OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

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WORK PLAN FOR TO 0061
REMEDIATION OF SITES 4, 21, AND 22
NAVAL WEAPONS STATION-YORKTOWN
YORKTOWN, VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
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1.0 INTRODUCTION

1.1 BACKGROUND

OHM Remediation Services Corp. (OHM) has been retained by the Department of the Navy, Facilities Engineering Command (NAVFACENGCOM), Norfolk, Virginia, under Task Order No. 061 (TO #061) to perform remediation of contaminated soils at Sites 4, 21, and 22 (Figure 1), Naval Weapons Station Yorktown (NWS Yorktown), located in Yorktown, Virginia. The scope of work entails the removal of 2,100 cyd. of soil (2 feet below ground surface at each site) that are potentially contaminated with inorganic materials, CPAH, PAH, and explosives; the demolition and removal of an existing bio-cell at Site 22; and restoration of each site with on-base soil and topsoil and seeding.

The excavated soil waste will be transported to and disposed at a Navy approved off-site commercial subtitle C landfill. Concrete rubble from the bio-cell demolition will be used as road base at Site 6 on the Base. Metal debris will be recycled through the Base DRMO.

The scope of work for TO #061 may be summarized as follows:

- Pre-construction submittals and plans;
- Mobilization of resources;
- Site set up and installation of erosion and sediment controls;
- Survey the sites to determine the area of excavation;
- Construction of decontamination pads;
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils;
- Transport and disposal of waste soils;
- Conduct confirmatory sampling at Sites 4, 21, and 22;
- Decontaminate, demolish and dispose of bio-cell at Site 22;
- Backfill and restore Sites 4, 21, and 22;
- Project demobilization; and
- Final report preparation and review

1.2 SITE DESCRIPTION

1.2.1 Site Description and History

Sites 4, 21, and 22 are located in the northeastern portion of WPNSTA Yorktown, between Indian Field Creek and Felgates Creek (Figure 1). The site descriptions and histories of Sites 4, 21, and 22 are presented in the following subsections.

1.2.2 Site 4 - Burning Pad Residue Landfill

Site 4, the Burning Pad Residue Landfill, consists of over 10 acres. As shown on Figures 1 and 2, the site is bordered by the Explosives Burning Facility 1401 (Site 22) to the southwest, the Battery and Drum Disposal Area (Site 21) and an unnamed drainage way to the southeast, West Road to the northeast, and a gravel road leading to the burning facility to the northwest.

The majority of the site is relatively open, with scrub grasses and small trees; larger trees are present in the northern and southeastern portions of the site. A gravel road now loops through the site and meets West Road. A dirt or gravel road formerly cut through the site and led towards Site 22. The topography within the open area of Site 4 is relatively flat with elevations ranging between 33 to 47 feet above mean sea level (msl). In the wooded areas along the southeastern portion of the site, the topography slopes sharply down towards the unnamed drainage way with elevations changing from 39 to less than 10 feet above msl.

1.2.3 Site 21 - Battery and Drum Disposal Area

Site 21, the Battery and Drum Disposal Area, is a small wooded area covering approximately 1 acre. The site is located immediately adjacent to the unnamed drainage way leading to Felgates Creek. West Road is located southwest of the site, and Site 4 is to the northwest (Figures 1 and 3).

The site has been cleared in the area of the previous Removal Action. Small and large trees surround the removal action area and make up the remaining area of the site. A dirt road extending from West Road leads to the removal action area. The topography within the site is relatively steep; it falls sharply towards the on-site drainage way located along the western and southeastern portions of the site. Site elevations range from 5 to 45 feet above msl. The remaining removal areas are to the north and west, down slope from the previous work.

1.2.4 Site 22 - Burn Pad

Site 22 is located south of Site 4 and west of Site 21 (Figures 1 and 4). In the past, a circular array of 11 steel burning pans was used for burning waste plastic explosives and spent solvents. The pans surrounded a 150-foot diameter circular area. The burn pad is not currently in use and the area is relatively clean. The site was used for a treatability study (TS) for the treatment of explosive contaminated soil. As part of the TS, OHM constructed a bio-cell which measured 153 feet long by 86 feet wide by 7 feet deep. The bio-cell's construction consisted of a six inch layer of sand as the base overlain by a three layered liner system. This liner system was made of a layer of 60 mil HDPE on bottom, a geo-net fabric as a middle layer, and a layer of 80 mil HDPE on top. The entire liner was secured by placing its edges in a trench dug around the entire perimeter of the bio-cell and filling the trench with concrete. A steel gantry which held the pumps and other equipment was mounted on rails that extended the length of the bio-cell. These rails were also anchored into the same concrete filled trench that anchored the liner. A dewatering area was constructed to the east of the bio-cell. Currently, the bio-cell remains at Site 22, but has been partially dismantled. The gantry and rails have been removed. The liner remains in place but its condition is unknown. The site is generally overgrown with grasses, and the bio-cell and dewatering area are filled with water. The berm of the dewatering area was not designed to be a long-term structure. Its condition is also unknown but is currently holding water in the dewatering area. An area to the west of the bio-cell is showing signs of severe erosion. The bio-cell, dewatering area, and the erosion area are shown on Figure 4. It should be noted that these locations have been approximated based on aerial photographs and accounts from site visitors.

2.0 RESOURCES AND PROJECT ORGANIZATION

This section details the equipment and materials that OHM anticipates using during work at all sites.

2.1 EQUIPMENT LIST

- 320 Excavator
- 936 Loader
- Ditch-witch (1 walk behind)
- Pressure washer
- 6 CY dump truck (5)
- 10 ton vibratory compactor – smooth drum
- D5 LGP bulldozer
- Generator – 15 kw

The equipment listed above will either be OHM-owned equipment from the Windsor, New Jersey, operations center or will be rented from local vendors. Not all equipment listed above will be present on site during the entire project. In the event that specific pieces of equipment are not available, OHM will use equivalents.

2.2 MATERIALS LIST

OHM anticipates utilizing the following materials on site:

- Silt fence – 5,000 lf
- 500 gal polypropylene tank for containing the decontamination fluids
- 5,450 cyd. of backfill
- 2,100 cyd. of topsoil
- 4 acres of hydroseed
- 600 hay bales
- 400 lb. of grass seed

2.3 MANPOWER REQUIREMENTS

OHM will mobilize operational personnel from OHM resource centers in Windsor, New Jersey, and Glenn Allen, Virginia, for the performance of all site activities. Project management, scheduling, and technical support will be based in Virginia Beach, Virginia.

2.4 PROJECT MANAGEMENT AND FIELD SUPERVISION

The OHM project management approach is to work closely with the client to accomplish all project objectives and ensure continuous client satisfaction with the project. Therefore, the project manager will have overall responsibility for project schedule, costs, and resources. A project superintendent will be assigned to the project with responsibility for accomplishing all field-work. The project superintendent will report directly to the project manager and supervise all day-to-day activities in the field.

The project manager and project superintendent will jointly develop project schedules and budgets throughout the project. Resource requirements will be addressed with the full support of the OHM Trenton resource manager prior to mobilization and on a regular basis during the course of work.

A project business associate will be assigned to the project to assist with daily cost tracking and equipment/materials procurement. The project business associate will work closely with the project manager and superintendent with regard to project costs and planning.

2.5 PERSONNEL – DUTIES AND RESPONSIBILITIES

2.5.1 OHM Responsibilities

OHM will accomplish the following:

- Perform the scope of work described in the Work Plan as required by Task Order No. 061
- Prepare monthly performance reports
- Prepare and submit a monthly status report to the Navy documenting percentage completion, unresolved delays (encountered on anticipated) that may affect scheduling and a description of efforts made to mitigate those delays, revisions to the construction schedule, listing of activities scheduled for the next month; and other information relating to progress of construction
- Initiate and maintain a thorough and proactive safety program during the entire project
- If a conflict, error, or discrepancy is found in contract documents, obtain a written interpretation or clarification from the Navy Technical Representative (NTR) before proceeding with the task(s) in question
- Notify the NTR representative in writing of any change to site conditions
- Implement the Contractor Quality Control Plan (CQCP) and establish a chain-of-command
- Assign a project superintendent for the life of the project (with prior written notice provided to the Navy before any necessary changes in OHM supervision are executed)
- Maintain at the site two record copies of all as-built drawings; and one copy of specifications, addenda, written amendments, change orders, work directive changes, field test records, field orders, and written interpretations and clarifications
- Manage all resources to meet the project schedule in a cost-effective manner
- Effectively communicate project-related information with the ROICC and RPM

2.5.2 Responsibilities of OHM's Project Management Team

The project manager will have day-to-day responsibility for all technical, schedule, and budget issues. The site superintendent, site safety officer, project business associate, and other support personnel (as needed) will support the project manager in the field. Due to the size of the project, OHM anticipates that the site superintendent will serve both as operations supervisor and quality control manager. Responsibilities and authority of the project manager and supporting field personnel are discussed in the following sections.

2.5.3 Project Manager

The project manager is the person in charge of the overall project and has full authority for project coordination and direction. The project manager will communicate directly with the NTR/RPM. Specific responsibilities assigned to the project manager will include:

- Interpret and plan overall work effort
- Review and approve all submittals
- Define resource needs and secure staff and equipment commitments
- Monitor subcontractor performance, schedules, budgets, and invoices
- Develop, review, and meet work schedule and budget objectives
- Ensure technical adequacy of field, laboratory, data management, and construction activities
- Attendance at meetings with the Navy, as required
- Document the need for required contract modifications

To carry out these functions, the project manager will have the authority to:

- Determine staff and subcontractor priorities
- Allocate additional personnel as needed
- Establish work budgets and schedules with milestones
- Approve subcontractor work and invoices
- Communicate with the superintendent regarding site activities and identify potential concerns
- Review and approve invoices

2.5.4 Project/Site Superintendent

The site superintendent is the OHM site contact and is responsible for the performance of all remediation activities in accordance with the Work Plan and other project plans and specifications. The site superintendent's responsibilities include:

- Implementing day-to-day aspects of the Health and Safety Plan (HASP) and Work Plan
- Coordinating engineering activities at the site, as directed by the project manager
- Managing day-to-day administrative and procurement activities at the site
- Monitoring work progress and schedule, and advise project manager of variances
- Compliance of all site work tasks with governing state and federal regulations pertinent to the work
- Assisting in preparation of work progress schedules, project reports, and as-built drawings
- Compiling the daily logs into a weekly report for submittal to the project manager
- Attending work progress meetings
- Timely reporting of any proposed significant project changes to the project manager to allow review and approval prior to incorporating the changed condition

2.5.5 Site QC Manager

The QC Manager, in his role as NWS Yorktown site QC representative, will be responsible for performing inspection activities. The QC Manager will be supported in the field by a sample technician and geotechnician, as needed. The QC Manager and technicians will monitor site activities on a periodic basis. Results of the inspections and testing will be documented in a report describing site operations performed each day. The site superintendent will take on the responsibility of the QC manager for this project and sample technicians will be provided as needed. The QC Manager will also be responsible for:

- Day-to-day coordination of technical activities
- Reviewing results of on-site verification testing and inspection reports
- Implementing appropriate plan provisions

- Serving as the collection point for remediation-related non-conformance
- Perform, or cause to be performed, daily inspections and tests necessary to achieve the quality of construction outlined in the plans and specifications for work performed on and off site
- Maintain the latest drawings and specifications with amendments and/or approved modifications at the site and ensure they are used for shop drawings, fabrication, construction, inspections, and testing
- Maintains as-built drawings at the site, available for review by the Navy at all times
- Hold and preside over biweekly quality review meetings to discuss work performed and review proposed work
- Maintain a contractor-generated submittal register, ENG Form 4288, for the duration of the contract. A review of the register will be performed at least every 14 days in conjunction with the scheduled dates on the register and in relation to actual work status
- Review all submittals for conformance with contract requirements prior to delivery to the Navy
- Establish and maintain an Rework Item List of work that does not conform to specifications. Track and monitor these items to assure that the rework inspection and testing activities and frequencies are in accordance with contract requirements
- Attend and assist the government at the pre-final inspection and the final acceptance inspection
- Confirm the quality and quantity of materials delivered to the site as referenced by project specifications and/or design drawings

2.5.6 Site Safety Officer

The site safety officer (SSO) is responsible for implementing the HASP which satisfied federal, state, and local regulations and is consistent with site conditions. The SSO may take actions independent of the project group to stop the project, if required, to address safety concerns.

The site superintendent is responsible for conformance of all site work with requirements and procedures identified in the HASP. The site safety officer will oversee the day-to-day implementation of the HASP as follows:

- Directing entrance and exit medical physical requirements, as required
- Approval of personnel protective equipment and safety procedures specified in the HASP
- Overseeing the maintenance and use of field monitoring equipment
- Designating appropriate personnel protection levels, including upgrades
- Providing guidance to the project staff to maintain compliance of all site work with federal and state regulations

The SSO will be on site during the site set-up and excavation/removal activities.

2.5.7 Project Business Associate

The responsibilities of the project business associate (PBA) will be:

- Accrue daily costs into VISION/Insite
- Assist the project manager with preparation of schedules, budgets, and invoices
- Use VISION to track costs and budget variances
- Provide weekly progress reports on budget and schedule status to the project manager
- Prepare daily report deliverables

- Audit weekly postings of charges to work budgets
- Assist site superintendent with procurement activities
- Finalize costs for invoices to the government
- Perform site administrative duties

2.5.8 Field Technicians

The responsibilities of the sample technician will be:

- Perform all sampling activities in accordance with Navy quality assurance procedures
- Conduct and record the results of all quality control inspections and testing
- Operate construction equipment
- Remediate the site in accordance with site superintendent's directives.

3.0 REMEDIATION ACTIVITIES

3.1 OVERVIEW OF PROPOSED APPROACH AND RATIONALE

OHM has developed an operational approach for the remedial action at Sites 4, 21, and 22 at NWS Yorktown that is protective of the OHM and Station personnel as well as the environment. This approach is based on firsthand experience with similar projects and consultation with in-house specialists.

A total of 2,100 cyd. of TNT/chlorinated solvent soils will be excavated from the three sites. The soil will be transported to a commercial subtitle C landfill. After excavation of the wastes, the excavations at each of the sites will be confirmed clean, and will then be restored. Restoration will include backfilling with clean on-base soil, placement of a layer of topsoil, and then establishing vegetation on the sites.

The existing biological treatment cell at Site 22 will be decontaminated and demolished. The concrete debris will be recycled and the liner will be disposed. The bio-cell will be removed prior to performing the removal action at Site 22.

3.2 PRE-MOBILIZATION ACTIVITIES

OHM has prepared the following documents for review and approval by the Navy:

- Operational Work Plan
- Quality Control Plan (Appendix A)
- Erosion and Sediment Control Plan (Appendix B)
- Site-Specific HASP (Appendix C)
- Site-Specific Accident Prevention Plan (Appendix D)
- Field Sampling and Quality Assurance Plan (Appendix E)

3.2.1 Utility Markout and Line Termination

To assist in the planning of the site activities, OHM will submit a request to the Public Works Center for a utility markout at Sites 4, 21, and 22 prior to mobilization.

3.2.2 Pre-Construction Meeting

Prior to mobilization, OHM will coordinate the scheduling of a pre-construction meeting with the ROICC (who will provide notification to attendees). OHM will use the meeting to present in detail the steps of removal activities and construction activities. Lines of communication between OHM, ROICC, RPM, and Station personnel will be confirmed during the meeting.

3.2.3 Station Permits

OHM will submit applications as required to the NWS Yorktown Public Works Department in conjunction with mobilization to the site. At a minimum, OHM anticipates that permits will be required for excavation of impacted soils and hot work. The hot work permit will be renewed at the beginning of each shift or as required by the NWS Yorktown Safety Department. The excavation permit will be obtained prior to the start of any excavation activities.

3.3 MOBILIZATION AND SITE PREPARATION

OHM will schedule a mobilization date upon receiving Work Plan approval and notice to proceed from the ROICC. OHM personnel, equipment, and materials will be mobilized from OHM operating centers located near Richmond, Virginia, and Trenton, New Jersey. Local vendors will provide some equipment and materials needed for the project.

OHM will comply with site security requirements upon mobilization and throughout the course of the project. OHM will submit pass application forms for clearances five working days prior to mobilization. Security badges will be obtained for all on-site OHM and subcontract employees upon arrival at NWS Yorktown. Each employee will register with the security department by providing their names, social security numbers, and photo identification. OHM personnel will be restricted from entering areas at NWS Yorktown not associated with the project.

OHM will mobilize all labor, equipment, and materials necessary to safely and efficiently remediate Sites 4, 21, and 22. Upon mobilization, OHM will initially establish a command center for administration and support personnel. The command center will be a one-time setup that will be used during the life of the project. The command center will be located in the same area occupied by OHM during previous activities. The hook ups for electrical and telephone services are already installed.

3.3.1 Project Support Area

OHM will establish the Project Support Area at Site 4 off West Road. This area will have a combined crew break/tool storage trailer and will serve all three sites. Utility installations will not be required. Electrical power will be supplied by a gasoline generator. Telephone and fax lines will be provided at the OHM Base Command Center. Potable water coolers will be provided in the crew trailer.

3.3.2 Contamination Reduction Zone

Contamination reduction zones will be established around each excavation area at each site. A decontamination trailer will be stationed adjacent to West Road (Site 4). Portable personnel decontamination facilities will be stationed at each excavation area. Truck decontamination facilities will be placed at Site 4. Visqueen sheeting will be placed on the ground under the haul trucks during loading to minimize additional site contamination.

3.3.3 Exclusion Zone

Exclusion zones will be set up around each excavation area at each site. The exclusion zones will also encompass each excavated material stockpile area. OHM will install a temporary, high-visibility barricade fence at the limits of each exclusion zone to restrict access to unauthorized personnel and to keep personnel and animals from falling into the excavations at night. The OHM supervisor and Health and Safety Officer will monitor and control exclusion area access. All activities within the exclusion area will conform to the OHM Health and Safety Plan. The high-visibility fence will be removed at the completion of hazardous material removal.

3.3.4 On-Site Traffic Patterns

Due to limited sight distances caused by uneven terrain, OHM will establish defined routes for material handing and movement around all three sites. Where necessary, OHM will employ spotters to

guide heavy equipment operators and vehicles transporting materials in tight work areas. A general traffic pattern for each site will be established for each site and will be communicated in advance to field personnel.

3.3.5 Off-Site Traffic Control

OHM will conform to Station requirements with respect to controlling unauthorized vehicle access into Sites 4, 21, and 22. In addition, OHM will coordinate any required roadway closures with ROICC and the appropriate department(s) at the Station. Haul routes through the Station will be approved in advance by the ROICC and NTR.

3.3.6 Water Source for Remedial Activities

A source of non-potable water will be required for pressure washing of the bio-cell. The water source is a spigot connection adjacent to the right hand side of the road into the bio-cell (Site 22). The water will be collected and transported off-site for disposal.

3.3.7 Stand-by Station Fire Protection

OHM will consult with the Navy to determine the requirements for placing the Station Fire Department on Stand-by status during site activities. In addition, OHM will implement on-site fire protection measures specified by the Navy.

3.3.8 Decontamination Pad

OHM will utilize personal portable decon pads at each site and a truck decon pad near Site 4. Plastic sheeting will be placed under the trucks to minimize contamination transport. Decon pads may be moved around each site if necessary.

3.3.9 Stockpile Area Construction

The stockpile areas for the staging of backfill material or waste will be constructed by initially regrading the area to promote positive drainage away from the pile. The stockpile area will then be covered with a double layer of 8-mil plastic and surrounded with a silt fence.

A LGP bulldozer will be utilized to grade the stockpile area. Laborers will use a ditch witch trencher to excavate the narrow trench where the silt fence will be placed. A sledge hammer will be used to install the wood fence posts. Once the silt fence has been installed, laborers will backfill the trench with excavated soils and hand tamp the soil to secure the base of the fence.

3.3.10 Waste Characterization Sampling

The intent of the remediation at the three sites is to be a direct load out of the waste from the excavations at Sites 4 and 21, to the haul trucks for the transportation and disposal of the waste soils. The wastes at Site 22 will be temporarily staged at the site and then loaded and transported to a disposal facility. To accomplish this, the proposed excavation areas at the three sites will be sampled prior to mobilizing to the field for the remediation. The areas will be sampled approximately one month prior to mobilizing. The samples will be collected and will be sent to an off-site laboratory for characterization

according to the FSAP. Once the wastes are characterized, the T & D service will be procured and scheduled per the proposed project schedule for the remediation of the sites.

3.4 SITE 4 REMEDIATION

The remediation activities for Site 4 will consist of removal of approximately 1000 cubic yards of soil and additional construction debris, confirmation sampling / analysis of the excavation, backfilling the excavation, and restoring the area with vegetation. OHM will provide a site surveyor to define the limits of excavation per the SOW. A UXO supervisor will be available if required during the clearing, grubbing and excavation operations.

3.4.1 Clearing and Grubbing

Clearing and grubbing will consist of felling trees, the removal of stumps, and removal of all vegetation within the area surrounded by silt fence. OHM will perform the clearing and grubbing necessary within 3 acres. Once cleared, OHM will install the silt fence around the perimeter of the proposed excavation areas prior to the intrusive grubbing operation to remove the low growth vegetation. The trees will be cut to reasonable lengths and stockpiled near the site for use on Base. The stumps and excess timber will be chipped using a tub grinder. The chips will be stored on site for future use.

3.4.2 Excavate Areas and Remove Construction Debris

The excavation limits at each site will be identified and staked based on the SOW. Per the SOW there are nine small areas to be excavated. A CAT 320 excavator will remove the soil to a depth of 2 feet within the excavation areas. Total estimated tonnage of soil and construction debris is 1800 tons. The excavated material will be loaded into vehicles and will be transported to an approved commercial subtitle C disposal facility. The waste will be characterized prior to beginning the excavation and the T & D will be procured to facilitate the excavation and direct load of the waste soil.

OHM will perform addition excavation of "hot" spots if indicated by the confirmation sampling and analysis.

3.4.3 Confirmation Sampling and Analysis

OHM will collect 24 samples for confirmation analysis from the nine excavation areas. The samples will be collected and analyzed per the FSAP. The samples must meet the concentrations for the parameters listed in Table 3-1 to achieve the clean up standards for this site.

If hot spots are indicated, the areas will be marked in the field, additional excavation will be performed, and the area will be sampled and analyzed again.

Table 3-1

Clean-Up Criteria for Sites 4, 21, and 22

Site 4		Site 21		Site 22	
Parameter	Concentration	Parameter	Concentration	Parameter	Concentration
	(mg/kg)		(mg/kg)		(mg/kg)
TNT	44	Aluminum	24,100	HMX	5.7
Total PAHs	44	Cadmium	4	Cadmium	4
Total cPAHs	10	Copper	100	Copper	100
Aluminum	24,100	Manganese	491	Lead	400
Antimony	11	Mercury	0.3	Mercury	0.3
Arsenic	63.9	Thallium	0.1	Silver	50
Chromium	33.5	Zinc	410	Zinc	410
Copper	100				
Lead	400				
Manganese	491				
Mercury	0.3				
Zinc	410				

3.4.4 Site Restoration

All excavated areas will be restored by backfilling the areas with common fill material to a level six inches below the design finished grade. OHM will coordinate with Station Environmental and Natural Resources to determine a suitable fill source on Station Property. The fill material will be placed within the excavation area in 12-inch lifts and will be passed over twice with a vibratory roller to achieve an acceptable degree of compaction. A 6-inch lift of topsoil will be placed over the common fill material. The final grade will be returned to the original grade prior to excavation with care taken to provide positive drainage for the site. Once the topsoil is placed, OHM will seed and fertilize the area to complete restoration.

OHM will perform physical and chemical laboratory testing on any off-site fill materials, as required by the SOW and identified in the FSAP. OHM will ensure that all imported materials are certified clean through laboratory analytical testing. All geotechnical and chemical testing results will be submitted to the Navy.

OHM will monitor the progress of site restoration and stabilization to determine the appropriate time for removal of erosion and sediment features. OHM may recommend leaving the erosion and sediment control features in place following demobilization.

3.5 SITE 21 REMEDIATION

The remediation activities for Site 21 will consist of removal of approximately 100 cubic yards (180 tons) of soil, confirmation sampling / analysis of the excavation, backfilling the excavation, and restoring the area with vegetation. OHM will provide a site surveyor to define the limits of excavation per the SOW. A UXO supervisor will be available if required during the clearing, grubbing and excavation operations.

3.5.1 Clearing and Grubbing

Clearing and grubbing will consist of felling trees, the removal of stumps, and removal of all vegetation within a 1 acre area surrounded by silt fence. OHM will perform the clearing and grubbing.

Once the area is cleared, OHM will install the silt fence around the perimeter of the proposed excavation areas prior to the intrusive grubbing operation to remove the low growth vegetation. The trees will be cut to reasonable lengths and stockpiled near the site for use on Base. The stumps and excess timber will be chipped using a tub grinder. The chips will be stored on site for future use.

3.5.2 Excavate Area

The excavation limits at each site will be identified and staked based on the SOW. Per the SOW there are three small areas to be excavated. A CAT 320 excavator will remove the soil to a depth of 2 feet within the excavation areas. Total estimated tonnage of soil is 180 tons (100 cyd.). The excavated material will be loaded into vehicles and will be transported to an approved commercial subtitle C disposal facility. The waste will be characterized prior to beginning the excavation and the T & D will be procured to facilitate the excavation and disposal of the waste soil.

The areas to be excavated are over the hill from a small meadow area. The terrain is rugged and there is not easy access to the excavation areas. OHM will excavate the soil and haul the waste with a front-end loader to a staging area in the level meadow area. The staging area will be lined with 8-mil polyethylene and the waste will be covered with the same plastic daily. The waste will be sampled and characterized and the T & D procured prior to beginning the waste excavation. Therefore the T & D will be established prior to excavating and the staging area will be short lived. OHM will perform additional excavation of "hot spots" as indicated by the confirmation sampling and analysis.

3.5.3 Confirmation Sampling and Analysis

OHM will collect 4 samples for confirmation analysis from the three excavation areas. The samples will be collected and analyzed per the FSAP. The samples must meet the concentrations for the parameters listed in Table 3-1 to achieve the clean up standards for this site. If "hot spots" are indicated, the areas will be marked in the field, additional excavation will be performed, and the area will be sampled and analyzed again.

3.5.4 Site Restoration

All excavations will be restored by backfilling the excavation area with common fill material. OHM will coordinate with Station Environmental and Natural Resources to determine a suitable fill source on Station Property. The fill material will be placed within the excavation area in 12-inch lifts and will be passed over twice with a vibratory roller to achieve an acceptable degree of compaction. A 6" lift of topsoil will be placed over the common fill material. The final grade will be returned to the original grade prior to excavation with care taken to provide positive drainage for the site. Once the topsoil is placed, OHM will seed and fertilize the area to complete restoration. Due to the slope of the terrain, OHM will place erosion matting over the disturbed areas to minimize potential erosion of the restored areas.

OHM will perform physical and chemical laboratory testing on any off-site fill materials, as required by the base. OHM will ensure that all imported materials are certified clean through laboratory analytical testing. All geotechnical and chemical testing results will be submitted to the Navy.

OHM will monitor the progress of site restoration and stabilization to determine the appropriate time for removal of erosion and sediment features. OHM may recommend leaving the erosion and sediment control features in place following demobilization.

3.6 SITE 22 REMEDIATION

The remediation activities for Site 22 will consist of removal of approximately 1000 cubic yards (1800 tons) of soil, demolition and removal of the concrete bio-cell, demolition and removal of additional concrete structures on site, confirmation sampling / analysis of the excavation, backfilling the excavation, and restoring the area with vegetation. OHM will provide a site surveyor to define the limits of excavation per the SOW. A UXO supervisor will be available if required during the clearing, grubbing and excavation. The demolition of the bio-cell is addressed in Section 3.6.5 of this Work Plan. The water in the bio-cell will be removed / pumped out onto the surrounding ground.

3.6.1 Clearing and Grubbing

Clearing and grubbing will consist of felling trees, the removal of stumps, and removal of all vegetation within the area surrounded by silt fence. OHM will perform the clearing and grubbing necessary within a 1 acre area. Once cleared, OHM will install the silt fence around the perimeter of the proposed excavation area prior to the intrusive grubbing operation to remove the low growth vegetation and the removal of the bio-cell. The few trees will be cut to reasonable lengths and stockpiled near the site for use on Base. The stumps and excess timber will be chipped using a tub grinder. The chips will be stored on site for future use.

3.6.2 Excavate Area

The excavation limits at each site will be identified and staked based on the SOW. Per the SOW, the areas to be excavated are two small areas east of the bio-cell and the soil beneath the bio-cell. A CAT 320 excavator will remove the soil to a depth of 2 feet within the excavation areas. Total estimated tonnage of soil and construction debris is 1800 tons (1000 cyd.). The excavated material will be loaded into vehicles and will be transported to an approved commercial subtitle C disposal facility. The waste will be characterized prior to beginning the excavation and the T & D will be procured to facilitate the excavation and disposal of the waste soil. The excavation activities will begin after the bio-cell has been demolished and removed from the work area.

3.6.3 Confirmation Sampling and Analysis

OHM will collect 16 samples for confirmation analysis from the three excavation areas. The samples will be collected and analyzed per the FSAP. The samples must meet the concentrations for the parameters listed in Table 3-1 to achieve the clean up standards for this site. IF "hot spots" are indicated, the areas will be marked in the field, additional excavation will be performed, and the area will be sampled and analyzed again.

3.6.4 Site Restoration

All sites will be restored by backfilling the excavation area with common fill material. OHM will coordinate with Station Environmental and Natural Resources to determine a suitable fill source on Station Property. The fill material will be placed within the excavation area in 12-inch lifts and will be passed over twice with a vibratory roller to achieve an acceptable degree of compaction. A 6" lift of topsoil will be placed over the common fill material. The final grade will be returned to the original grade prior to excavation with care taken to provide positive drainage for the site. Once the topsoil is placed, OHM will seed and fertilize the area to complete restoration.

OHM will perform physical and chemical laboratory testing on any off-site fill materials, as required by the base. OHM will ensure that all imported materials are certified clean through laboratory analytical testing. All geotechnical and chemical testing results will be submitted to the Navy.

OHM will monitor the progress of site restoration and stabilization to determine the appropriate time for removal of erosion and sediment features. OHM may recommend leaving the erosion and sediment control features in place following demobilization.

3.6.5 Bio-Cell Removal

The bio-cell at Site 22 will be cleaned, demolished, and removed. OHM will utilize pressure washers to clean the surface of the floor or walls of the cell. A hydraulic excavator with a jack-hammer attachment will be utilized to break up the concrete and separate the reinforcing steel.

Pressure washing will begin at the top of the southern wall and progress side-to-side down the face of the wall to the bottom. After the north wall is complete, work will progress along the east and west walls and, finally, the floor. Fluids within the cell and those generated during cleaning activities will be pumped to Site 4 for infiltration.

Upon approval from the Navy, OHM will begin to demolish the concrete portion of the bio-cell. A hydraulic excavator with a jack-hammer attachment will break the concrete into manageable pieces and a rubber tired loader will load the material into awaiting dump trucks for transportation for reuse as road base at Site 6 on the base. The reinforcing steel will be separated from the concrete and will be sent to a recycling facility.

The geomembrane liner will be cut in manageable pieces and placed in a roll-off container for off-site disposal.

3.6.6 Bio-Cell Water Removal

The water in the bio-cell will be pumped to Site 4 located to the northeast of the site for infiltration. The infiltration area will be reinforced with hay bales and erosion matting to adsorb the energy of the pumped water, distribute flow and minimize erosion.

3.7 BORROW AREA OPERATION

OHM will coordinate with Base personnel to determine an acceptable area for the borrow area. Borrow area operation will consist of installation of silt fence around the perimeter, clearing and grubbing of the area, stripping and stockpiling of topsoil, excavation of fill material, and restoration.

3.7.1 Erosion and Sediment Control

OHM will install silt fence around the perimeter of the proposed borrow area prior to any earth disturbing activities. A ditch-witch will be utilized to excavate a narrow trench that will be used to secure the bottom of the fence fabric. Laborers will be used to secure the bottom of the fence fabric. Laborers will use a sledgehammer to install wooden fence posts to secure the silt fence. Laborers will backfill the trench with trench spoils and the material will be compacted with hand tampers.

3.7.2 Clearing and Grubbing

Clearing and grubbing will consist of felling trees, the removal of stumps, and removal of all vegetation within the area surrounded by silt fence. OHM will perform the clearing and grubbing work necessary for obtaining the common fill borrow material.

3.7.3 Topsoil Stripping

Any existing topsoil within the limits of the borrow area will be stripped and stockpiled. OHM will utilize an LGP dozer to strip the topsoil. Once the soil is stripped and stockpiled, it will be temporarily seeded.

3.7.4 Fill Excavation

A LGP dozer and excavator will work together to remove the common fill and grade the borrow area. As excavation progresses, the borrow area will be graded so that all runoff water passes through the silt fence. The excavator will direct load soils into awaiting dump trucks.

3.7.5 Borrow Area Restoration

Restoration of the borrow area will consist of spreading the stockpiled topsoil over the entire area, and seeding and mulching the site. OHM will subcontract the seeding and mulching. A LGP dozer will be utilized to place and compact the topsoil. No additional compaction will be performed.

3.8 EQUIPMENT AND PERSONNEL DECONTAMINATION

OHM will decontaminate equipment and personnel in accordance with our standard decontamination procedures as described in Section 6.0 of the HASP (Appendix C) prior to leaving each site.

3.9 PROJECT SCHEDULE

The proposed project schedule is presented as Figure 5. The project will begin once the ROD is accepted by all parties. The project has an assumed start date of September 17, 2001. This may vary due to the approval of the ROD.

4.0 CLOSEOUT REPORT PREPARATION AND REVIEW

Upon completion of all field activities, OHM will prepare a closeout report documenting site activities and reporting all data. This report will include all daily notes from field activities, a description of each project task, any problems encountered along with corrective measures, project photographs, as-build drawings, and all pertinent analytical data. OHM will submit a draft closeout report to the Navy for review and comment. Upon receiving review comments, OHM will incorporate all comments and will submit the report as the final version.

5.0 ENVIRONMENTAL PROTECTION PLAN

5.1 PURPOSE

This plan presents environmental protection measures to be employed during site activities for Task Order 061. OHM will implement procedures and supply materials necessary for environmental protection for activities associated with excavation and backfill at Sites 4 and 21, and excavation, backfill, and decontamination of Site 22. Principle concerns include small spills and erosion and sediment control. Additional information may be found in the health and safety plan.

5.2 EMERGENCY AND DECONTAMINATION EQUIPMENT

5.2.1 Small-Scale Emergency Equipment

Small scale emergency equipment will include dry chemical, ABC-rated fire extinguishers; spill control equipment; absorbent materials; decontamination equipment; breathing respirators; radio and telephone equipment; and various hand tools. This equipment will be made accessible to all on-site workers.

5.2.2 Large-Scale Emergency Equipment

Large-scale emergency equipment will consist of an excavator, if equipment of such size and power is necessary. Other emergency equipment will be made available from the local fire department.

5.2.3 Decontamination Equipment

Equipment necessary for decontamination activities will be provided, installed, and verified in working order prior to any site operations. Equipment for the decontamination area includes the following items:

- Clean water supply
- Detergent solution
- Brushes
- Waste containers
- Decontamination pad with rinseate collection
- Pressure washer

5.3 PREVENTATIVE ACTIONS

5.3.1 Equipment Maintenance

Construction equipment will be properly maintained to ensure safe operation. The excavator will be regularly inspected and maintained (and documented in the inspection/maintenance log) in such manner as to minimize spillage or leakage which may occur during on-site transportation operations.

5.3.2 Housekeeping Program

OHM's housekeeping program includes many items such as neat and orderly storage of materials, proper truck and tank placards, prompt removal of spillage, refuse pickup and disposal, maintenance of roads and surfaces, and provisions for the storage of material. A daily departure inspection will be performed by the site supervisor.

Small spills may include solid or liquid materials being mishandled, dumped, leaked, knocked over, etc. Any material spillage will be immediately contained and collected for subsequent disposal. Excavation will be performed such that exposed source materials remain within the limits of excavation. Any spilled liquids will be contained and collected by absorbent materials. Spilled fuel and impacted soil will be collected and staged for later disposal.

5.4 PROTECTION OF NATURAL RESOURCES

OHM will preserve the natural resources within the project boundaries and outside the limits of disturbance, except as is necessary to implement required work. The work site will be restored to pre-existing or improved condition upon project completion. OHM will prepare an Environmental Conditions Report of the project site with the ROICC and take photographs showing existing environmental conditions in and adjacent to the site. OHM will also conform to Station requirements with respect to the protection of natural resources.

OHM will remove obvious traces of construction, such as stockpiles of excess waste material and barricades.

5.5 PETROLEUM WASTES

OHM will implement all reasonable precautions to prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Equipment an storage vessels containing oils an fuels will be visually inspected prior to site entry and daily thereafter for leakage, drips, or other preventable releases. Any equipment or vessel damage will be immediately repaired or removed from the site. Releases of oily wastes will be remediated upon observation and impacted materials disposed of appropriately. OHM will immediately notify the NTR of any oil spills.

The site will be equipped with a spill kit, sufficient to contain and clean up on-site quantities of petroleum products. In the event of a spill, OHM will notify the ROICC.

5.6 WASTE HANDLING

Contaminated materials will be removed and staged on site pending loading, transport, and disposal. The T and D activities will be performed in accordance with local, state, and federal regulations as well as Station requirements. T and D service will be procured prior to mobilizing to the site. The services will be scheduled based on the schedule of the site activities.

5.7 SEDIMENT AND EROSION CONTROL

OHM will limit the extent of operations to the areas required for excavation. All reasonable attempts will be made to minimize the disturbed area in order to prevent potential damage to the service

area. Straw bales will be placed around existing storm drains and inlets. However, if additional erosion protection is needed, silt fencing or other devices will be used.

All disturbed areas will be regraded, seeded, fertilized, and mulched to promote a permanent vegetative cover. Prior to seeding, four inches of clean topsoil will be placed and graded over the disturbed area. Seed and fertilizer will be selected and spread in accordance with the Erosion and Sediment Control Plan (Appendix B).

6.0 EROSION AND SEDIMENT CONTROL PLAN

This plan describes the erosion and sediment control measures that will be installed at Sites 4,21,22 and the on-base borrow area to limit the migration of soil and sediment from distributed areas. Additional measures are provided for stabilization and restoration of the site following fill placement and site grading. All erosion and sediment control devices and procedures will be in accordance with the "Virginia Erosion and Sediment Control Handbook," Third Edition, 1992, as prepared by the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (Tel: 804-786-2064). Applicable sections from the Virginia Erosion and Sediment Control handbook (VESCH) are provided in Appendix B.

Earth-disturbing activities are as follows:

stump removal

- Grubbing of vegetation
- Removing existing topsoil
- Excavation of contaminated soils
- Fill placement and site grading
- Topsoil placement.

Proposed erosion and sediment control measures are as follows:

- Silt fence
- Temporary stone construction entrances
- Temporary diversion dike
- Dust control
- Topsoil placement
- Permanent seeding and mulching.

6.1 SILT FENCE

Silt fence will be installed at Sites 4, 21, 22 and the on-base Borrow Area to minimize off-site migration of sediment. Installation of the silt fence will be conducted as shown in VESCH Standard and Specification 3.05 (Appendix B). At a minimum, silt fence will be installed as part of the site preparation work and will be in place locally prior to any ground disturbance. The silt fence will be inspected during each workday and after every significant precipitation event. OHM will complete any needed repairs promptly following detection.

The silt fence will be removed upon establishment of adequate vegetative cover and with the prior authorization of the NTR.

6.2 TEMPORARY STONE CONSTRUCTION ENTRANCE

A temporary stone construction entrance, consisting of filter fabric overlain by VDOT #1 coarse aggregate (2- to 3-inch diameter), will be installed at all Sites to control migration of sediment onto adjacent roadways. The entrances may be omitted if, in the opinion of the ROICC, significant tracking of sediment onto adjacent roads will not result from site activities. If required, each entrance will have minimum dimensions of 70 feet long by 12 feet wide, and will have a minimum thickness of 6 inches with three of the six inches embedded below surrounding grade. The entrance will be installed as

described in VESCH Standard and Specification 3.02 (Appendix B). The construction entrance will be removed upon completion of all earthmoving and prior to site restoration.

6.3 TEMPORARY DIVERSION DIKES

Temporary diversion dikes, consisting of compacted soil, will be used as necessary to divert storm water runoff away from open excavation during removal activities. The diversion dikes will be installed using clean fill as described in VESCH Standard and Specifications 3.09 (Appendix B). The diversion dikes will be removed after excavations are backfilled with clean fill material.

6.4 DUST CONTROL

Dust control will be performed as necessary in all disturbed areas using a small centrifugal pump, polyethylene water tank, and water authorized for use by the ROICC. Dust control will be performed in accordance with the guidance provided in VESCH Standard and Specification 3.39 (Appendix B) and as directed by the Navy.

6.5 TOPSOIL

After placing, grading, and compacting fill to within 6 inches of finished grade, OHM will place a minimum of 4 inches of suitable imported topsoil over all disturbed areas. The topsoil will conform to requirements for organic content, pH, and soluble salts provided in VESCH Standard and Specification 3.30 (Appendix B). Final approval of the topsoil will be provided by the Navy.

