX F:	Analytical Report – Treatment Cell on Day 28
APPENDIX G:	Analytical Report – Treatment Cell on Day 42
APPENDIX H:	Analytical Report – Treatment Cell on Day 56
APPENDIX I:	Analytical Report – Treatment Cell on Day 84
APPENDIX J:	Analytical Report – Treatment Cell on Day 112

1.0 INTRODUCTION

This document presents the results of a Bench Scale Treatability Study performed by OHM Remediation Services Corp. (OHM) to determine the potential for biological remediation of Polyaromatic Hydrocarbons (PAHs) contaminated soil at Operable Unit No. 12, Site 3 (OU 12 (Site 3), MCB Camp Lejeune, North Carolina. The site known, as the Old Creosote Plant, is a former location of a creosote operation used for construction of the Camp Lejeune railroad. It has been described previously by Baker Environmental, Inc. (Baker), in the 60% Design Package dated August 22, 1997.

Subsurface soils at OU 12 (Site 3) have been contaminated with PAHs. Site characterization activities have indicated the following contaminants of concern, remediation levels, and maximum concentrations as shown below. The table reflects the revised risk based remediation criteria for Chrysene of 160 mg/kg as discussed with Baker on 3/25/98.

Contaminant of Concern	Remediation Level (ppb)	Maximum Concentration (ppb)
Naphthalene	30,000	95,000
2-Methylnaphthalene	30,000	31,000
Carbazole	500	4,900
Benzo(a)anthracene	700	8,000
Chrysene	160,000	8,400
4-Nitrophenol	0	570
N-nitrosodiphenylamine	200	1,100

The Scope of Work for Delivery Order No. 100 includes construction and operation of a biological treatment cell to remediate the target PAH constituents to acceptable levels. It was agreed that prior to execution of this scope of work, OHM would perform a bench scale treatability test to determine the efficiency of biological treatment to achieve these goals and to evaluate full scale treatment/disposal options for the material at OU 12 (Site 3). The primary objectives of this Bench Scale Treatability Study were to:

1. Determine if biological treatment can render the soil "non-hazardous" by definition, (assuming as received soil exhibited hazardous characteristic)

2. Assess biological treatment efficiencies of the 7 target PAH contaminants for on-site remediation in an engineered biocell.

3. Develop performance data and design parameters to estimate costs for larger scale operations.

As discussed later in this report, the first objective was to determine if biological treatment could remove the RCRA-hazardous classification from the soil. Based on the

characterization analyses, the soil as received was classified as non-hazardous. Therefore, treatment was not necessary to accomplish this objective. Secondly, risk based clean-up standards based on total constituent analysis are established for remediation of this soil as discussed in the Baker Design Package. Based on OHM's discussions with Baker and NCDENR, excavated materials containing the target PAH constituents in excess of the remediation levels, which are treated (i.e., biocell) below the criteria can be subsequently managed in an unrestricted manner. Therefore, the treatability study focused on the latter two objectives.

Treatability tasks included the following:

- Perform baseline characterization of the soil for parameters relevant to solid-phase biological treatment
- Classify the soil based on TCLP volatiles and semi-volatiles present in the soil (e.g., determine if the soil is "hazardous" due to toxicity characteristic)
- Simulate solid-phase biological treatment processes in the laboratory maintaining optimal operating conditions
- Sample and analyze the treated soil at intervals of 14, 28, 42, 56, 84, and 112 days
- Provide a summary report of the results

2.0 SAMPLE COLLECTION AND CHARACTERIZATION

One representative five-gallon soil sample was collected at the site on October 23, 1997, and shipped by express delivery to OHM's Corporate Treatability Laboratory in Findlay, Ohio. A Chain-of-Custody Record for shipment of that sample is presented in *Appendix A*. Upon receipt, the sample was homogenized and screened through a 3/8-inch sieve to remove any remaining oversize debris or stones from the soil. Care was exercised to minimize volatilization of organics during the preparation steps. Although difficult to quantify, some loss of some volatile organic compounds (VOCs) is typical during routine tilling operations in land treatment cells. Analyses, as presented in Table 1, were then performed to characterize the soil. The results of those analyses are presented in Table 2. *Appendix B* contains the complete analytical results.