6.6 PERMANENT SEEDING AND MULCHING

An approved seed mixture will be applied to all disturbed areas. Seeding will be accomplished with either a hand-held broadcast seeder or by a hydroseeding subcontractor. The seed will be covered with a mulch or erosion matting unless the seed is applied by hydroseeding. The permanent seed mixture will consist of tall fescue at a rate of approximately 200 pounds per acre and Kentucky bluegrass at a rate of 0 to 10 pounds per acre. Seed and mulch application will be performed in conformance with VESCH Standard and Specifications 3.32 (Appendix B) or as directed by the Navy.

FIGURES

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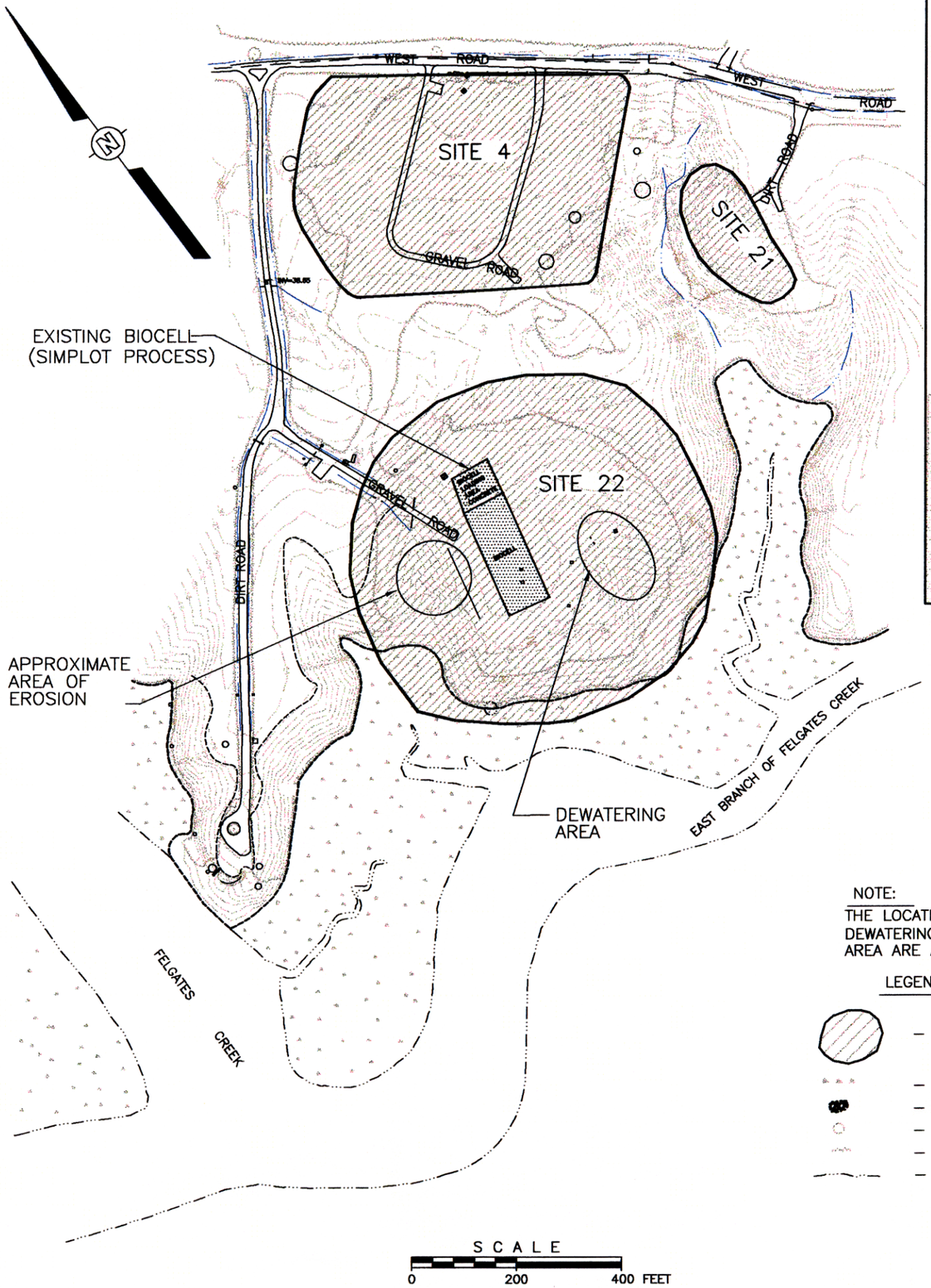
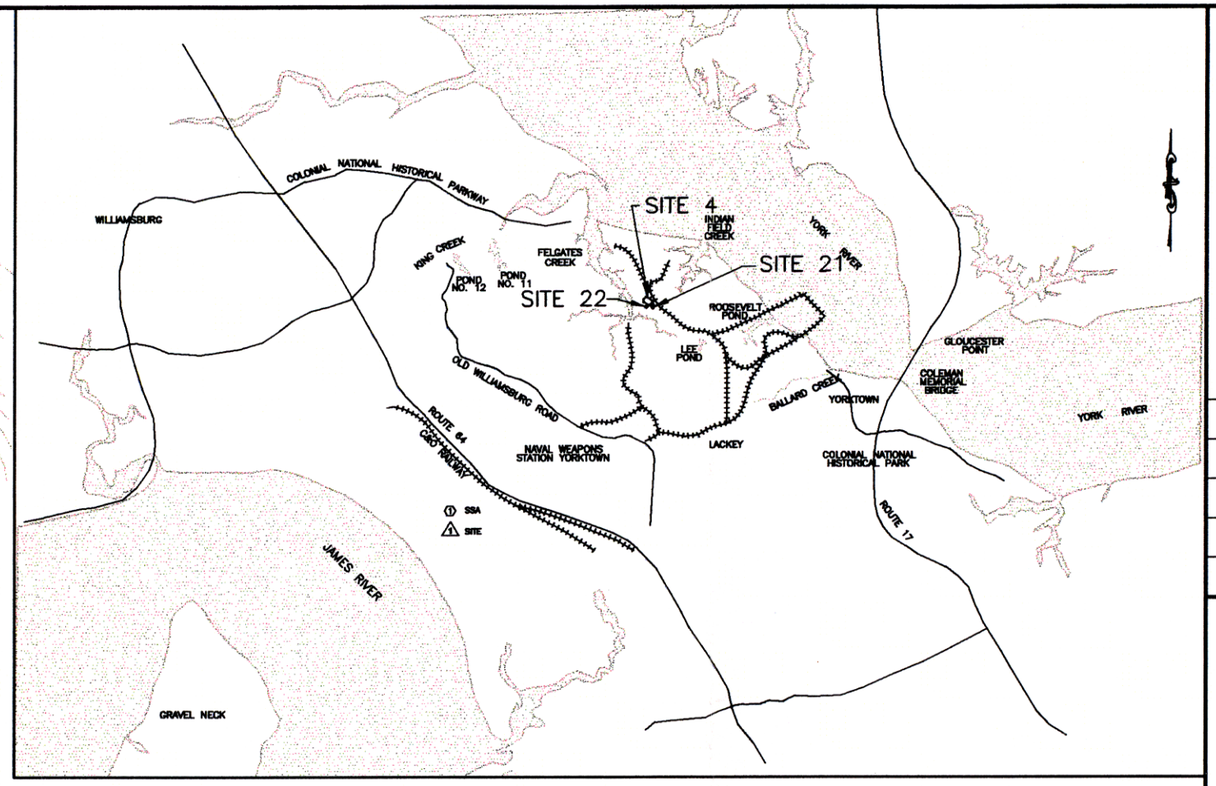
DRAWING NUMBER: 809275-B1



NOTE:
THE LOCATIONS OF THE BIOCELL, DEWATERING AREA, AND EROSION AREA ARE APPROXIMATE.

LEGEND:

- REMEDIAL INVESTIGATION SITE
- MARSH
- RIPRAP
- DEBRIS AREA
- TREE LINE
- INTERMITTANT DRAINAGE



VICINITY MAP
NTS

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

REVISIONS

OHM Remediation Services Corp.
PROJECT NO. 809275

DESIGNED BY	J.COLELLA	1/25/0
DRAWN BY	CULLIGAN	1/25/0
CHECKED BY		
APPROVED BY		

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA
REMEDIATION OF SITES 4, 21, AND 22

SITE LOCATION MAP SITES 4, 21, AND 22

SCALE: AS SHOWN
SIZE: B
DELIVERY ORDER NO. 0061
CONSTR. CONTRACT NO. N62470-97-D-5000
NAVFAC DRAWING NO. ?
SHEET I.D. FIGURE 1

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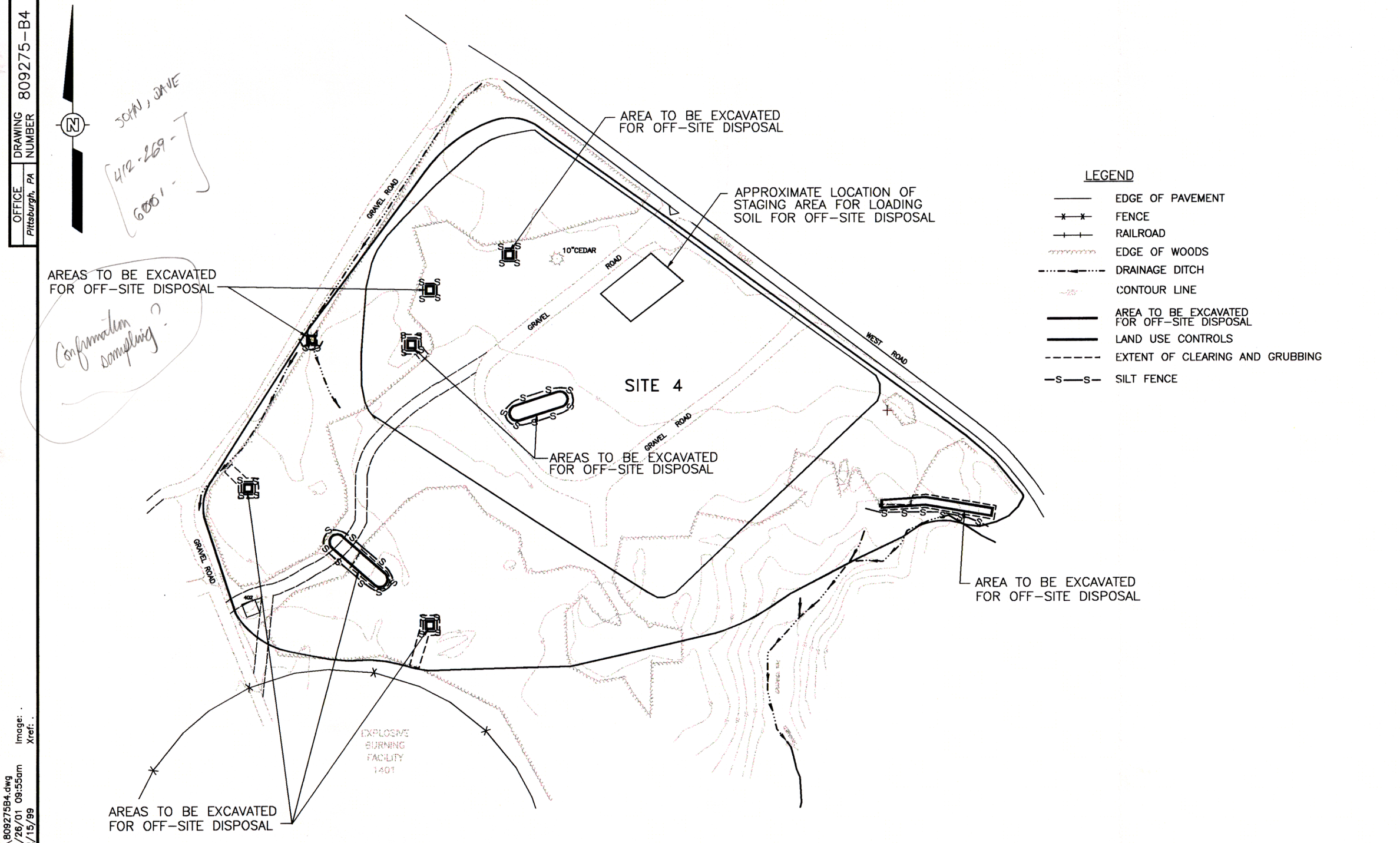

SOURCE: MILLER-STEPHENSON & ASSOCIATES, MAY 1996.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

REVISIONS

OHM Remediation Services Corp.

PROJECT NO. 809275

DESIGNED BY	J.COLELLA	1/25/01	CHECKED BY	
DRAWN BY	CULLIGAN	1/25/01	APPROVED BY	

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

REMEDIATION OF SITES 4, 21, AND 22

SITE 4 EXCAVATION AREAS

SCALE: AS SHOWN	SIZE: B
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CONSTR. CONTRACT NO. N62470-97-D-5000	
NAVFAC DRAWING NO. ?	
SHEET I.D. FIGURE 2	

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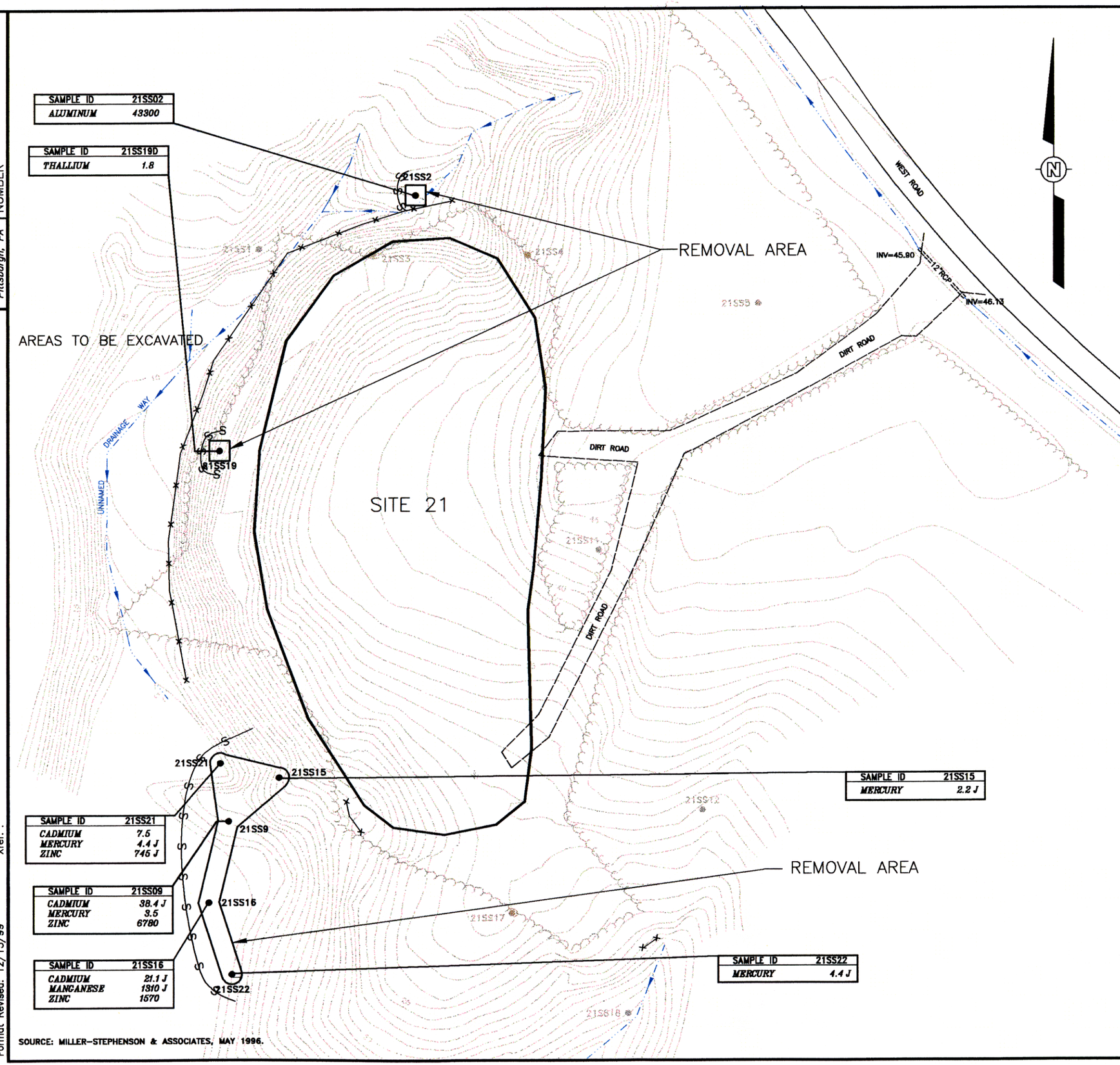

SOURCE: MILLER-STEPHENSON & ASSOCIATES, MAY 1996.

50 0 25 50
1 inch = 50 ft.

LEGEND

- EDGE OF PAVEMENT
- FENCE
- EDGE OF WOODS
- DRAINAGE DITCH
- 21SS21 — SAMPLE LOCATION WHERE CONTAMINANT CONCENTRATION EXCEEDS FINAL REMEDIATION GOAL
- 21SS12 — SAMPLE LOCATION WHERE NO CONTAMINANT CONCENTRATION EXCEEDS FINAL REMEDIATION GOAL
- CONTOUR LINE
- SILT FENCE

BASIS OF SELECTION:	
ALUMINUM	ECOC
CADMIUM	ECOC
COPPER	ECOC
MANGANESE	ECOC
MERCURY	ECOC
THALLIUM	ECOC
ZINC	ECOC

FINAL REMEDIATION GOALS (mg/kg)	
ALUMINUM	24100
CADMIUM	4
COPPER	100
MANGANESE	491
MERCURY	0.3
THALLIUM	0.1
ZINC	410

J = ESTIMATED VALUE

mg/kg = MILLIGRAMS PER KILOGRAM

NOTES:

(1.) ALL SAMPLES COLLECTED FROM 0-0.5 FEET.

(2.) ALL CONCENTRATIONS IN mg/kg.

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REVISIONS

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OHM Remediation Services Corp.
PROJECT NO. 809275

DESIGNED BY J.COLELLA 1/25/01 CHECKED BY
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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

REMEDIATION OF SITES 4, 21, AND 22

SITE 21 EXCAVATION AREAS

SCALE: AS SHOWN
SIZE: B
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CONSTR. CONTRACT NO. N62470-97-D-5000
NAVFAC DRAWING NO. ?
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FIGURE 3

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GRAVEL ROAD

SITE 4

SITE 21

ST INV=38.65

SITE 22

AREAS TO BE EXCAVATED

CONCRETE TO BE REMOVED

INORGANIC AREA OF CONCERN

HMX AREA OF CONCERN

ST GRAVEL ROAD

BIOCELL TO BE REMOVED

DEWATERING AREA

INORGANIC AREA OF CONCERN

DIRT ROAD

APPROXIMATE AREA OF EROSION

AREAS TO BE EXCAVATED AND SAMPLED FOR RCRA CLOSURE

EAST BRANCH OF FELGATES CREEK

SOURCE: MILLER-STEPHENSON & ASSOCIATES, MAY 1996.

100 0 50 100
1 inch = 100 ft.

LEGEND:

- DRAINAGE
- MARSH
- TREE LINE
- EDGE OF PAVEMENT
- STRUCTURE
- REMEDIAL INVESTIGATION SITE
- FRENCH DRAIN
- RCRA CLOSURE AREA
- HMX AREA OF CONCERN
- INORGANIC AREA OF CONCERN
- CONTOUR LINE WITH ELEVATION, MSL
- GRATE
- RIPRAP
- DEBRIS AREA
- RAILROAD
- FENCE
- SILT FENCE

NOTE:
ONE SAMPLE WILL BE COLLECTED FOR EVERY 2500 SQUARE FEET AND ANALYZED FOR TOTAL METALS AND EXPLOSIVES

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

REVISIONS

OHM Remediation Services Corp.

PROJECT NO. 809275

DESIGNED BY J.COLELLA 1/25/01 | CHECKED BY
DRAWN BY CULLIGAN 1/25/01 | APPROVED BY

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION YORKTOWN, VIRGINIA
NAVAL WEAPONS STATION YORKTOWN

REMEDIATION OF SITES 4, 21, AND 22

SITE 22 DEMOLITION AND EXCAVATION AREA

SCALE: AS SHOWN | SIZE: B

DELIVERY ORDER NO. 0061

CONSTR. CONTRACT NO. N62470-97-D-5000

NAVFAC DRAWING NO. ?

SHEET I.D.
FIGURE 4

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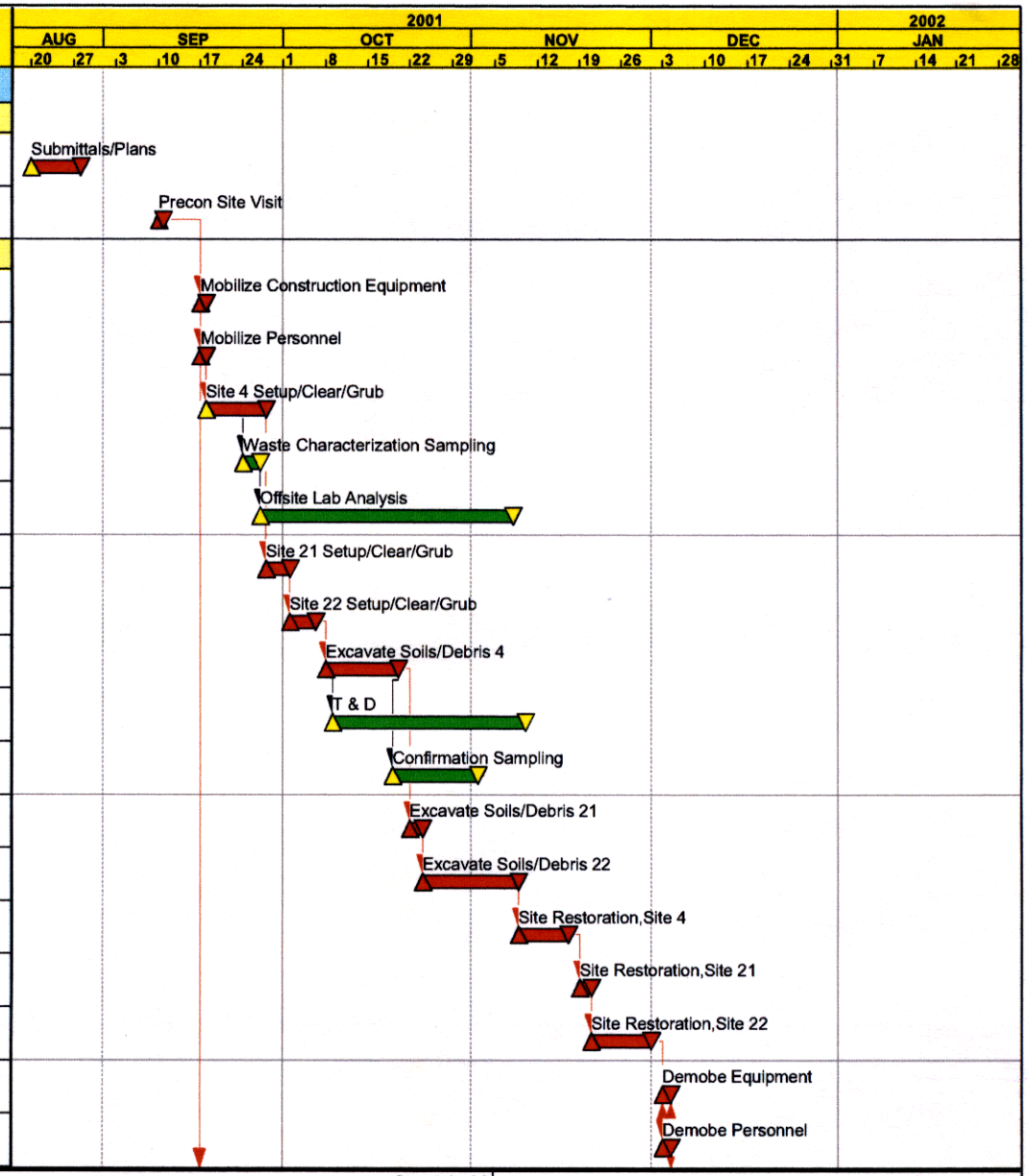
Xref: .

Activity ID	Activity Description	Early Start	Early Finish	Orig Dur
Activities in 2001				
Preliminary Activities - 2001				
01003000	Submittals/Plans	20AUG01*	27AUG01	6
01001010	Precon Site Visit	10SEP01*	10SEP01	1
Field Activities - 2001				
01001000	Mobilize Construction Equipment	17SEP01	17SEP01	1
01002000	Mobilize Personnel	17SEP01	17SEP01	1
01004004	Site 4 Setup/Clear/Grub	18SEP01	27SEP01	8
02006010	Waste Characterization Sampling	24SEP01	26SEP01	3
02014000	Offsite Lab Analysis	27SEP01	07NOV01	30
01004021	Site 21 Setup/Clear/Grub	28SEP01	01OCT01	2
01004022	Site 22 Setup/Clear/Grub	02OCT01	05OCT01	4
03003004	Excavate Soils/Debris 4	08OCT01	19OCT01	10
19020000	T & D	09OCT01	09NOV01	24
02006020	Confirmation Sampling	19OCT01	01NOV01	10
03003021	Excavate Soils/Debris 21	22OCT01	23OCT01	2
03003022	Excavate Soils/Debris 22	24OCT01	08NOV01	12
20004004	Site Restoration,Site 4	09NOV01	16NOV01	6
20004021	Site Restoration,Site 21	19NOV01	20NOV01	2
20004022	Site Restoration,Site 22	21NOV01	30NOV01	8
21004000	Demobe Equipment	03DEC01	03DEC01	1
21005000	Demobe Personnel	03DEC01	03DEC01	1



Start Date	01SEP00
Finish Date	14JAN02
Data Date	15AUG01
Run Date	15AUG01 14:10

061X

Figure 5
Task Order 61, Project 809275
Sites 4, 21, & 22
NWS Yorktown, VA
As of 08/15/01

Sheet 1 of 2

OHM Remediation Services Corp.

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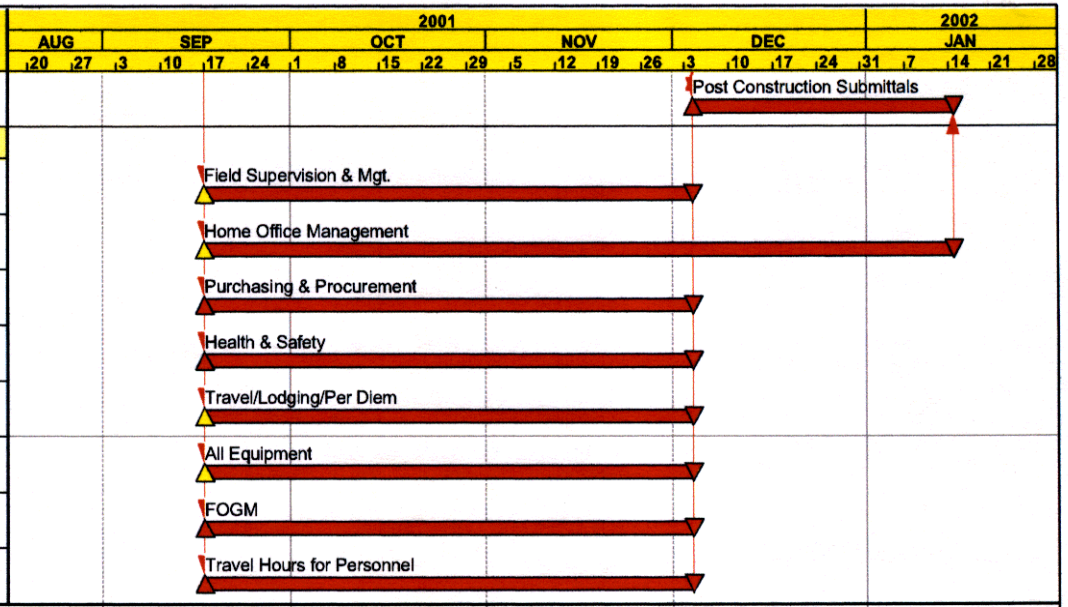
Activity ID	Activity Description	Early Start	Early Finish	Orig Dur
21006000	Post Construction Submittals	04DEC01	14JAN02	30
Project Support - 2001				
99001000	Field Supervision & Mgt.	17SEP01	03DEC01	56*
99003000	Home Office Management	17SEP01	14JAN02	86*
99005000	Purchasing & Procurement	17SEP01	03DEC01	56*
99015000	Health & Safety	17SEP01	03DEC01	56*
99016000	Travel/Lodging/Per Diem	17SEP01	03DEC01	56*
99092000	All Equipment	17SEP01	03DEC01	56*
99092001	FOGM	17SEP01	03DEC01	56*
99093000	Travel Hours for Personnel	17SEP01	03DEC01	56*



Start Date	01SEP00
Finish Date	14JAN02
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061X

Figure 5
Task Order 61, Project 809275
Sites 4, 21, & 22
NWS Yorktown, VA
As of 08/15/01

OHM Remediation Services Corp.

APPENDIX A
QUALITY CONTROL PLAN

QUALITY CONTROL PLAN
FOR
SITES 4, 21, AND 22 REMEDIATION
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Task Order No. 061

Prepared by:

IT/OHM Remediation Services Corp.
Trenton, New Jersey

William L. Hughes, R.G.

Charles W. Hunter
Program QC Manager

Roland Moreau, P.E.
Program Manager

OHM Remediation Services Corp.
A Subsidiary of The IT Group

January 2001
Revised August 2001
IT/OHM Project No. 809275QC

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V-1 SUBMITTAL REGISTER
V-2 LIST OF PERSONNEL AUTHORIZED TO REVIEW AND CERTIFY SUBMITTALS
VI-1 TEST PLAN AND LOG
VII-1 QUALITY CONTROL INSPECTION PLAN
VIII-1 PERSONNEL MATRIX

STATEMENT OF QC PROGRAM

OHM Remediation Services Corporation (IT/OHM), a subsidiary of IT Corporation, 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. N62470-97-D-5000, Atlantic Division, Naval Facilities Engineering Command and to the Task Order (TO) specification(s) made applicable to each project, task or work activity. IT/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 personnel that can build quality into the product are the individuals performing the task of producing the end product.

It should be noted by all employees that the documentation requirements of IT/IT/OHM procedures, plans, and the task 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 planning 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.

I. QUALITY CONTROL ORGANIZATION

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

II. IDENTIFICATION OF PERSONNEL ASSIGNED TO THE QC ORGANIZATION

Figure II-I 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.

III. 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.

IV. OUTSIDE ORGANIZATIONS

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

V. INITIAL SUBMITTAL REGISTER & REVIEWER

V.1 Submittal Register

A sample Submittal Register is provided as Exhibit V-1. Submittal Registers will be prepared as necessary based on project size and complexity, or as required by individual TO.

V.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.

VI. TESTING LABORATORY ACCREDITATION

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

VII. TESTING PLAN & LOG PREPARATION

A Testing Plan and Log, Exhibit VI-1, will be prepared for this TO and shall be maintained current.

VIII. QUALITY CONTROL INSPECTION PLAN

The Quality Control Inspection Plan, Exhibit VII-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 that is separate and district from other tasks and requires separate control procedures.

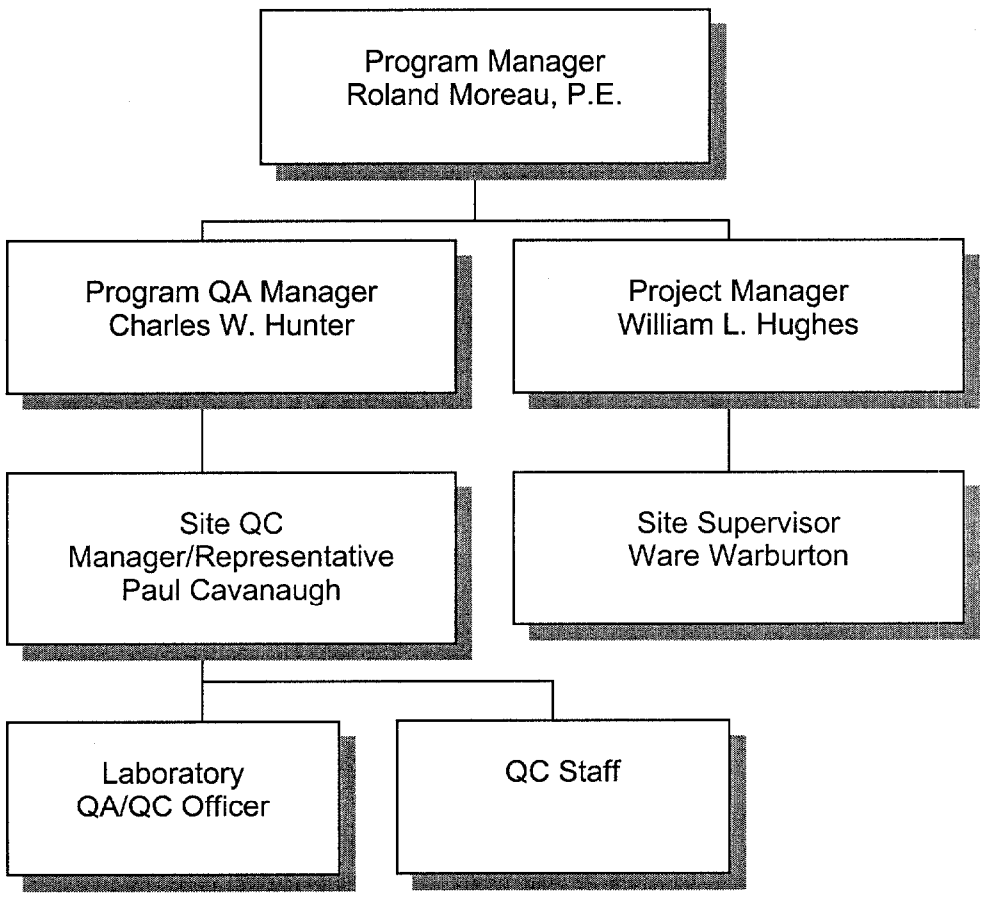
This list has been prepared and maintained in accordance with the contract specification Section C, Part 6.7 and will be agreed upon during the Coordination and Mutual Understanding Meeting. The list will be keyed to the construction schedule. Each preparatory, initial and follow-up phase checklist/report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

IX. PERSONNEL MATRIX

The Site QC Manager/Representative will prepare and maintain the personnel matrix, Exhibit VIII- I, showing each section of the TO 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 I-1

IT/OHM Remediation Services Corporation
Task Order No. 061
QC Organizational Chart



Paul M. Cavanaugh
Professional Qualifications

Mr. Cavanaugh has twelve years of experience which include a wide range of environmental disciplines. During this time he has worked a number of environmental contracts with a variety of regulatory organizations including ERCS, LANTDIV, ACOE, USAF, FEMA, VADEQ, PADER, NJDEP. Recent experiences include QA/QC management, technical supervision and engineering. Previous field experiences as a senior technologist and field chemist have exposed him to a wide variety of field technical services applications. As a senior technologist/ field chemist his experiences included all types of environmental sampling and analysis, performing compatibility analysis, chemical bulking and nuetralization, biolological treatment, reactive and explosive handling, biological sampling and taxonomy, nuclear density testing, lab packing, air monitoring, all aspects of T&D including profiling/manifesting and waste tracking, immunoassay field testing, soil classification, monitoring well installation, soil stabilization, thermal treatment, groundwater treatment. Recent experiences in QA/QC management and supervisory roles have exposed him to contract compliance, subcontractor coordination, cost tracking, daily contractor quaility control reporting and scheduling/monitoring QA/QC testing activities.

Education

B.S., Biology, Northland College; 1988
Additional Training
OSHA 40-hour Training (29 CFR 1910.120)
OSHA 8-hour Refresher Training Certification; 2001
8-hour Supervisory Safety Management Training; 1995
Fifty (50) Hour Sampling Course; 1989
EOD Training; 1995
NRC Training Course; 1996
USACE, Construction Quality Management Course for Contractors; 1997

Registrations/Certifications

Troxler Certified, 1996

Experience and Background

1989 - Present
Engineer/Scientist, IT Corporation, Glenn Allen, Virginia

Project work includes:

QA/QC Manager, LANTDIV RAC, Camp Gieger, NC. Project involved thermal destruction of 35,000 ton of PCA contaminated soil at a DRMO site cleanup. Responsible for all the technical aspects of the project as well as enforcing contract QA/QC program. Provided oversight of thermal unit subcontractor ensuring all regulatory complience issues were adhered to inculing all required calibrations and emmisions standards. Reviewed all data from on site mobile laboratory determining clean excavation limitations, thermal destruction effectiveness and internal laboratory QA/QC protocols. Maintained daily progress reporting and site surveys. Worked closely with accounting personnel tracking and verifying subcontractor billing process. Profiled ,manifested and arranged T&D for all project offsite wastes.

QA/QC Manager, LANTDIV RAC, New River Air Station, NC. Provided oversite and inspection of subcontractor operations during installation of V-22 mock osprey fire training facility. Inspected all mateials and workmanship insuring state and federal regulatory compliance. Worked closely with subcontractor during numerous testing phases prior to system start up through BOD.

QA/QC Manager, Pneumo Abex Superfund Site, Portsmouth, VA. Lead abatement project where in excess 100,000 tons of soil was disposed of using a lead stabilization process. Managed all project technical aspects, contract compliance issues and analytical interperetation. Provided oversight to operations and technical personnel involved with stabilization process, T&D and sampling and analysis. Performed scheduling and oversight of subcontractors and monitored all field QA/QC testing. Generated all cost tracking associated with technical aspects of project and maintained project progress reports.

QA/QC Manager, LANTDIV RAC, Patuxent Naval Air Station, Patuxent River, MD. Pesticide removal involving facility decontamination/demolition and soil excavation. Resposibilities included contract compliance, daily and weekly QA/QC report generation and implementation of three-phase inspection process. Provided analytical interperetation and on site delineation using immunoassay field test kits. Scheduled and maintained all T&D activities.

QA/QC Manager, LANTDIV RAC, Yorktown Naval Weapons Station, Yorktown, VA. Project technical and QA/QC oversight for TNT/asbestos remediation and biotreatment project. Project activities involved facility decontamination/demolition, asbestos/TNT abatement, soil excavation and an innovative TNT/RDX anaerobic biotreatment process. Worked closely with project manager and client simultaneously running three different projects. Lead weekly QA/QC meetings monitoring progress and three-phase inspection process.

Site Supervisor/QA/QC Manager, LANTDIV RAC, Quantico Marine Base, Quantico, VA. Supervised operations personnel for biotreatment of 2000 yds hydrocarbon contaminated soil. Responsibilities included all QA/QC and technical functions. Assisted the Senior Project Manager with the collection and interpretation of field data to verify levels of contamination and ensured adequate performance of the bioremediation cell. The project received two 100% award fees.

QC Coordinator at the Drake Chemical USEPA Region III Superfund site, Lock Haven, Pennsylvania. Mr. Cavanaugh assisted during the startup operations of the incinerator. His duties included generating USACE daily reports associated with plant operations during the trial burn phase, and ensured all phases of contract compliance relating to engineering and technical controls. He was responsible for analytical interpretation and T&D of all wastes generated on site.

Staff Scientist, under LANTDIV RAC, at the Camp Allen Landfill, Norfolk, Virginia. This 45-acre site contained soil and groundwater contaminated with a variety of chlorinated and petroleum organic compounds. Provided valuable backup services to other crew members with continuous monitoring of ambient air quality utilizing PID, LEL, OVA, CGI, monitox, dosimeter, and personal and stationary air monitors. He also assisted in the various soil and groundwater sampling activities required during the remedial investigation stage. Project received a 100% award fee.

Staff Scientist, under LANTDIV RAC, at Bolling Air Force Base, Washington D.C. Assisted the Senior Project Manager in developing a work plan and installing/operating a free product recovery system for the removal of #2 and #6 fuel oil. Between three and five feet of floating product was found in monitoring wells adjacent to USTs located in the vicinity of Building #18 of the base's Heat Plant. Approximately 600 gallons of free product was recovered and 15 tons of contaminated drilling cuttings were prepared for transportation and disposal. He assisted in the monitoring and analysis activities required during all stages of the project. Project received a 100% award fee.

Senior Technologist, under an U.S. Army Environmental Center Total Environment Program Support (TEPS) contract, at the Sudbury Training Annex, 2,700 acre site in Sudbury, Massachusetts. Contaminants of concern during this $6.9 million RI/FS were VOCs, metals, pesticides and dioxins. Collected over 200 groundwater, surface water/sediment, surface sil and subsurface soil samples. He also participated in an ecological risk assessment and a fish study at Puffer Road on the Annex.

Staff Scientist, under LANTDIV RAC, at the US Naval Transmitting Station, Driver, Virginia. The crew was contracted to remove and dispose assorted surface debris, including PCB-contaminated concrete and 12 PCB transformers. Conducted a comprehensive physical site inspection prior to removal. The project received an overall rating of 95%, and was completed on time and within budget.

Staff Scientist, under LANTDIV RAC, at the Yorktown Naval Weapons Station Fleet and Industrial Supply Center, Defense Fuel Supply Point Fields Annex remediation, Yorktown, Virginia. Collected and interpreted filed dates to verify the levels of contamination and evaluated opportunities for enhancement of removal operations. OHM and the Navy's CLEAN contractor were closely integrated in the redesign (conceptualization) of an innovative technique for recovery of 1.5 million gallons of Navy Supply Fuel Oil (NFS) from groundwater. The physical characteristics of NFS necessitated the introduction of heat to achieve sufficient mobility for its recovery from soils. During the evaluation of alternate technologies, it was determined that the application of heat through enclosed conduits would sufficiently distribute heat and would mitigate environmental and engineering concerns. The proposed 40 gpm treatment system includes oil/water separation; particulate removal; carbon adsorption; water cooling for off-site discharge and a biofouling suppressant system. The project received a 100% award fee.

Senior Technologist, under a USEPA Region II ERCS contract, at the White Chemical Superfund site in Newark, New Jersey. During this project, OHM characterized and repacked 9,000 drums, drained approximately 150 ASTs and USTs, and labpacked approximately 10,000 small containers. Level A, B, and C PPE was required. The contaminants consisted of air and water reactive materials as well as toxic, explosive, and corrosive hazardous chemicals. Mr. Cavanaugh was responsible for an eight person sampling and tracking crew. He participated in the development of a first-time computerized drum bulking system.

His additional experience includes the following:

Experience performing density tests for soil compaction with Troxler nuclear density gauges.

Performed elevation surveys with laser levels and transits for excavation and backfilling activities.

Extensive experience in data management and interpretation on a variety of projects. Project experience includes facility decontamination, tank and drum removal, bioremediation, thermal incineration, soil excavation, water treatment, lab packing, and emergency response.

Air monitoring experience involving the use of a PID, LEL, OVA, CGI, monitox, dosimeter, and personal and stationary air monitors.

Familiar with the use of many field analytical methods, including immunoassay field screening, soil fertility testing, PCB screening, compatibility analysis, and bulk testing.

Performed hydrogeological testing such as slug testing and aquifer drawdown tests. Familiar with well sampling, equipment, including peristalic pumps, submersibles, water level indicators, scavengers, water quality screening, and stephens recorders.

OHM Remediation
Services Corp.
A Subsidiary of the IT Group

Figure III-1

August 10, 2001

Mr. Paul Cavanaugh
IT/OHM Remediation Services Corporation
5700 Thurston Avenue, Suite 116B
Virginia Beach, VA 23455-3302

RE: Site QC Manager
Contract N62470-97-D-5000
Task Order No. 061

Dear Paul:

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 Task Order Quality Control Plan.

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 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 question in this matter, please call me at (609) 584-6840.

Sincerely,

William L. Hughes for

Charles W. Hunter
Program QC Manager
LANTDIV RAC Program

EXHIBIT IV-1

APPROVED CONSULTANT & SUBCONTRACTOR LIST

COMPANY NAME & ADDRESS:	DESCRIPTION OF SERVICES PROVIDED:
TBD	TBD

SUBMITTAL REGISTER

Install Recovery Wells, Site System Refurbishment

Delivery Order:
Contract No.:

Project No.:
Project Title:

Contractor: OHM Remediation Services Corporation

							Contractor Action			Approving Authority Action				Contractor	
Spec. Section No.	Material or Product	Work Plan Paragraph No.	Classification Approval *	Government or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Action Code	Date of Action	Date Forwarded to Approving Authority/ Date Received from Contractor	Date Forwarded from Other Reviewer	Date Received from Other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approving Authority	Remarks
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)	(j)	(k)	(l)	(m)	(n)	(o)	(p)

EXHIBIT V-2

LIST OF PERSONNEL AUTHORIZED TO REVIEW & CERTIFY SUBMITTALS

SPECIFICATION SECTION:	SUBMITTAL TYPE:	AUTHORIZED PERONNEL:
N/A	All	William Hughes

EXHIBIT VII-1

TESTING PLAN AND LOG

CONTRACT NUMBER	PROJECT TITLE & LOCATION	CONTRACTOR
N62470-97-D-5000, Task Order 061	Sites 4, 21 and 22 Remediation Naval Weapons Station Yorktown, Yorktown, VA	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				
No specification (See plans)	001	Pre-Mobilization Sampling & Analysis Sites 4, 21 & 22	×						Per FSAP			
	002	Site 4 Confirmatory Sampling & Analysis	×						Per FSAP			
	003	Site 21 Confirmatory Sampling & Analysis	×						Per FSAP			4 Samples from 9 Excavation Areas
	004	Site 21 Off-Site Fill Materials	×					×	Per Contract Specification			Physicals and Chemicals

EXHIBIT VII-1

TESTING PLAN AND LOG

CONTRACT NUMBER N62470-97-D-5000, Task Order 061	PROJECT TITLE & LOCATION Sites 4, 21 and 22 Remediation Naval Weapons Station Yorktown, Yorktown, VA	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				
	005	Site 22 Confirmatory Sampling & Analysis	×						Per FSAP Table 3-1			16 Samples from 3 Excavation Areas
	006	Site 22 Off-Site Fill Materials	×					×	Per Contract Specification			Physicals & Chemicals
	007	Top Soil	×									VESCH 3.30 Appendix B
	008	Seed & Mulch	×									VESCH 3.32 Appendix B

EXHIBIT VIII-1
QUALITY CONTROL INSPECTION PLAN
Sites 4, 21, and 22 Remediation
Naval Weapons Station Yorktown
Delivery Order No. 061, Yorktown, Virginia

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.
No Specification	<u>Pre-mobilization</u> ▪ Waste Characterization Sampling & Analysis ▪ Utility Markout & Line Termination ▪ Permits <u>Mobilization & Site Preparation</u> ▪ Establish Work & Support Areas ▪ Exclusion & Contamination Reduction Zones ▪ Decontamination Pad ▪ Stockpile Area ▪ Erosion & Sediment Controls <u>Site 4 Remediation</u> ▪ Clearing & Grubbing ▪ Excavation ▪ Confirmatory Sampling ▪ Site Restoration <u>Site 21 Remediation</u> ▪ Clearing & Grubbing ▪ Excavation ▪ Confirmatory Sampling ▪ Site Restoration <u>Site 22 Remediation</u> ▪ Clearing & Grubbing ▪ Biocell Removal ▪ Excavation ▪ Confirmatory Sampling ▪ Site Restoration				

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.
	Borrow Area Operations ▪ Clearing & Grubbing ▪ Topsoil Stripping ▪ Fill Excavation ▪ Borrow Area Restoration Decontamination Waste Handling Seeding & Mulching				

* Include schedule date if a CPM network is invoked.

EXHIBIT IX-1

PERSONNEL MATRIX

SPECIFICATION SECTION:	SUBMITTAL REVIEWED BY:	THREE PHASE PERFORMED BY:	TESTING PERFORMING BY:
N/A	Site QC Manager	Site QC Manager	TBD

APPENDIX B
VIRGINIA EROSION AND SEDIMENTATION SPECIFICATIONS

STD & SPEC 3.02

TEMPORARY STONE CONSTRUCTION ENTRANCE

CE

Definition

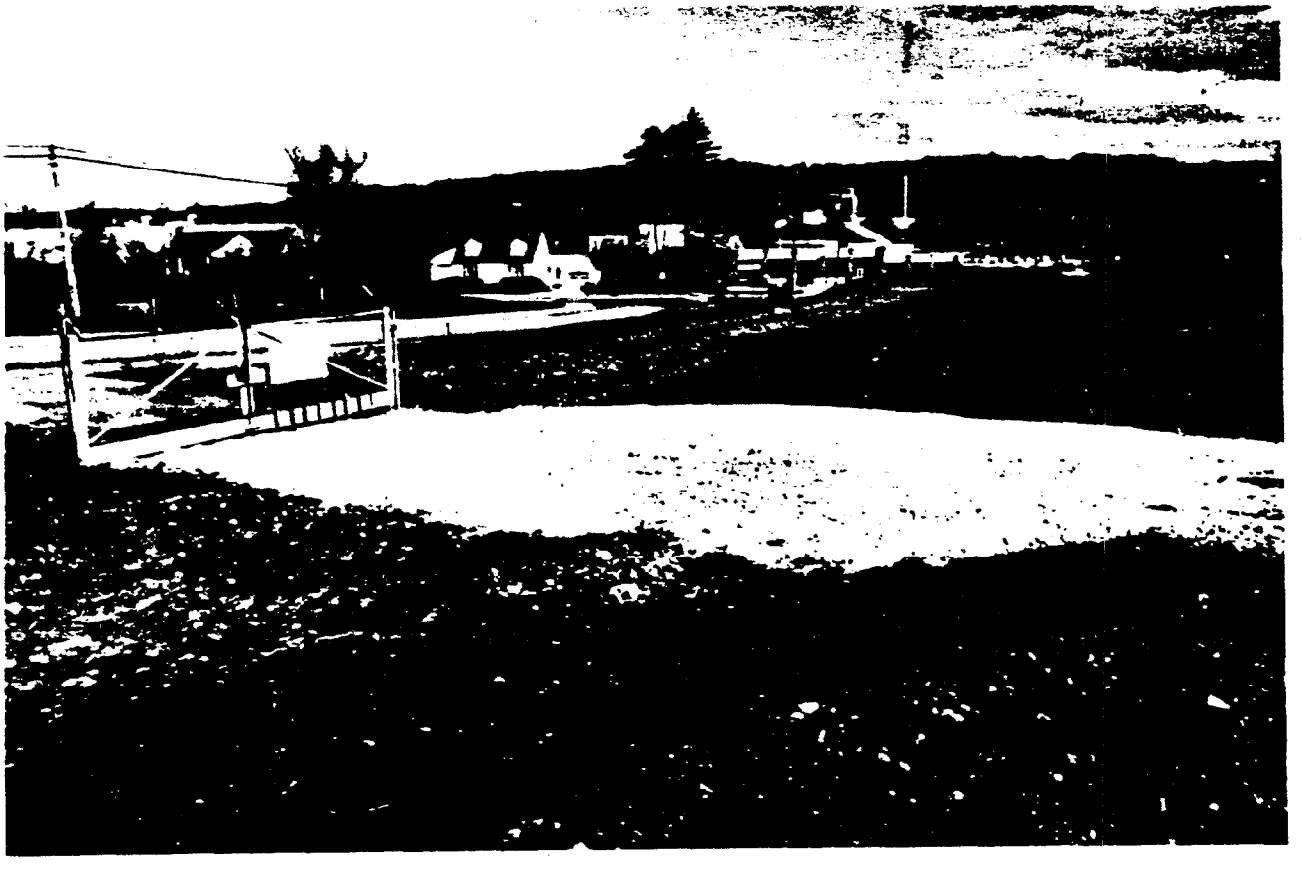
A stabilized stone pad with a filter fabric underliner located at points of vehicular ingress and egress on a construction site.

Purpose

To reduce the amount of mud transported onto paved public roads by motor vehicles or runoff.

Conditions Where Practice Applies

Wherever traffic will be leaving a construction site and move directly onto a public road or other paved area.



Planning Considerations

Minimum Standard #17 (MS #17) requires that provisions be made to minimize the transport of sediment by vehicular traffic onto a paved surface. Construction entrances provide an area where a significant amount of mud can be removed from construction vehicle tires before they enter a public road and, just as important, the soil adjacent to the paved surface can be kept intact. A filter fabric liner is used as a "separator" to minimize the dissipation of aggregate into the underlying soil due to construction traffic loads. If the action of the vehicles traveling over the gravel pad is not sufficient to remove the majority of the mud or there exists an especially sensitive traffic situation on the adjacent paved road, the tires must be washed before the vehicle enters the public road. If washing is necessary, provisions must be made to intercept the wash water and trap the sediment so it can be collected and stabilized. Construction entrances should be used in conjunction with the stabilization of construction roads (see Std. & Spec. 3.03, CONSTRUCTION ROAD STABILIZATION) to reduce the amount of mud picked up by construction vehicles and to do a better job of mud removal. Other innovative techniques for accomplishing the same purpose (such as a bituminous entrance) can be utilized, but only after specific plans and details are submitted to and approved by the appropriate Plan-Approving Authority.

Design Criteria

Aggregate Size

VDOT #1 Coarse Aggregate (2- to 3-inch stone) should be used.

Entrance Dimensions

The aggregate layer must be at least 6 inches thick; a minimum three inches of aggregate should be placed in a cut section to give the entrance added stability and to help secure filter cloth separator. It must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. The length of the entrance must be at least 70 feet (see Plate 3.02-1).

Washing

If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, then the tires of the vehicles must be washed before entering the public road. Wash water must be carried away from the entrance to a approved settling area to remove sediment. All sediment shall be prevented from entering storm drains, ditches, or watercourses. A wash rack may also be used to make washing more convenient and effective (see Plate 3.02-1).

Location

The entrance should be located to provide for maximum utilization by all construction vehicles.

Construction Specifications

The area of the entrance must be excavated a minimum of 3 inches and must be cleared of all vegetation, roots, and other objectionable material. The filter fabric underliner will then be placed the full width and length of the entrance.

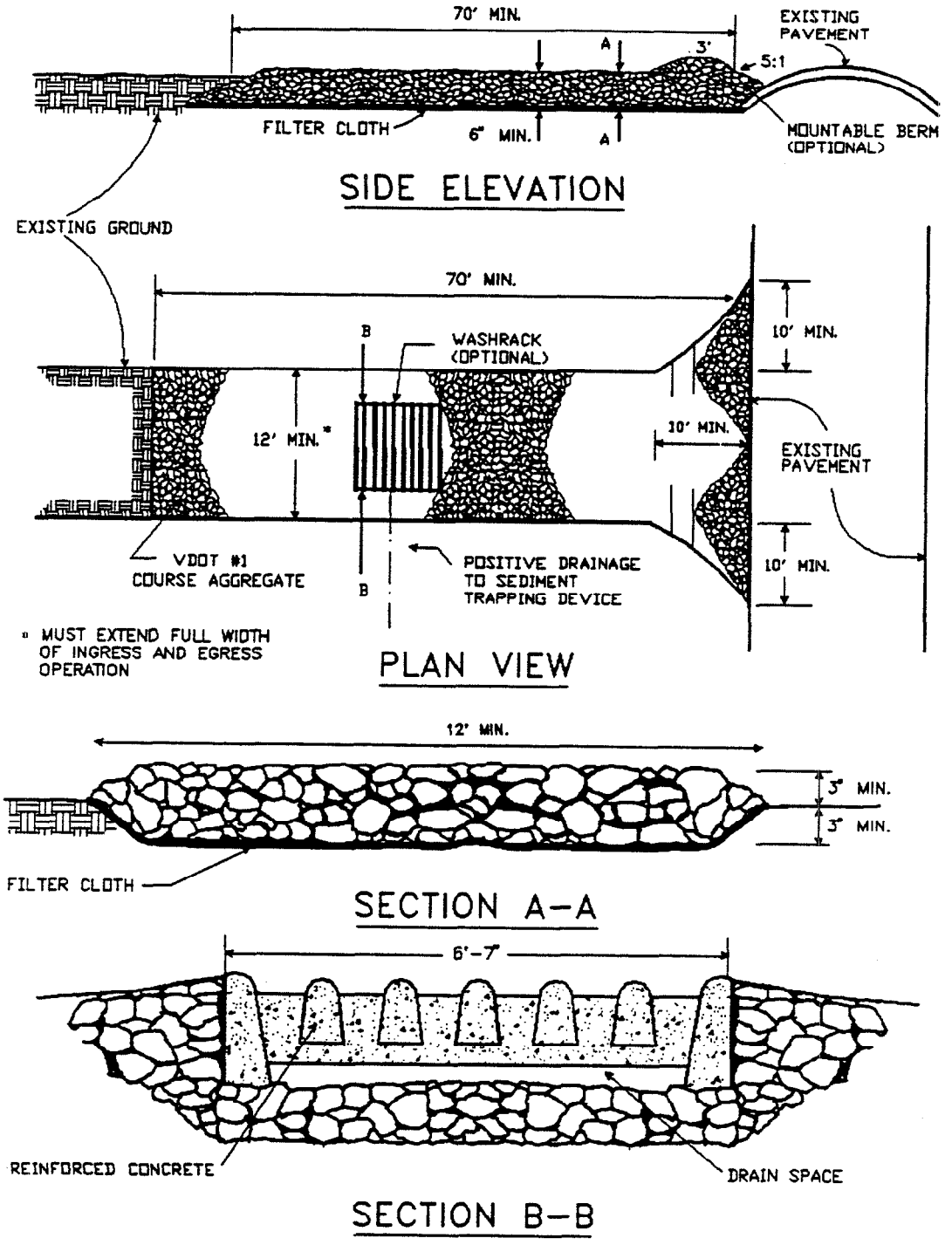
Following the installation of the filter cloth, the stone shall be placed to the specified dimensions. If wash racks are used, they should be installed according to manufacturer's specifications. Any drainage facilities required because of washing should be constructed according to specifications. Conveyance of surface water under entrance, through culverts, shall be provided as required. If such conveyance is impossible, the construction of a "mountable" berm with 5:1 slopes will be permitted.

The filter cloth utilized shall be a woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals and hydrocarbons, be mildew and rot resistant, and conform to the physical properties noted in Table 3.02-A.

Maintenance

The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

STONE CONSTRUCTION ENTRANCE



Source: Adapted from 1983 Maryland Standards for Soil Erosion and Sediment Control, and Va. DSWC

Plate 3.02-1

TABLE 3.02-A

CONSTRUCTION SPECIFICATIONS FOR FILTER CLOTH UNDERLINER

Fabric Properties[1]	Light-Duty Entrance[2] (Graded Subgrade)	Heavy-Duty Entrance[3] (Rough Graded)	Test Method
Grab Tensile Strength (lbs.)	200	220	ASTM D1682
Elongation at Failure (%)	50	220	ASTM D1682
Mullen Burst Strength (lbs.)	190	430	ASTM D3786
Puncture Strength (lbs.)	40	125	ASTM D751 (modified)
Equivalent Opening Size (mm)	40-80	40-80	U.S. Standard Sieve CW-02215

[1] Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

[2] Light Duty Entrance: Sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Examples of fabrics which can be used are: Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[3] Heavy Duty Entrance: Sites with only rough grading and where most travel would be multi-axle vehicles. Examples of fabrics which can be used are: Trevira Spunbond 1135, Mirafi 600X, or equivalent.

Source: Virginia Highway and Transportation Research Council (VHTRC)

STD & SPEC 3.04

STRAW BALE BARRIER

STB

Definition

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas of limited extent in order to prevent sediment from leaving the construction site.

2. To decrease the velocity of sheet flows.

Conditions Where Practice Applies

1. Below disturbed areas subject to sheet and rill erosion.

2. Where the size of the drainage area is no greater than one-fourth of an acre per 100 feet of barrier length; the maximum slope length behind the barrier is 100 feet; and the maximum slope gradient behind the barrier is 50 percent (2:1).

3. Where effectiveness is required for less than 3 months.

4. Under no circumstances should straw bale barriers be constructed in live streams or in swales where there is the possibility of a washout.

5. The measure should not be used where water may concentrate in defined ditches and minor swales.

6. Straw bale barriers shall not be used on areas where rock or another hard surface prevents the full and uniform anchoring of the barrier.

Planning Considerations

Based on observations made in Virginia, Pennsylvania, Maryland and other parts of the nation, straw bale barriers have not been as effective as many users had hoped they would be - especially when used to slow down and filter concentrated flows. They should be used judiciously and with caution as erosion control measures. There are three major reasons for such ineffectiveness.

First, improper utilization of straw bale barriers has been a major problem. Straw bale barriers have been used in streams and drainageways where high water depth and velocities have destroyed or damaged the control. Secondly, improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, has allowed undercutting and end flow. This has resulted in additions of, rather than removal of, sediment from runoff waters. Finally, inadequate maintenance lowers the effectiveness of these barriers. Trapping efficiencies of carefully installed straw bale barriers on one project in Virginia dropped from 57% to 16% in one month due to lack of maintenance.

There are serious questions about the continued use of straw bale barriers as they are presently installed and maintained. Averaging from $3 to $6 per linear foot, the thousands of straw bale barriers used annually in Virginia represent such a considerable expense that optimum installation procedures should be emphasized.

Design Criteria

A formal design is not required. However, an effort should be made to locate the straw bale barrier, as well as other perimeter controls, at least 5 to 7 feet from the base of disturbed slopes with grades greater than 7%. This will help prevent the measure from being rendered useless following the initial movement of soil.

Construction Specifications

Sheet Flow Application

1. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.

2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings (see Plate 3.04-1).

3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier (see Plate 3.04-1).

4. Each bale shall be securely anchored by at least two stakes (minimum dimensions 2 inches x 2 inches x 36 inches) or standard "T" or "U" steel posts (minimum weight of 1.33 pounds per linear foot) driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.

6. Inspection shall be frequent and repair or replacement shall be made promptly as needed.

7. Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

Maintenance

1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.

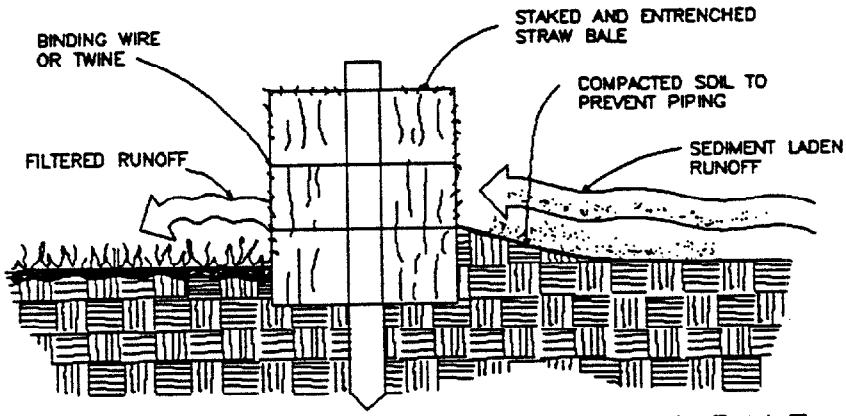
2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.

3. Necessary repairs to barriers or replacement of bales shall be accomplished promptly.

4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

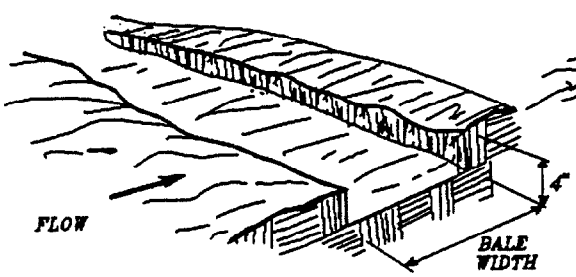
5. Any sediment deposits remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

STRAW BALE BARRIER

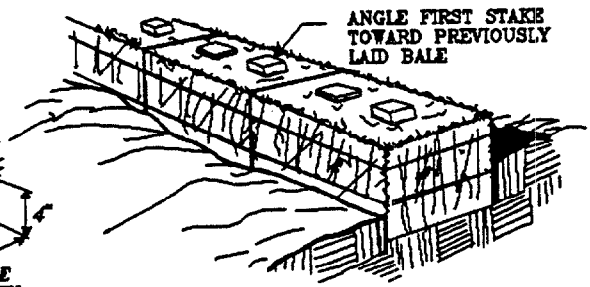


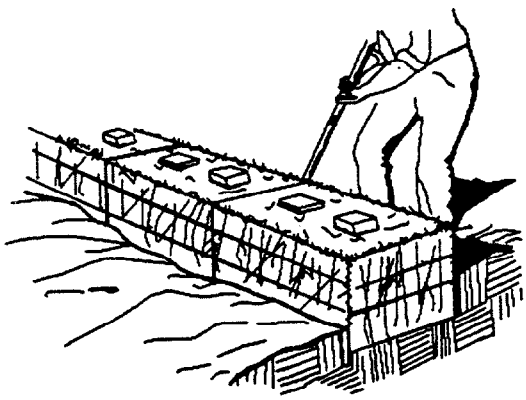
PROPERLY INSTALLED STRAW BALE (CROSS SECTION)

1. EXCAVATE THE TRENCH.

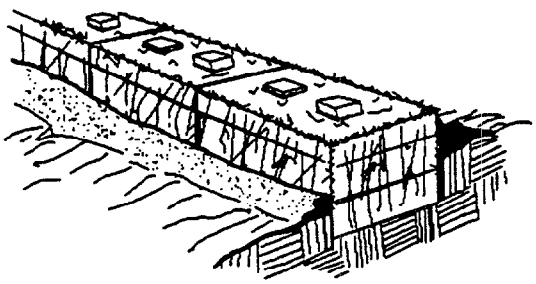


2. PLACE AND STAKE STRAW BALES.





3. WEDGE LOOSE STRAW BETWEEN BALES.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.

CONSTRUCTION OF STRAW BALE BARRIER

Source: Va. DSWC

Plate 3.04-1

STD & SPEC 3.05

SILT FENCE

SF

Definition

A temporary sediment barrier consisting of a synthetic filter fabric stretched across and attached to supporting posts and entrenched.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site.

2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.

Conditions Where Practice Applies

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion.

2. Where the size of the drainage area is no more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).

3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cfs.

4. Silt fence will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.

Planning Considerations

Laboratory work at the Virginia Highway and Transportation Research Council (VHTRC) has shown that silt fences can trap a much higher percentage of suspended sediments than straw bales, though silt fence passes the sediment-laden water slower. Silt fences are preferable to straw barriers in many cases because of their durability and potential cost savings. While the failure rate of silt fences is lower than that of straw barriers, many instances have been observed where silt fences are improperly installed, inviting failure and sediment loss. The installation methods outlined here can improve performance and reduce failures.

As noted, flow rate through silt fence is significantly lower than the flow rate for straw bale barriers. This creates more ponding and hence more time for sediment to fall out. Table 3.05-A demonstrates these relationships.

Both woven and non-woven synthetic fabrics are commercially available. The woven fabrics generally display higher strength than the non-woven fabrics and, in most cases, do not require any additional reinforcement. When tested under acid and alkaline water conditions, most of the woven fabrics increase in strength, while the reactions of non-woven fabrics to these conditions are variable. The same is true of testing under extensive ultraviolet radiation. Permeability rates vary regardless of fabric type. While all of the fabrics demonstrate very high filtering efficiencies for sandy sediments, there is considerable variation among both woven and non-woven fabrics when filtering the finer silt and clay particles.

Design Criteria

1. No formal design is required. As with straw bale barriers, an effort should be made to locate silt fence at least 5 feet to 7 feet beyond the base of disturbed slopes with grades greater than 7%.

TABLE 3.05-A

TYPICAL FLOW RATES AND FILTERING EFFICIENCIES OF PERIMETER CONTROL

Material	Flow Rate (gal./sq.ft./min)	Filter Efficiency(%)
Straw	5.6	67
Synthetic Fabric	0.3	97

Source: VHTRC

2. The use of silt fences, because they have such a low permeability, is limited to situations in which only sheet or overland flows are expected and where concentrated flows originate from drainage areas of 1 acre or less.

3. Field experience has demonstrated that, in many instances, silt fence is installed too short (less than 16 inches above ground elevation). The short fence is subject to breaching during even small storm events and will require maintenance "clean outs" more often. Properly supported silt fence which stands 24 to 34 inches above the existing grade tends to promote more effective sediment control.

Construction Specifications

Materials

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the requirements noted in Table 3.05-B.

2. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F to 120° F.

3. If wooden stakes are utilized for silt fence construction, they must have a diameter of 2 inches when oak is used and 4 inches when pine is used. Wooden stakes must have a minimum length of 5 feet.

TABLE 3.05-B

PHYSICAL PROPERTIES OF FILTER FABRIC IN SILT FENCE

Physical Property	Test	Requirements
Filtering Efficiency	ASTM 5141	75% (minimum)
Tensile Strength at 20% (max.) Elongation*	VTM-52	Extra Strength - 50 lbs./linear inch (minimum) Standard Strength - 30 lbs./linear inch (minimum)
Flow Rate	ASTM 5141	0.2 gal./sq.ft./ minute (minimum)
Ultraviolet Radiation Stability %	ASTM-G-26	90% (minimum)

* Requirements reduced by 50% after six months of installation.

Source: VHTRC

4. If steel posts (standard "U" or "T" section) are utilized for silt fence construction, they must have a minimum weight of 1.33 pounds per linear foot and shall have a minimum length of 5 feet.

5. Wire fence reinforcement for silt fences using standard-strength filter cloth shall be a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

Installation

1. The height of a silt fence shall be a minimum of 16 inches above the original ground surface and shall not exceed 34 inches above ground elevation.

2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.

3. A trench shall be excavated approximately 4-inches wide and 4-inches deep on the upslope side of the proposed location of the measure.

4. When wire support is used, standard-strength filter cloth may be used. Posts for this type of installation shall be placed a maximum of 10-feet apart (see Plate 3.05-1). The wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of two inches and shall not extend more than 34 inches above the original ground surface. The standard-strength fabric shall be stapled or wired to the wire fence, and 8 inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees.

5. When wire support is not used, extra-strength filter cloth shall be used. Posts for this type of fabric shall be placed a maximum of 6-feet apart (see Plate 3.05-2). The filter fabric shall be fastened securely to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and eight inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees. This method of installation has been found to be more commonplace than #4.

6. If a silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate endflow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope (see Plate 3.05-2). Extra-strength filter fabric shall be used for this application with a maximum 3-foot spacing of posts.

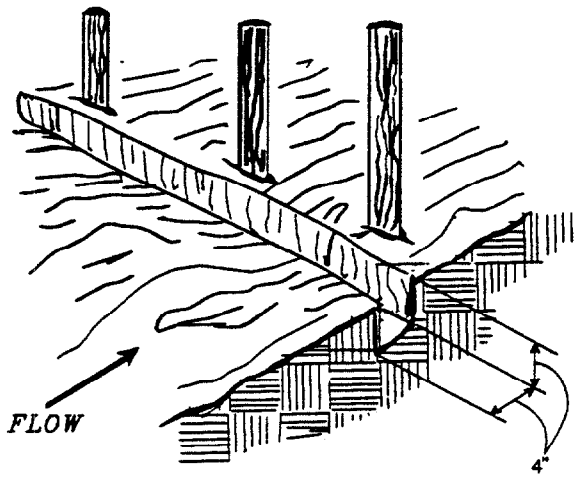
   All other installation requirements noted in #5 apply.

7. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric.

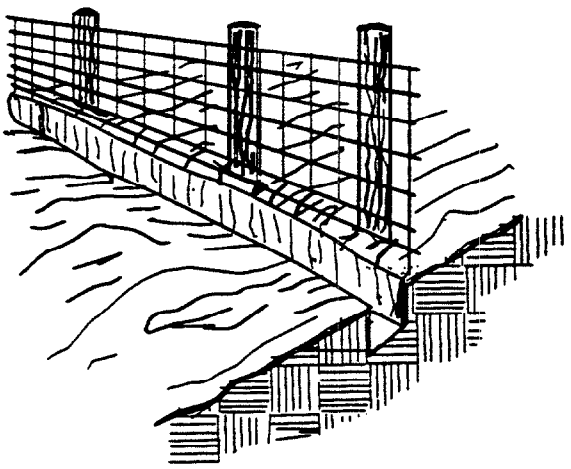
8. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)

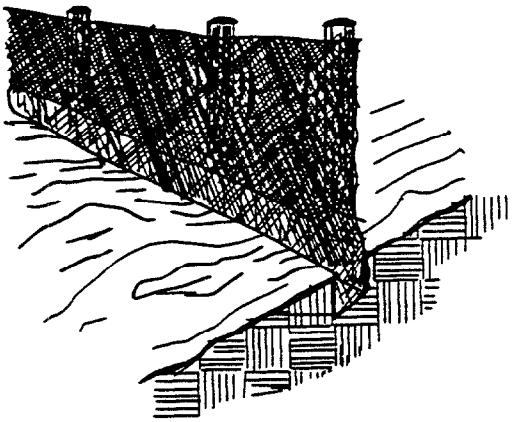
1. SET POSTS AND EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.



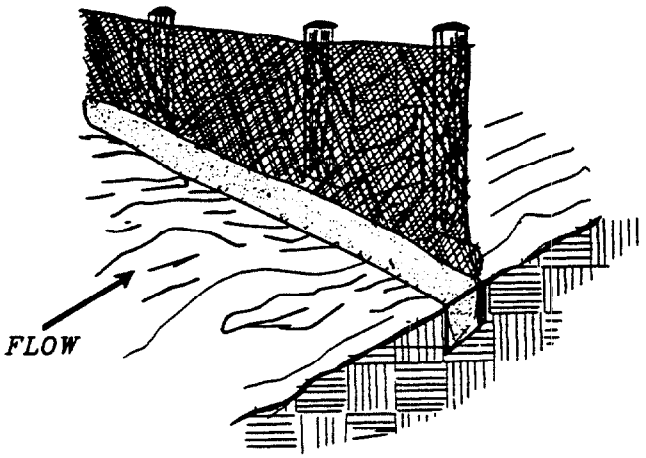
2. STAPLE WIRE FENCING TO THE POSTS.



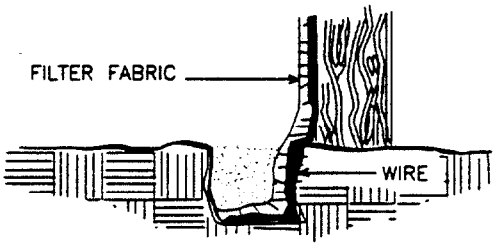
3. ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC AND WIRE INTO THE TRENCH.

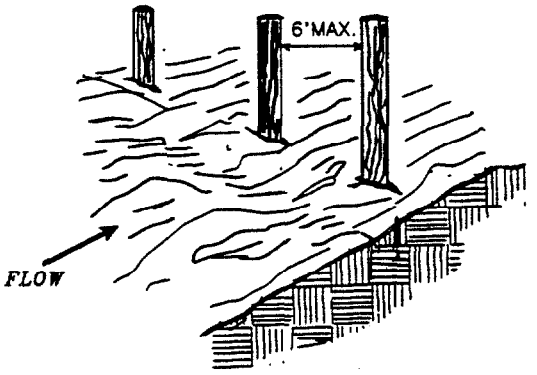


Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

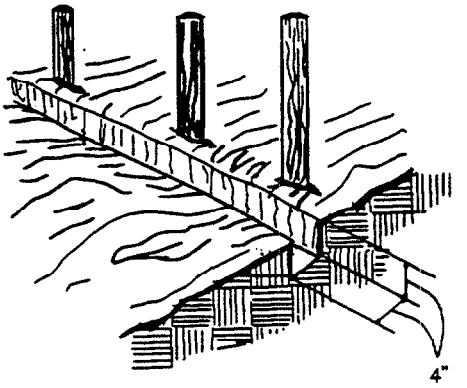
Plate 3.05-1

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

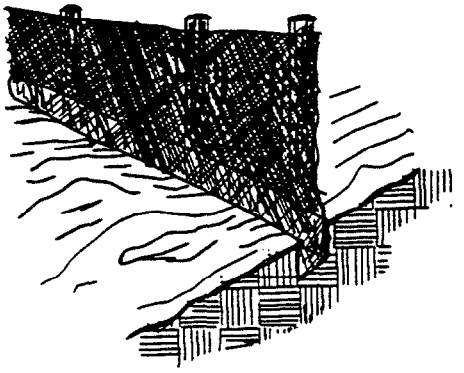
1. SET THE STAKES.



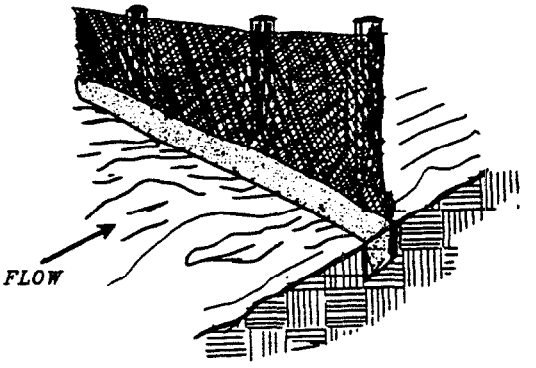
2. EXCAVATE A 4"X 4" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



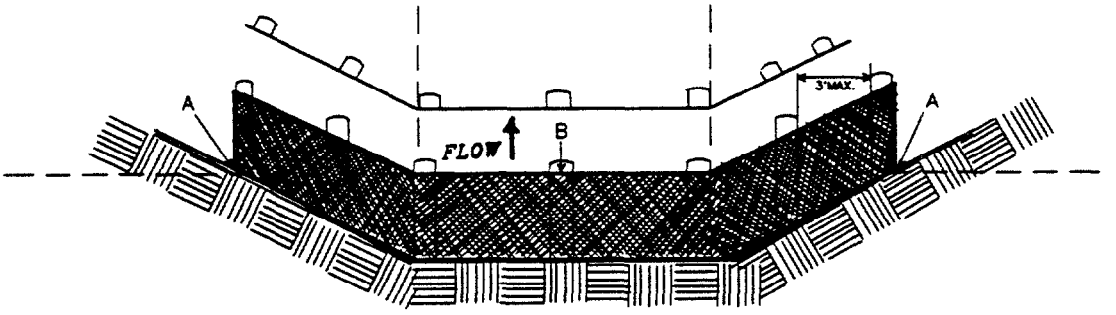
3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



SHEET FLOW INSTALLATION
(PERSPECTIVE VIEW)



POINTS A SHOULD BE HIGHER THAN POINT B.

DRAINAGEWAY INSTALLATION
(FRONT ELEVATION)

Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-2

Maintenance

1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

2. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

3. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

4. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

5. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

APPENDIX C
SITE-SPECIFIC HEALTH AND SAFETY PLAN

IT CORPORATION
A Member of The IT Group

SITE-SPECIFIC HEALTH & SAFETY PLAN FOR TO 0061 SITES 4,21 AND 22 REMEDIATION NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
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August 2001
Project 809275
Revision 1

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1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 POLICY STATEMENT

The policy of OHM Remediation Services, a subsidiary of the IT Group (OHM/IT) is to provide a safe and healthful work environment for all employees. OHM/IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At OHM/IT, it is believed all accidents and injuries are preventable. OHM/IT will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Health and Safety Plan (HASP) prescribes the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and the Health and Safety Manager.

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of the plan.

1.3 REFERENCES

This HASP complies with applicable Occupational Safety and Health Administration (OSHA), United States Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), and IT Group Health & Safety policies and procedures. This plan follows the guidelines established in the following:

- Standard Operating Safety Guides, EPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG, EPA (86-116, October 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.
- Title 29 of the Code of Federal Regulations (CFR), Part 1926.
- Health and Safety Requirements Manual, US Army Corps. Of Engineers, EM 385-1-1
- IT Group Health and Safety Program.

1.4 DISCLAIMER

The following (HASP) has been designed for the methods presently contemplated by OHM/IT for execution of the proposed work. Therefore, the HASP may not be appropriate if the work is not performed by or using the methods presently contemplated by OHM/IT. In addition, as the work is performed, conditions different from those anticipated might be encountered and the HASP may have to be modified. Therefore, OHM/IT only makes representations or warranties as to the adequacy of the HASP for currently anticipated activities and conditions.

1.5 OBJECTIVE

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.6 POLICY STATEMENT

The policy of OHM Remediation Services, a subsidiary of the IT Group (OHM/IT) is to provide a safe and healthful work environment for all employees. OHM/IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At OHM/IT, it is believed all accidents and injuries are preventable. OHM/IT will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Health and Safety Plan (HASP) prescribes the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and the Health and Safety Manager.

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of the plan.

1.7 REFERENCES

This HASP complies with applicable Occupational Safety and Health Administration (OSHA), United States Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), and IT Group Health & Safety policies and procedures. This plan follows the guidelines established in the following:

- Standard Operating Safety Guides, EPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG, EPA (86-116, October 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.
- Title 29 of the Code of Federal Regulations (CFR), Part 1926.
- Health and Safety Requirements Manual, US Army Corps. Of Engineers, EM 385-1-1
- IT Group Health and Safety Program.

1.8 DISCLAIMER

The following (HASP) has been designed for the methods presently contemplated by OHM/IT for execution of the proposed work. Therefore, the HASP may not be appropriate if the work is not performed by or using the methods presently contemplated by OHM/IT. In addition, as the work is performed, conditions different from those anticipated might be encountered and the HASP may have to be modified. Therefore, OHM/IT only makes representations or warranties as to the adequacy of the HASP for currently anticipated activities and conditions.

2.0 Site History/Scope Of Work

2.1 SITE HISTORY/BACKGROUND

Sites 4, 21, and 22 are located in the northeastern portion of WPNSTA Yorktown, between Indian Field Creek and Felgates Creek . The site descriptions and histories of Sites 4, 21, and 22 are presented in the following subsections.

2.1.1 Site 4 - Burning Pad Residue Landfill

Site 4, the Burning Pad Residue Landfill, consists of over 10 acres. The site is bordered by the Explosives Burning Facility 1401 (Site 22) to the southwest, Site 21 (the Battery and Drum Disposal Area) and an unnamed drainage way to the southeast, West Road to the northeast, and a gravel road leading to the burning facility to the northwest.