Five VOCs were quantified in the soil. With the exception of naphthalene at a concentration of 3.0 mg/kg, the highest concentration of the remaining four VOCs quantified was 0.03 mg/kg. Thirteen base-neutral-acid extractable organic compounds (BNAs) were quantified in the soil, based on an analytical limit of detection (practical quantitation limit (PQL) of 3.8 mg/kg). This limit was the practical limit the laboratory could achieve with the specific matrix. At a pH of 6.7 standard units, soil pH was within the acceptable range of 6.5 to 8.0 standard units. Available ammonium-nitrogen (NH_4-N) and nitrate-nitrogen (NO_3-N) were quantified at concentrations of 4.0 mg/kg, and phosphate-phosphorus (PO_4-P) was not detected at a level of detection (LOD) of 0.25 mg/kg.

3.0 *BENCHSCALE BIOLOGICAL TREATMENT*

The potential of land (or solid-phase) treatment to remediate the soil to established clean-up levels (Table 3) was simulated in the laboratory using the soil collected from the site. Approximately 20 kg of contaminated soil was placed in an 18" x 18" x 4" deep aluminum tray which was used as a treatment vessel. Diammonium phosphate (DAP) was added as a readily available source of the nitrogen and phosphorus required to support enhanced microbial growth. The soil was tilled approximately twice per week throughout the duration of the study using a small garden rake. At a minimum, one composite sample was collected weekly for moisture content, pH, and nutrient analyses. Adjustments to pH, nutrients, and soil moisture content were performed as required to maintain optimal biological degradation conditions (Table 4). One composite sample was collected on days 0, 14, 28, 42, 56, 84, and 112 and submitted to OHM's Analytical Division for target PAH analysis by USEPA Method 8270.

The concentrations of the original seven target organics in soil samples collected from the treatment cell on Days 0, 14, 28, 42, 56, 84, and 112 are presented in Table 5. The analytical reports for these analyses are respectively presented in *Appendices D through J.* Table 6 presents initial and final concentrations of VOCs and BNAs quantified in soil. The laboratory treatment cell monitoring results and operational activities are presented in *Appendix C.*

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the Bench Scale Treatability Study, the following conclusions can be made for the biological treatment of the creosote contaminated soils:

- The soil sample collected for the treatability study can be classified as non-characteristically hazardous following RCRA TCLP testing for volatile and semi-volatile compounds.
- Based on the analytical results from the monitoring analyses, optimal conditions for biological degradation of PAHs were maintained in the treatment cell for the duration of the 112-day study.
- Of the seven target PAHs, two compounds were not treated to the target cleanup criteria. Treatment criteria for carbazole and benzo (a) anthracene are 0.5 mg/kg and 0.7 mg/kg respectively. After 112 days of biological treatment, the concentrations were reduced to 0.82 mg/kg and 2.4 mg/kg respectively.
- After 84 days of biological treatment, the concentrations of three PAH contaminants (naphthalene, 2-methylnaphthalene, and chrysene) were below treatment standards.
- After 84 days of biological treatment, N-nitrosodiphenylamine was treated to less than 0.38 mg/kg, which is below the method detection limit (MDL) for this compound at 0.66 mg/kg. It should be noted that the target remediation criteria for N-nitrosodiphenylamine at 0.2 mg/kg is below the MDL and unachievable.
- After 84 days of biological treatment, 4-Nitrophenol was treated below 0.38 mg/kg, which is also below the MDL of 0.66 mg/kg. The treatment criteria of zero is not achievable or quantifiable. If treatment goals are revised to the detection limit for this compound, then the final criteria can be achieved using biological treatment methods.
- After approximately 56 days of treatment, biological treatment of the target contaminants were essentially complete and additional degradation of the contaminants were diminished over the remaining 56 days of treatment. Based on OHM's previous experience with the biological treatment of PAHs, the remaining contaminants have undergone "biostablization" and are not available for further biological treatment.