The majority of the site is relatively open, with scrub grasses and small trees; larger trees are present in the northern and southeastern portions of the site. A gravel road now loops through the site and meets West Road. A dirt or gravel road formerly cut through the site and led towards Site 22. The topography within the open area of Site 4 is relatively flat with elevations ranging between 33 to 47 feet above mean sea level (msl). In the wooded areas along the southeastern portion of the site, the topography slopes sharply down towards the unnamed drainage way with elevations changing from 39 to less than 10 feet above msl.

2.1.2 Site 21 - Battery and Drum Disposal Area

Site 21, the Battery and Drum Disposal Area, is a small wooded area covering approximately 1 acre. The site is located immediately adjacent to the unnamed drainage way leading to Felgates Creek. West Road is located southwest of the site, and Site 4 is to the northwest .

The site has been cleared in the area of the previous Removal Action. Small and large trees surround the removal action area and make up the remaining area of the site. A dirt road extending from West Road leads to the removal action area. The topography within the site is relatively steep; it falls sharply towards the on-site drainage way located along the western and southeastern portions of the site. Site elevations range from 5 to 45 feet above msl.

2.1.3 Site 22 - Burn Pad

Site 22 is located south of Site 4 and west of Site 21. A circular array of 11 steel burning pans was used for burning waste plastic explosives and spent solvents. The pans surround a 150-foot diameter circular area. The burn pad is not currently in use and the area is relatively clean. The site became an area to be used for a treatability study (TS) for the treatment of explosive contaminated soil. As part of the TS, OHM constructed a biocell which measured 153 feet long by 86 feet wide by 7 feet deep. The biocell's construction consisted of a six inch layer of sand as the base overlain by a three layered liner. This liner was made of a layer of 60 mil HDPE on bottom, a geo-net fabric as a middle layer, and a layer of 80 mil HDPE on top. The entire liner was secured by placing its edges in a trench dug around the entire perimeter of the biocell and filling the trench with concrete. A steel gantry which held the pumps and other equipment was mounted on rails that extended the length of the biocell. These rails were also anchored into the same concrete filled trench that anchored the liner. A dewatering area was constructed to the east of the biocell. Currently, the biocell remains at Site 22, but has been partially dismantled.

dismantled. The gantry and rails have been removed. The liner remains in place but its condition is unknown. The site is generally overgrown with grasses, and the biocell and dewatering area are filled with water. The berm of the dewatering area was not designed to be a long-term structure. Its condition is also unknown but is currently holding water in the dewatering area. Without restoration and replacement of equipment the bio-cell and dewatering area are unfit for use as a treatment unit. An area to the west of the bio-cell is showing signs of severe erosion.

2.2 SCOPE OF WORK

This Health and Safety Plan focuses on tank cleaning, removal, and sampling activities.

The principal tasks to be conducted are listed below:

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
- Survey the site to determine the area of excavation;
- Construction of decontamination pad
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils
- Decontaminate and demolish bio-cell at Site 22
- Conduct confirmatory sampling at Sites 4, 21, and 22
- Backfill and restore Sites 4, 21, and 22
- Site restoration
- Project demobilization

These activities have been analyzed for potential hazards for which control measures are provided in Appendix D Activity Hazard Analysis.

3.0 Key Personnel and Management

The Project Manager (PM), Site Superintendent (SS), Site Safety Officer (SSO), Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM), and the Health and Safety Coordinator (HSC) are responsible for formulating and enforcing health and safety requirements, and for implementing this HASP. The supervisor's and employee safety responsibilities are detailed in IT Group HS001 & HS010. The following summarizes the health and safety responsibilities of the site management.

3.1 PROJECT SAFETY RESPONSIBILITIES

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the HASP requirements. The PM will coordinate with the SS & SSO to assure that the work is completed in a manner consistent with the HASP. The SS is responsible for field implementation of the HASP. The SS will be the main contact in any on-site emergency situation and will insure off-site emergency agencies have been contacted prior to the start of work. The SS & SSO are authorized to administer this HASP. The SS & SSO are authorized to stop work when an imminent health or safety risk exists. The CIH and/or HSM are responsible for reviewing the HASP and ensuring that the HASP is complete and accurate. The CIH, HSM, and HSC provide technical and administrative support for the Health and Safety Program and will be available for consultation when required. Each employee is responsible for personal safety as well as the safety of others in the work area.

3.2 KEY SAFETY PERSONNEL

The following individuals share responsibility for health and safety at the site:

Project Manager	William Hughes 757-318.5140 (office)
Site Superintendent	Ware Warburton 757-887-5961 757-887-5963 (FAX)
Site Safety Officer	TBD TBD (site phone)
Health and Safety Coordinator	Joe Hoyt 804-264-4342 (office)
Certified Industrial Hygienist	Paul Lawless, CIH 609-588-6391 (office)
Health and Safety Manager	Robert Brooks, CSP (732) 469-5599 ext. 681 (office)
Vice President, Health & Safety	Warren Houseman, CIH (412) 858-3741

4.0 Activity Hazard Analysis

This section outlines the potential chemical and physical hazards, which workers may be to during work at the NRL tank cleaning. Table 4.1 lists know contaminants. Chemicals which may be brought to the site for which an MSDS is necessary will be located in the site Hazard Communication (HAZCOM) notebook.

4.1 CHEMICAL HAZARDS

Based on site historical records and previous investigations, the primary site contaminants at Sites 4,21, and 22 are listed below.

TABLE 4-1

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Aluminum	Inhalation, skin, eyes	5 mg/m3	• Irritation of eyes, skin, and respiratory system. • Incompatible with strong acids and acids, halogenated hydrocarbons
Antimony	Inhalation, ingestion, skin, eyes	0.5 mg/m3	• Irritation of eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly • Incompatible with oxidizers, acids, halogenated hydrocarbons
Arsenic	Inhalation, ingestion	0.01 mg/m3	• A human carcinogen; a powerful allergen, inhalation and contact causing burning, swelling and redness in the eyes, nose, throat and skin; ingestion causes nausea, vomiting, nervous system effects in the extremities (numbness, tingling, weakness); long term exposure can cause liver, kidney and blood damage. • A fire hazard in the form of dust or contact with oxidizers; thermal decomposition produces toxic gases.
PAHs; e.g., Benzo(a) Pyrene	Skin, eye, inhalation, ingestion	0.2 mg/m^3	• An Animal Carcinogen, probable human carcinogen; a nasal, respiratory tract, and skin irritant; (all substances have probable, possible carcinogenic potential) • Reacts with acids and oxidizers; produces acrid smoke, toxic gases when involved in fires, thermal decomposition
Chromium	Skin, eye, inhalation, ingestion	0.5 mg/m^3 Cr (VI) Soluble 0.05 mg/m^3 Insoluble 0.01 mg/m^3	• Some Chromium (VI) compounds are confirmed human carcinogens; corrosive irritant to skin, eyes, respiratory tract; deep skin ulcers; not (always) immediately painful; an allergic sensitizer; 5 grams ingested can be fatal • Reacts with strong oxidizers, alkalis, can react with, ignite oils, grease, paper and plastics
Copper	Inhalation, ingestion, skin, eye contact	1 mg/m3	• Irritation of eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis • Incompatible with oxidizers, alkalis, sodium azide, acetylene

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Lead	Inhalation, ingestion	0.050 mg/m^3	• Weakness, insomnia; loss of appetite, loss of weight, abdominal pain; anemia; tremors; weakness of wrists/ ankles; kidney damage; low blood pressure • Incompatible with strong oxidizers, hydrogen peroxide and acids
Manganese	Inhalation, ingestion	1 mg/m3	• Parkinson's; asthenia, insomnia, mental confusion,; metal fume fever: dry throat, cough, chest tightness, breathing difficulty, rales, flu-like fever; low back pain; vomiting; malaise; fatigue; kidney damage • Incompatible with oxidizers
Mercury	Skin, inhalation	0.025 mg/m3 Alkyl Compounds mg/m3 (10 mg/m3 IDLH)	• Silver-white, heavy, odorless liquid. VP: 0.0012mm, LEL/UEL: NA • Cough, chest pain, shortness of breath; tremor, insomnia, irritability, headache, weakness, stomach pain, loss of appetite; kidney damage. • Reacts with acetylene, ammonia, chlorine dioxide, copper and other metals.
Silver	Inhalation, ingestion, skin, eye contact	0.01 mg/m3	• Blue-grey eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance. • Incompatible with acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid
2,3,6 Trinitrotoluene	*Inhalation, skin absorption, ingestion, skin, eye contact*	0.5 mg/m3	• Irritation of skin, mucous membrane; liver damage., jaundice; cyanosis; sneezing; cough, sore throat; peripheral neuropathy, muscle pain; kidney damage; cataract; sensitization dermatitis; increased blood leukocytes; anemia; cardiac irregularities. • Incompatible with stro0ng oxidizers, ammonia, strong alkalis, combustible materials, heat
Zinc	Inhalation	5 mg/m3	• Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough: weakness, lassitude: metallic taste; headache; blurred vision; low back pain; vomiting; fatigue; malaise; tightness in chest; dyspnea, rales, decreased pulmonary function • Incompatible with chlorinated rubber, water

The following general symptoms may indicate exposure to a hazardous chemical. Personnel will be removed from the work site and provided immediate medical attention if the following symptoms occur:

- Weakness
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Abdominal pain

4.2 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 personnel and subcontractors. Hazard communication will include:

4.2.1 Container Labeling

OHM/IT 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.

4.2.2 Material Safety Data Sheets (MSDSs)

There will be an MSDS located on site for each hazardous chemical known to be used on site. All hazardous waste chemical MSDSs are located in Appendix A of the HASP. MSDS's for chemicals that will be brought to the site will be located in the site HAZCOM Notebook.

4.2.3 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/IT field projects and by an initial site orientation program.

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

- An in-depth review of the tank contaminant of concern identified listed in Section 4.1.
- OSHA regulated 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/IT sites
- Emergency spill procedures
- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM/IT and related subcontractor employee will be given information in the same manner as during 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 A of the site safety plan to find a list of hazardous chemicals anticipated to be brought to the site.

4.3 PHYSICAL HAZARDS

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

The SS/SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures. The crew leaders and SS will inspect Work areas. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this site.

Activity Hazard Analyses will be developed for each principal activity and will identify all major hazards to which employees may be exposed. 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.

Physical hazards include safety and environmental hazards. The following physical hazards may be present during project activities:

- Heat stress
- Biological hazards (Poison Ivy ,Ticks, Lyme Disease)
- Manual lifting/back strain
- Vehicle Traffic
- Noise
- Lightening

Heat stress Prevention procedures will be implemented according to HS400. Personal noise exposures will be controlled by instituting the Hearing Conservation Program, according to HS402.

4.4 LIGHTNING

The procedures provided below will be used to protect site personnel from lightning related injuries.

4.4.1 Training

A tailgate safety meeting will be conducted to increase awareness to the hazards and prevention of lightning related incidents.

4.4.2 Detection of Lightning

The Site Superintendent will be proactive in monitoring conditions that may produce thunderstorms and lightning. A daily and weakly weather forecast will be tracked and communicated to site personnel. When signs of impending storms, i.e., increasing wind, darkening skies, or lightening appear, local weather monitoring will be increased. The National Weather Service (www.nws.noaa.gov/) should be consulted frequently. Personnel will be notified when thunderstorms may impact the site.

The "flash/bang" (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each five seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is one mile away.

4.4.3 Suspension/Resumption of Activities

All outside activities will be suspended when a lightning flash is immediately in the area or a f/b of 20 seconds (4 miles away) is noted. Personnel may continue indoor work activities. Outdoor activities will resume when 30 minutes has passed since the last observable f/b is 20 seconds or greater.

4.4.4 Lightning Protection

When notification is given, all outside work activities will stop and personnel will gather in the support zone for a head count and further instructions. Indoor work will continue, except for the use of electrical equipment, telephones and computers. When a safe location is not present and personnel are caught by a sudden lightning event, employees should seek the lowest possible area, away from large objects which

might attract lightning or fall over, e.g., trees, utility poles. The employee should assume a crouching position with their head lowered and hands over their ears. AVOID: WATER, HIGH GROUNDS, HEAVY EQUIPMENT AND TALL, ISOLATED OBJECTS.

4.4.5 First Aid

An employee that is struck by lightning needs immediate assistance. The body will not carry an electrical charge, but receives a sever electrical shock and may be burned. Personnel certified in first aid/CPR should inspect for shock and burns around fingers, toes, buckles and jewelry. Stay with the injured employee until medical help arrives.

4.5 VEHICLE SAFETY MANAGEMENT

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. Fifty percent or more of vehicle safety incidents occur while backing up. OHM/IT employees involved in the operation and use of OHM/IT and/or leased or rented vehicles will comply with the ***IT Motor Vehicle/Commercial Vehicle Operation and Maintenance Procedures*** (HS800/810). OHM/IT requires employees to use seat belts at all times when traveling in IT owned or leased/rented vehicles. The SS/SSO will develop a parking area plan, including backing vehicles into parking spaces, using spotters for backing vehicles and policy mandated vehicle inspections.

OHM/IT employees are expected to incorporate safe actions and preparations to avoid vehicle accidents and personal injury during work and off-hours. Breaks should be planned into lengthy job mobilizations and demobilizations, including rotation of drivers at regular intervals. If parking areas are busy or crowded and more than one worker is traveling in the same vehicle, one worker should remain outside the vehicle as it leaves the parking space to assist the driver with traffic observation. Vehicles traveling before dawn and at dusk in rural or wooded areas should be prepared for wildlife, e.g. deer crossing roadways.

OHM/IT employees arriving at work areas should park vehicles away from delivery, heavy equipment and vehicle loading/unloading locations to prevent parked vehicles from damage by various deliveries. Heavy equipment operators should inspect areas and request vehicles to be moved or spotters used if necessary, to maneuver equipment in tight areas. Employees who observe near misses or potential risks to parked or moving vehicles must report these to the SS/SSO immediately.

OHM/IT employees are expected to use the vehicle inspection form and check/test the safety systems on the vehicle on a daily basis. Check the following: brakes, mirrors, seat belts, tires, leakage from the undercarriage, lights and turn signals. Vehicles with safety deficiencies must be reported immediately and not driven until properly repaired. Vehicles running errands from different project sites should have telephone numbers of the job site in the vehicle in case calls for assistance are required.

Because of the different ways alcohol can affect behavior, even in very small amounts, the best and safest course is not to drink before driving. At OHM/IT, a driver with blood alcohol concentration (BAC) over 0.04% is considered to be under the influence and subject to disciplinary action. Personnel involved in motor vehicle incidents are subject to drug and alcohol testing. Whenever an employee is convicted or pleads no contest to a company related driving under the influence, he/she will be immediately terminated in accordance with HS800.

Weather conditions can have a profound effect on driving. On slippery roads, drive more slowly. Stop and turn with care. Keep several car lengths from other vehicles. At speeds in excess of 35 mph, the chances of hydroplaning increase with speed. In general, keep back 1 car length for every 10 mph to prevent striking the car ahead.

Vehicles will be operated in accordance with the requirements listed below:

- Seatbelt use is mandatory for all passengers;
- Personnel may not ride in the back of cargo vehicles;
- The driver must make a 360 degree walk around the assigned vehicle prior to vehicle movement;
- A ground guide is used to back up any vehicle;
- Vehicle speed is limited to the posted speed limits for developed roadways, 25 mph maximum on dirt roads and 10 mph maximum off-road (based on conditions);
- Vehicle driven in four wheel low and low gear when on dirt roads or off road driving where steep grades dictate;
- All operators must possess a valid drivers license;
- Fuel or gasoline are not transported inside the passenger compartment;
- No vehicle is left running when unattended; and
- Parking brakes are used when vehicles are parked.

In the event of a vehicle incident, notify your Site Superintendent ***immediately*** and complete all required reports.

4.6 ACTIVITY HAZARD ANALYSES

Appendix D contains Activity Hazard Analyses (AHA) for primary site tasks. They contain detailed information on physical and chemical hazards, and provide control measures for these hazards. The AHA's will be field checked by the SS/SSO on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew.

5.0 Work and Support Areas

To prevent migration of contamination from personnel and equipment, work areas will be clearly specified as designated below prior to beginning operations. Each work area will be clearly identified using signs or physical barriers.

- Exclusion Zone
- Contamination Reduction Zone
- Support Zone

A log of all personnel visiting, entering or working on the site shall be maintained by the SS/SSO.. Visitors will attend a site orientation given by the SS/SSO and sign the HASP.

The following are standard safe work practices that apply to all site personnel and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking.
- 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.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by 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.

6.0 Protective Equipment

This section specifies the levels of personal protective equipment (PPE) which are or may be required for each principal activity performed at this site. All site personnel must be trained in the use of all PPE utilized. The PPE program contained in HS600 will be applied to project activities.

6.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the site work activities.

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Site mobilization, Installation of erosion and sediment controls, Site survey, Construction of decon pad, Backfilling, and Site restoration.	Level D	None	Generally none; Some clearing activities may require Tyvek coveralls to prevent insect bites/contact with poisonous plants or if in direct contact with contaminated soil (i.e. sweeping off the sides of the truck)	None	Hard-hat, Steel-toe work boots, hearing protection, leather work gloves.
Confirmation sampling,	Level D+	C	Sample gloves, goggles/face shield when in contact with liquid contamination	Upgrade: APR	Hard-hat, Steel-toe work boots, and hearing protection >85 dBA
Excavate, segregate, and stockpile contaminated soils	Level C	B	Poly-coated tyvek, sample inner gloves, PVC or Nitrile outer gloves, Latex booties or robars	Initial: APR Upgrade: SAR	Hard-hat, Steel –toe work boots, and hearing protection > 85 dBA
Decontamination and demolition of bio-cell	Level D+	Level C	PVC Rain Suit, surgical inner gloves, PVC or Nitrile outer gloves, Robars, splash shield attached to hard hat, foot and shin shields.	Initial – Air purifying respirator with organic vapor cartridge. Upgrade – Supplied air respirator (SAR)	Hard-hat, Steel – toe work boots, and hearing protection > 85 dBA
Equipment Decon	Level D+	None	Poly-coated Tyvek, inner sample gloves, outer nitrile gloves, goggles/face shield and boot covers	None	Hard-hat, Steel-toe work boots, and hearing protection >85 dBA
General SZ Activities	Level D	None	None	None	Hard-hat, Steel-toe boots, Safety glasses, hearing protection

6.2 PROTECTION LEVEL DESCRIPTIONS

This section lists the minimum requirements for each protection level. Modification to these requirements may have been noted above.

6.2.1 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

6.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Tyvek coveralls (for spotter inside the excavation)
- Poly-coated Tyvek (for equipment decontamination)
- Sample gloves
- Nitrile gloves
- Face shield and goggles (when projectiles or splashes pose a hazard)
- Rain gear if necessary

6.2.3 Level C

Level C consists of the following:

- Full-face, air-purifying respirator with appropriate cartridges
- Hooded Coveralls suited for the contamination involved
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Wrists and ankles must be taped

6.3 AIR PURIFYING RESPIRATORS

A NIOSH approved full-face respirator with appropriate air purifying cartridges will be used for level C work. The crew members working in Level C will wear respirators equipped with air-purifying cartridges approved for: 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 and radionuclides. Cartridges will be thrown away at the end of 8 hours based on Survivair manufacturer recommendations.

7.0 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.

7.1 PERSONNEL DECONTAMINATION

7.1.1 Decontamination Procedures

Level D+ Decontamination

- Go to end of EZ
- Remove and discard latex booties
- Remove outer gloves and discard
- Cross into CRZ (dirty side of respirator wash area)
- Remove protective suit (polycoated/regular tyvek)
- Remove inner sample gloves and discard
- Wash face and hands

Level C Decontamination

1. Go to end of EZ
2.
   a) Wash outer boots (Tingley or Robars) and stage to let dry; or

- Remove and discard latex booties
- Remove outer gloves and discard
- Remove outer suit (Saranex/polycoated/regular tyvek)
- Remove outer sample gloves and discard
- Cross into CRZ (dirty side of respirator wash area)
- Remove inner suit and discard, (if applicable)
- Remove and wash respirator (4 stages)
- Soap and water solution
- First rinse
- Disinfect respirator (1 cap full of bleach to 1 gallon of water)
- Final rinse
- Hang respirator to dry
- Remove inner sample gloves and discard
- Wash face and hands
- Showers will be mandatory at the end of each shift if airborne levels of site contaminants are above their respective PELs

Level B Decontamination (Airline/Egress)

3. Go to end of EZ

   a) Wash outer boots (Tingley or Robars) and stage to let dry; or

- Remove and discard latex booties
- Remove outer gloves and discard
- Cross into CRZ
- Disconnect airline, remove egress system, and disconnect egress from mask
- Stage egress bottle for cleaning

- Remove outer suit
- Remove outer sample gloves and discard
- Move to respirator wash area, and wash egress mask and related hose line
- Soap and water solution
- First rinse
- Disinfect respirator (1 cap full of bleach to 1 gallon of water)
- Final rinse
- Hang egress mask (upside down) and line to dry
- Remove inner sample gloves and discard.
- Wash face and hands

Level B Decontamination (SCBA)

4. Move to edge of EZ
5. Bottle change only

- Wash boots and gloves
- Move to edge of EZ and CRZ
- Remove face mask airline from regulator assembly
- Allow assistant to change bottle and reconnect face mask airline
- Return to EZ
- Wash outer boots and stage to let dry (Tingley or Robars only); or
- Remove and discard latex booties

6. Remove and discard outer gloves
7. Disconnect from SCBA bottle and stage SCBA (NOTE: SCBA mask remains on)
8. Remove outer suit (Saranex/polycoated/regular tyvek)
9. Remove outer sample gloves and discard
10. Cross into CRZ
11. Remove inner suit (if applicable)
12. Move to respirator wash area and wash SCBA facepiece and hose line

- Soap and water solution
- First rinse
- Disinfect respirator (1 cap full of bleach to 1 gallon of water)
- Final rinse

13. Hang mask to dry
14. Remove inner sample gloves and discard
15. Wash face and hands

7.1.2 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 clothing, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided based on the degree of injury.

7.1.3 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

7.2 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 SS/SSO.

7.3 DISPOSAL

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

7.4 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided based on the degree of injury.

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

8.0 Air Monitoring

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions from site contaminants. Principal contaminants of concern are listed in Section 4.0 of this HASP.

8.1 WORK AREA AIR MONITORING

Work area air monitoring under TO 0061 will consist of direct reading methods. Air monitoring will be conducted during soil excavation activities, demolition, and confirmatory sampling activities.

8.1.1 Direct Reading Air Monitoring

During soil excavation activities, direct reading air monitoring will be performed in the EZ to determine exposure to workers. A Mini aerosol monitor (MiniRam), PID, and LEL/O2 will be used to monitor for particulate concentrations, organic vapors, flammable and oxygen deficient atmospheres, and particulate concentrations in the breathing zone. A summary of air monitoring information is provided in the table below.

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
Mini Ram	Equipment Operators(EO), Recovery Technicians(RT), Sample Technicians (ST)	Initially, then periodically during contaminated soil excavation, demolition, and confirmation sampling activities	< 0.5 mg/m^3 ≥ 0.5 mg/m^3	Level D Level C Stop Work/Evaluate
PID	EO, RT. ST	Initially, then periodically during contaminated soil excavation, demolition, and confirmation sampling activities	< 0.5 ppm ≥ 0.5 ppm < 2.5 ppm ≥ 2.5 ppm	Level D Level C Stop Work/Evaluate
LEL/O_2	EO, RT, ST	Initially, then periodically during contaminated soil excavation, demolition, and confirmation sampling activities	>10% LEL <20.8% O_2 or 23.5% O2	Evacuate area

*Sustained levels above background for 5 minutes

8.2 INSTRUMENTATION

The following is a description of the air monitoring equipment to be used at this site.

8.2.1 Photoionization Detector (PID)

8.2.1.1 Type and Operational Aspects

PID Model PI 101 or equivalent

- Principle of Operation

  Ionization potential (IP) – The energy required to remove the outermost electron from a molecule; measured in electron volts (eV); characteristic property of a specific chemical.

  Photoionization – Using ultraviolet (UV) light to remove the outermost electron from a molecule.

  Energy of UV light (10.2, 9.5, 11.7 eV) must be equal to or greater than the IP to photoionize the molecule.

  Fan or pump is used to draw air into the detector where the contaminants are exposed to an UV light source (lamp).

  Ions are collected on a charged plate and produce a current directly proportional to the number of ionized molecules; current is amplified and displayed on the meter.

8.2.1.2 Calibration Method/Frequencies

The PID Model PI 101 is designed for trace gas analysis in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride, and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, H_2S, etc.).

IT will use a PID with a 10.2 eV lamp. This lamp has been determined to be most responsive to the contaminants on site. Optional probes containing lamps of 9.5 and 11.7 eV is interchangeable in use within individual read-out assemblies for different applications.

The approximate span settings for the probe that would give different readings of the amounts of trace gas of a particular species in a sample are based upon the relative photoionization sensitivities of various gases twice daily (beginning and end of shift).

It is recommended that calibration be checked twice each day (beginning and end of shift). The SSO will record and log such calibration information into an air monitoring notebook.

8.2.1.3 Preventative Maintenance

Maintenance of the PID Model PI 101 consists of cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or sub-assemblies.

8.2.2 Time Aerosol Monitor (Mini Ram Model PDM-3 and Model Pr100 Data Ram)

8.2.2.1 Type And Operational Aspects

- Principle of Operation

  Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume

The higher the dust concentration the more back-scattering of light to the sensor, resulting in increased readings

Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method

8.2.2.2 Calibration Methods/Frequencies

There is no calibration method or procedure for calibrating the mini-ram monitor. However, it is recommended that the mini-ram monitor be re-zeroed once a week. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

8.2.2.3 Preventative Maintenance

Maintenance of the mini-ran consists of replacement of filters and desiccant; battery replacement; and cleaning of the optical detection assembly.

8.2.3 Lower Explosive Limit/Oxygen (LEL/O_2) Meter

8.2.3.1 Types and Operational Aspects

MSA Watchman LEL/O2 Meter or equivalent

8.2.3.2 Principle of Operation

- Oxygen detector uses an electrochemical sensor; produces a minute electric current proportional to the oxygen content.
- Combustible gas indicators use a combustion chamber containing a filament that ignites flammable vapors; filament is heated or coated with a catalyst (platinum) to facilitate combustion.
- Filament is part of a balanced resistor circuit; combustion in the chamber causes the filament temperature to increase; results in increased filament resistance.
- Change in the filament's resistance causes an imbalance in the circuit proportional to the percent of the lower explosive limit (% LEL).
- Concentrations greater than the LEL and lower than the upper explosive limit (UEL) will read 100% LEL; combustible atmosphere present.
- Concentrations greater than the UEL will read above 100% LEL then return to zero. (NOTE: Some devices have catchment mechanisms which will cause the needle to remain at 100% until the meter is reset.) This type of response indicates the gas mixture is too rich to burn and is not combustible. The danger is that the addition of air to the gas mixture could bring it into the flammable range (less than the UEL).
- Oxygen meter set at the factory to alarm at 19.5% (oxygen deficient atmosphere) combustible gas meter set by the user to alarm at 10% LEL.

8.2.3.3 Calibration Methods/Frequencies

Before the calibration of the combustible gas indicator can be checked, the unit must be in operating condition. The combustible gas indicator (LEL) is normally calibrated on pentane as being representative of the flammability characteristics of most commonly encountered combustible gases. The meter scale is calibrated from zero to 100% LEL, which corresponds in actual volume concentrations of 0 to approximately 14% pentane in air. A booklet of response curves is supplied with the Watchman Meter. These curves may be used to interpret meter readings when sampling combustible gases other than pentane.

It is recommended that calibration be checked before and after using each time. The PSO will record and log such calibration information into an air monitoring notebook. The O_2 meter is calibrated by adjusting the O_2 control knob to 20.8% while the meter is operated in a fresh air atmosphere.

8.2.3.4 Preventative Maintenance

The primary maintenance of unit is the rechargeable 2.4 volt nickel cadmium battery. Recommended charging time is 16 hours. It may be left on charge for longer periods without damaging the battery. The battery sometimes will not supply full power capacity after repeated partial use between charging. Therefore, it is recommended that the battery be exercised at least once a month by running for eight to 10 hours and recharged. If the instrument has not been used for 30 days, the battery should be charged prior to use.

8.3 AIR MONITORING LOG

The SS/SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include instrument used, wind direction, work process, etc. The IT CIH and/or HSM may periodically review this data.

8.4 CALIBRATION REQUIREMENTS

The PID will be calibrated daily before and after use. A separate log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

8.5 AIR MONITORING RESULTS

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

9.0 Emergency Response

9.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the site, OHM/IT will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition site personnel will receive training during the site orientation concerning proper emergency response procedures.

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

Fire/Explosion	• The potential for human injury exists. • 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.
Natural Disaster	• A rainstorm 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). • 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 Management Agency (EMA) 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 on site to summon assistance in an emergency.

9.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the Site Superintendent/Site Safety Officer, 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 • Excessive noise
Mechanical Hazards	• Pinch points • 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/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
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Following all OHM/IT standard operating procedures

9.3 ACTIONS

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 Superintendent. In the event an emergency occurs and the emergency coordinator is not on site, the SS 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.

9.3.1 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/IT will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required. OHM/IT 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.

9.3.2 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.
- Notify local Emergency Response Teams if their help is necessary to control the incident. Table 9.1 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 facility Fire Department.
- Notify client representative
- Notify OHM/IT 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, 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.

9.4 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 that 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 feet 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.

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 9.1.

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
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the main entrance to the IT/OHM site, 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.

9.5 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.

9.5.1 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. The crew Superintendent will have a two-way radio. Only the emergency coordinator will initiate total site evacuation, however, in his absence, decision to preserve the health and safety of employees will take precedence.

9.5.2 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.

- The emergency coordinator or designee will make a final tally of persons. No attempt to find persons not accounted for will involve endangering lives of OHM/IT or other employees by re-entry 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 Manager. 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 the emergency coordinator gives clearance. 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.

9.6 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 9.1 provide a quick reference guide to follow in the event of a major spill.

9.6.1 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.

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.

9.6.2 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 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 9.1)

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), OHM/IT'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/IT 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.

9.6.3 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
- Emergency signal horn

9.6.4 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 following equipment will be dedicated for spill cleanup:

- Shovels
- Sorbent sheets (diapers) for absorbing liquid spills.
- 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.

9.7 EMERGENCY CONTINGENCY PLAN

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

9.8 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies. The SS/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.

9.8.1 Response

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

The work crew Superintendent will immediately make radio contact with the on-site emergency coordinator to alert him of a medical emergency situation. The Superintendent 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 Site Safety Officer. 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 Superintendent 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 him/her quickly taken to the victim. Any injury within the EZ will be evacuated by OHM/IT 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 Site Manager 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 Site Superintendent.

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 SS/SSO. An accident/injury/illness report will be completely and properly filled out and submitted to the Health and Safety Director/Project CIH, in accordance with OHM/IT's reporting procedures.

A list of emergency telephone numbers is given in Table 9.1.

9.8.2 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

9.9 FIRE CONTINGENCY MEASURES

OHM/IT 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.
- "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.

9.9.1 Response

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

- Anyone who sees a fire will notify his or her Superintendent 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 worker has extinguished a small fire, the emergency coordinator will be notified.

9.10 HAZARDOUS WEATHER CONTINGENCY MEASURES

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

- Lightning
- Heavy Rains
- High Winds

9.10.1 Response

- All equipment will be shut down and secured to prevent damage.

- Personnel will be moved to safe refuge. 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.

9.10.2 Notification

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

- OHM/IT employees and subcontractors
- Client representative
- Local Emergency Management Agency

9.11 SPILL/RELEASE CONTINGENCY MEASURES

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

9.11.1 Response

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. Attempt to stop the spill at the source, if possible. 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. 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 CLIENT REPRESENTATIVE 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
- Personal safety equipment
- Steel drums
- Miscellaneous hand tools

The major supply of material and equipment will be located in the Support Zone. Smaller supplies will 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 CLIENT REPRESENTATIVE. 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 CLIENT REPRESENTATIVE and obtain his concurrence with the remedial action plan.

10.0 Training Requirements

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Acknowledgment in Appendix C.

Site-specific training for activities involved in TO 0061 will include potential site contaminants, Hazard Communication as per 29 CFR 1926.59 site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS before any site work activities begin. Outlines of the orientation for OHM/IT / sub-contract personnel and visitors are presented below:

OHM/IT/SUBCONTRACTORS	VISITOR ORIENTATION
• HASP sign off • Sign in/out procedures • Site background • Chain of command • Rules and regulations • Hours of work • Absences • Equipment • Emergency Information • Emergency signal • Gathering point • Responsibilities/roles • Emergency phone numbers • Work Zones • Contaminants and Material Safety Data Sheets (MSDS) [Hazard Communication Program] • Activity Hazard Analysis (AHAs) • Forms, site-specific • Incident Reporting	• Sign in/out procedures • Review of Site map • Work Zones in progress • Hazard Communication • Emergency plan/signals • Training/medical requirements • Zones/areas open to visitors

11.0 Medical Surveillance Program

All OHM/IT 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/IT's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and IT/OHM's occupational health physician. Other medical consultants are retained when additional expertise is required.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120/1926.65(f).

The following information is provided in the event that medical attention is necessary.

The IT/OHM Medical Director is:

Dr. Jerry H. Berke, MD, MPH
600 West Cumming Park
Suite 3400
Woburn, Mass 01801-6350
(800) 350-8581

Non-emergency work related injuries:

Now Medical Center
4323 D Indian River Road
Chesapeake, VA 23325
(757) 424-4300 (phone)
(757) 523-0632 (fax)
Contact: Fred Burt

The IT/OHM Medical Director and the HSC, CIH or HSM will be immediately notified of any suspected exposures to hazardous materials/wastes.

APPENDIX A
MATERIAL SAFETY DATA SHEETS
(MSDS's)

MSDS's for site contaminants listed in section 3 are included in this section. A listing of chemicals that may be brought to the site are listed below. Copies of the MSDS' for those chemicals listed below will be maintained in the IT site office.

Materials Brought to the Site:

Diesel
Gasoline

* *
NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
oduced by: US National Institute for Occupational Safety and Health *
ovided by: Canadian Centre for Occupational Health and Safety *
* NPG diskette - March 1998 *

CHEMICAL NAME : **Aluminum**
SYNONYMS : Aluminium
Aluminum metal
Aluminum powder
Elemental **aluminum**
CAS REGISTRY NUMBER : 7429-90-5
RTECS NUMBER : BD0330000
DOT/NAERG NUMBERS : 1309 / 170 (powder, coated)
1396 138 (powder, uncoated)
9260 169 (molten)
ICSC RECORD NUMBER : 22
MOLECULAR FORMULA : Al

DESCRIPTION : Silvery-white, malleable, ductile, odorless metal.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
TIME WEIGHTED AVERAGE (TWA) : 10 mg/m3 (total particulate)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (respirable particulate)

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 15 mg/m3 (total particulate)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (respirable particulate)

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 15 mg/m3 (total particulate)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (respirable particulate)

IDLH CONCENTRATION : Not determined yet.

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
To be added later.

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
No recommendation is made specifying the need for personal protective equipment for the body.

EYE PROTECTION :
No recommendation is made specifying the need for eye protection.

SKIN CLEAN-UP :
No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

CLOTHING/PPE REMOVAL :
No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

CLOTHING/PPE CHANGE :
No recommendation is made specifying the need for the worker to change clothing after the workshift.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irritation eyes, skin, respiratory system

TARGET ORGANS :
Eyes, skin, respiratory system

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. Other measures are usually unnecessary.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT	: 27.0
BOILING POINT	: 4221 deg F
FREEZING POINT	: MLT: 1220 deg F
SOLUBILITY	: Insoluble
VAPOR PRESSURE	: 0 mmHg (approx)
SPECIFIC GRAVITY	: 2.70

FLASH POINT	: Not applicable.
LOWER EXPLOSIVE LIMIT	: Not applicable.
UPPER EXPLOSIVE LIMIT	: Not applicable.
IONIZATION POTENTIAL	: Not applicable.

FLAMMABILITY CLASS :
Combustible Solid, finely divided dust is easily ignited; may cause explosions.

INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers & acids, halogenated hydrocarbons

NOTE :
Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.

MEASUREMENT METHOD :
Particulate filter; Nitric acid; Flame atomic absorption spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition #7013 Also #7300, Elements

*** END OF RECORD ***

* *
* NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
* Produced by: US National Institute for Occupational Safety and Health *
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* NPG diskette - March 1998 *

CHEMICAL NAME : **Antimony**
SYNONYMS : **Antimony** metal
Antimony powder
Stibium
CAS REGISTRY NUMBER : 7440-36-0
RTECS NUMBER : CC4025000
DOT/NAERG NUMBERS : 1549 / 157 (inorganic compounds, n.o.s.)
2871 170 (powder)
3141 157 (inorganic liquid compounds, n.o.s.)
CCOHS RECORD NUMBER : 36
MOLECULAR FORMULA : Sb

DESCRIPTION : Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
NIOSH REL*:
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
[NOTE : The REL also applies to other **antimony** compounds (as Sb).]

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
[NOTE : The PEL also applies to other **antimony** compounds (as Sb).]

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
[NOTE : The PEL also applies to other **antimony** compounds (as Sb).]

IDLH CONCENTRATION : 50 mg/m3 (as Sb)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH AND OSHA PEL

UP TO 5 mg/m3:
Any dust and mist respirator except single-use and quarter-mask respirators (APF = 10). IF NOT present as a fume
OR Any supplied-air respirator (APF = 10)

UP TO 12.5 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with a dust and mist filter (APF = 25). IF NOT present as a fume

UP TO 25 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 50 mg/m3:

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly

TARGET ORGANS :
Eyes, skin, respiratory system, cardiovascular system

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :

If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT	: 121.8
BOILING POINT	: 2975 deg F
FREEZING POINT	: MLT: 1166 deg F
SOLUBILITY	: Insoluble
VAPOR PRESSURE	: 0 mmHg (approx)
SPECIFIC GRAVITY	: 6.69

FLASH POINT	: Not applicable.
LOWER EXPLOSIVE LIMIT	: Not applicable.
UPPER EXPLOSIVE LIMIT	: Not applicable.
IONIZATION POTENTIAL	: Not applicable.

FLAMMABILITY CLASS :
Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.

INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers, acids, halogenated acids

NOTE :
Stibine is formed when **antimony** is exposed to nascent (freshly formed) hydrogen.

MEASUREMENT METHOD :
Particulate filter; Acid; Flame atomic absorption spectrometry; NIOSH Manual of Analytical Methods, 2nd edition: Vol. 4 P&CAM #261

*** END OF RECORD ***

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*              NIOSH POCKET GUIDE TO CHEMICAL HAZARDS                  *
*                                                                      *
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  Provided by: Canadian Centre for Occupational Health and Safety      *
  * * * * * * * * * * * * * * * * * * * * * * * NPG diskette - March 1998 *
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CHEMICAL NAME : **Arsenic (inorganic compounds,** as As)
SYNONYMS : Arsenic metal: Arsenia
Other synonyms vary depending upon the specific As compound.
CAS REGISTRY NUMBER : 7440-38-2 (metal)
RTECS NUMBER : CG0525000 (metal)
DOT/NAERG NUMBERS : 1558 / 152 (metal)
1562 152 (dust)
CCOHS RECORD NUMBER : 38
MOLECULAR FORMULA : As (metal)

NOTE : OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite & all inorganic compounds containing arsenic **except**
ARSINE.
DESCRIPTION : Metal: Silver-gray or tin-white, brittle, odorless solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
CEILING EXPOSURE LIMIT (C) : 0.002 mg/m3 15-minute
NOTE : See Appendix A

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
[1910.1018]
TIME WEIGHTED AVERAGE (TWA) : 0.010 mg/m3

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
[1910.1018]
TIME WEIGHTED AVERAGE (TWA) : 0.010 mg/m3

IDLH CONCENTRATION : Potential NIOSH carcinogen.
[5 mg/m3 (as As)]

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH REL

AT CONCENTRATIONS ABOVE THE NIOSH REL, OR WHERE THERE IS NO REL, AT ANY DETECTABLE CONCENTRATION:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated./The worker should wash daily at the end of each work shift.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

PPE FACILITIES :
Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection., Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Skin absorption; Skin and/or eye contact; Ingestion

POTENTIAL SYMPTOMS OF EXPOSURE :
Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, potential occupational carcinogen

TARGET ORGANS :
Liver, kidneys, skin, lungs, lymphatic system

POTENTIAL OCCUPATIONAL CARCINOGEN :
lung & lymphatic cancer

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT	: 74.9
BOILING POINT	: Sublimes
FREEZING POINT	: MLT: 1135 deg F (Sublimes)
SOLUBILITY	: Insoluble

VAPOR PRESSURE : 0 mmHg (approx)
SPECIFIC GRAVITY : 5.73 (metal)

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.
INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers, bromine azide
NOTE :
Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.

MEASUREMENT METHOD :
Particulate filter; Acid; Hydride generation atomic absorption spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition #7900 Also #7300, Elements

*** EXPOSURE LIMIT APPENDICES ***

NIOSH REL NOTES
Appendix A:
New Policy
For the past 20 plus years, NIOSH has subscribed to a carcinogen policy that was published in 1976 by Edward J. Fairchild, II, Associate Director for Cincinnati Operations, which called for "no detectable exposure levels for proven carcinogenic substances" (Annals of the New York Academy of Sciences, 271:200-207, 1976). This was in response to a generic OSHA rulemaking on carcinogens. Because of advances in science and in approaches to risk assessment and risk management, NIOSH has adopted a more inclusive policy. NIOSH recommended exposure limits (RELs) will be based on risk evaluations using human or animal health effects data, and on an assessment of what levels can be feasibly achieved by engineering controls and measured by analytical techniques. To the extent feasible, NIOSH will project not only a no-effect exposure, but also exposure levels at which there may be residual risks. This policy applies to all workplace hazards, including carcinogens, and is responsive to Section 20(a)(3) of the Occupational Safety and Health Act of 1970, which charges NIOSH to ". . .describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience."

The effect of this new policy will be the development, whenever possible, of quantitative RELs that are based on human and/or animal data, as well as on the consideration of technological feasibility for controlling workplace exposures to the REL. Under the old policy, RELs for most carcinogens were non-quantitative values labeled "lowest feasible concentration (LFC)." [Note: There are a few exceptions to LFC RELs for carcinogens (e.g., RELs for asbestos, formaldehyde, benzene, and ethylene oxide are quantitative values based primarily on analytical limits of detection or technological feasibility). Also, in 1989, NIOSH adopted several quantitative RELs for carcinogens from OSHA's permissible exposure limit (PEL) update.]

Under the new policy, NIOSH will also recommend the complete range of respirators (as determined by the NIOSH Respirator Decision Logic) for carcinogens with quantitative RELs. In this way, respirators will be consistently recommended regardless of whether a substance is a carcinogen or a non-carcinogen.

Old Policy
In the past, NIOSH identified numerous substances that should be treated as potential occupational carcinogens even though OSHA might not have

identified them as such. In determining their carcinogenicity, NIOSH used the OSHA classification outlined in 29 CFR 1990.103, which states in part:

"Potential occupational carcinogen means any substance, or combination or mixture of substances, which causes an increased incidence of benign and/or malignant neoplasms, or a substantial decrease in the latency period between exposure and onset of neoplasms in humans or in one or more experimental mammalian species as the result of any oral, respiratory or dermal exposure, or any other exposure which results in the induction of tumors at a site other than the site of administration. This definition also includes any substance which is metabolized into one or more potential occupational carcinogens by mammals."

When thresholds for carcinogens that would protect 100 percent of the population had not been identified, NIOSH usually recommended that occupational exposures to carcinogens be limited to the lowest feasible concentration. To ensure maximum protection from carcinogens through the use of respiratory protection, NIOSH also recommended that only the most reliable and protective respirators be used. These respirators include (1) a self-contained breathing apparatus (SCBA) that has a full facepiece and is operated in a positive-pressure mode, or (2) a supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in a pressure-demand or other positive-pressure mode.

*** END OF RECORD ***

* *
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*
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* NPG diskette - March 1998 *

CHEMICAL NAME : **Chromium** metal
SYNONYMS : Chrome
Chromium
CAS REGISTRY NUMBER : 7440-47-3
RTECS NUMBER : GB4200000
CCOHS RECORD NUMBER : 141
MOLECULAR FORMULA : Cr

DESCRIPTION : Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
NOTE : See Appendix C

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
NOTE : See Appendix C
[NOTE : The PEL also applies to insoluble **chromium** salts.]

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
NOTE : See Appendix C
[NOTE : The PEL also applies to insoluble **chromium** salts.]

IDLH CONCENTRATION : 250 mg/m3 (as Cr)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH REL

UP TO 2.5 mg/m3:
Any dust and mist respirator (APF = 5). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 5 mg/m3:
Any dust and mist respirator except single-use and quarter-mask respirators (APF = 10). Substance reported to cause eye irritation or damage; requires eye protection
OR Any supplied-air respirator (APF = 10). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 12.5 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25). Substance reported to cause eye irritation or damage; requires eye protection
OR Any powered, air-purifying respirator with a dust and mist filter (APF = 25). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 25 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50). Substance reported to cause eye irritation or damage; requires eye protection

OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 250 mg/m3:
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 2000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
No recommendation is made specifying the need for personal protective equipment for the body.

EYE PROTECTION :
No recommendation is made specifying the need for eye protection.

SKIN CLEAN-UP :
No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

CLOTHING/PPE REMOVAL :
No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

CLOTHING/PPE CHANGE :
No recommendation is made specifying the need for the worker to change clothing after the workshift.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irritation eyes, skin; lung fibrosis (histologic)

TARGET ORGANS :
Eyes, skin, respiratory system

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, wash the contaminated skin with soap and water.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical

attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT : 52.0
BOILING POINT : 4788 deg F
FREEZING POINT : MLT: 3452 deg F
SOLUBILITY : Insoluble
VAPOR PRESSURE : 0 mmHg (approx)
SPECIFIC GRAVITY : 7.14

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.
INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers (such as hydrogen peroxide), alkalis

MEASUREMENT METHOD :
Particulate filter; Acid; Flame atomic absorption spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition [#7024]

*** EXPOSURE LIMIT APPENDICES ***

NIOSH REL NOTES
Appendix C: The NIOSH REL (10-hour TWA) is 0.001 mg Cr(VI)/m3 for all hexavalent **chromium** [Cr(VI)] compounds. NIOSH considers all Cr(VI) compounds (including chromic acid, tert-butyl chromate, zinc chromate, and chromyl chloride) to be potential occupational carcinogens. The NIOSH REL (8-hour TWA) is 0.5 mg Cr/m3 for **chromium** metal and **chromium**(II) and **chromium**(III) compounds.

OSHA PEL NOTES
Appendix C: The OSHA PEL is 0.1 mg CrO3/m3 (ceiling) for chromic acid and chromates (including tert-butyl chromate with a "skin" designation and zinc chromate); 0.5 mg Cr/m3 (8-hour TWA) for **chromium**, soluble chromic, chromous salts; and 1 mg Cr/m3 (8-hour TWA) for **chromium** metal and insoluble salts.

*** END OF RECORD ***

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CHEMICAL NAME : **Copper (dusts and mists,** as Cu)
SYNONYMS : Copper metal dusts
Copper metal fumes
CAS REGISTRY NUMBER : 7440-50-8
RTECS NUMBER : GL5325000
CCOHS RECORD NUMBER : 150
MOLECULAR FORMULA : Cu

DESCRIPTION : Reddish, lustrous, malleable, odorless solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
NIOSH REL*:
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
[NOTE : The REL also applies to other copper compounds (as Cu) except Copper fume.]

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
[NOTE : The PEL also applies to other copper compounds (as Cu) except copper fume.]

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
[NOTE : The PEL also applies to other copper compounds (as Cu) except copper fume.]

IDLH CONCENTRATION : 100 mg/m3 (as Cu)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH AND OSHA PEL

UP TO 5 mg/m3:
Any dust and mist respirator (APF = 5). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 10 mg/m3:
Any dust and mist respirator except single-use and quarter-mask respirators (APF = 10). Substance reported to cause eye irritation or damage; requires eye protection. IF NOT present as a fume
OR Any supplied-air respirator (APF = 10). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 25 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25). Substance reported to cause eye irritation or damage; requires eye protection
OR Any powered, air-purifying respirator with a dust and mist filter (APF = 25). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 50 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50). Substance reported to cause eye

irritation or damage; requires eye protection
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 100 mg/m3:
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 2000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia

TARGET ORGANS :
Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to

fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

ESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT : 63.5
BOILING POINT : 4703 deg F
FREEZING POINT : MLT: 1981 deg F
SOLUBILITY : Insoluble
VAPOR PRESSURE : 0 mmHg (approx)
SPECIFIC GRAVITY : 8.94

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Noncombustible Solid in bulk form, but powdered form may ignite.
INCOMPATIBILITIES AND REACTIVITIES :
Oxidizers, alkalis, sodium azide, acetylene

MEASUREMENT METHOD :
Particulate filter; Acid; Flame atomic absorption spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition [#7029]

*** END OF RECORD ***

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*              NIOSH POCKET GUIDE TO CHEMICAL HAZARDS                  *
*                                                                      *
* Produced by: US National Institute for Occupational Safety and Health *
  Provided by: Canadian Centre for Occupational Health and Safety      *
  * * * * * * * * * * * * * * * * * * * * * * * * * NPG diskette - March 1998 *
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CHEMICAL NAME : **Lead**
SYNONYMS : **Lead** metal
Plumbum
CAS REGISTRY NUMBER : 7439-92-1
RTECS NUMBER : OF7525000
CCOHS RECORD NUMBER : 368
MOLECULAR FORMULA : Pb

DESCRIPTION : A heavy, ductile, soft, gray solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
NIOSH REL*:
TIME WEIGHTED AVERAGE (TWA) : 0.100 mg/m3
NOTE : See Appendix C
[NOTE : The REL also applies to other **lead** compounds (as Pb).]

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
[1910.1025]
TIME WEIGHTED AVERAGE (TWA) : 0.050 mg/m3
NOTE : See Appendix C
[NOTE : The PEL also applies to other **lead** compounds (as Pb).]

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
[1910.1025]
TIME WEIGHTED AVERAGE (TWA) : 0.050 mg/m3
NOTE : See Appendix C
[NOTE : The PEL also applies to other **lead** compounds (as Pb).]

IDLH CONCENTRATION : 100 mg/m3 (as Pb)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON OSHA PEL

UP TO 0.5 mg/m3:
Any air-purifying respirator with a high-efficiency particulate filter (APF = 10)
OR Any supplied-air respirator (APF = 10)

UP TO 1.25 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with a high-efficiency particulate filter (APF = 25)

UP TO 2.5 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 50 mg/m3:

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

UP TO 100 mg/m3:
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 2000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should wash daily at the end of each work shift.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

LOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Weakness, lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension

TARGET ORGANS :
Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, promptly flush the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and flush the skin with water. If irritation persists after washing, get medical attention.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT : 207.2
BOILING POINT : 3164 deg F
FREEZING POINT : MLT: 621 deg F
SOLUBILITY : Insoluble
VAPOR PRESSURE : 0 mmHg (approx)
SPECIFIC GRAVITY : 11.34

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Noncombustible Solid in bulk form.
INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers, hydrogen peroxide, acids

MEASUREMENT METHOD :
Particulate filter; Nitric acid/Hydrogen peroxide; Flame atomic absorption spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition [#7082] [Also #7105, #7300]

*** EXPOSURE LIMIT APPENDICES ***

IOSH REL NOTES
Appendix C: NIOSH considers "**Lead**" to mean metallic **lead**, **lead** oxides, and **lead** salts (including organic salts such as **lead** soaps but excluding **lead** arsenate). The NIOSH REL for **lead** (10-hour TWA) is 0.100 mg/m3; air concentrations should be maintained so that worker blood **lead** remains less than 0.060 mg Pb/100 g of whole blood.

OSHA PEL NOTES
Appendix C: OSHA considers "**Lead**" to mean metallic **lead**, all inorganic **lead** compounds (**lead** oxides and **lead** salts), and a class of organic compounds called soaps; all other **lead** compounds are excluded from this definition. The OSHA PEL (8-hour TWA) is 0.050 mg/m3; other OSHA requirements can be found in 29 CFR 1910.1025. The OSHA PEL (8-hour TWA) for **lead** in "non-ferrous foundries with less than 20 employees" is 0.075 mg/m3.

*** END OF RECORD ***

* *
NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
Produced by: US National Institute for Occupational Safety and Health *
Provided by: Canadian Centre for Occupational Health and Safety *
* NPG diskette - March 1998 *

CHEMICAL NAME : **Manganese compounds and fume (as Mn)**
SYNONYMS : Manganese metal: Colloidal manganese
Manganese-55
Synonyms of other compounds vary depending upon the specific manganese compound.
CAS REGISTRY NUMBER : 7439-96-5 (metal)
RTECS NUMBER : OO9275000 (metal)
CCOHS RECORD NUMBER : 379
MOLECULAR FORMULA : Mn (metal)

DESCRIPTION : A lustrous, brittle, silvery solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
NIOSH REL*:
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
SHORT TERM EXPOSURE LIMIT (STEL) : 3 mg/m3
[NOTE : Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl
cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
CEILING EXPOSURE LIMIT (C) : 5 mg/m3
[NOTE : Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl
manganese tricarbonyl.]

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
Compounds:
CEILING EXPOSURE LIMIT (C) : 5 mg/m3
Fume:
TIME WEIGHTED AVERAGE (TWA) : 1 mg/m3
SHORT TERM EXPOSURE LIMIT (STEL) : 3 mg/m3
[NOTE : Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]

IDLH CONCENTRATION : 500 mg/m3 (as Mn)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH REL

UP TO 10 mg/m3:
Any dust and mist respirator except single-use and quarter-mask respirators (APF = 10). IF NOT present as a fume
OR Any supplied-air respirator (APF = 10)

UP TO 25 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with a dust and mist filter (APF = 25). IF NOT present as a fume

UP TO 50 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)

OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 500 mg/m3:
Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
No recommendation is made specifying the need for personal protective equipment for the body.

EYE PROTECTION :
No recommendation is made specifying the need for eye protection.

SKIN CLEAN-UP :
No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

CLOTHING/PPE REMOVAL :
No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

CLOTHING/PPE CHANGE :
No recommendation is made specifying the need for the worker to change clothing after the workshift.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion

POTENTIAL SYMPTOMS OF EXPOSURE :
Parkinson's; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); fatigue; kidney damage

TARGET ORGANS :
Respiratory system, central nervous system, blood, kidneys

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :

If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

ECULAR WEIGHT : 54.9
LING POINT : 3564 deg F
FREEZING POINT : MLT: 2271 deg F
SOLUBILITY : Insoluble
VAPOR PRESSURE : 0 mmHg (approx)
SPECIFIC GRAVITY : 7.20 (metal)

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Metal: Combustible Solid
INCOMPATIBILITIES AND REACTIVITIES :
Oxidizers
NOTE :
Will react with water or steam to produce hydrogen.

MEASUREMENT METHOD :
Particulate filter; Acid; Inductively coupled plasma; NIOSH Manual of Analytical Methods (NMAM), 4th edition #7300, Elements

*** END OF RECORD ***

* NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
* Produced by: US National Institute for Occupational Safety and Health *
Provided by: Canadian Centre for Occupational Health and Safety *
* NPG diskette - March 1998 *

CHEMICAL NAME : Mercury compounds [except (organo) alkyls] (as Hg)
SYNONYMS : **Mercury metal: Colloidal mercury**
Metallic mercury
Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.
CAS REGISTRY NUMBER : 7439-97-6 (metal)
RTECS NUMBER : OV4550000 (metal)
DOT/NAERG NUMBERS : 2809 / 172
CCOHS RECORD NUMBER : 383
MOLECULAR FORMULA : Hg (metal)

DESCRIPTION : Metal: Silver-white, heavy, odorless liquid.
DESCRIPTION NOTE : "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
Hg Vapor:
TIME WEIGHTED AVERAGE (TWA) : 0.05 mg/m3
SKIN PRECAUTION : Potential for skin absorption.
Other:
CEILING EXPOSURE LIMIT (C) : 0.1 mg/m3
SKIN PRECAUTION : Potential for skin absorption.

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
CEILING EXPOSURE LIMIT (C) : 0.1 mg/m3

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
Hg Vapor:
TIME WEIGHTED AVERAGE (TWA) : 0.05 mg/m3
SKIN PRECAUTION : Potential for skin absorption. Other non-alkyl compounds:
CEILING EXPOSURE LIMIT (C) : 0.1 mg/m3
SKIN PRECAUTION : Potential for skin absorption.

IDLH CONCENTRATION : 10 mg/m3 (as Hg)

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
Mercury vapor:
BASED ON NIOSH REL

UP TO 0.5 mg/m3:
Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern (APF = 10). End of service life indicator (ESLI) required.
OR Any supplied-air respirator (APF = 10)

UP TO 1.25 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern (APF = 25). End of service life indicator (ESLI) required. (canister)

UP TO 2.5 mg/m3:

Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern (APF = 50). End of service life indicator (ESLI) required.
OR Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern (APF = 50). End of service life indicator (ESLI) required.
OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern (APF = 50)(canister)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 10 mg/m3:
Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus
Other mercury compounds:
BASED ON NIOSH AND OSHA PEL

UP TO 1 mg/m3:
Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern (APF = 10). End of service life indicator (ESLI) required.
OR Any supplied-air respirator (APF = 10)

UP TO 2.5 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern (APF = 25). End of service life indicator (ESLI) required. (canister)

UP TO 5 mg/m3:
Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern (APF = 50). End of service life indicator (ESLI) required.
OR Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern (APF = 50). End of service life indicator (ESLI) required.
OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern (APF = 50)(canister)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 10 mg/m3:
Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
No recommendation is made specifying the need for eye protection.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Skin absorption; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis pneumonitis; tremor, insomnia, irritability, indecision, headache, fatigue, weakness; stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

TARGET ORGANS :
Eyes, skin, respiratory system, central nervous system, kidneys

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT : 200.6
BOILING POINT : 674 deg F
FREEZING POINT : -38 deg F
SOLUBILITY : Insoluble
VAPOR PRESSURE : 0.0012 mmHg
SPECIFIC GRAVITY : 13.6 (metal)

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Unknown for lack of data.
FLAMMABILITY CLASS :
Metal: Noncombustible Liquid
INCOMPATIBILITIES AND REACTIVITIES :
Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

MEASUREMENT METHOD :
Hopcalite; Acid; AA cold: NIOSH Manual of Analytical Methods (NMAM), 4th edition [#6009, Mercury]

*** END OF RECORD ***

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* NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
* Produced by: US National Institute for Occupational Safety and Health *
Provided by: Canadian Centre for Occupational Health and Safety *
* NPG diskette - March 1998 *

CHEMICAL NAME : **Silver (metal dust and soluble compounds,** as Ag)
SYNONYMS : Silver metal; Argentum
Synonyms of soluble silver compounds such as Silver nitrate (AgNO3) vary depending upon the specific compound.
CAS REGISTRY NUMBER : 7440-22-4 (metal)
RTECS NUMBER : VW3500000 (metal)
CCOHS RECORD NUMBER : 557
MOLECULAR FORMULA : Ag (metal)

DESCRIPTION : Metal: White, lustrous solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
TIME WEIGHTED AVERAGE (TWA) : 0.01 mg/m3

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 0.01 mg/m3

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 0.01 mg/m3

IDLH CONCENTRATION : 10 mg/m3 (as Ag)

*** RESPIRATORY PROTECTION ***

COMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH AND OSHA PEL

UP TO 0.25 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25). Substance causes eye irritation or damage; requires eye protection
OR Any powered, air-purifying respirator with a high-efficiency particulate filter (APF = 25). Substance causes eye irritation or damage; requires eye protection

UP TO 0.5 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 10 mg/m3:
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 2000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced. (AgNO3)

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

PPE FACILITIES :
Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance

TARGET ORGANS :
Nasal septum, skin, eyes

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, flush the contaminated skin with water. Where there is evidence of skin irritation, get medical attention.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT	: 107.9
BOILING POINT	: 3632 deg F
FREEZING POINT	: MLT: 1761 deg F
SOLUBILITY	: Insoluble
VAPOR PRESSURE	: 0 mmHg (approx)
SPECIFIC GRAVITY	: 10.49 (metal)
FLASH POINT	: Not applicable.

LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IONIZATION POTENTIAL : Not applicable.
FLAMMABILITY CLASS :
Metal: Noncombustible Solid, but flammable in form of dust or powder.
COMPATIBILITIES AND REACTIVITIES :
Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid

MEASUREMENT METHOD :
Particulate filter; Acid; Inductively coupled plasma; NIOSH Manual of Analytical Methods (NMAM), 4th edition [#7300, Elements]

*** END OF RECORD ***

* *
* NIOSH POCKET GUIDE TO CHEMICAL HAZARDS *
*
* Produced by: US National Institute for Occupational Safety and Health *
Provided by: Canadian Centre for Occupational Health and Safety *
* NPG diskette - March 1998 *

CHEMICAL NAME : 2,4,6-Trinitrotoluene
SYNONYMS : 1-Methyl-2,46-trinitrobenzene
TNT
Trinitrotoluene
sym-Trinitrotoluene
Trinitrotoluol
CAS REGISTRY NUMBER : 118-96-7
RTECS NUMBER : XU0175000
DOT/NAERG NUMBERS : 1356 / 113 (wet)
CCOHS RECORD NUMBER : 641
MOLECULAR FORMULA : CH3C6H2(NO2)3

DESCRIPTION : Colorless to pale-yellow, odorless solid or crushed flakes.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
SKIN PRECAUTION : Potential for skin absorption.

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 1.5 mg/m3
SKIN PRECAUTION : Potential for skin absorption.

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 0.5 mg/m3
SKIN PRECAUTION : Potential for skin absorption.

IDLH CONCENTRATION : 500 mg/m3

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH REL

UP TO 5 mg/m3:
Any supplied-air respirator (APF = 10). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 12.5 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25). Substance reported to cause eye irritation or damage; requires eye protection

UP TO 25 mg/m3:
Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 500 mg/m3:
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 2000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency articulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
Wear appropriate personal protective clothing to prevent skin contact.

EYE PROTECTION :
Wear appropriate eye protection to prevent eye contact.

SKIN CLEAN-UP :
The worker should immediately wash the skin when it becomes contaminated./The worker should wash daily at the end of each work shift.

CLOTHING/PPE REMOVAL :
Work clothing that becomes wet or significantly contaminated should be removed and replaced.

CLOTHING/PPE CHANGE :
Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation; Skin absorption; Ingestion; Skin and/or eye contact

POTENTIAL SYMPTOMS OF EXPOSURE :
Irrrit skin, mucous membrane ; liver damage, jaundice; cyanosis; sneezing; cough, sore throat; peripheral neuropathy, muscle pain; kidney damage; cataract; sensitization dermatitis; leukocytosis (increased blood leukocytes); anemia; cardiac irregular/irregularities

TARGET ORGANS :
Eyes, skin, respiratory system, blood, liver, cardiovascular system, central nervous system, kidneys

EYES - FIRST AID :
If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN - FIRST AID :
If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION - FIRST AID :
If this chemical has been swallowed, get medical attention immediately.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT : 227.1
BOILING POINT : 464 deg F (Explodes)

FREEZING POINT : MLT: 176 deg F
SOLUBILITY : Sol(77 deg F): 0.01 percent
VAPOR PRESSURE : 0.0002 mmHg
SPECIFIC GRAVITY : 1.65

. SH POINT : Unknown for lack of data. (Explodes)
LOWER EXPLOSIVE LIMIT : Unknown for lack of data.
UPPER EXPLOSIVE LIMIT : Unknown for lack of data.
IONIZATION POTENTIAL : 10.59 eV
FLAMMABILITY CLASS :
Combustible Solid (Class A Explosive)
INCOMPATIBILITIES AND REACTIVITIES :
Strong oxidizers, ammonia, strong alkalis, combustible materials, heat
NOTE :
Rapid heating will result in detonation.

MEASUREMENT METHOD :
Tenax(R) Gas chromatography tube; Acetone; Gas chromatography with thermal energy analyzer detection with explosives package; OSHA Analytical Methods Manual, 1990 edition #44

*** END OF RECORD ***

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*                NIOSH POCKET GUIDE TO CHEMICAL HAZARDS                  *
*                                                                        *
* Produced by: US National Institute for Occupational Safety and Health *
* Provided by: Canadian Centre for Occupational Health and Safety        *
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CHEMICAL NAME : **Zinc oxide**
SYNONYMS : Zinc peroxide
CAS REGISTRY NUMBER : 1314-13-2
RTECS NUMBER : ZH4810000
DOT/NAERG NUMBERS : 1516 / 143
CCOHS RECORD NUMBER : 675
MOLECULAR FORMULA : ZnO

DESCRIPTION : White, odorless solid.

*** EXPOSURE LIMITS ***

NIOSH RECOMMENDED EXPOSURE LIMITS (REL)
Dust:
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3
CEILING EXPOSURE LIMIT (C) : 15 mg/m3
Fume:
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3
SHORT TERM EXPOSURE LIMIT (STEL) : 10 mg/m3

OSHA CURRENT PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (fume)
TIME WEIGHTED AVERAGE (TWA) : 15 mg/m3 (total dust)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (resp dust)

OSHA 1989 (VACATED) PERMISSIBLE EXPOSURE LIMITS (PEL)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (fume)
SHORT TERM EXPOSURE LIMIT (STEL) : 10 mg/m3 (fume)
TIME WEIGHTED AVERAGE (TWA) : 10 mg/m3 (total dust)
TIME WEIGHTED AVERAGE (TWA) : 5 mg/m3 (resp dust)

IDLH CONCENTRATION : 500 mg/m3

*** RESPIRATORY PROTECTION ***

RECOMMENDATIONS FOR RESPIRATOR SELECTION
BASED ON NIOSH AND OSHA PEL

UP TO 50 mg/m3:
Any dust, mist, and fume respirator (APF = 10)
OR Any supplied-air respirator (APF = 10)

UP TO 125 mg/m3:
Any supplied-air respirator operated in a continuous-flow mode (APF = 25)
OR Any powered, air-purifying respirator with a dust, mist, and fume filter (APF = 25)

UP TO 250 mg/m3:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50)
OR Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50)
OR Any self-contained breathing apparatus with a full facepiece (APF = 50)
OR Any supplied-air respirator with a full facepiece (APF = 50)

UP TO 500 mg/m3:

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode (APF = 1000)

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000)
OR Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode (APF = 10,000)

ESCAPE:
Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter (APF = 50)
OR Any appropriate escape-type, self-contained breathing apparatus

*** PERSONAL PROTECTION AND SANITATION ***

SKIN PROTECTION :
No recommendation is made specifying the need for personal protective equipment for the body.

EYE PROTECTION :
No recommendation is made specifying the need for eye protection.

SKIN CLEAN-UP :
No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

CLOTHING/PPE REMOVAL :
No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

CLOTHING/PPE CHANGE :
No recommendation is made specifying the need for the worker to change clothing after the workshift.

*** HEALTH HAZARDS AND FIRST AID ***

POTENTIAL ROUTES OF EXPOSURE :
Inhalation

POTENTIAL SYMPTOMS OF EXPOSURE :
Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; weakness, lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; fatigue; malaise (vague feeling of discomfort); tightness chest; dyspnea (breathing difficulty), rales, decreased pulmonary function

TARGET ORGANS :
Respiratory system

INHALATION - FIRST AID :
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

*** PHYSICAL AND CHEMICAL PROPERTIES ***

MOLECULAR WEIGHT	: 81.4
BOILING POINT	: Unknown for lack of data.
FREEZING POINT	: MLT: 3587 deg F
SOLUBILITY	: Sol(64 deg F): 0.0004 percent
POR PRESSURE	: 0 mmHg (approx)
PECIFIC GRAVITY	: 5.61

FLASH POINT : Not applicable.
LOWER EXPLOSIVE LIMIT : Not applicable.
UPPER EXPLOSIVE LIMIT : Not applicable.
IZATION POTENTIAL : Not applicable.
MMABILITY CLASS :
Noncombustible Solid
INCOMPATIBILITIES AND REACTIVITIES :
Chlorinated rubber (at 419 deg F), water
NOTE :
Slowly decomposed by water.

MEASUREMENT METHOD :
Particulate filter; none; X-ray diffraction spectrometry; NIOSH Manual of Analytical Methods (NMAM), 4th edition #7502

*** END OF RECORD ***

APPENDIX B
SPECIFIC HEALTH AND SAFETY PROCEDURES

NOTE: IT health and safety procedures that will be utilized during the project are listed below.

HS020	Accident Prevention Program: Reporting Investigation and Review
HS021	Accident Prevention Program: Management Safety Reviews
HS051	Tailgate Safety Meeting
HS060	Hazard Communication Program
HS106	First Aid Kits
HS060	Hazard Communication Program
HS300	Confined Spaces
HS303	Pressurized Water Cleaning and Cutting Equipment
HS307	Excavation and Trenching
HS400	Working in Hot Environments
HS402	Hearing Conservation Program
HS600	Personal Protection Program
HS601	Respiratory Protection Program
HS800	Motor Vehicle Operation: General Requirements

APPENDIX C
SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

I HAVE READ THE TO 0061 SITE-SAFETY PLAN AND RELATE APPENDICES AND FULLY UNDERSTAND ITS CONTENTS.

Name	Date

APPENDIX D
ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow IT procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		

ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	

ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with IT Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Clearing, Grubbing	Struck By/ Against Heavy Equipment	• Make eye contact with operators before approaching equipment • Understand and review hand signals	Hard hat, safety glasses, Steel toe work boots	
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment. • Consider the size, shape, and weight of the object to be lifted. Two persons must lift an object if it cannot be lifted safely alone (e.g., greater than 60 lbs). • The hands and the object should be free of dirt or grease that could prevent a firm grip. • Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces. • Fingers must be kept away from points that could crush or pinch them, especially when putting an object down. • Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear. • The load should be kept as low as possible, close to the body with the knees bent. • To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible. • A worker should not carry a load that he or she cannot see around or over. • When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.		
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, vegetation, and debris • Clean mud and grease from your boots before mounting equipment and watch for slippery/unstable ground when		

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		dismounting equipment.		
Clearing and Grubbing (Continued)	Eye Injuries	• Wear face shield, goggles when operating powered clearing / grubbing equipment	Full face shield/ guard, goggles	
	Insect/ Snake Bites	• Review injury potential and types of snakes with workers • Avoid insect nests areas, likely habitats of snakes outside work areas • Emphasize The Buddy System where such injury potential exists and use insect repellant and wear PPE to protect against sting/bite injuries.	Tyvek coveralls, duct tape bottom of coveralls to boots in areas with possible insect/animal contact	
	Contact Dermatitis	• Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers • Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	Tyvek coveralls, duct tape bottom of coveralls to boots if possibility of contact with poisonous plants	
	Operations of power clearing tools (brush saws, weed wackers)	• Wear eye, face, hand & hearing protection when operating power clearing equipment • Shut-off / idle power tools walking between work areas • Store flammable liquids in well ventilated areas, away from work areas • Shut off equipment during re-fueling • Prohibit smoking while operating clearing equipment • Provide ABC (or equivalent) fire extinguishers for all work	Face shield/guard, goggles, cloth gloves, ear plugs, Steel toe work boots	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	High/Low Ambient	• Monitor for Heat/Cold stress in accordance with IT H&S		

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Temperature	Procedures # HS400,HS401		
Clearing and Grubbing (Continued)	Unstable ground; rollover of equipment.	• Identify path of travel before moving dozer and inspect area for stable ground. • Clearly mark any unstable areas.		
	Walking on machine tracks	• Avoid walking on machine tracks whenever possible; clean tracks for safe walking/working surfaces • Observe track surfaces when walking, move cautiously on uneven, slippery surfaces • Avoid sudden awkward motions (pulling/jerking fuel hoses)		
	Adverse weather conditions: -Lightning -High winds -Driving rain	• Monitor weather forecast • shut down operations should severe weather conditions exist		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator and/or dozer • Brush hog • Power clearing tools (Brush saws, weed wakers)	• Daily equipment inspections as per manufacturers requirements • Inspect all safety equipment (i.e. fire extinguishers, first aid kits and eye washes)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized • Review potential hazardous plants and insects/animals

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR TREE FELLING, CHIPPERS AND CHAINSAWS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Tree Felling; Chippers, Chain saws	Fires	• Eliminate sources of ignition from the work area • Prohibit Smoking • Provide ABC (or equivalent) fire extinguishers for all flammable storage areas, powered cutting equipment re-fueling areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Enforce use of approved flammable liquid safety cans • Store combustible materials away from flammables • Allow chainsaw to cool off before re-fueling • Prohibit chainsaw startup in re-fueling areas • Inspect chain saw fuel cup and hose for leaks	Portable fire extinguishers	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris • Mark, identify, or barricade other obstructions • Ensure safe footing before starting/operating chainsaws • Remove cut wood from immediate work area		
	Struck By/ Against Heavy Equipment, Falling Objects, Flying Debris	• Wear face protection to avoid facial injury from flying debris • Verify trees/branches will not foul overhead utility lines • Isolate equipment operation, tree felling areas (2 tree lengths) • Make eye contact with (chain saw) operators before approaching • Inspect tree for dead, broken limbs before cutting • Prohibit cutting overhead, above shoulder height • Understand and review hand signals	Hard hat, safety goggles and face shield/guard, steel toe work boots, leather gloves	

ACTIVITY HAZARD ANALYSIS FOR TREE FELLING, CHIPPERS AND CHAINSAWS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		• Identify/clear retreat path before beginning saw cuts		
Tree Felling; Chippers, Chainsaws (continued)	Operation of chippers	• Lockout/tag-out/de-energize chippers before clearing/ maintenance • Identify staging area for debris • Keep chipper approach free of ground debris • Follow all manufacturers instructions for operation of power tools	Ear plugs/muffs	Sound Level Meter
	Cuts, Lacerations, Punctures	• Wear cut resistant work gloves when the possibility of cuts, lacerations, punctures or other injury may be caused by sharp edges or protruding objects • Prohibit handling, touching chain blade while chain saw is operating • Test/inspect chain brake, chain guards before each days use • Follow proper startup procedures • Prohibit drop start of chain saw • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Carry saw with blade pointing behind	Leather gloves, Chain saw chaps	
	Caught in/between	• Prohibit standing on, straddling logs while ground cutting • Stand uphill while ground cutting • Start relieving cuts on compression side of log first, then make bucking cut on tension side • Prohibit workers from holding logs while being cut • Stop saw motor to remove saw if pinched	Chain saw chaps	
	Kickback	• Maintain both hands on chain saw while cutting • Notch cuts before through-cutting of trunks/limbs		

ACTIVITY HAZARD ANALYSIS FOR TREE FELLING, CHIPPERS AND CHAINSAWS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Tree Felling; Chippers, Chainsaws (continued)	Kickback (Continued)	• Prohibit cutting of limbs/logs in piles • Avoid cutting actions that may pinch the chain blade • Idle or shut down chain saw when walking any distance • Operate chain saws only at full power when cutting • Prohibit chain saw use for shrubs or brush • Position yourself on the inside of tree bends • Make slow cuts of two inches on tensioned limbs/trees until it starts to break • Prohibit use of defective chainsaws		
	Burns	• Wear proper PPE for protection from hot motor parts, muffler • Keep muffler/hot parts away from body while walking • Shut off equipment during re-fueling	Leather gloves	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use heavy equipment (320) to move logs and brush		
	Insect Bites	• Review injury potential and types of snakes with workers • Avoid insect nests areas, likely habitats outside work areas • Emphasize The Buddy System where such injury potential exists • Use insect repellant, wear PPE to protect against sting/bite injuries.	Tyvek coveralls, duct tape bottom of coveralls to boots in areas with possible insect/animal contact	
	Contact Dermatitis	• Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers • Apply protective cream/lotion to exposed skin to prevent	Tyvek coveralls, duct tape bottom of coveralls to boots when the is a possibility of poisonous	

ACTIVITY HAZARD ANALYSIS FOR TREE FELLING, CHIPPERS AND CHAINSAWS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		poison ivy or similar reactions	plants	
Tree Felling; Chippers, Chainsaws (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85 dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs/muffs	Sound Level Meter
	High/Low Ambient Temperature	• Monitor for Heat stress in accordance with OHM/IT Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator/Dozer • Chipper • Chainsaws • Slings, chokers, chains	• Daily equipment inspections as per manufacturers requirements • Inspect all slings, chokers, and chains for damaged links, frayed or ripped fabric, and frayed wire rope.	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized • Review potential hazardous plants and insects/animals

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR EROSION CONTROL INSTALLATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Silt Fence Installation	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools and debris • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Allergic Reaction	• Review allergy hazards with work crew • Identify workers with allergies • Review work assignments PPE upgrades • Identify and review poisonous plants with workers • Provide workers proper skin protection to prevent skin allergic reaction from exposure to hay, contaminated soil, plants, or other skin irritants	Tyvek coveralls, duct tape bottom of coveralls to boots; latex gloves within cotton gloves, if required	
	Struck-by Hand Tools, Flying Debris	• Hold stakes in place with tongs, vice-pliers or other remote grasping tools • Wear safety goggles when using sledge hammer, hatchet, maul or axe	Leather gloves, face shield/guard and goggles	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition and keep guards in place during use	Leather gloves	

ACTIVITY HAZARD ANALYSIS FOR EROSION CONTROL INSTALLATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Silt fence installation (continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	• Monitor for Heat stress in accordance with IT Health and Safety Procedures # HS400,HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Fencing • Ditch witch	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Survey of Site	Struck By/Against Motor Vehicles/ Operating Equipment	X Use reflective warning vests worn when exposed to vehicular traffic X Isolate potential equipment swing areas X Avoid/isolate survey activities in high traffic areas, warehouse ship/receive areas X Make eye contact with vehicle operators before approaching/crossing high traffic areas X Understand and review hand signals X Emphasize The Buddy System where injury potential exists	Hard hat, safety glasses	
	Slips, Trips, Falls	X Clear walkways, work areas of equipment and tools X Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	X Observe proper lifting techniques X Obey sensible lifting limits (60 lb. maximum per person manual lifting) X Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	X Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects X Maintain all hand and power tools in a safe condition X Keep guards in place during use X Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves, reinforced palms	
	Insect/ Animal Bites	X Review injury potential with workers X Avoid insect nests areas, habitats outside work areas X Emphasize The Buddy System where such injury potential exists X Use insect repellant to protect against sting injuries	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	

ACTIVITY HAZARD ANALYSIS FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
	Contact Dermatitis	X Wear long sleeveshirts / trousers to avoid skin contact with plants or other skin irritants X Identify and review poisonous plants with workers X Avoid unnecessary clearing of plant/vegetation areas X Cover vegetation with plastic(visqueen) where survey position raises exposure potential	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	High/Low Ambient Temperature	X Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 X Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Filed Survey Equipment	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR DEON PAD CONSTRUCTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Decon PAD Construction	Struck by/ Against Heavy Equipment, Protruding Objects	X Wear reflective warning vests when exposed to vehicular traffic X Avoid equipment swing areas X Make eye contact with operators before approaching equipment X Barricade or enclose the work area X Restrict entry to the work area to authorized personnel during paving activities X Understand and review hand signals	Warning vests, Hard hat, goggles, face shield, Steel-toe work boots	
	Handling Heavy Objects	X Observe proper lifting techniques X Obey sensible lifting limits (60 lb. maximum per person manual lifting) X Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Slips, Trips, Falls	X Clear walkways, work areas of equipment, tools, debris, & other materials X Mark, identify, or barricade other obstructions X Use 3 point contact when ascending/descending heavy equipment X Park heavy equipment on level ground to avoid potential sprains/strains when ascending/descending		
	Inhalation and Contact with Dusts and Particulates, Contact Dermatitis	X Provide workers proper skin, eye and respiratory protection based on the exposure hazards present X Apply water spray to road surfaces to minimize/eliminate fugitive dust X Wear PPE to avoid skin contact with contaminated soil, or other skin irritants X Monitor breathing zone air to determine levels of	Tyvek coveralls, Hard hat, Steel-toe boots, Cotton or equivalent gloves,duct tape bottom of coveralls to boots or latex boot covers	

ACTIVITY HAZARD ANALYSIS FOR DEON PAD CONSTRUCTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		contaminants		
	High/Low Ambient Temperature	X Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401 X Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Heavy equipment • Shovels	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO:_____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation	Underground/Overhead Utilities	• Identify all utilities at the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Step away from equipment when bucket adjustments are made. • Do not attempt verbal communication in high noise backgrounds • Park equipment in areas where operator can see clearly to dismount equipment • Report minor incidents to site supervisor		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Observe work area and location of other personnel before lifting/moving objects with sharp edges	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	Slips, Trips, Falls	• Clear, walkways of equipment, vegetation, excavated material, tools and debris • Mark, identify, or barricade other obstructions • Exit equipment slowly and maintain three point contact		

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		• Clean boot soles before climbing on equipment		
Excavation (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Review proper lifting posture/techniques regularly at safety meetings • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting	Warning vests, hard hat, safety glasses, steel toe work boots	
	High/Low Ambient Temperature	• Monitor for Heat stress in accordance with IT Health and Safety Procedures HS400,HS401 • Provide fluids to prevent worker dehydration		
	Excavation Wall Collapse	• Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil classification and proper sloping • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in		

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
		excavations		
Manual Excavation (Continued)	Struck/Struck By (Continued)	• Use the right tool for the task at hand • Maintain personal balance when performing manual excavation • Concentrate on the work task being performed		
	Overexertion	• Use the right tool for the task at hand • Avoid actions/activities that produce overexertion		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Excavator • Shovels • LEL/O2 (potential)		• Daily equipment inspections as per manufacturers requirements • Excavation inspection/permit • Confined space permit (potential) • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized • Review site specific chemical hazards	

Activity Hazard Analysis has been reviewed and approved by:
Site Supervisor: _____ SSO:_____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR DEMOLITION OF BIO -CELL				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Liner and concrete	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic and Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the demolition area • Restrict entry to the work area to heavy equipment operator(s) and signaler(s) during demolition • Wear hard hats, safety glasses with side shields, and steel-toe safety boots and Understand and review hand signals • Cease operations for electrical storms, high winds	Warning vests, Hard hat, Safety glasses	
	Slips, Trips, Falls	• Clear, walkways of equipment, vegetation, excavated material, tools and debris • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Fire/ Explosion	• Test atmospheres with combustible gas meter when working around flammable materials • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers for all work and flammable storage areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not		LEL/O_2

ACTIVITY HAZARD ANALYSIS FOR DEMOLITION OF BIO -CELL				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Liner and concrete (Continued)	Fire/ Explosion (Continued)	in use • Separate Flammables and Oxidizers by 20 feet minimum		
	Premature structural Collapse	• Barricade or enclose the demolition area • Restrict entry to the work area to heavy equipment operator(s) and signaler(s) during demolition • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review posted hand signals	Warning vests, Hard hat, Safety glasses	
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Maintain tools in a safe condition • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout-Tagout procedures in accordance with IT Health and Safety Procedures #HS315	Lockout/Tagout Devices	Voltage Meter or ATic≅ Tracer

ACTIVITY HAZARD ANALYSIS FOR DEMOLITION OF BIO -CELL				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition and keep guards in place during use	Leather gloves	
Walls and Floors (Continued)	Burns	• Wear proper work gloves, face shield/safety goggles, and leather apron to protect workers from skin burns when welding, cutting, and burning	Tinted face shield	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile or latex gloves, neoprene or latex boots	LEL/O_2,
Piping	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment and Understand and review hand signals • Barricade or enclose the demolition area • Restrict entry to the work area to heavy equipment operator(s) and signaler(s) during demolition • Wear hard hats, safety glasses with side shields, and steel-toe safety boots	Warning vests, Hard hat, Safety glasses	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Fire/Explosion	• Test atmospheres with combustible gas meter when working around	Portable Fire	LEL/O_2

ACTIVITY HAZARD ANALYSIS FOR DEMOLITION OF BIO -CELL				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Piping (Continued)	Fire/Explosion (Continued)	flammable materials • Eliminate sources of ignition from the work area and Prohibit smoking • Provide ABC (or equivalent) fire extinguishers for all work and flammable storage areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers and Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	extinguishers	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Burns	• Wear proper work gloves, face shield/safety goggles, and leather apron to protect workers from skin burns when welding, cutting, and burning	Tinted goggles/face shield	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) and do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator • Attachments • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review JSA with all task personnel • Review Site Specific Safety and Occupational Health Program.