Based on the results of the Bench Scale Treatability Study, solid-phase biological treatment of the PAH contaminated soil could not achieve all of the treatment criteria for the target PAH constituents. Given similar initial concentrations of target PAH constituents, biological land treatment technology using an engineered biocell approach is not likely to achieve the established risk based treatment criteria. Other treatment and disposal options should be explored to determine the most cost effective management alternative for the estimated 1,340 cubic yards of creosote contaminated material at OU 12 (Site 3). Possible options include thermal treatment, Subtitle D land disposal, and Subtitle C land disposal. OHM recommends

that a waste profile be completed and sent to prospective T&D facilities to obtain pricing for this evaluation.

TABLE 1

SOIL CHARACTERIZATION PARAMETERS AND ANALYTICAL METHODS

Parameter	Analytical Method
Volatile organic compounds (VOCs)	USEPA 5030, 8260A
Base/neutral/acid extractable semivolatile organic compounds (BNAs)	USEPA 3540, 8270B
Toxicity characteristic leaching procedure (TCLP) - volatiles and base/neutral/acid extractable semivolatiles	USEPA 1311, 1311-ZHE, 8260A, 8270B
pH	USEPA 9045C
Available mineral nutrients	
NH_4-N, NO_3-N	ASA/SSSA 33-3, 33-4
PO_4-P	ASA/SSSA 24-5.1, 24-5.3
Soil moisture	EPA/600/R-93/164
Field capacity	EPA/600/R-93/164
Aerobic heterotrophic bacterial population density	SM 9215C

TABLE 2

SOIL CHARACTERIZATION AND ANALYTICAL RESULTS

Parameter	Analytical Results
VOCs (mg/kg)	
Acetone	0.033
Naphthalene	3.0
1,2,4-Trimethylbenzene	0.027
1,3,5-Trimethylbenzene	0.016
Xylenes	0.006
BNAs (mg/kg)	
Acenaphthene	66
Acenaphthylene	< 3.8
Anthracene	29
Benzo (a) anthracene	20
Benzo (b) fluoranthene	8.1
Benzo (k) fluoranthene	8.6
Benzo (ghi) perylene	< 3.8
Benzo (a) pyrene	6.8
Carbazole	5.1
Chrysene	25
Dibenzo (a,h) anthracene	< 3.8
Dibenzofuran	19
2,4-Dinitrotoluene	< 3.8
Fluoranthene	150
Fluorene	42
Indeno (1,2,3-cd) pyrene	< 3.8
2-Methylnapthalene	< 3.8
Phenanthrene	150
4-Nitrophenol	< 3.8
Pyrene	100
N-Nitrosodiphenylamine	< 3.8
TCLP VOCs (mg/L)	< 0.12
TCLP BNAs (mg/L)	< 0.10
pH	6.7
Available mineral nutrients (mg/kg)	
NH_4-N	4.0
NO_3-N	4.0
PO_4-P	< 0.25
Soil moisture (% wet weight or as received)	11.8
Field capacity (%)	22.8
Soil moisture - % of field capacity	51.8
Heterotrophic bacterial population density	7.7×10^7 CFU/gram (dry-weight)

TABLE 3

TREATMENT CRITERIA FOR TARGET ORGANICS

Target Organic	Initial Concentration (mg/kg)	Treatment Criteria (mg/kg)
Naphthalene	3.0	30
2-Methylnaphthalene	< 3.8	30
Carbazole	5.1	0.5
Benzo (a) anthracene	20	0.7
Chrysene	25	160
4-Nitrophenol	< 3.8	0[1]
N-Nitrosodiphenylamine	< 3.8	0.2[2]

[1] Limit is below MDL and not achievable with analytical methods.
[2] Treatment criteria for N-nitrosodiphenylamine at 0.2 mg/kg is below the MDL and not achievable.