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO:_____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR CONFIRMATION SAMPLING				
Task Breakdown	**Potential Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Sampling	Sharp Objects	X Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects X Maintain all hand and power tools in a safe condition X Keep guards in place during use	Wizard gloves or equivalent	
	Handling Heavy Objects	X Observe proper lifting techniques X Obey sensible lifting limits (60 lb. maximum per person manual lifting) X Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Slips, Trips, Falls	X Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris X Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances • Lead • Asbestos	X Provide workers proper skin, eye and respiratory protection based on the exposure hazards present X Review hazardous properties of site contaminants with workers before operations begin X Review lead and asbestos hazards with task personnel	Tyvek coveralls, latex or neoprene boots, nitrile gloves	
	High/Low Ambient Temperature	X Monitor for Heat/Cold stress in accordance with IT Gropu Health and Safety Procedures HS400 & 401 X Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Misc sampling equipment	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO:_____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR BACKFILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfilling	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, construction debris and other materials • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the work area • Restrict work area entry to authorized personnel only during construction activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter

ACTIVITY HAZARD ANALYSIS FOR BACKFILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	High/Low Ambient Temperature	• Monitor for Heat stress in accordance with IT Health and Safety Procedures HS400,HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Excavator • Dozer • Dump trucks		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized	

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ Date: _____

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION				
Principal Steps	**Potential Safety/Health Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Site Restoration	Struck By/Against Heavy Equipment, Protruding Objects	X Use reflective warning vests when exposed to vehicular traffic X Avoid equipment swing areas X Make eye contact with operators before approaching equipment X Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times X Understand and review hand signals	Warning vests, Hard hat, Safety glasses	
	Slips, Trips, Falls	X Clear, walkways of equipment, tools, debris, other materials X Mark, identify, or barricade other obstructions		
	High Noise Levels	X Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	
	Handling Heavy Objects	X Observe proper lifting techniques X Obey sensible lifting limits (60 lb per person for manual lifting) X Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Contact Dermatitis	X Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants X Identify and review poisonous plants with workers	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	High Ambient Temperature	X Monitor for Heat stress in accordance with IT group Health and Safety Procedure # 400 X Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
•	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

Activity Hazard Analysis has been reviewed and approved by:

Site Supervisor: _____ SSO:_____ Date: _____

APPENDIX D
SITE-SPECIFIC ACCIDENT PREVENTION PLAN

1.0 SIGNATURE SHEET

Plan Preparer:
Health and Safety Manager

Robert Brooks, CSP
(732) 469-5599 (office)

Approved by:
Project Manager

William L. Hughes
(757) 318-5140 (office)

2.0 BACKGROUND INFORMATION

2.1 OHM REMEDIATION SERVICES CORPORATION, A SUBSIDIARY OF THE IT GROUP (OHM/IT)

Contract No. N62470-97-D-5000
Task Order No. 0061

The principal tasks to be conducted are listed below:

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
- Clearing, Grubbing, and Tree Felling
- Survey the site to determine the area of excavation;
- Construction of decontamination pad
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils
- Decontaminate and demolish bio-cell at Site 22
- Conduct confirmatory sampling at Sites 4, 21, and 22
- Backfill and restore Sites 4, 21, and 22
- Project demobilization

2.2 OHM/IT ACCIDENT EXPERIENCE

YEAR	EMR (Interstate)*	OSHA Recordable Incident Rate*
1999	0.53	3.3
1998	0.58	3.7
1997	0.54	2.5

* OHM/IT

2.3 HAZARDOUS ACTIVITIES REQUIRING ACTIVITY HAZARD ANALYSIS*

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
- Clearing, Grubbing, and Tree Felling
- Survey the site to determine the area of excavation;
- Construction of decontamination pad
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils
- Decontaminate and demolish bio-cell at Site 22
- Conduct confirmatory sampling at Sites 4, 21, and 22
- Backfill and restore Sites 4, 21, and 22
- Project demobilization

*OHM/IT's Activity Hazard Analyses are located in the Site Specific Health and Safety Plan Appendix D.

3.0 STATEMENT OF SAFETY AN HEALTH POLICY

3.1 CORPORATE POLICY STATEMENT (ATTACHED)

PROCEDURE

Subject: SAFETY

1.0 PURPOSE AND SUMMARY

It is the policy of IT Corporation (IT) to provide a safe and healthful workplace for all employees, subcontractors and consultants in compliance with government requirements. Additionally, when appropriately communicated, the more stringent safety requirements of our clients will take precedence.

We believe in two fundamental principles of safety: all accidents, injuries and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, all employees will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner. Every employee has responsibility for proper health and safety performance.

Safety, industrial hygiene and loss prevention are the direct responsibility of all members of IT management. Safety shall take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established IT safety rules and procedures. No individual(s) may pose a threat to the health and safety of other individuals in the workplace.

The implementation of effective safety and health practices is a key measure of managerial performance. The effectiveness of these practices is evaluated through periodic audits.

All injuries, occupational illnesses, vehicle accidents, and health and safety incidents will be investigated. Appropriate corrective measures will be taken to prevent recurrence and continually improve safety in the workplace.

4.0 RESPONSIBILITIES AND LINES OF AUTHORITIES

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the HASP. The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM), Health and Safety Coordinator (HSC), and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the Site Specific Health and Safety Plan (HASP).

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 LIST OF SUBCONTRACTORS (TBD)

5.2 SUBCONTRACTOR/SUPPLIER COORDINATION AND CONTROL

OHM/IT subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. OHM/IT subcontractors will comply with the requirements for site safety as outlined in OHM/IT Group Health and Safety Procedure HS011 (see IT Corporate Health and Safety Procedures Manual). The Site Superintendent/Supervisor will be responsible for the conduct and control of OHM/IT subcontractors.

5.3 SUBCONTRACTOR/SUPPLIER SAFETY RESPONSIBILITIES

All subcontractor employees are subject to the same training and medical surveillance requirements as OHM/IT personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 CFR 1910.120 and 29 CFR 1926.65. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit Job Safety Analyses for their work activities to the SS. The subcontractor reports directly to the Project Manager. All incidents involving subcontractor employees shall be reported to the Site Supervisor and a copy of the subcontractor's injury/illness report shall be submitted to the SS within 24 hours.

OHM/IT subcontractors are required to sign off and comply with all requirements of the OHM/IT Site-Specific Health and Safety Plan and Accident Prevention Plan. Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120/1926.65. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow Facility hot work rules if hot work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of and litter will not permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

6.0 TRAINING

6.1 SAFETY INDOCTRINATION SUBJECTS:

Outlines of the site safety orientation for OHM/IT / sub-contract personnel and visitors are provided in Section 10.0 of the HASP.

6.2 MANDATORY TRAINING AND CERTIFICATIONS

Mandatory training and certifications are discussed in Section 10.0 of the HASP.
All personnel entering the exclusion zone will be trained in the provisions of this Accident Prevention Plan and be required to sign the Accident Prevention Plan.

Site-specific training for the TO 0061 will include a review of potential site contaminants, Hazard Communication as per 29 CFR 1910.1200/1926.59, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS and SSO before any site work activities begin. Although all OHM/IT workers receive confined space training during initial 40 hour health and safety training, site specific training, including rescue procedures, will be conducted before any confined space entry is performed.

6.3 EMERGENCY RESPONSE TRAINING

All OHM/IT personnel who have completed 40 hour HAZWOPER Training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

6.4 SUPERVISORY AND EMPLOYEE SAFETY MEETINGS

The OHM/IT SS and SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the OHM/IT daily safety meetings. Daily safety meetings will comply with HS051 (see IT Health and Safety Procedures Manual).

7.0 SAFETY AND HEALTH INSPECTIONS

7.1 SAFETY INSPECTIONS

The OHM/IT Project Manager and Site Supervisors/ Superintendents are required to conduct bi-monthly inspections of their sites using the Project Safety Inspection Report according to HS021 (see IT Group Health and Safety Program). SSOs are responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions and submitting them to SS. The SSO will discuss any necessary corrective actions with the SS and review new procedures. Copies of these reports are maintained on file at the project locations.

The OHM/IT Health and Safety Manager (HSM) or his designated representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Somerset, New Jersey, Office and are tracked in a database for each OHM/IT Project Manager and Supervisor/ Superintendent, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

7.2 EXTERNAL INSPECTIONS/CERTIFICATIONS

OHM/IT does not anticipate, but may consider the use of outside sources, to provide safety inspections on an as necessary basis.

As required, OHM/IT safety equipment will comply with appropriate OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), and US Coast Guard or other recognized certification organizations.

8.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

8.1 COMPANY SAFETY PROGRAM GOALS

OHM/IT considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner which minimizes the probability of near misses, equipment/property damage or injury. OHM/IT will establish programs to recognize people and projects that demonstrate excellence in safety performance. OHM/IT will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. OHM/IT site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. OHM/IT will provide and enforce safety rules to protect employees, subcontractors, clients and the public.

8.2 OHM/IT SAFETY INCENTIVE PROGRAMS:

A copy of the OHM/IT Safety Incentive Award Program is provided at the project. The OHM/IT Project Manager will develop a site-specific program for approval by the HSM and the Business Line Lead within 10 days of project mobilization.

8.3 OHM/IT EMPLOYEE SAFETY RESPONSIBILITY REQUIREMENTS

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM/IT personnel will follow the policies set forth in the IT Group Health and Safety Program HS001-999. Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM or HSC. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. OHM/IT Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules

8.4 MANAGERS AND SUPERVISORS SAFETY ACCOUNTABILITY

It is the duty of the first line supervisor to motivate employees to adhere to OHM/IT's safety policy in each work situation. A first line supervisor for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All supervisors shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions, which involved OHM/IT employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment as specified by this APP, site-specific health and safety plan, other OHM/IT procedures or as directed by the SSO, HSC, CIH or HSM.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the OHM/IT Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

9.0 ACCIDENT REPORTING

9.1 EXPOSURE DATA (MAN-HOURS WORKED)

The Vice President of Health and Safety tracks and maintains incident records as to Federal reporting requirements (OSHA 200 Log). Incident rates are reported monthly to the HSM. Incident Rates and Workers Compensation losses are tracked for the LANTDIV Program.

9.2 ACCIDENT INVESTIGATIONS, REPORTS AND LOGS

The site supervisor conducts Accident/incident investigations. A report is completed by the site supervisor and is required to be reviewed and signed by the site safety officer and the Project Manager. The report must be submitted to the HSM within 24 hours. All incident reporting forms are provided in HS020.

9.3 IMMEDIATE NOTIFICATION OF MAJOR INCIDENTS

OHM/IT will immediately notify the client of any major incident, including injury, fire, equipment/ property damage and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

9.3.1 Response

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

The work crew supervisor will immediately make radio contact with the site supervisor to alert him of a medical emergency situation. The work crew supervisor 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 injury, if known

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 supervisor 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 him/her quickly taken to the victim. OHM/IT personnel will evacuate any injury within the EZ 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 Site Safety Officer 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 Site Safety Officer has cleared the scene.

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 aggravates 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.

10.0 MEDICAL SUPPORT

On-site Medical Support/Off-site Medical Arrangements are provided in Section 9 and 11 of the HASP.

11.0 PERSONAL PROTECTIVE EQUIPMENT

11.1 HAZARD ASSESSMENT PROCEDURES/WRITTEN CERTIFICATIONS FOR PERSONAL PROTECTIVE EQUIPMENT

Protection levels provided in the HASP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SSO in consultation with the HSC, CIH and/or HSM. Personal Protective Equipment (PPE) selection criteria are outlined in HS 600 and HS601 (see IT Health and Safety Procedures Manual).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS100.

12.0 PLANS REQUIRED BY THE SAFETY MANUAL

12.1 HAZARD COMMUNICATION PROGRAM

The Site-Specific Hazard Communication Program is included Section 4.2 of the HASP. IT Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (see IT Group Health and Safety Program).

12.2 .EMERGENCY RESPONSE PLANS

The Site-Specific Emergency Response and Contingency Plan is included in Section 9.0 of the HASP.

12.3 LAYOUT PLANS

Site Layout Plans (indicating work zones) are included in the Work Plan. Work zones are defined in Section 5.0 of the HASP.

12.4 RESPIRATORY PROTECTION PLAN

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. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (see Section 8.0 HASP). All respirator users will be 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, HSM, HSC, and SSO will also evaluate the implementation of the HASP, periodically, to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

12.5 LEAD ABATEMENT PLAN

Not Applicable

12.6 ASBESTOS ABATEMENT PLAN

Not Applicable

12.7 ABRASIVE BLASTING

Not Applicable

12.8 CONFINED SPACE

Confined Space Entry Procedures are outlined in IT Procedure HS300

12.9 HAZARDOUS ENERGY CONTROL PLAN

Lockout/Tagout Procedures are outlined in HS315.

12.10 CRITICAL LIFT PROCEDURES

Not Applicable

12.11 CONTINGENCY PLAN FOR SEVERE WEATHER

Contingency plans for severe weather are included in Section 9.0 of HASP. A site Specific Hurricane Preparedness Plan is located in Appendix F of the HASP.

12.12 ACCESS AND HAUL ROAD PLAN

Not Applicable

12.13 DEMOLITION PLAN

Not Applicable

12.14 EMERGENCY RESCUE (TUNNELING)

Not Applicable

12.15 UNDERGROUND CONSTRUCTION FIRE PREVENTION AND PROTECTION PLAN

Not Applicable

12.16 COMPRESSED AIR PLAN

Not Applicable

12.17 FORM WORK AND SHORING ERECTION AND REMOVAL PLANS

Not Applicable

12.18 LIFT SLAB PLANS

Not Applicable

12.19 SSHP

The OHM/IT Site Specific Health and Safety Plan is included with this submission.

12.20 BLASTING PLAN

Not Applicable

12.21 DIVING PLAN

Not Applicable

12.22 ALCOHOL AND DRUG ABUSE PREVENTION PLAN

OHM/IT substance abuse procedures are outlined in IT HS101 - Drug, and Alcohol Testing.

13.0 CONTRACTOR INFORMATION TO MEET THE REQUIREMENTS OF THE MAJOR SECTIONS OF EM 385-1-1

In addition to this Accident Prevention Plan, OHM/IT has prepared a Site-Specific Health and Safety Plan to meet the major requirements of USACE Manual 385-1-1. Additional procedures for major requirements are provided in the IT Group Health and Safety Procedures Manual HS001-999.

APPENDIX F
HURRICANE PREPAREDNESS PLAN

SITE-SPECIFIC HURRICANE PREPAREDNESS PLAN FOR YORKTOWN NAVAL WEAPONS STATION YORKTOWN, VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Task Order 0061

Prepared by:

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Robert A. Brooks, CSP
Health and Safety Manager

September 13, 2000
IT Project 809275
Revision 0

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1.0 INTRODUCTION

PURPOSE

This procedure outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings at the NWS Yorktown. All personnel should understand that predicting the occurrence and path of a hurricane is difficult, however the risk can be minimized and controlled by following the procedures in this plan.

SCOPE

This procedure is applicable to all contractor personnel, including OHM's subcontractors, temporary construction facilities, and Remediation equipment present at the NWS Yorktown project sites.

DISCUSSION

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the Yorktown, Virginia area, attention must be paid to all hurricanes, since there is no way to determine with 100 percent accuracy whether a hurricane will actually hit the area until a few hours before landfall.

The following table demonstrates that the accuracy of forecasting where a hurricane landfall will occur is very low more than 24 hours in advance of a storm.

Hours Before Landfall	Maximum Probability Values
72 Hours	10 Percent
48 Hours	13-18 Percent
36 Hours	20-25 Percent
24 Hours	35-45 Percent
12 Hours	60-70 Percent

2.0 DEFINITIONS

The following definitions apply to various terms used in this document.

Conditions of Readiness (CORS):

Condition V - Destructive winds are possible at the NWS Yorktown within 96 hours. Normal daily jobsite cleanup and good housekeeping practices.

Condition IV - Destructive winds are possible at the NWS Yorktown within 72 hours. Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material, and rubbish for removal and disposal at the end of each workday. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects, which could become missile hazards. Contact client representative for Condition requirements, updates, and completion of required actions.

Condition III - Destructive winds are possible atthe NWS Yorktown within 48 hours. Maintain Condition IV requirements. Begin securing the jobsite for and taking those actions necessary for Condition I, which cannot be completed within 18 hours. Cease all routine activities that might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to Condition II and continue action as necessary to attain Condition III readiness. Contact the weather station on base for weather and COR updates and completion of required actions.

Condition II - Destructive winds are possible at the NWS Yorktown within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove formwork and scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the jobsite. Contact client representative for weather and COR updates and completion of required actions.

Condition I - Destructive winds are possible at the NWS Yorktown within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the jobsite and leave the government premises.

Destructive Winds - Generally winds reaching or exceeding the force of a tropical storm ($\geq$ 39 mph or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury which would warrant the NWS Yorktown to initiate a Condition IV alert.

Hurricane Watch - An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.

Hurricane Warning - A warning that sustained winds of 74 MPH (64 knots) or higher, associated with a hurricane are expected in a specified coastal area in 24 hours or less.

Hurricane - A tropical cyclone in which the maximum sustained surface wind is 64 knots (74 MPH) or greater.

Missile Hazard - Any object that may become airborne during high winds.

Severe Weather - Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds

Storm Surge - An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.

Storm Tide - The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."

Tropical Depression - A tropical low-pressure system in which the maximum sustained surface wind is 33 knots (38 MPH) or less.

Tropical Storm - A tropical low pressure system in which the maximum surface wind ranges from 34 to 63 knots (39 to 73 MPH) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.

Tropical Storm Watch - Tropical storm conditions pose a threat to a coastal area generally within 36 hours.

Tropical Storm Warning - A warning for tropical storm conditions with sustained winds within the range of 39 to 73 MPH which are expected in a specified coastal area within 24 hours or less.

3.0 RESPONSIBILITIES

Project Manager – Joe Colella

The Project Manager (PM) is responsible for ensuring that all adequate measures have been taken to prepare for hurricanes and to protect IT site personnel and property in the event of a hurricane. The PM will ensure that ample resources are available to implement this plan and that all personnel are aware of this plan and their responsibilities.

Site Supervisor – John Dormi

The Site Supervisor (SS) will communicate all hurricane information to site personnel, and keep the site personnel continually informed of the measures to be taken. The SS is responsible for the coordination and direction of site equipment shutdown and will oversee the preparation of site facilities for any imminent storm. The SS will oversee the coordination of both pre- and post-storm operations and will ensure that the proper material, equipment, and supplies are utilized to implement this procedure.

Site Safety Officer – TBD

The Site Safety Officer (SSO) will monitor weather information, including the National Weather Service probability values for landfall. The SSO will maintain the necessary emergency supplies, and will periodically tour the site to ensure that proper steps are being taken to protect site personnel and property. The SSO will develop the emergency contact list and post the list in a prominent area in the office trailer.

Project Accountant – TBD

The Project Accountant is responsible for the back up of critical computer files at the site and will oversee the securing of the site computers and project files prior to any storm.

Note: When personnel identified in Section 3.0 leave the site, they are responsible for notifying the Project Manager of a designated back-up person. The back-up person will be instructed in their responsibilities in the event of a hurricane.

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination from personnel and equipment, work areas will be clearly specified as designated below prior to beginning operations. Each work area will be classified in accordance with NIOSH/OSHA/USCG/EPA'S document *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. Each work area will be clearly identified using signs or physical barriers. The following work zones will be established:

- Exclusion Zone
- Contamination Reduction Zone
- Support Zone

A log of all personnel visiting, entering or working on the site shall be maintained in the main office trailer location. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120/1926.65(e), (f). Visitors will attend a site orientation given by the SSO and sign the HASP.

The following are standard safe work practices that apply to all site personnel and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum , tobacco or smoking .
- 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.
- 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 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 EMERGENCY OPERATING PROCEDURES

Condition V - Early Preparedness

The SSO will notify the PM and SS when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at the NWS Yorktown within 96 hours. This will initiate Condition of Readiness (COR) Condition V. This phase will continue until:

The storm or condition is downgraded
The storm track poses no threat to the site
Condition IV begins

During Condition V, the progress of the storm will be monitored and tracked. The client will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Appendix A for the Hurricane Preparedness Responsibility Punch List - Condition V.

Condition IV - (Destructive winds are possible within 72 Hours)

This COR starts when IT is notified by the client representative that severe weather is within 72 hours of posing a threat to the project location. The SSO will ensure that the following steps are taken:

Monitor the storm and inform the PM and SS of its progress
Check PPE supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed

During Condition IV, the progress of the storm will be continuously monitored and tracked. The SS will instruct site personnel to begin general cleanup of all loose materials that may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other debris that may become missile hazards. All form lumber will be stacked in neat piles less than 4 feet high. The client representative will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV.

The SS will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations which might interfere with securing operations, such as starting a major excavation, will cease.

The SS will ensure that the following steps are taken:

- Fill fuel tanks in all equipment on-site
- Secure stockpiled material on-site or place in the storage trailer located near the site office trailer.
- Review requirements for Condition II with all crewmembers.
- Maintain condition IV requirements.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition IV.

Condition III - Tropical Storm Warning (Destructive winds are possible Within 48 Hours)

This COR starts when severe weather places the project site under a tropical storm warning. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching NWS Yorktown has generated destructive winds in other locations. The PM, SS, and SSO will determine when to cease all operations based upon current weather conditions and/or as directed by the client representative. If the storm or Condition is downgraded, the PM, SS, and SSO will meet with the client to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

> Machinery, tools, equipment, and materials will be secured or removed form the site.
> Take actions to secure jobsite necessary for Condition I that cannot be completed within 18 hours.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition III.

Condition II - Destructive Winds are anticipated <u>within 24 hours</u>.

Condition II begins when destructive winds are anticipated within 24 hours and/or as directed by the ROICC. The PM, SS, and SSO will determine when to demobilize from the site based upon weather conditions. During this phase:

The SS will:

- Secure machinery, tools, equipment and materials or remove them from the jobsite.
- Conduct a roll call of personnel on-site
- Notify personnel, on leave, of schedule changes
- Personnel needing to leave the project to attend to personal matters will notify their SS immediately.
- Valuable records, files, and equipment will be boxed in preparation for movement to a safe location such as the hotel or Tidewater Office (optional).

The SSO will ensure that the following step is taken:

- All visitors from the site are evacuated
- Make a final site walk-through to determine that the site is secure and clear all missile hazards from the jobsite
- Inform the Project Manager that all personnel are being released from the site

The Project Accountant shall ensure that the following steps are taken:

- Valuable records, files, and small office equipment are moved to a safe location such as the Tidewater Office (optional).
- Move large office equipment away from doors and windows
- Tape or board the windows in the office trailer

If the storm or Condition is downgraded, the PM, SS, and SSO will meet to decide if a downgrade of the phase is necessary.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition II.

Condition I - Destructive winds are anticipated <u>within 12 hours</u>.

Complete all remaining actions required for lower conditions of readiness.
Secure jobsite access and evacuate to safe refuge.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition I.

Resume Site Operations

The PM will contact the client representative to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The SSO will conduct a damage survey with the PM and SS. Photographs of the storm damage at the site will be taken by the SS. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Resume Site Operations.

6.0 DEBRIEFING

Following the return to work of site personnel, the Site Supervisor will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

- Finalize a recovery plan
- Review the Hurricane Plan for effectiveness
- Suggest and agree on improvements to the plan
- Incorporate plan changes

When completed, the PM and SS will meet with site personnel to discuss any corrective actions or changes in this plan.

7.0 REFERENCES

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response.

Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA).

U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA)

ATTACHMENT A

HURRICANE PREPAREDNESS RESPONSIBILITY CHECKLISTS

HURRICANE PREPAREDNESS CHECKLIST
Itemized Equipment Checklist, Condition III.

Equipment	Secure in Place	Remove from Project Site

HURRICANE PREPAREDNESS CHECKLIST

Condition V

Date/Time Entered Condition V:_____

Severe Weather/Tropical Storm: _____

Action Items

- ☐ Project Manager Notified
- ☐ Track of Storm Poses No Threat
- ☐ Storm or Condition is downgraded
- ☐ Upgrade to Condition IV

Storm Location

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Condition V Action Items Complete:_____

Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall within 72 hours)

Date/Time Entered Condition IV:_____

Action Items:

- ☐ Notify Project Manager
- ☐ Notify Project Superintendent
- ☐ Notify Site Personnel
- ☐ Assemble Shift personnel to begin preparation
- ☐ Track storm on hurricane tracking map (Attachment C) (if applicable)

The Project Foremen will ensure the following steps are taken:

- ☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to the aviation field and/or site 6.
- ☐ All equipment fuel tanks will be filled.
- ☐ All subcontractors with equipment or supplies on-site will be notified to begin removal procedures
- ☐ Ensure all generators and lights are operational and make arrangements to secure additional ones if needed.

Condition IV Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall within 48 hours)

Date/Time Entered Condition III:_____

Action Items:

☐ Provide the status of the storm to site personnel on an hourly basis

☐ Remove all valuable records, files, and small equipment from the trailers to the Tidewater VA office (optional. At the discursion of the Project manager)

☐ Take actions to secure job-site necessary for Condition I that cannot be accomplished in 18 hours

☐ Recheck all items on checklist IV to ensure they are complete (ie.: gas tanks are still filled)

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action)

Condition III Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition II

Date/Time Entered Condition II:_____

Action Items:

- ☐ Evacuate all visitors from the site
- ☐ Conduct a role call of site personnel and inform the SSO
- ☐ Move large office equipment away from doors and windows
- ☐ Check the status all incoming shipments of supplies and equipment
- ☐ Remove all unnecessary vehicles from the site
- ☐ Secure heavy equipment in accordance with manufacturer's specification
- ☐ Tape or board site office trailer windows
- ☐ Secure all valuable records and equipment
- ☐ Release personnel from the site
- ☐ Recheck all items on checklist IV and III to ensure they are complete (i.e.: gas tanks are still filled)

Condition II Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition I

Date/Time Entered Condition I:_____

Action Items:

- ☐ Complete all action items for lower conditions of readiness
- ☐ Secure job-site access and evacuate to safe refuge

Condition I Action Items Complete:_____
Date:_____

ATTACHMENT B
EMERGENCY PHONE NUMBERS

SEE SECTION 9.0 OF THE SITE-SPECIFIC HEALTH AND SAFETY PLAN.

Attachment C
HURRICANE TRACKING MAP

This map will be displayed in the site office trailer or alternate location as designated by the site supervisor.

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations: _____

Action Items:

- ☐ Conduct a damage survey
- ☐ Notify all site personnel when to return to work
- ☐ Develop a prioritized recovery plan
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage
- ☐ Inspect trailers for structural damage. Repair as needed.
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink
- ☐ Remove storm debris from site
- ☐ Notify client representative of the resumption of site activities

Resume Site Operations Action Items Complete: _____
Date: _____

APPENDIX D
SITE-SPECIFIC ACCIDENT PREVENTION PLAN

1.0 SIGNATURE SHEET

Plan Preparer:
Health and Safety Manager

Robert Brooks, CSP
(732) 469-5599 (office)

Approved by:
Project Manager

William L. Hughes
(757) 318-5140 (office)

2.0 BACKGROUND INFORMATION

2.1 OHM REMEDIATION SERVICES CORPORATION, A SUBSIDIARY OF THE IT GROUP (OHM/IT)

Contract No. N62470-97-D-5000
Task Order No. 0061

The principal tasks to be conducted are listed below:

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
- Clearing, Grubbing, and Tree Felling
- Survey the site to determine the area of excavation;
- Construction of decontamination pad
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils
- Decontaminate and demolish bio-cell at Site 22
- Conduct confirmatory sampling at Sites 4, 21, and 22
- Backfill and restore Sites 4, 21, and 22
- Project demobilization

2.2 OHM/IT ACCIDENT EXPERIENCE

YEAR	EMR (Interstate)*	OSHA Recordable Incident Rate*
1999	0.53	3.3
1998	0.58	3.7
1997	0.54	2.5

* OHM/IT

2.3 HAZARDOUS ACTIVITIES REQUIRING ACTIVITY HAZARD ANALYSIS*

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
- Clearing, Grubbing, and Tree Felling
- Survey the site to determine the area of excavation;
- Construction of decontamination pad
- Excavate/segregate and stockpile PAH, CPAH, inorganic, and explosive contaminated soils
- Decontaminate and demolish bio-cell at Site 22
- Conduct confirmatory sampling at Sites 4, 21, and 22
- Backfill and restore Sites 4, 21, and 22
- Project demobilization

*OHM/IT's Activity Hazard Analyses are located in the Site Specific Health and Safety Plan Appendix D.

3.0 STATEMENT OF SAFETY AN HEALTH POLICY

3.1 CORPORATE POLICY STATEMENT (ATTACHED)

PROCEDURE

Subject: SAFETY

1.0 PURPOSE AND SUMMARY

It is the policy of IT Corporation (IT) to provide a safe and healthful workplace for all employees, subcontractors and consultants in compliance with government requirements. Additionally, when appropriately communicated, the more stringent safety requirements of our clients will take precedence.

We believe in two fundamental principles of safety: all accidents, injuries and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, all employees will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner. Every employee has responsibility for proper health and safety performance.

Safety, industrial hygiene and loss prevention are the direct responsibility of all members of IT management. Safety shall take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established IT safety rules and procedures. No individual(s) may pose a threat to the health and safety of other individuals in the workplace.

The implementation of effective safety and health practices is a key measure of managerial performance. The effectiveness of these practices is evaluated through periodic audits.

All injuries, occupational illnesses, vehicle accidents, and health and safety incidents will be investigated. Appropriate corrective measures will be taken to prevent recurrence and continually improve safety in the workplace.

4.0 RESPONSIBILITIES AND LINES OF AUTHORITIES

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the HASP. The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM), Health and Safety Coordinator (HSC), and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the Site Specific Health and Safety Plan (HASP).

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 LIST OF SUBCONTRACTORS (TBD)

5.2 SUBCONTRACTOR/SUPPLIER COORDINATION AND CONTROL

OHM/IT subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. OHM/IT subcontractors will comply with the requirements for site safety as outlined in OHM/IT Group Health and Safety Procedure HS011 (see IT Corporate Health and Safety Procedures Manual). The Site Superintendent/Supervisor will be responsible for the conduct and control of OHM/IT subcontractors.

5.3 SUBCONTRACTOR/SUPPLIER SAFETY RESPONSIBILITIES

All subcontractor employees are subject to the same training and medical surveillance requirements as OHM/IT personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 CFR 1910.120 and 29 CFR 1926.65. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit Job Safety Analyses for their work activities to the SS. The subcontractor reports directly to the Project Manager. All incidents involving subcontractor employees shall be reported to the Site Supervisor and a copy of the subcontractor's injury/illness report shall be submitted to the SS within 24 hours.

OHM/IT subcontractors are required to sign off and comply with all requirements of the OHM/IT Site-Specific Health and Safety Plan and Accident Prevention Plan. Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120/1926.65. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow Facility hot work rules if hot work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of and litter will not permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

6.0 TRAINING

6.1 SAFETY INDOCTRINATION SUBJECTS:

Outlines of the site safety orientation for OHM/IT / sub-contract personnel and visitors are provided in Section 10.0 of the HASP.

6.2 MANDATORY TRAINING AND CERTIFICATIONS

Mandatory training and certifications are discussed in Section 10.0 of the HASP.
All personnel entering the exclusion zone will be trained in the provisions of this Accident Prevention Plan and be required to sign the Accident Prevention Plan.

Site-specific training for the TO 0061 will include a review of potential site contaminants, Hazard Communication as per 29 CFR 1910.1200/1926.59, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS and SSO before any site work activities begin. Although all OHM/IT workers receive confined space training during initial 40 hour health and safety training, site specific training, including rescue procedures, will be conducted before any confined space entry is performed.

6.3 EMERGENCY RESPONSE TRAINING

All OHM/IT personnel who have completed 40 hour HAZWOPER Training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

6.4 SUPERVISORY AND EMPLOYEE SAFETY MEETINGS

The OHM/IT SS and SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the OHM/IT daily safety meetings. Daily safety meetings will comply with HS051 (see IT Health and Safety Procedures Manual).

7.0 SAFETY AND HEALTH INSPECTIONS

7.1 SAFETY INSPECTIONS

The OHM/IT Project Manager and Site Supervisors/ Superintendents are required to conduct bi-monthly inspections of their sites using the Project Safety Inspection Report according to HS021 (see IT Group Health and Safety Program). SSOs are responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions and submitting them to SS. The SSO will discuss any necessary corrective actions with the SS and review new procedures. Copies of these reports are maintained on file at the project locations.

The OHM/IT Health and Safety Manager (HSM) or his designated representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Somerset, New Jersey, Office and are tracked in a database for each OHM/IT Project Manager and Supervisor/ Superintendent, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

7.2 EXTERNAL INSPECTIONS/CERTIFICATIONS

OHM/IT does not anticipate, but may consider the use of outside sources, to provide safety inspections on an as necessary basis.

As required, OHM/IT safety equipment will comply with appropriate OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), and US Coast Guard or other recognized certification organizations.

8.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

8.1 COMPANY SAFETY PROGRAM GOALS

OHM/IT considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner which minimizes the probability of near misses, equipment/property damage or injury. OHM/IT will establish programs to recognize people and projects that demonstrate excellence in safety performance. OHM/IT will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. OHM/IT site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. OHM/IT will provide and enforce safety rules to protect employees, subcontractors, clients and the public.

8.2 OHM/IT SAFETY INCENTIVE PROGRAMS:

A copy of the OHM/IT Safety Incentive Award Program is provided at the project. The OHM/IT Project Manager will develop a site-specific program for approval by the HSM and the Business Line Lead within 10 days of project mobilization.

8.3 OHM/IT EMPLOYEE SAFETY RESPONSIBILITY REQUIREMENTS

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM/IT personnel will follow the policies set forth in the IT Group Health and Safety Program HS001-999. Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM or HSC. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. OHM/IT Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules

8.4 MANAGERS AND SUPERVISORS SAFETY ACCOUNTABILITY

It is the duty of the first line supervisor to motivate employees to adhere to OHM/IT's safety policy in each work situation. A first line supervisor for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All supervisors shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions, which involved OHM/IT employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment as specified by this APP, site-specific health and safety plan, other OHM/IT procedures or as directed by the SSO, HSC, CIH or HSM.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the OHM/IT Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

9.0 ACCIDENT REPORTING

9.1 EXPOSURE DATA (MAN-HOURS WORKED)

The Vice President of Health and Safety tracks and maintains incident records as to Federal reporting requirements (OSHA 200 Log). Incident rates are reported monthly to the HSM. Incident Rates and Workers Compensation losses are tracked for the LANTDIV Program.

9.2 ACCIDENT INVESTIGATIONS, REPORTS AND LOGS

The site supervisor conducts Accident/incident investigations. A report is completed by the site supervisor and is required to be reviewed and signed by the site safety officer and the Project Manager. The report must be submitted to the HSM within 24 hours. All incident reporting forms are provided in HS020.

9.3 IMMEDIATE NOTIFICATION OF MAJOR INCIDENTS

OHM/IT will immediately notify the client of any major incident, including injury, fire, equipment/ property damage and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

9.3.1 Response

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

The work crew supervisor will immediately make radio contact with the site supervisor to alert him of a medical emergency situation. The work crew supervisor 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 injury, if known

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 supervisor 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 him/her quickly taken to the victim. OHM/IT personnel will evacuate any injury within the EZ 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 Site Safety Officer 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 Site Safety Officer has cleared the scene.

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 aggravates 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.

10.0 MEDICAL SUPPORT

On-site Medical Support/Off-site Medical Arrangements are provided in Section 9 and 11 of the HASP.

11.0 PERSONAL PROTECTIVE EQUIPMENT

11.1 HAZARD ASSESSMENT PROCEDURES/WRITTEN CERTIFICATIONS FOR PERSONAL PROTECTIVE EQUIPMENT

Protection levels provided in the HASP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SSO in consultation with the HSC, CIH and/or HSM. Personal Protective Equipment (PPE) selection criteria are outlined in HS 600 and HS601 (see IT Health and Safety Procedures Manual).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS100.

12.0 PLANS REQUIRED BY THE SAFETY MANUAL

12.1 HAZARD COMMUNICATION PROGRAM

The Site-Specific Hazard Communication Program is included Section 4.2 of the HASP. IT Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (see IT Group Health and Safety Program).

12.2 .EMERGENCY RESPONSE PLANS

The Site-Specific Emergency Response and Contingency Plan is included in Section 9.0 of the HASP.

12.3 LAYOUT PLANS

Site Layout Plans (indicating work zones) are included in the Work Plan. Work zones are defined in Section 5.0 of the HASP.

12.4 RESPIRATORY PROTECTION PLAN

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. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (see Section 8.0 HASP). All respirator users will be 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, HSM, HSC, and SSO will also evaluate the implementation of the HASP, periodically, to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

12.5 LEAD ABATEMENT PLAN

Not Applicable

12.6 ASBESTOS ABATEMENT PLAN

Not Applicable

12.7 ABRASIVE BLASTING

Not Applicable

12.8 CONFINED SPACE

Confined Space Entry Procedures are outlined in IT Procedure HS300

12.9 HAZARDOUS ENERGY CONTROL PLAN

Lockout/Tagout Procedures are outlined in HS315.

12.10 CRITICAL LIFT PROCEDURES

Not Applicable

12.11 CONTINGENCY PLAN FOR SEVERE WEATHER

Contingency plans for severe weather are included in Section 9.0 of HASP. A site Specific Hurricane Preparedness Plan is located in Appendix F of the HASP.

12.12 ACCESS AND HAUL ROAD PLAN

Not Applicable

12.13 DEMOLITION PLAN

Not Applicable

12.14 EMERGENCY RESCUE (TUNNELING)

Not Applicable

12.15 UNDERGROUND CONSTRUCTION FIRE PREVENTION AND PROTECTION PLAN

Not Applicable

12.16 COMPRESSED AIR PLAN

Not Applicable

12.17 FORM WORK AND SHORING ERECTION AND REMOVAL PLANS

Not Applicable

12.18 LIFT SLAB PLANS

Not Applicable

12.19 SSHP

The OHM/IT Site Specific Health and Safety Plan is included with this submission.

12.20 BLASTING PLAN

Not Applicable

12.21 DIVING PLAN

Not Applicable

12.22 ALCOHOL AND DRUG ABUSE PREVENTION PLAN

OHM/IT substance abuse procedures are outlined in IT HS101 - Drug, and Alcohol Testing.

13.0 CONTRACTOR INFORMATION TO MEET THE REQUIREMENTS OF THE MAJOR SECTIONS OF EM 385-1-1

In addition to this Accident Prevention Plan, OHM/IT has prepared a Site-Specific Health and Safety Plan to meet the major requirements of USACE Manual 385-1-1. Additional procedures for major requirements are provided in the IT Group Health and Safety Procedures Manual HS001-999.

APPENDIX E
ACCIDENT PREVENTION PLAN

1.0 SIGNATURE SHEET

Plan Preparer:
Health and Safety Manager

William L. Hughes for
Robert Brooks, CSP
(732) 469-5599 (office)

Approved by:
Project Manager

William L. Hughes
William L. Hughes
(757) 318-5140 (office)

2.0 BACKGROUND INFORMATION

2.1 OHM REMEDIATION SERVICES CORPORATION, A SUBSIDIARY OF THE IT GROUP (OHM/IT)

Contract No. N62470-97-D-5000
Task Order No. 0061

The principal tasks to be conducted are listed below:

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
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- Survey the site to determine the area of excavation;
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2.2 OHM/IT ACCIDENT EXPERIENCE

YEAR	EMR (Interstate)*	OSHA Recordable Incident Rate*
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* OHM/IT

2.3 HAZARDOUS ACTIVITIES REQUIRING ACTIVITY HAZARD ANALYSIS*

- Mobilization/Site Preparation
- Installation of erosion and sediment controls;
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- Survey the site to determine the area of excavation;
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- Backfill and restore Sites 4, 21, and 22
- Project demobilization

*OHM/IT's Activity Hazard Analyses are located in the Site Specific Health and Safety Plan Appendix D.

3.0 STATEMENT OF SAFETY AN HEALTH POLICY

3.1 CORPORATE POLICY STATEMENT (ATTACHED)

4.0 RESPONSIBILITIES AND LINES OF AUTHORITIES

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the HASP. The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM), Health and Safety Coordinator (HSC), and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the Site Specific Health and Safety Plan (HASP).

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 TBD

5.2 SUBCONTRACTOR/SUPPLIER COORDINATION AND CONTROL

OHM/IT subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. OHM/IT subcontractors will comply with the requirements for site safety as outlined in OHM/IT Group Health and Safety Procedure HS011 (see IT Corporate Health and Safety Procedures Manual). The Site Superintendent/Supervisor will be responsible for the conduct and control of OHM/IT subcontractors.

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6.0 TRAINING

6.1 SAFETY INDOCTRINATION SUBJECTS:

Outlines of the site safety orientation for OHM/IT / sub-contract personnel and visitors are provided in Section 10.0 of the HASP.

6.2 MANDATORY TRAINING AND CERTIFICATIONS

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7.0 SAFETY AND HEALTH INSPECTIONS

7.1 SAFETY INSPECTIONS

The OHM/IT Project Manager and Site Supervisors/ Superintendents are required to conduct bi-monthly inspections of their sites using the Project Safety Inspection Report according to HS021 (see IT Group Health and Safety Program). SSOs are responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions and submitting them to SS. The SSO will discuss any necessary corrective actions with the SS and review new procedures. Copies of these reports are maintained on file at the project locations.

The OHM/IT Health and Safety Manager (HSM) or his designated representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Somerset, New Jersey, Office and are tracked in a database for each OHM/IT Project Manager and Supervisor/ Superintendent, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

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As required, OHM/IT safety equipment will comply with appropriate OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), and US Coast Guard or other recognized certification organizations.

8.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

8.1 COMPANY SAFETY PROGRAM GOALS

OHM/IT considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner which minimizes the probability of near misses, equipment/property damage or injury. OHM/IT will establish programs to recognize people and projects that demonstrate excellence in safety performance. OHM/IT will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. OHM/IT site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. OHM/IT will provide and enforce safety rules to protect employees, subcontractors, clients and the public.

8.2 OHM/IT SAFETY INCENTIVE PROGRAMS:

A copy of the OHM/IT Safety Incentive Award Program is provided at the project. The OHM/IT Project Manager will develop a site-specific program for approval by the HSM and the Business Line Lead within 10 days of project mobilization.

8.3 OHM/IT EMPLOYEE SAFETY RESPONSIBILITY REQUIREMENTS

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM/IT personnel will follow the policies set forth in the IT Group Health and Safety Program HS001-999. Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM or HSC. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. OHM/IT Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules

8.4 MANAGERS AND SUPERVISORS SAFETY ACCOUNTABILITY

It is the duty of the first line supervisor to motivate employees to adhere to OHM/IT's safety policy in each work situation. A first line supervisor for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All supervisors shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.

- Immediately correct unsafe conditions, which involved OHM/IT employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment as specified by this APP, site-specific health and safety plan, other OHM/IT procedures or as directed by the SSO, HSC, CIH or HSM.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the OHM/IT Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

9.0 ACCIDENT REPORTING

9.1 EXPOSURE DATA (MAN-HOURS WORKED)

The Vice President of Health and Safety tracks and maintains incident records as to Federal reporting requirements (OSHA 200 Log). Incident rates are reported monthly to the HSM. Incident Rates and Workers Compensation losses are tracked for the LANTDIV Program.

9.2 ACCIDENT INVESTIGATIONS, REPORTS AND LOGS

The site supervisor conducts Accident/incident investigations. A report is completed by the site supervisor and is required to be reviewed and signed by the site safety officer and the Project Manager. The report must be submitted to the HSM within 24 hours. All incident reporting forms are provided in HS020.

9.3 IMMEDIATE NOTIFICATION OF MAJOR INCIDENTS

OHM/IT will immediately notify the client of any major incident, including injury, fire, equipment/ property damage and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

9.3.1 Response

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

The work crew supervisor will immediately make radio contact with the site supervisor to alert him of a medical emergency situation. The work crew supervisor 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 injury, if known

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 supervisor 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 him/her quickly taken to the victim. OHM/IT personnel will evacuate any injury within the EZ 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 Site Safety Officer 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 Site Safety Officer has cleared the scene.

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 aggravates 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.

10.0 MEDICAL SUPPORT

On-site Medical Support/Off-site Medical Arrangements are provided in Section 9 and 11 of the HASP.

11.0 PERSONAL PROTECTIVE EQUIPMENT

11.1 HAZARD ASSESSMENT PROCEDURES/WRITTEN CERTIFICATIONS FOR PERSONAL PROTECTIVE EQUIPMENT

Protection levels provided in the HASP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SSO in consultation with the HSC, CIH and/or HSM. Personal Protective Equipment (PPE) selection criteria are outlined in HS 600 and HS601 (see IT Health and Safety Procedures Manual).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS100.

12.0 PLANS REQUIRED BY THE SAFETY MANUAL

12.1 HAZARD COMMUNICATION PROGRAM

The Site-Specific Hazard Communication Program is included Section 4.2 of the HASP. IT Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (see IT Group Health and Safety Program).

12.2 .EMERGENCY RESPONSE PLANS

The Site-Specific Emergency Response and Contingency Plan is included in Section 9.0 of the HASP.

12.3 LAYOUT PLANS

Site Layout Plans (indicating work zones) are included in the Work Plan. Work zones are defined in Section 5.0 of the HASP.

12.4 RESPIRATORY PROTECTION PLAN

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. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (see Section 8.0 HASP). All respirator users will be 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, HSM, HSC, and SSO will also evaluate the implementation of the HASP, periodically, to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

12.5 LEAD ABATEMENT PLAN

Not Applicable

12.6 ASBESTOS ABATEMENT PLAN

Not Applicable

12.7 ABRASIVE BLASTING

Not Applicable

12.8 CONFINED SPACE

Confined Space Entry Procedures are outlined in IT Procedure HS300

12.9 HAZARDOUS ENERGY CONTROL PLAN

Lockout/Tagout Procedures are outlined in HS315.

12.10 CRITICAL LIFT PROCEDURES

Not Applicable

12.11 CONTINGENCY PLAN FOR SEVERE WEATHER

Contingency plans for severe weather are included in Section 9.0 of HASP. A site Specific Hurricane Preparedness Plan is located in Appendix F of the HASP.

12.12 ACCESS AND HAUL ROAD PLAN

Not Applicable

12.13 DEMOLITION PLAN

Not Applicable

12.14 EMERGENCY RESCUE (TUNNELING)

Not Applicable

12.15 UNDERGROUND CONSTRUCTION FIRE PREVENTION AND PROTECTION PLAN

Not Applicable

12.16 COMPRESSED AIR PLAN

Not Applicable

12.17 FORM WORK AND SHORING ERECTION AND REMOVAL PLANS

Not Applicable

12.18 LIFT SLAB PLANS

Not Applicable

12.19 SSHP

The OHM/IT Site Specific Health and Safety Plan is included with this submission.

12.20 BLASTING PLAN

Not Applicable

12.21 DIVING PLAN

Not Applicable

12.22 ALCOHOL AND DRUG ABUSE PREVENTION PLAN

OHM/IT substance abuse procedures are outlined in IT HS101 - Drug, and Alcohol Testing.

13.0 CONTRACTOR INFORMATION TO MEET THE REQUIREMENTS OF THE MAJOR SECTIONS OF EM 385-1-1

In addition to this Accident Prevention Plan, OHM/IT has prepared a Site-Specific Health and Safety Plan to meet the major requirements of USACE Manual 385-1-1. Additional procedures for major requirements are provided in the IT Group Health and Safety Procedures Manual HS001-999.

APPENDIX F
FIELD SAMPLING AND QUALITY ASSURANCE PLAN

FIELD SAMPLING AND QUALITY ASSURANCE PLAN
FOR
SITES 4, 21 AND 22
NAVAL WEAPONS STATION YORKTOWN, VA

Prepared for:

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LIST OF ACRONYMS

A_2LA	American Association for Laboratory Accreditation
AIHA	American Industrial Hygiene Association
ASTM	American Society for Testing and Materials
bgs	Below ground surface
CAR	Corrective Action Report
CO	Contracting Officer
COC	Chain-Of-Custody
CON	Confirmation
COTR	Contracting Officer's Technical Representative
DOD	Department of Defense
DRMO	Defense Recycling Material Office
DRO	Diesel Range Organics
FSP	Field Sampling Plan
FSQAP	Field Sampling and Quality Assurance Plan
GRO	Gasoline Range Organics
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HNO_3	Nitric Acid
IT	International Technology Corporation
LCS	Laboratory Control Sample
LQMP	Laboratory Quality Management Plan
MDL	Method Detection Limit
mg/kg	Milligrams per kilogram (ppm)
mg/L	Milligrams per liter (ppm)
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NEESA	Naval Energy and Environmental Support Activity
NFESC	Naval Facilities Engineering Service Center
NIOSH	National Institute for Occupational Safety and Health
NTR	Navy Technical Representative
OHM	OHM Remediation Services Corporation
oz	Ounce
p	Average Percent Recovery
PAH	Polynuclear Aromatic Hydrocarbon
PAT	Proficiency Analytical Testing
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
PMO	Program Management Office
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QAR	Quality Assurance Report
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference

LIST OF ACRONYMS (CONTINUED)

RPM	Remedial Program Manager
SD	Standard Deviation
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
TAL	Target Analyte List
TAT	Turn-around-time
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TNT	2,4,6-trinitrotoluene
TPH	Total Petroleum Hydrocarbon
USACE-MRD	US Army Corp of Engineers-Missouri River Division
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WDC	Waste Disposal Characterization
WPNSTA	Weapons Station
WS/WP	Water Supply/Water Pollution
<	Less than
%	Percent

1.0 INTRODUCTION

This Field Sampling and Quality Assurance Plan (FSQAP) 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 Sites 4, 21 and 22 at Naval Weapons Station Yorktown, Virginia. This work will be performed under Task Order 0061 of Contract Number N62470-97-D-5000 for the Navy Atlantic Division (LANTDIV) at Naval Weapons Station, Yorktown, Virginia.

This FSQAP 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), IT/OHM Project Manager, and IT/OHM Project Chemist. These changes shall be documented by the Field Chemist/Scientist and distributed to the appropriate persons as amendments to the FSQAP.

The overall goal for the Remedial Action of Sites 4, 21 and 22 is to provide protection of human health and the environment by removal of soil contaminated with inorganics, polynuclear aromatic hydrocarbons including carcinogenic PAH and explosives.

2.0 PROJECT MANAGEMENT

2.1 PROJECT OBJECTIVE AND SCOPE OF WORK

The scope of work for Task Order No. 0061 in Sites 4, 21 and 22 is to characterize the wastes for disposal purposes, excavate and remove the contaminated soil, dispose the contaminated soil as a non-hazardous waste at an off-site commercial Sub-title C landfill and restore/regrade the sites. The objectives of the field analytical activities are as follows:

- Sample and analyze the soil from Sites 4, 21 and 22 for disposal analyses,
- Sample and analyze containerized water, obtained during construction activities, for disposal analyses,
- Sample and analyze the material that will be used for clean fill and topsoil. The analysis for clean fill parameters performed will determine the suitability of the material to be used as clean fill or topsoil, and
- Sample and analyze soil from Sites 4, 21 and 22 for confirmatory analyses.

The waste characterization of the soil will determine the appropriate handling of the material. Table 2.1 lists the Resource Conservation and Recovery Act (RCRA) guidelines for hazardous wastes.

2.2 PROJECT TASK DESCRIPTIONS

The following tasks will be performed in support of the Task Order 0061 remedial actions at Naval Weapons Station Yorktown:

- Collection, and off-site analysis of excavated soils at Sites 4, 21 and 22 to determine proper waste disposal,
- Collection and analysis of containerized water samples for disposal analyses,
- Collection and analysis of each imported source of clean fill and topsoil, to determine that the materials are suitable for use,
- Collection and analysis of twenty-four (24) confirmatory soil samples obtained from the nine (9) soil excavation areas within Site 4 for semivolatile analysis (PAH), total metals analysis (aluminum, antimony, arsenic, chromium, copper, lead, manganese, mercury and zinc) and explosives (TNT),
- Collection and analysis of four (4) confirmatory soil samples obtained from the three (3) soil excavation areas within Site 21 for total metals analysis (aluminum, cadmium, copper, manganese, mercury, thallium and zinc),
- Demolition of the existing biocell at Site 22,

- Collection and analysis of sixteen (16) confirmatory soil samples obtained from the three (3) soil excavation areas within Site 22 for total metals analysis (cadmium, copper, lead, mercury, silver and zinc) and explosives (HMX),
- Disposal of the contaminated soil at an off-site commercial Sub-title C landfill, and
- Backfill of excavations with clean soil from an on-site borrow source and restoration of the sites (topsoil and seed).

TABLE 2.1
RCRA HAZARDOUS WASTE REGULATORY LIMITS

Analyte	RCRA Regulatory Limit, mg/L
TCLP VOLATILES, METHOD 1311/8260B (mg/L)	
Benzene	0.5
Carbon Tetrachloride	0.5
Chlorobenzene	100.0
Chloroform	6.0
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.7
Methyl Ethyl Ketone	200.0
Tetrachloroethene	0.7
Trichloroethene	0.5
Vinyl Chloride	0.2
TCLP SEMIVOLATILES, METHOD 1311/8270C (mg/L)	
Total Cresols (ortho, para & meta)	200.0
2,4-Dinitrotoluene	0.13
Hexachloro-1,3-butadiene	0.5
Hexachlorobenzene	0.13
Hexachloroethane	3.0
Nitrobenzene	2.0
Pentachlorophenol	100.0
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	2.0
Pyridine	5.0
1,4-Dichlorobenzene	7.5
TCLP PESTICIDES, METHOD 1311/8081A (mg/L)	
Lindane	0.4
Heptachlor and Heptachlor Epoxide	0.008
Endrin	0.02
Methoxychlor	10.0
Chlordane	0.03
Toxaphene	0.5
TCLP HERBICIDES, METHOD 1311/8151A (mg/L)	
2,4-D	10.0
2,4,5-TP (Silvex)	1.0
TCLP METALS, METHOD 1311/6010B/7471A (mg/L)	
Arsenic	5.0
Barium	100.0
Cadmium	1.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Selenium	1.0
Silver	5.0

2.3 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 the deputy project manager and other members of the project staff.

An organizational chart of the project team is presented in Figure I-1 of the QA/QC Plan. The responsibilities of the key members in the project organization are:

Project Manager – William Hughes

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 nonconformance, notification of QA personnel, and implementation of corrective actions.
- Determination of the effect of nonconformance 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.
- Serve as final reviewer prior to release of project information.
- 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 – Ware Warburton

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 Chemist – To be announced

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/She is also responsible for informing the chemical QA officer of any site-specific problems and for coordinating QA efforts with the contracted laboratory. His/Her 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).
- Implementing corrective actions as required by the QC Manager.
- Ongoing QA/QC training of new and current personnel.
- Reviewing laboratory invoices for completeness and accuracy.
- Implement the FSQAP and designated QA/QC procedures.
- 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 laboratory supplies the sample containers, shipping supplies, chain-of-custody records, and the required QC samples (i.e., trip blanks).
- Carrying out all sampling in accordance with approved procedures and methodologies as defined in the FSQAP.
- Generating field blanks, equipment rinsate blanks, and acquiring field duplicate samples as required by the FSQAP.
- Completing sampling logbooks, sampling forms, labels, custody seals, and chain-of-custody forms and other paperwork as required by the FSQAP.
- Packaging and shipping of samples to appropriate laboratories.

2.4 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

Data generated from those tasks described in Section 2.2 will be used to make the decisions on proper disposal and use of clean fill. Project-specific quality objectives are listed in Appendix A, Table A-1. These include the quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated.

An American Association for Laboratory Accreditation (A_2LA), 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 Virginia-approved. A copy of the laboratory's QA Manual, statement of qualifications, and appropriate certificates of approval are kept on file in the Virginia Beach office and are available upon request from the NTR, LANTDIV, or other regulatory agencies. A copy of the approved FSQAP will be forwarded to the laboratory selected to perform chemical analysis of the samples.

Waste disposal characterization samples will meet OHM's minimum requirement while confirmation samples will require the Navy NEESA Level 3 Deliverable Data Package for the QA/QC as specified in OHM QP-650. A copy of QP-650 is included in Appendix B. On-site air measurements will be non-definitive field screening analyses. For disposal analysis, 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-2, "Sampling and Analytical Summary" 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 closeout report.

3.1 SAMPLING METHODS AND PROCEDURES

The following sections describe sampling locations, frequencies, sample matrices, and measurements of parameters of interest. Table A-2 "Sampling and Analytical Summary" in Appendix A presents a summary of these items.

3.1.1 Sampling of the soil to be excavated at Sites 4, 21 and 22 for waste characterization

The sites will be sampled prior to excavation and analyzed for disposal purposes. The areas to be excavated will be sampled in accordance with the Standard Operating Procedure (SOP) attached in Appendix C. In summary the following procedure will be followed:

The soil samples will be sent to an off-site laboratory for:

- Full Toxicity Characteristic Leaching Procedure (TCLP) including RCRA characteristics, paint filter, total metals (aluminum, antimony, arsenic, chromium, copper, lead, manganese, mercury and zinc), semivolatiles (PAH) and explosives at Site 4
- Full TCLP including RCRA characteristics, paint filter, total metals (aluminum, cadmium, copper, manganese, mercury, thallium and zinc) at Site 21
- Full TCLP including RCRA characteristics, paint filter, total metals (cadmium, copper, lead, mercury, silver and zinc) and explosives at Site 22

The complete list of analytical requirements appears in Appendix A, Table A-2. If any results exceed the levels listed in Table 2.1 for Hazardous Wastes, the material represented by the sample will be considered contaminated. The results for the total metals and explosives analyses will be reviewed and will also assist in the determination of the appropriate handling and use of the soil. Contaminated materials will then be sent to an appropriate off-site disposal facility, for disposal.

To profile the soil for disposal, one grab and one composite sample will be collected from ***each*** of the three removal sites. The grab sample for volatiles analysis will be collected using the following procedure:

1. At one (1) random sample point within the removal area, dig to a depth of one foot using a shovel, stainless steel spoon or scoop.
2. Collect a grab sample from the resulting hole using a stainless steel scoop or spoon.
3. Fill a 4-ounce (oz) glass jar immediately to the top.
4. Tap the jar and fill with more of the soil sample to ensure no headspace.

5. Close the jar, label, and package the sample for shipment to the lab.

The composite sample for the remaining analyses will be collected using the following procedure:

1. At five (5) additional sampling points, collect a grab from each of the resulting holes using a shovel, stainless steel spoon or scoop.
2. Place the grab samples into a stainless steel bowl.
3. Homogenize the 5 grab samples by the quartering technique using a stainless steel spoon.
4. Fill the appropriate sample jars approximately ¾ full with the composite sample.
5. Close the jar, label, and package the sample for shipment to the lab.

In the unlikely event that any buried cans, containers and/or drums are uncovered during the excavation activities at the sites, appropriate sampling procedures will be followed in order to characterize the waste(s) for proper disposal purposes.

Non-disposable sampling equipment will be thoroughly cleaned between samples using the decontamination procedures described in Section 3.4. Field sampling personnel will wear disposable sampling gloves during sampling and will change gloves between sample locations to minimize the potential for cross-contamination. Other personal protective equipment (PPE) may be required for sampling as per the Site Safety and Health Plan (SSHP). Contact with the sample should be avoided to minimize the potential for cross-contamination.

3.1.2 Liquid Waste Sampling

During activities at the sites, containerized water may be generated. This liquid waste will consist of decontamination water. The liquid waste from the sites will be collected and held in drums until samples are analyzed and disposal can be arranged. The analysis of the container(s) will be performed according to the criteria given in Appendix A, Table A-2, to determine proper disposal. At least one representative composite sample of each drum(s) contents will be collected through the bung port of the drum. The SOP for drum sampling is included in Appendix C.

3.1.3 Clean Fill and Topsoil Sampling

The clean fill that will be used at the sites will be provided by a current certification of analysis for the on-site borrow material and the remaining clean fill will be imported, as needed, and sampled for: Total (Volatiles, Semivolatiles, Pesticides and PCB), Target Analyte List (TAL) Metals and

Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) and Diesel Range Organics (DRO). Topsoil will also be imported and sampled for the same parameters as the clean fill.

The sampling will be conducted in a similar manner as the waste characterization soil sampling of Sites 4, 21 and 22. One grab sample will be collected for the volatiles and TPH-GRO and a five-point composite for the metals, semivolatiles, pesticides, PCB and TPH-DRO. The SOP for sampling soil piles is included in Appendix C.

3.1.4 Confirmation Sampling – Sites 4, 21 and 22

Sites 4, 21 and 22 will be excavated approximately two feet below ground surface (bgs), with segregation of the soil from each site into separate stockpiles. Following excavation of the nine (9) contaminated locations within Site 4, a total of twenty-four (24) confirmatory, composite soil samples will be collected and sent to the off-site laboratory for analysis by SW-846 for semivolatiles (PAH), Method 8270C, total metals (aluminum, antimony, arsenic, chromium, copper, lead, manganese, mercury and zinc), Method 6010B/7041/7471A and explosives (TNT), Method 8330. At ***each*** of the six (6) smaller excavation areas, divide the area in half and collect two (2) composite soil samples from the floor of the excavation at depth (D=0.0-0.5'). At ***each*** of the three (3) larger excavation areas, divide the area into four (4) approximately equal quadrants and collect four (4) composite soil samples from the floor of the excavation at depth (D=0.0-0.5').

Additionally, one (1) of the confirmation soil samples from Site 4 will be selected as a field duplicate. The duplicate soil sample will be prepared in the same manner as the confirmation soil sample and submitted to the off-site laboratory blind. Also, one (1) of the confirmation soil samples from Site 4 will be selected for matrix spike/matrix spike duplicate (MS/MSD) analysis at the laboratory. As per the FSQAP, the MS/MSD aliquot will be clearly identified on the sample label and chain-of-custody form.

Following excavation of the three (3) contaminated locations within Site 21, a total of four (4) confirmatory, composite soil samples will be collected and sent to the off-site laboratory for analysis by SW-846 for total metals (aluminum, cadmium, copper, manganese, mercury, thallium and zinc), Method 6010B/7471A/7841. One (1) composite soil sample will be collected from ***each*** of the two (2) smaller excavation areas from the floor of the excavation at depth (D=0.0-0.5'). Divide the larger excavation area in half and collect two (2) composite soil samples from the floor of the excavation at depth (D=0.0-0.5').

Site 22 will require demolition and removal of the existing biocell prior to the excavation and removal of the contaminated soils. The concrete from the biocell is considered non-hazardous and

will be disposed as a non-hazardous waste. Following excavation of the three (3) contaminated locations within Site 22, a total of sixteen (16) confirmatory, composite soil samples will be collected and sent to the off-site laboratory for analysis by SW-846 for total metals (cadmium, copper, lead, mercury, silver and zinc), Method 6010B/7471A and explosives (HMX), Method 8330. At ***each*** of the two (2) smaller excavation areas, divide the area in half and collect two (2) composite soil samples from the floor of the excavation at depth (D=0.0-0.5'). After excavation and removal of the biocell, that area will be divided into twelve (12) approximately equal 50' x 50' grids. One (1) composite soil sample will be collected from ***each*** grid from the floor of the excavation at depth (D=0.0-0.5').

In the same manner as for Site 4, one (1) of the confirmation soil samples from Site 22 will be selected as a field duplicate. The duplicate soil sample will be prepared in the same manner as the confirmation soil sample and submitted to the off-site laboratory blind. Also, one (1) of the confirmation soil samples from Site 22 will be selected for matrix spike/matrix spike duplicate (MS/MSD) analysis at the laboratory. As per the FSQAP, the MS/MSD aliquot will be clearly identified on the sample label and chain-of-custody form.

The analytical results for the confirmation soil samples for Sites 4, 21 and 22 will be compared to the Target Cleanup Goals listed in Section 3.1.5. Any exceedance of the Target Cleanup Goals will require additional excavation followed by re-sampling for confirmation or direction by the Navy for further course of action.

Metallic debris (if encountered) will be recycled at the DRMO on base, in accordance with WPNSTA Yorktown Environmental Directorate requirements.

3.1.5 Target Cleanup Goals

Target cleanup (remediation) goals have been established based on site-specific risk-based calculations for human health, and soil screening values for ecological receptors for contaminants that were detected at Sites 4, 21 and 22. The target cleanup goals for the sites are presented below:

Target Cleanup Goals

Site 4	*Concentration, mg/kg*	*Site 21*	*Concentration, mg/kg*	*Site 22*	*Concentration, mg/kg*
TNT	44	Aluminum	24100	HMX	5.7
Total PAH	44	Cadmium	4	Cadmium	4
Total cPAH	10	Copper	100	Copper	100
Aluminum	24100	Manganese	491	Lead	400
Antimony	11	Mercury	0.3	Mercury	0.3
Arsenic	63.9	Thallium	0.1	Silver	50
Chromium	33.5	Zinc	410	Zinc	410
Copper	100				
Lead	400				
Manganese	491				
Mercury	0.3				
Zinc	410				

TNT 2,4,6-trinitrotoluene

cPAH Carcinogenic PAH fraction includes: Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Chrysene
Dibenzo(a,h)anthracene
Indeno(1,2,3-cd)pyrene

HMX Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

3.1.6 Laboratory Turn-Around-Time

All waste characterization, imported clean fill and topsoil samples will be analyzed by the laboratory on a seven (7) day turn-around-time (TAT), with seven (7) workdays for submission of the deliverable data package. All confirmation soil samples will be analyzed by the laboratory on a three (3) day TAT, with seven (7) workdays for submission of the deliverable data package.

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:

XXXXX-YY-ZZZ-NNN

where:

XXXXX = Project Number (809275)
YY = Site (4, 21 or 22)
ZZZ = Sample matrix or type (WDC = waste disposal characterization, CON = confirmation)
NNN = Sequential number starting at 001 (Sequence number in Sample Logbook)

Sample location information will be included in the sample description area of the Chain-Of-Custody (COC). Sample sequential numbers are not to be duplicated.

3.3 SAMPLE PRESERVATION AND HOLDING TIMES

Samples collected for off-site analyses will be sent to the laboratory within 24 hours after collection. The holding time begins from the date and time of collection in the field.

All environmental samples will be preserved to a temperature of 4°± 2°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-2.

3.4 DECONTAMINATION

All sampling equipment (shovels, hand augers, scoops, 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 Naval Energy and Environmental Support Activity (NEESA) 20.2-047B are as follows.

1) Remove gross contamination by scraping or brushing.
2) Clean with tap water and phosphate-free laboratory detergent (liquinox), using a stiff brush to remove all surface contaminants.
3) Rinse thoroughly with tap water.
4) Rinse with 1:1 nitric acid (HNO_3) metals grade (metal samples only).
5) Rinse thoroughly with tap water.

6) Rinse thoroughly with deionized/distilled water.
7) Rinse twice with reagent grade isopropanol or methanol.
8) 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.)
9) 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.

3.5 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, glass thieves, tongue depressors, 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 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 polyvinyl chloride (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	Polynuclear Aromatic Hydrocarbons (PAH)
Spraying for insects	Pesticides, oils, solvents
Spraying for weeds	Herbicides, oils, solvents

Refueling	BTEX, hydrocarbons
Painting and paint stripping	Solvents

3.6 SAMPLE LOGBOOK

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, COC and air bill numbers, preservatives, date samples were sent and date results were received.
- 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 logbook 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 into the data base program that 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 output from the database is an acceptable substitute for the sample logbook.

3.7 SAMPLE LABELS

Any samples placed into a sample container will be identified by a sample label. The sample label will identify the following information:

(1) PROJECT NUMBER
(2) DATE- Month, day, year
(3) TIME- Military time
(4) SAMPLE NUMBER- See Section 3.2 for designations
(5) SAMPLE DESCRIPTION
(6) SAMPLER- Sampler's name
(7) PRESERVATIVES
(8) ANALYSIS REQUIRED- See Appendix A, Table A-2

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 log book. An example of a sample label is presented in Appendix D.

3.8 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 D.

3.9 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, COC procedures are followed as described below:

A sample is under your custody if:

(1) It is in your actual possession, or
(2) It is in your view, after being in your physical possession, or
(3) It was in your physical possession and then you locked it up to prevent tampering, or
(4) It is in a designated secure area

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

(1) Project Name
(2) Project Location-City and State in which the project site is located
(3) Project Number
(4) 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)
(5) Site Telephone Number-The telephone number of on-site office trailer or number where person responsible for samples can be contacted
(6) Sample Date-Month, Day, Year
(7) Sample Time-Military time
(8) Sample Identification-Sample number and location
(9) Sample Type-Designation of sample as grab or composite
(10) Sample Description-Sample matrix, and a brief description of the sampling location
(11) Sample Preservation-Preservatives used
(12) Analytical Parameters Requested-Analytical parameter, method numbers, and specific compounds of interest, if applicable
(13) Air bill Number
(14) Laboratory-Laboratory where samples are to be sent
(15) Laboratory Phone-Telephone number of laboratory
(16) Laboratory Contact-Contact person for laboratory
(17) Relinquished By-Signature of sender (OHM)
(18) Date Relinquished-Date samples were relinquished
(19) Accepted By-Signature of acceptor
(20) Date Received-Date samples were accepted
(21) Turn-around-time-Turn-around-times requested or date the results are required from the lab

(22) 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).

3.10 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°± 2°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. Aqueous samples for metals analysis, except hexavalent chromium, shall not be shipped or stored under refrigeration.

Samples will be shipped via an overnight shipping agency to the appropriate laboratory. Instructions for filling out shipment documentation are included in Appendix D. These instructions are for shipping samples with unknown or limited hazards. All information will be entered as directed. No changes or substitutions to these instruction will be made irrespective of their significance. A copy of the OHM sample shipping label is included in Appendix D. Included in Appendix D is the OHM SOP procedure for sample packaging and shipping of environmental samples.

4.0 DATA ACQUISTION

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 United States Environmental Protection Agency (USEPA) SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods whenever possible. Alternative methods of analysis from other sources such as the American Society for Testing and Materials (ASTM), National Institute for Occupational Safety and Health (NIOSH) and Standard Methods, etc.) may also be used.

4.2 QUALITY CONTROL REQUIREMENTS

Project (QC) requirements for precision, accuracy, completeness, and quantitation limits are listed in Appendix A, Table A-1. QC 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 and 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.

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 SOPs have been followed.
- Analytical results are correct and complete.

- Analysis is performed within prescribed holding times.
- QC samples are within established control limits.
- Blanks are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.
- Documentation is complete.

The next level of review is performed by the section supervisor or data review specialist. 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/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 acceptable criteria.
- Reviewing blank data for contamination.
- Reviewing field QC results for inconsistencies.
- Verifying that the data generated meet the project Data Quality Objectives.

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/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 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. The laboratory files will be maintained in the Program Management Office (PMO). These files are maintained in a centralized data management manner to ensure proper maintenance of the data. The Program Chemist is responsible for the maintenance of the data for LANTDIV projects. The project manager/supervisor will also have a second copy. The Project Manager is responsible for ensuring the collection, assembly, and inventory of all documents relative to the project at the time the objectives are met. These files then become 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:

A. Project logbooks

B. Drum logs and other forms
C. Sample identification documents
D. Chain-of-custody records
E. Analytical logbooks, laboratory data, calculations, graphs, etc.
F. Correspondence
   - Inter-office
   - Client
   - Regulating agencies
   - Record of confidential material
G. Report notes, calculations, drafts
H. References, literature
I. Sample (on-hand) inventory
J. Check-out logs
K. Litigation documents
L. 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 QC 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 result is entered in 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 Quality Assurance Manual (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 mid-standard. During 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 - 3SD

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 differences (RPDs) are listed in Appendix A, Table A-1. 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 are based on historical laboratory data.

Matrix spike (MS) and matrix spike duplicate (MSD) samples, on a per batch basis 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 is used to define the precision of the analysis. Minimum limits are listed in Appendix A, Table A-1.

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-1.

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. The 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 a 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, American Industrial Hygiene Association (AIHA), Proficiency Analytical Testing (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, Department of Defense (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 system 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 as soon as possible 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 are 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 Manager, 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 Manager 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 PROJECT QUALITY CONTROL OBJECTIVES
TABLE A-2 SAMPLING SUMMARY

TABLE A-1
PROJECT QUALITY CONTROL OBJECTIVES

Method No	Analyte / Component	Project Action Limits TCLP	Minimum PQL TCLP	Accuracy Limits MS/MSD Recoveries TCLP	Precision Limits MS/MSD Deviation TCLP	Accuracy Limits LCS Recoveries TCLP	Precision Limits Field Dup Deviation TCLP	Completeness Limits TCLP
TCLP Volatiles		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8260B	1,1-Dichloroethylene	0.7	0.1	50-150	<50	70-130	<50	90
8260B	1,2-Dichloroethane	0.5	0.1	50-150	<50	70-130	<50	90
8260B	Benzene	0.5	0.1	50-150	<50	70-130	<50	90
8260B	Carbon Tetrachloride	0.5	0.1	50-150	<50	70-130	<50	90
8260B	Chlorobenzene	100	20	50-150	<50	70-130	<50	90
8260B	Chloroform	6	1	50-150	<50	70-130	<50	90
8260B	Methyl Ethyl Ketone	200	20	50-150	<50	70-130	<50	90
8260B	Tetrachloroethylene	0.7	0.7	50-150	<50	70-130	<50	90
8260B	Trichloroethylene	0.5	0.1	50-150	<50	70-130	<50	90
8260B	Vinyl Chloride	0.2	0.05	50-150	<50	70-130	<50	90
TCLP Semivolatiles		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8270C	1,4-Dichlorobenzene	7.5	1	50-150	<50	70-130	<50	90
8270C	2,4,5-Trichlorophenol	400	80	50-150	<50	70-130	<50	90
8270C	2,4,6-Trichlorophenol	2	0.4	50-150	<50	70-130	<50	90
8270C	2,4-Dinitrotoluene	0.13	0.02	50-150	<50	70-130	<50	90
8270C	Cresol	200	40	50-150	<50	70-130	<50	90
8270C	Hexachlorobenzene	0.13	0.02	50-150	<50	70-130	<50	90
8270C	Hexachloroethane	3	0.5	50-150	<50	70-130	<50	90
8270C	Hexachlorobutadiene	0.5	0.4	50-150	<50	70-130	<50	90
8270C	Nitrobenzene	2	0.4	50-150	<50	70-130	<50	90
8270C	Pentachlorophenol	100	80	50-150	<50	70-130	<50	90
8270C	Pyridine	5	1	50-150	<50	70-130	<50	90
TCLP Pesticides		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8081A	Endrin	0.02	0.004	50-150	<50	70-130	<50	90
8081A	Lindane	0.4	0.08	50-150	<50	70-130	<50	90
8081A	Methoxychlor	10	1	50-150	<50	70-130	<50	90
8081A	Toxaphene	0.5	0.1	50-150	<50	70-130	<50	90
8081A	Chlordane	0.03	0.005	50-150	<50	70-130	<50	90
8081A	Heptachlor and its Epoxide	0.008	0.001	50-150	<50	70-130	<50	90

T[illegible]E A-1
PROJECT QUALITY CONTROL OBJECTIVES

Method No	Analyte / Component	Project Action Limits TCLP	Minimum PQL TCLP	Accuracy Limits MS/MSD Recoveries TCLP	Precision Limits MS/MSD Deviation TCLP	Accuracy Limits LCS Recoveries TCLP	Precision Limits Field Dup Deviation TCLP	Completeness Limits TCLP
TCLP Herbicides		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8151A	2,4-D	10	2	50-150	<50	70-130	<50	90
8151A	2,4,5-TP	1	0.2	50-150	<50	70-130	<50	90
TCLP Metals		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
6010B	Arsenic	5	1	50-150	<50	70-130	<50	90
6010B	Barium	100	20	50-150	<50	70-130	<50	90
6010B	Cadmium	1	0.2	50-150	<50	70-130	<50	90
6010B	Chromium	5	1	50-150	<50	70-130	<50	90
6010B	Lead	5	1	50-150	<50	70-130	<50	90
7470A	Mercury	0.2	0.04	50-150	<50	70-130	<50	90
6010B	Selenium	1	0.2	50-150	<50	70-130	<50	90
6010B	Silver	5	1	50-150	<50	70-130	<50	90
RCRA Characteristics		(mg/kg)	(mg/kg)	(%)	(%)	(%)	(%)	(%)
Section 7.3	Reactive Sulfide	500	50	N/A	<50	N/A	<50	90
Section 7.3	Reactive Cyanide	250	25	N/A	<50	N/A	<50	90
1010	Ignitability (Pensky Martens)	< 60° C or <140° F	40° C or 100° F	N/A	<50	N/A	<50	90
1020A	Ignitability (Setaflash)	< 60° C or <140° F	40° C or 100° F	N/A	<50	N/A	<50	90
1030	Ignitability of Solids	< 60° C or <140° F	40° C or 100° F	N/A	<50	N/A	<50	90
9040B/9045C	pH (Corrosivity)	≤ 2 ; ≥ 12.5	N/A	N/A	<50	N/A	<50	90
Miscellaneous				(%)	(%)	(%)	(%)	(%)
9095A	Paint Filter	Pass	Pass/Fail	N/A	N/A	N/A	N/A	90

TABLE A-1
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	Analyte / Component	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil
TCL SEMIVOLATILES BY GC/MS (PAH)		mg/L	mg/kg	ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8270C	Naphthalene	NS	44 combined total	10	330	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270C	Acenaphthylene	NS		10	330	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270C	Acenaphthene	NS		10	330	60-140	20-150	<30	<50	49-124	39-135	<50	<75	95	90
8270C	Fluorene	NS		10	330	60-140	20-150	<30	<50	48-139	38-149	<50	<75	95	90
8270C	Phenanthrene	NS		10	330	60-140	20-150	<30	<50	54-125	44-135	<50	<75	95	90
8270C	Anthracene	NS		10	330	60-140	20-150	<30	<50	45-165	35-175	<50	<75	95	90
8270C	Fluoranthene	NS		10	330	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270C	Pyrene	NS		10	330	60-140	20-150	<30	<50	47-136	37-146	<50	<75	95	90
8270C	Benzo (g,h,i) perylene	NS		10	330	60-140	20-150	<30	<50	34-149	25-159	<50	<75	95	90
8270C	Benzo (a) anthracene	NS	10 combined total	10	330	60-140	20-150	<30	<50	51-133	41-143	<50	<75	95	90
8270C	Chrysene	NS		10	330	60-140	20-150	<30	<50	55-133	45-143	<50	<75	95	90
8270C	Benzo (b) fluoranthene	NS		10	330	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270C	Benzo (k) fluoranthene	NS		10	330	60-140	20-150	<30	<50	37-123	37-123	<50	<75	95	90
8270C	Benzo (a) pyrene	NS		10	830	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270C	Indeno (1,2,3-cd) pyrene	NS		10	330	60-140	20-150	<30	<50	27-160	25-170	<50	<75	95	90
8270C	Dibenzo (a,h) anthracene	NS		10	330	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270C	Nitrobenzene-d5					35-114	23-120								
8270C	2-Fluorobiphenyl					43-116	30-115								
8270C	Terphenyl-d14					33-141	18-137								
8270C	Phenol-d5					10-110	24-113								
8270C	2-Fluorophenol					21-110	25-121								
8270C	2,4,6-Tribromophenol					10-123	19-122								
8270C	2-Chlorophenol-d4					33-110	20-130								
8270C	1,2-Dichorobenzene-d4					16-110	20-130								