TABLE 4

TREATMENT VESSEL PREPARATION

Parameter	Measure
Soil (Wet Weight)	20 kg
PH	6.5 - 7.9
Soil Moisture (Wet Weight)	13% - 18%
Diammonium Phosphate (DAP), $(NH_4)_2HPO_4$	15 g

TABLE 5

LAND (OR SOLID-PHASE) TREATMENT OF TARGET ORGANICS
TREATMENT INTERVALS DAY 0 THROUGH 112

Target Organic	Treatment Criteria (mg/kg)	Concentration (mg/kg)						
		Day 0	Day 14	Day 28	Day 42	Day 56	Day 84	Day 11
Naphthalene	30	< 9.2	< 3.5	< 3.9	< 2.0	< 1.9	< 0.38	< 0.38
2-Methylnaphthalene	30	< 3.8	< 3.5	< 3.9	< 2.0	< 1.9	< 0.38	< 0.38
Carbazole	0.5	< 5.1	< 3.5	< 3.9	< 2.0	< 1.9	1.6	0.82
Benzo (a) anthracene	0.7	20	26	19	6.5	2.5	2.8	2.4
Chrysene	160	25	31	24	16	9.8	8.8	14
4-Nitrophenol	0[1]	< 3.8	< 3.5	< 3.9	< 2.0	< 1.9	< 0.38	< 0.38
N-Nitrosodiphenylamine	0.2[2]	< 3.8	< 3.5	< 3.9	< 2.0	< 1.9	< 0.38	< 0.38

[1] Limit is below MDL and not achievable with analytical methods.
[2] Treatment criteria for N-nitrosodiphenylamine at 0.2 mg/kg is below the MDL and not achievable.

TABLE 6

INITIAL AND FINAL CONCENTRATIONS OF PARAMETERS AND TREATMENT EFFICIENCY

PARAMETER	Concentration (mg/kg)		Reduction (%)
	Day 0	Day 112	(%)
DROs, *n*-C_{10} - *n*-C_{21} (mg/kg)	580	50	91
LROs, *n*-C_{21} - *n*-C_{40} (mg/kg)	410	230	44
[1]VOCs (mg/kg)			
Acetone	0.033	< 0.011	> 67
Naphthalene	3.0	< 0.006	> 98
1,2,4-Trimethylbenzene	0.027	< 0.006	> 78
1,3,5-Trimethylbenzene	0.016	< 0.006	> 62
Xylenes	0.006	< 0.006	> 0
BNAs (mg/kg)			
Acenaphthene	66	< 0.38	> 99
Acenaphthylene	< 3.8	0.52	[3]ND
Anthracene	29	7.8	73
Benzo (a) anthracene	20	2.4	88
Benzo (b) fluoranthene	8.1	8.5	0
Benzo (k) fluoranthene	8.6	4.2	51
Benzo (ghi) perylene	< 3.8	2.7	ND
Benzo (a) pyrene	6.8	3.8	44
Carbazole	5.1	0.82	84
Chrysene	25	14	44
Dibenzo (a,h) anthracene	< 3.8	0.95	ND
Dibenzofuran	19	< 0.38	> 98
2,4-Dinitrotoluene	< 3.8	4.3	ND
Fluoranthene	150	9.8	93
Fluorene	42	1.8	96
Indeno (1,2,3-cd) pyrene	< 3.8	2.9	ND
2-Methylnapthalene	< 3.8	< 0.38	> 90
Phenanthrene	150	8.2	95
4-Nitrophenol	< 3.8	< 0.38	[3]ND
Pyrene	100	9.6	90
N-Nitrosodiphenylamine	< 3.8	< 0.38	[3]ND
TCLP VOCs (mg/L)	< 0.12	[2]NA	---
TCLP BNAs (mg/L)	< 0.10	NA	---
PH	6.7	6.9	---
NH_4-N (mg/kg)	4.0	210	---
NO_3-N (mg/kg)	4.0	300	---
PO_4-P (mg/kg)	< 0.25	100	---
Soil moisture (% wet weight or as received)	11.8	11.7	---
Field capacity (%)	22.8	NA	---
Soil moisture - % of field capacity	51.8	NA	---
Heterotrophic bacterial population density (CFU/g)	7.7 x 10'		---

[1]Level of Detection=0.006 mg/kg [2]NA = Not Analyzed [3]ND = Not Determined