TAL METALS BY ICP		mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%
6010B	Aluminum	NS	24100	0.2	22.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Antimony	NS	11	0.06	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Arsenic	NS	63.9	0.01	40.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Barium	NS	NA	0.2	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Beryllium	NS	NA	0.005	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Cadmium	NS	4	0.005	0.50	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Calcium	NS	NA	5	100	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Chromium	NS	33.5	0.01	20	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90

TABLE A-1
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	Analyte / Component	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil
6010B	Cobalt	NS	NA	0.05	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Copper	NS	100	0.025	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Iron	NS	NA	0.1	3.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Lead	NS	400	0.003	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Magnesium	NS	NA	5	100	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Manganese	NS	491	0.015	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Nickel	NS	NA	0.04	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Potassium	NS	NA	5	600	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Selenium	NS	NA	0.005	3.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Silver	NS	50	0.01	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Sodium	NS	NA	5	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Thallium	NS	NA	0.01	6.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Vanadium	NS	NA	0.05	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Zinc	NS	410	0.02	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
TAL METALS BY GFAA		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7041	Antimony	NS	11	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7060A	Arsenic	NS	63.9	0.005	0.5	50-150	30-170	<30	<50	74-120	74-1120	<50	<75	95	90
7091	Beryllium	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7131A	Cadmium	NS	NA	0.001	0.1	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7191	Chromium	NS	33.5	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7421	Lead	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7740	Selenium	NS	NA	0.005	0.5	50-150	30-170	<30	<50	70-125	70-125	<50	<75	95	90
7761	Silver	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7841	Thallium	NS	0.1	0.001	0.1	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
MERCURY BY COLD VAPOR		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7470A	Mercury	NS	NA	0.001	NA	50-150	NA	<30	NA	70-130	NA	<50	NA	95	NA
7471A	Mercury	NA	0.3	NA	0.1	50-150	NA	<30	NA	70-130	NA	<50	NA	95	NA

TA E A-2
SAMPLING AND ANALYTICAL SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx No. Samples	Sample Type	Sampling Equipment	TAT[1]	QC Level	Required Analysis	Analytical Method SW-846	Holding Time	Sample Preservation	Sample Containers
Construction Sampling and Off-Site Analysis													
Characterization Excavation Area Soils	Sites 4, 21 and 22	Soil	One sample	1 sample per site	Grab for VOC 5 pt Composite for remaining	Shovel SS Auger SS Spoon SS Scoop SS Bowl	7 days	OHM Minimum	TCLP Volatiles TCLP Semivolatiles TCLP Pesticides TCLP Herbicides TCLP Metals Ignitability Corrosivity Reactivity Paint Filter TCL Semivolatiles (PAH) Total Aluminum Total Antimony Total Arsenic Total Cadmium Total Chromium Total Copper Total Lead Total Manganese Total Mercury Total Silver Total Thallium Total Zinc Explosives	1311/8260B 1311/8270C 1311/8081A 1311/8151A 1311/6010B/7471A 1020A 9045C Sect 7.3 9095A 8270C (Site 4) 6010B (Sites 4, 21) 6010B/7041 (Site 4) 6010B/7060A (Site 4) 6010B (Sites 21, 22) 6010B/7191 (Site 4) 6010B (Sites 4, 21, 22) 6010B (Sites 4, 22) 6010B (Sites 4, 21) 7471A (Sites 4, 21, 22) 6010B (Site 22) 7841 (Site 21) 6010B (Sites 4, 21, 22) 8330 (Sites 4, 22)	14 days See Note 2	Cool to 4°C	(1) 4-oz Glass (4) 8-oz Glass
Characterization Clean Fill Topsoil	Clean Fill Topsoil	Soil	One sample	1 sample per source	Grab for VOC, TPH GRO 5 pt Composite for remaining	Shovel SS Auger SS Spoon SS Scoop SS Bowl	7 days	OHM Minimum	TCL Volatiles TCL Semivolatiles TCL Pesticides Total PCB TAL Metals TPH GRO/DRO	8260B 8270C 8081A 8082 6010B/7471A 8015B Modified	14 days See Note 2	Cool to 4°C	(1) 4-oz Glass (4) 8-oz Glass
Drummed Water During Construction	Drum	Water	One sample per drum	1	Grab	Drum Thief	7 days	OHM Minimum	TCLP Volatiles TCLP Semivolatiles TCLP Pesticides TCLP Herbicides TCLP Metals Ignitability Corrosivity Reactivity TCL Volatiles TCL Semivolatiles TCL Pesticides Total PCB TAL Metals TPH GRO/DRO	1311/8260B 1311/8270C 1311/8081A 1311/8151A 1311/6010B/7470A 1020A 9040B Sect 7.3 8260B 8270C 8081A 8082 6010B/7471A 8015B Modified	7 days for extraction, 40 days after extraction See Note 2	HCl Cool to 4°C Cool to 4°C Cool to 4°C HNO_3 Cool to 4°C Cool to 4°C Cool to 4°C HCl Cool to 4°C Cool to 4°C Cool to 4°C HNO_3 Cool to 4°C	(3) 40-ml VOA (6) 32-oz Glass (1) 500-ml plastic

Notes:
1) Calculated days for prelim data, final data due 7 days later
2) TCLP:VOA--14d TCLP ex, 14d an; SVOC--14d TCLP ex, 7d ex, 40d an; Hg--28d TCLP ex, 28d an; Met--180d TCLP ex, 180d an

TA_E A-2
SAMPLING AND ANALYTICAL SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx No. Samples	Sample Type	Sampling Equipment	TAT[1]	QC Level	Required Analysis	Analytical Method SW-846	Holding Time	Sample Preservation	Sample Containers
Construction Sampling and Off-Site Analysis													
Confirmation	Site 4	Soil	Twenty-four samples plus one duplicate, one MS/MSD	24 plus 1 duplicate, 1 MS/MSD	Composite	SS Auger SS Spoon SS Scoop SS Bowl	3 days	NEESA Level 3	TCL Semivolatiles (PAH) Total Aluminum Total Antimony Total Arsenic Total Chromium Total Copper Total Lead Total Manganese Total Mercury Total Zinc Explosives	8270C 6010B 6010B/7041 6010B/7060A 6010B/7191 6010B 6010B 6010B 7471A 6010B 8330	14 days	Cool to 4^0 C	(2) 4-oz Glass
Confirmation	Site 21	Soil	Four samples	4	Composite	SS Auger SS Spoon SS Scoop SS Bowl	3 days	NEESA Level 3	Total Aluminum Total Cadmium Total Copper Total Manganese Total Mercury Total Thallium Total Zinc	6010B 6010B 6010B 6010B 7471A 7841 6010B	180 days except Mercury - 28 days	Cool to 4^0 C	(1) 4-oz Glass
Confirmation	Site 22	Soil	Sixteen samples plus one duplicate, one MS/MSD	16 plus 1 duplicate, 1 MS/MSD	Composite	SS Auger SS Spoon SS Scoop SS Bowl	3 days	NEESA Level 3	Total Cadmium Total Copper Total Lead Total Mercury Total Silver Total Zinc Explosives	6010B 6010B 6010B 7471A 6010B 6010B 8330	14 days	Cool to 4^0 C	(2) 4-oz Glass

Notes:
1) Calculated days for prelim data, final data due 7 days later
2) TCLP:VOA--14d TCLP ex, 14d an; SVOC--14d TCLP ex, 7d ex, 40d an; Hg--28d TCLP ex, 28d an; Met--180d TCLP ex, 180d an

APPENDIX B

STANDARD ANALYTICAL DATA DELIVERABLE REQUIREMENTS

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-650	Title : Standard Analytical Data Deliverable Requirements

APPROVAL

Name	Title	Signature	Date
Guy Gallello	Midwest Region FAS Manger		
Emma Popek	Western Region FAS Manager		
Mike Quinlan	Eastern Region FAS Manager		
Terry Whitt	Southern FAS Manager		

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1	8/4/94	issue	-	-	-	-	-	-	-
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

OHM Corporation

STANDARD OPERATING PROCEDURE

Title : Standard Analytical Data Deliverable Requirements **Document #:** QP-650

1.0 PURPOSE

The purpose of this procedure is to set forth guidelines for the standardization of hard copy analytical data packages provided to OHM by Analytical Laboratories. This procedure defines the specific deliverable requirement to be include when a minimum data packages, standard data packages and maximum data packages is requested by OHM employees.

2.0 SCOPE

These procedures applies to all purchases of analytical services and the analytical data packages provided to OHM by all analytical laboratories.

3.0 RELATED DOCUMENTS

HAZWRAP, July 1990. Quality Control Requirements for Field Methods DOE/HWP69/R1.

HAZWRAP, July 1988. Requirements for Quality Assurance of Analytical Data, DOE/HWP-65, Rev. 0, July 1988.

USEPA , Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846

United States Environmental Protection Agency, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

4.0 GENERAL INFORMATION

In the past OHM has experienced that Each analytical laboratory has a different report format that they call their standard deliverable package. Many times the laboratory=s standard deliverable package does not include all of the information required to meet our client=s expectations in performing data assessment and data validation of the analytical deliverable. When the additional information has been requested from the laboratories often additional charges are levied. In order to better service our client and to assure each and every laboratory bidding on a given set of samples understands precisely what is required to be included within each analytical report, the following procedures have been developed.

5.0 DEFINITIONS

Accuracy - A measure of how close a measured value is to a known true value.

Aliquot - A measured portion of a sample taken for analysis.

Analytical Batch - Batch size is determined the analytical method and project specific quality assurance requirements. Batch size is ussually set at 20 or less samples of the same matrix being analyzed for the same parameters at the same time. All samples in a batch are prepared and analyzed together with a basic set of QC samples. Specific project requirements are listed in the Quality Assurance Project Plan (QAPP).
Background Correction - A technique usually employed relative to metals analysis which compensates for variable background contribution to the instrument signal in the determination of trace elements

Blank - An artificial sample designed to monitor the introduction of artifacts into the measurement process.

Calibration - The systematic determination of the relationship of the response of the measurement system to the concentration of a analyte of interest

Chain-of-Custody - A form used to track the custody of the samples from the time they are taken until the time they are analyzed.

Continuing Calibration - Subsequent checks on the instrument calibration performed throughout the analysis of samples.

Data Assessment - A systematic review of the analytical data to assure all method specific requirement were performed.

Data Quality Objectives - The established quality of the data required to support specific decisions or regulatory actions. DQOs must take into account sampling considerations as well as analytical protocols.

Data Validation - A systematic effort to review data for identification of errors for the purpose of flagging suspected values to assure the validity of the data for the user.

Deliverables - Analytical Report Package provide by the analytical laboratory which includes the analytical data and a specified set of supporting documentation.

Hold Times - The time stipulated in the method or regulations which is allowed to elapse from the time of sampling to the time of extraction and/or analysis. Samples analyzed after the hold times are of questionable usefulness.

ICP - Inductively coupled argon plasma (also referred to ICAP). An instrument used for metals analysis.

Internal Standard - A compound added to every standard, blank, matrix spike, matrix spike duplicate, sample and/or sample extract at a known concentration, prior to analysis. Internal standards are used as the basis for quantification of the target compounds.

Initial Calibration - Instrument calibration performed before any samples are analyzed.

Laboratory Control Sample - An artificial sample usually prepared in the laboratory, which either contains all or some of the compounds of interest. The sample is processed through the entire procedure including sample preparation and analysis. This sample is used to verify that the method is being performed properly. One laboratory control sample should be analyzed with each analytical batch.

Matrix Spike - An Aliquot of a sample that has been spiked with a known quantity of specified compounds of interest. The matrix spike is used to measure the accuracy of the analytical system.

Matrix Spike Duplicate - A second aliquot of the same sample used for the matrix spike spiked the same way as the matrix spike. The matrix spike duplicate is used to measure the precision of the analytical system..

Maximum Deliverable Package - Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Maximum Deliverable Package is requested.

Minimum Deliverable Package - Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Minimum Deliverable Package is requested.

Precision - a measure of the analytical method=s ability to reproduce analytical results.

Preparation Logs - An official laboratory record of the sample preparation procedures used in processing a sample prior to analysis.

Standard Deliverable Package -Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Standard Deliverable Package is requested.

Surrogate - An organic compound that is similar to the analytes of interest in chemical composition, extraction and chromatography, but are not normally found in environmental samples. These compounds are spiked into quality control samples, calibration and check standards and samples prior to analysis.

Tentatively Identified Compounds (TICs) - Compounds detected in samples that are not target compounds. Usually TICs consist of up to 30 peaks identified that are greater than 10 percent of the peak areas or heights of the nearest internal standard are subjected to mass spectral library searches for tentative identification.

Tuning - A technique used in gas chromatography/mass spectrometry procedures to verify that the instrument is properly calibrated to produce reliable mass spectral information.

6.0 RESPONSIBILITIES

Regional Field Analytical Manager -. Responsible for the management of the Regional Field Analytical Department. Responsible for distributing these requirements to all subcontract laboratories used within there region.

7.0 PROCEDURE

7.1 All laboratories providing analytical services to OHM will be provided with a copy of these specification for minimum, standard and maximum data deliverable packages.

7.2 The desired data deliverable package will be selected at the time of procuring the analytical services. All price quotations must include providing OHM with the requested deliverable package.

7.3 All Data packages received must meet the requested requirements as specified in the Data Deliverables Package Requirements.

8.0 ATTACHMENTS

ATTACHMENT 8.1
DATA DELIVERABLE PACKAGE REQUIEMENTS TABLE

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Metals	Case Narrative		X	X	X
	Corrective Action Report		X	X	X
	Cross-reference of OHM Sample Numbers, Lab IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Data Summary for Each Sample (See Note 1)	I-IN	X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)	VII-IN	X	X	X
	Matrix Spike (MS) Report (including concentration spiked, percent recovered, percent recovery acceptance limits)	V (PART 1)IN	X	X	X
	Post-digestion Spike Recovery for ICP	V (PART 2)IN	X	X	X
	Duplicate Sample Report		X	X	X
	Blank Results	III-IN	X	X	X
	Initial Calibration Data	III-IN		X	X
	Continuing Calibration Data	II (PART I)-IN		X	X
	ICP Interference Check Sample Report	II (PART I)-IN		X	X
	Standard Addition Results	IV-IN		X	X
	ICP Serial Dilution Results	VIII-IN			X
	Copies of Preparation Logs	IX-IN			X
	Copies of Analysis Run Logs	XIII-IN		X	X
	Copies of Standard Preparation Logs	XIV-IN			X
	Raw Data and Instrument Printouts				X
	Percent Moisture		X	X	X
	PH				X (Note 2)
Organics by	Case Narrative		X	X	X
GC or HPLC	Corrective Action Report		X	X	X
	Cross-reference of OHM Sample Numbers, Lab IDs, and analytical QC batches	IV	X	X	X
	Chain-of-Custody Form, Cooler Receipt		X	X	X

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
	form				
	Data Summary for each blank and sample (See Note 1)	I	X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Surrogate Recovery Report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III	X	X	X
	Initial Calibration Data for each column (indicate which column was used for quantitation)	VI		X	X
	Continuing Calibration Data (indicate which column was used for quantitation)	VII		X	X
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards			X (Note 4)	X
	Raw Quantitation Report (area vs. retention time)				X
	Copies of Sample Preparation Bench Sheets			X	X
	Copies of Standard Preparation Logs				X
	Copies of Run Logs	VIII			X
Organics	Case Narrative		X		X
by GC/MS	Corrective Action Report		X		X
	Cross-reference of OHM sample numbers, Lab IDs, and analytical QC batches	IV			X
	Chain-of-Custody Form, Cooler Receipt Form		X		X
	Data Summary for each blank and sample (See Note 1)	I	X		X
	Tentatively Identified Compounds (TICs) for each sample (ten peaks)	I,TIC			X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X		X
	Surrogate Recovery Report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X		X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III	X		X
	Instrument Performance Check (Tuning)	V			X

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
	Report				
	Initial Calibration Data (including acceptance limits)	VI			X
	Continuing Calibration Data (including acceptance limits)	VII			X
	Internal Standard Areas and Retention Times Reports (including acceptance limits and out-of-control flags)	VIII			X
	Reconstructed Ion Chromatogram for each sample and rerun, blank, spike, duplicate, and standard				
	Raw Quantitation Report				
	Raw and background subtracted mass spectra for each target analyte found				
	Mass spectra of TICs with library spectra of 5 best-fit matches				
	Copies of Sample Preparation Bench Sheets				X
	Copies of Standard Preparation Logs				
	Copies of Run Logs				
	Percent Moisture		X		X
	PH				X (See Note 3)
Inorganic	Corrective Action Report		X	X	X
Chemistry	Cross-reference of OHM sample numbers, Lab IDs, and analytical QC batches		X	X	X
(Note 2)	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Data Summary for each blank and sample (See Note 1)		X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Duplicate Sample Report		X	X	X
	Calibration Reports Initial and Continuing			X	X
	Copies of Sample Preparation logs				X
	Raw Data and Instrument Printouts				X
	Percent Moisture		X	X	X

Notes:

1. Must include: OHM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date.
2. For water samples only.
3. Must include: OHM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date.
4. For petroleum fuels analyses chromatograms for samples with positive results only.

APPENDIX C

SOPs

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-605	Title Documentation

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									
N									
O									

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Documentation Procedures
Date Issued:

Document #: QP-605

Rev: 02 **Date:** 12 OCT 93

1 PROCEDURE

1.1 To describe documentation procedures for sample collection, transportation and analysis.

1.2 To demonstrate step by step documentation procedures to be followed from the beginning to the end of a project.

2 SCOPE

2.1 This procedure provides information on the proper documentation procedures to be carried out in all sampling activities.

3 RELATED DOCUMENTS

3.1 OHM Corporation, Field Sampling Manual, 1993.

4 GENERAL INFORMATION

4.1 This SOP is a general overview and some projects may require documentation beyond what is described in section 6.0.

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5 RESPONSIBILITY

5.1 All OHM employees are responsible for filling out dispatches for equipment, vehicles, and themselves.

5.2 Sample Technicians are responsible for recording the sampler's daily notes and sample log books. They are also responsible for properly filling out sample labels, chain-of-custody forms and any additional forms, such as drum logs, and any photo documentation which may be required.

6 PROCEDURES

This section describes the procedures to be followed to document samples collected, transported, and analyzed. This section will demonstrate, step by step, documentation procedures to be followed from the beginning to the end of a project. This is a general overview and some projects may require documentation beyond what is described in this section. The following is a list of topics that will be covered in this section:

- Development of a Site Sampling Plan
- Dispatching of equipment
- Samplers daily notes
- Sample labels
- Sample log books
- Site maps
- Photo documentation
- Chain of custody forms
- Additional forms

6.1 Sample Plan Development

A sample plan is necessary for all project sites that require sampling. This includes:

- Emergency response situations (After 72 hours)
- Long term project sites
- Small scale one day sampling events

The sample plan is a document which describes the "how, when, why, and where" of the environmental sampling portion of a project. The sample plan is designed to give:

- Detailed background information of the project site
- The concerns and/or goals of the project
- A step by step instruction of how samples are to be obtained, documented, and handled

The information provided in the sampling plan will serve as direction for the personnel obtaining the samples as well as to inform supervisory personnel of the manner in which samples will be collected. The information obtained to begin a sampling plan will be obtained from the Project Manager. This information should include the following:

- Site history,
- What needs to be sampled
- What analysis are needed
- What circumstances led to the need for sampling
- What is needed to be accomplished from sampling

In addition, a site operational history and a review of previous study data, conclusions and recommendations (if available) are helpful in familiarizing the sampling crew with the investigations taking place on a particular project site.

6.1.1 Introduction

The introduction section of a sampling plan will include the following:

- Project name
- Project number (or proposal number)
- Project location
- Site history

This information should familiarize the reader with where the project is, whom the project is being completed for, who is authorizing the work (i.e. OHM may be subcontracted by ITEP for instance, but the work is being performed for or authorized by the USEPA.) and what circumstances led to the need for the project. This section should also contain an overview or summary of what the sampling plan includes.

6.1.2 Scope of Work

The scope of work should include the information gathered from the project manager on the work to be performed (what tasks are to be accomplished?). This should detail every aspect of the sampling portion of the project. In addition this should include numbers (or approximations) of each type of sample to be taken for each matrix.

6.1.2.1 Objectives

This section should include the objectives of sampling (i.e. why are the samples being taken, what needs to be accomplished with the data generated). More specifically, the reason, or purpose, for sampling. There are many different objectives for sampling and each client has their own objectives and all sampling efforts are directed towards accomplishing those objectives. Listed below are some questions that this section should answer:

- Are samples being obtained to determine the extent of contamination?
- Are samples being obtained for the purpose of generating data for disposal requirements?
- Are samples being obtained for the purpose of completing treatability studies?
- Are samples being obtained for a statistical evaluation of the site?

These are only a few of the questions that this section can answer.

6.1.2.2 Technical Approach

This section should include the technical approach (i.e. How are the samples going to be obtained? In what way can the objectives be accomplished?). This section is going to address the approach of the sampling efforts. The sampling strategy necessary to fulfill the objectives will need to be addressed. Below are some types of sampling strategies commonly used:

- Random Sampling
- Systematic sampling
- Stratified Random Sampling
- Judgment Sampling

This section will also describe whether the samples will be:

- Grab or composite samples
- Surface or subsurface samples
- Upgradient or downgradient
- Influent or effluent

Every aspect of the "how" and "why" to attaining the project objectives are discussed in this section.

6.1.3 Sampling Methodologies

This section should describe in great detail the step by step procedures of how each type of sample will be obtained (reference will be made to SOP's for specific sampling methods). This should be a chronological order of events from set up of equipment, to physically placing the samples into the jars, and changing sample gloves. In addition, the usage of each specific sampling device will be discussed. Every task that personnel are required to perform should be described fully in this section.

6.1.4 Decontamination

The decontamination section should include all the decontamination procedures for every type of sampling which is to be performed. If only disposable sampling equipment is being utilized (i.e. tongue depressors) then this section should reflect that.

6.1.5 Quality Assurance/Quality Control (QA/QC)

This section should describe the types of the QA/QC samples to be taken (blanks, duplicates, etc.), the frequency for QA/QC sample collection, how the QA/QC samples are to be obtained and also answer questions on the matrices of QA/QC samples. For example: equipment blanks are being taken for project Z. Which of the following types of equipment blanks will be required.

1) A sample of rinsate collected from the sampling device
2) A sample of a solid material (such as play sand) taken in the same manner as the investigation samples.

6.1.6 Sample Documentation

The sample documentation section should include a description of all of the different types of required documentation to be completed on the project. This should include step by step instructions on how to properly complete the necessary forms. Any job specific or specialized forms that will be used should be included in this section.

6.1.7 Sample Packaging, Handling & Shipment

This section needs to give specific details on the packaging, handling and shipment of samples. Detailed step by step instructions must be given on sample packaging procedures. The designated laboratory or other location where the samples will be shipped should be listed in this section, along with the point of contact, the street address, city, state, zip code and telephone number.

6.1.8 Analytical

This section should include a listing of each type of analysis for each matrix for each sampling task. This could range from one analysis for many types of samples and matrices to several different types of analyses for a limited number of samples. The designated laboratory (or laboratories) must be listed in this section.

6.2 Dispatching Equipment

The second step in preparation for the project is the dispatching of equipment. A good practice is to make a listing of equipment on a separate sheet of paper. After completing this, review it. Also, check the equipment section of any applicable SOP's. Think about the task to be completed, then think about the list you have generated. Can you complete the task with this equipment? The dispatch is the single most important piece of documentation you can have. The reason for this is simple: If the you don't have the proper equipment to complete the task, then how can the task be completed properly? The following is a listing of the steps necessary to complete a dispatch properly (remember, these steps are only the "how" of completing a dispatch, it is up to you as to "what" is put on the dispatch). For an example of a completed dispatch, please refer to Figure 6.2-1, OHM dispatch form.

6.2.1 Instructions for filling out OHM's Dispatch Form

1. Original or Corrective - Check box which applies. Is dispatch an original or corrective?

2. To Job No. /Division - Billable job or division/shop number. The job/division number shall be the project accepting the expenses.

3. Destination - Commonly known city and state of the OHM site/ OHM division/ OHM region.

4. Client - Common site name and/or client name if there is a difference.

5. Date - Month, day, and year of departure.

6. Time - Time of the departure in military format (i.e. 0800hrs.)

7. Assigned Driver - Driver's signature and employee number.

8. Transporter - Company transporting personnel, equipment, and/or inventory. (May be OHM or other company name.)

9. Transferred Forms - Originating project or shop number. If transferred from a project include project number.

10. Transferred By - Signature and employee number of the dispatch preparer.

11. Accepted By - Signature, employee number, and date of the receiving party.

12. Data Entered By - Signature of data entry employee and employee number.

13. Entry Data & Time - Data and time of computer entry. (Completed by data entry personnel.)

14. Entry Location - City/state or Division/Region of data entry. (Completed by data entry personnel.)

15. Quantity & Type of Container - Total number and specific type of containers (i.e. cylinder, drum).

16. Hazardous Materials - Check if load contains hazardous materials.

17. Proper D.O.T. Shipping Name - Proper name as specified in Title 49 CFR, Section 172.101.

18. Hazard Class - Proper class as specified in Title 49 CFR. (172.101)

19. UN/NA Number - Proper UN/NA number of shipping material. (i.e. Gasoline is UN 1203)(from 49 CFR.172.101

20. Packing Group - Prescribed for materials in Column 5 of 49 CFR, Section 172.101 Table preceded by the letter "PG". (i.e. PG I, PG II, OR PG III)

21. Total Weight - Combined weight of material and container.

22. Qty. & Unit of Measure - Proper number of each item and unit of measure (i.e. each, pair, box)

23. I.D. Number - Employee number, unit number, or inventory number which ever is applicable.

24. Personnel, Equipment, and Inventory Description - Name of listed items in respective order. (Include the driver's name and vehicle number.)

25. Equipment Mileage or Hours - Applicable information for vehicles/equipment.

Figure 6.2-1

OHM Corporation

DISPATCH FORM

Form 0018A
Resource Management
Rev. 07/91

1. ORIGINAL ☒ CORRECTIVE ☐ CONTROL NO. 116806
2. TO JOB NO./DIV. 12148
3. DESTINATION Nitro, WV
4. CLIENT USACE
5. DATE 10 SEP 93 6. TIME 0600
7. ASSIGNED DRIVER Willie Ray # 824
8. TRANSPORTER OHM
9. TRANSFERRED FROM MW Tech Services
10. TRANSFERRED BY Willie Ray 824 Findlay
11. ACCEPTED BY John Freibel 1920
12. DATA ENTRY BY John Frebel 1920
13. ENTRY DATE & TIME 10-SEP-93 16:00
14. ENTRY LOCATION Nitro WV

Qty & Type 15. of Container	Hazardous 16. Material	17. Proper D.O.T. Shipping Name	18. Hazard Class	UN/NA 19. Number	Packing 20. Group	Total 21. Weight
2 - 1 Liter Glass	✓	Hydrochloric Acid, Solution	8	UN1789	II	6[redacted] lbs
2 - 2.5 Liter Glass	✓	Isopropanol	3	UN1219	II	14 lbs

IN CASE OF EMERGENCY CALL (800) 537-9540 (24-HOURS/DAY)

Qty & Unit 22. of Measure	23. I.D. Number	24. Personnel, Equipment and Inventory Description	Equip. Mileage 25. or Hours
1 ea	824	SNE Proj. Chemist - W. Moody	
1 ea	—	P.O.V. F-150 P/U	
3 pkg	400435	Sorbent diapers	
3 rls	400204	Visqueen	
2 cs	9200114	40 ml vials	

6.3 Sampling Notes

Because of legalities involved in cleanup activities, it has become necessary for the sampling crew to maintain a set of daily field samplers notes. Items that must be included are:

1. The reasons samples are taken.
2. Any changes from standard protocol.
3. Safety precautions.
4. Level of personnel protection.
5. Personnel on site.
6. Date
7. Weather
8. The time that a particular entry is made.
9. Descriptions of the work being performed.
10. Communications with the client, site supervisor, or other personnel on site.

Descriptions of special projects such as soil borings, test well installation, and air monitoring must be very detailed. The person taking notes must be knowledgeable enough about these activities to know which details are important.

On the first few pages of the samplers notes, the names and initials used of site personnel, any abbreviations used, any special notations concerning the scope of work, and a table of contents (if necessary) should be included. Leave enough room for entry of this information prior to beginning the samplers daily notes.

Enough information should be recorded to present a clear and accurate picture of on-site technical activities. This information should be detailed enough so that another person could retrace your exact steps from your notes. At a later date, should a question arise concerning a specific event or a procedure used, it will be answered from these notes. Some items that would be considered noteworthy are as follows:

- Termination of a sample point, reasons for termination.
- Unusual appearance of a sample.
- Additional samples, reasons for additional sampling.
- Weather conditions.
- Levels of protection used (with justification).
- Meetings and telephone conversations held with clients, regulatory agencies, citizens, or other personnel.
- Details concerning any samples split with another party.
- Basic rough measurements.
- General observations.

There are many other noteworthy occurrences not listed here. A good practice is to try to tell a story of what is happening on the project site. How well you tell the story will determine how well someone else will be able to understand those notes (make your notes and the details in them so that a child could understand). DO NOT DOUBLE-UP ON RECORDKEEPING. If the information is already included on a standard form or field data sheet it does not need to be in the sampling notebook.

Notes must be dated and signed on each page for validity in a court of law. When a consultant is used for making decisions, his remarks must also appear in these notes. Any consultant used should submit a written report including his 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.

The person in charge of the sampling program must review these notes daily and initial them at the bottom of each page. This person is also responsible for sending a copy of these notes to the appropriate person in Findlay, Ohio, on a weekly basis. These notes will be reviewed for troubleshooting, quality control, and putting together information for progress reports. See figure 6.3-1 for an example of samplers daily notes.

Figure 6.3-1 Samplers Daily Notes

6.4 Sample Labels

Figure 6.4-1 below shows an example of an OHM sample label.

Figure 6.4-1

Sample Label

JOB #: 417 Sample #: 001
DATE: 6-20-01 TIME: 1631
SAMPLE: Water from treatment pool #2
H_2SO_4 Added - TPHC
TAKEN BY: BS
WITNESS: EB

The following information is recorded on the label at a minimum:

- JOB NUMBER
- SAMPLE NUMBER - Number assigned (i.e. job number - sequential number) in the field during collection of samples. Note: Continue numbering in **sequence** from the **last** sample obtained; refer to field sample log.
- DATE - Month, day, year
- TIME - Military time (1000, 1400, 2320)
- SAMPLE - Description of sample (include matrix, point of sample, and preservatives used - if any).
- ANALYTE - Analysis which will be performed (if more than one analysis is being done on samples from that job).
- TAKEN BY - Initials of person taking sample

- WITNESS - Initials of person witnessing or assisting in taking sample

The sample label is a very important piece of documentation. It is the only method by which the laboratory will be able to identify the sample. The information on the label will be the only way the laboratory will be able to identify the sample from the information on the Chain of Custody form. It is imperative that the label information match the information in the samplers log and on the Chain Of Custody form (as well as any other specialized documentation). If there are any discrepancies in this paperwork chain, the samples and data generated could possibly be deemed invalid.

The sample label is completed during or immediately following collection of the sample. All information should be printed neatly and legibly. The sample label is attached to the sample container and the sample information is entered into the sample log (see section 6.5 Sample Logbooks).

6.4.1 Custody Seals

Custody seals are narrow strips of adhesive paper used to demonstrate that tampering has not occurred. They may be used on sampling equipment, sample transport containers, or individual sample jars. Custody seals are required by state or federal regulatory agencies and are to be used for any sampling event. The custody seal, at a minimum, should be signed and dated by the sampler. When actual custody seals are not available, it is acceptable to use an additional sample label as a replacement.

6.5 Sample Logbooks

The logbooks are set up according to project type (drum job, underground recovery, facility decontamination, etc.). <u>ALL</u> samples are logged in these books (including soil, air, water, sludge, etc.). The following columns are standard for all projects:

1. SAMPLE NUMBER - Consecutive series of numbers in which every sample is assigned.

2. DATE - Date sample was obtained.

3. TIME - Military time sampled.

4. DESCRIPTION OF SAMPLE - Physical description of sample (e.g., clear red, organic/cloudy, aqueous/brown sludge, or light sandy soil).

5. LOCATION - Description of area sampled (abbreviated form if sampled twice or more--log explaining locations and abbreviations should be attached to or written in front of the logbook).

6. SAMPLERS INITIALS - Persons obtaining sample (usually two, at least witnessing if not involved in actual sampling task).

7. VOLUME - Size of sample (8oz, 32oz, etc.).

8. ANALYSIS REQUIRED - The analysis required (or requested) for each sample.

9. RESULTS - Will vary according to project requirements; should be stated in consistent units (ppm, ppb, etc.,) when possible

10. C.O.C. NUMBER - Chain Of Custody number for the Chain Of Custody that relinquishes custody of a particular sample.

11. ADDITIONAL COMMENTS - Space reserved for any other information concerning particular sample or special procedure or analysis.

For specific projects columns may need to be added for different types of analysis. An additional book for sample logging may be needed if different types of samples are being taken which have very different requirements for logging.

All abbreviations of sample points and types of analysis are inserted on the front page of the log book. In addition, the names of all personnel and the initials used by those personnel must also be written on the front page of the log book. Writing in the log book should be neat and in black ink. If a mistake is made, one line should be drawn through it and initialed by the person correcting the mistake. White-out must never be used in a logbook. See figure 6.5-1 for an example of a sample log book.

Figure 6.5-1 Sample Log Book

6.6 Maps

All sites require some type of map describing the location of the project and what changes take place during a project. A project which involves sampling or air-monitoring activities must have maps drawn up describing locations of sample points, landmarks, treatment equipment, buildings and other reference points. All site maps generated should have the minimum of the following information:

1) DATE - The date on which the map was generated (Very important).

2) PROJECT NAME - Name assigned by OHM.

3) PROJECT LOCATION - City and state where the project is located.

4) PROJECT NUMBER - Number assigned by OHM.

5) MAP LOCATION - The area which is being mapped (i.e. Drum Staging Area, Building Z)

6) BASIC MEASUREMENTS - Any measurements obtained (i.e. Triangulation to a fixed point.

One master map should contain the following information:

- Survey points and/or survey line (if available).
- Local landmarks.
- Locations of OHM trailers, buildings, and equipment.
- Original data obtained from other maps.
- Measurements from fixed reference points to sample points.
- A legend, title, and North arrow.

An easy way to assemble a site map is to set up a survey line along a border of the site (a street or railroad can usually serve this purpose). Take measurements of all items from this line and then transfer to a map.

Maps are useful for communication with the client and project management to describe the site and show progress. This same map can be used to plot chemical contours, equipment locations, soil borings, and piezometric levels.

The site map should be revised whenever changes are made on the job. A copy of all maps and revisions can be sent to Findlay for formalization, or added to the job file. Refer to Figure 6.6-1 for examples of site maps.

Smaller jobs should at least have a site sketch prepared. If this sketch is not to scale, then the words "Not To Scale" should appear on it.

Figure 6.6-1 Site Map

6.7 Photo Documentation

Site video and/or site photographs aid in presenting a clear description of the actual site activities. In addition they can be used as an enhancement to the samplers notes, the samplers log, and the site maps. As a good practice, photo documentation should be done for every project site.

6.7.1 Photographs

When photographs are taken the name of the photographer, date, time, the direction the photograph is taken (i.e. looking North across the soil pile), site location, and site description are entered sequentially in a photograph logbook as photos are taken. Once the film is developed, information should be written on the photographs that corresponds to the logbook descriptions. Disposable cameras can be utilized for obtaining site photographs.

6.7.2 Video Footage

When site video footage is taken, the same information that is necessary on site photographs is also necessary. However, the information can be relayed in one of two ways. The first of these methods is to verbally relay the information during filming. The second of these methods is to use cardboard "quecards". This method may be the method of choice when obtaining footage in situations where the verbally relayed information may be impaired (i.e. when working around heavy equipment, or when wearing personal protective equipment - such as a respirator). It is always a good idea to have an agenda, whenever possible, prior to taking video footage (this can help in providing a clearer picture for the viewer). Since several video tapes may be generated it is a good idea to develop a "quecard" for the beginning of each video. This information should include the following:

- Project Name
- Project Number
- Project Location
- Video Cassette number*

The video cassette number can be a number starting with "Tape #1" and increasing sequentially. Since the final number of tapes will not be known until the last tape has been taken, it is not feasible that tapes be numbered tape 1 of ___, tape 2 of ___, etc.. However, at the end of the last tape made a notation can be made that "this tape is the last of 3 tapes (for example) for project #_____". This will make the viewer aware that there are no more tapes for this project.

6.8 Chain-of-Custody Procedures

Because of the evidentiary nature of samples collected during investigation and remediation activities, the possession of samples must be traceable from the time the samples are collected until they are analyzed or used up by the laboratory. To maintain and document sample possession, chain-of-custody procedures are followed as described below.

6.8.1 Sample Custody

A sample is under your custody if:

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

6.8.2 Transfer of Custody and Shipment

- Samples are accompanied by a chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, a mobile laboratory, or an analytical laboratory.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate record prepared for each laboratory, for each shipping container. Shipping containers will be sealed for shipment to the laboratory. Custody seals should be used on the shipping container to verify the absence of tampering.

- Whenever samples are split with a facility or government agency, a separate chain-of-custody record is prepared for those samples and marked to indicate with whom the samples are being split.

- All packages will be accompanied by the chain-of-custody record showing identification of the contents. The original record will accompany the shipment, and a copy will be retained with the project files.

- If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, the carrier should be indicated on the chain-of-custody record as receiving the samples and, if possible, the bill of lading number should be recorded on the chain-of-custody. Receipts from post offices and bills-of-lading will be retained as part of the permanent documentation.

6.8.3 Chain-Of-Custody Record instructions

The following is a set of instructions detailing the proper manner in which to complete the chain of custody form. See figure 6.8-1 for a copy of the Chain-of-Custody Form.

INSTRUCTIONS FOR FILLING OUT CHAIN-OF-CUSTODY RECORD

1. Project Name

   Name assigned by OHM (generally the clients company's name or the facility at which the work is being performed).

2. Project Location

   City and state in which the project is located. Use street address if possible.

3. Project Number

Number assigned by OHM.

4. Project Contact

Usually an OHM employee who is responsible for over- seeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given (i.e., senior sampling technician or project chemist).

5. Project Telephone Number

Telephone number of OHM on-site office trailer or number where person responsible for samples (project contact) can be contacted. On a short term project, write none or put in the project manager's number.

6. Client Representative

The individual employed by our client to oversee and coordinate work performed by OHM on-site (i.e., contract coordinator, OSC).

7. Project Manager/Supervisor

The name of the OHM designated project manager should be entered here. If the project does not have a project manager, such as an ERCS job, then the name of the site supervisor or response manager should be entered.

8. Sample Number

Number assigned (project number-sequential number) in the field during collection of samples. Continue numbering in sequence from last sample obtained; refer to project field sample log.

9. Date

Date on which sample is collected.

10. Time

Time at which sample is collected (24-hour time).

11. Composite/Grab

Check mark (/) in the appropriate column to indicate whether sample is composite or grab.

12. Sample Description (Include Matrix and Point of Sample)

Indicate whether it is soil, liquid, air, oil, etc., along with any useful description, such as appearance (color, density, odor, etc.) Includes the location, designation, such as monitoring well number, soil sample coordinates, or EPA description number. This information must be the same as the sample label information.

13. Number of Containers

Number, size (capacity), and types of containers that are sealed and labeled for transfer to another location.

14. Analysis Desired (Indicate Separate Containers)

The name of the test (i.e., PCBs) or series of tests (VOAs) is to be entered on the diagonal lines. For each sample container designated in the number of containers, a check mark (/) should appear in the column for the desired analysis.

15. Remarks

Enter sample specific instructions, cautions, or priorities (i.e., do cyanide test first on this sample or caution may contain hydrofluoric acid); also indicate preservation of sample (i.e., sulfuric acid added). Enter a sample specific comment (i.e., sample lost in shipping).

16. Item Number

Each sample number is considered a separate item. Use sequential number (1,2,3...). Item numbers begin with No. 1 on each form. Do not carry item numbers from one form to another. List items 1,2,3... that you accepted.

17. Transfers Relinquished By

Name of person and affiliation transferring or surrendering the sample to another person, (do not use only the name of the organization).

18. Transfers/Accepted By

Person signing this part is responsible for the sample(s). In addition to the person's name, he should include his company name or agency(s) initial. Person accepting sample(s) is also responsible for making sure that all samples are accounted for when he signs an acceptance. If a common carrier is used, include the carrier name and bill-of-lading number.

19. Date

Date on which sample is released to next person.

20. Time

Time at which sample is released to next person.

21. Remarks

Enter general instruction or requests, such as, send additional report to: _____

22. Sampler's Signature

The signature of the individual performing, or having immediate oversight of the sampling should appear in this section.

Figure 6.8-1 Chain Of Custody Form

LAB COPY

OHM Corporation

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 08/89

134456

O.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

PROJECT NAME		PROJECT LOCATION
PROJ. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.
CLIENT'S REPRESENTATIVE		PROJECT MANAGER/SUPERVISOR

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)								REMARKS
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME	REMARKS
1						
2						
3						
4						SAMPLER'S SIGNATURE

6.8.4 Sample Shipment Checklist

The sample shipment checklist is primarily used as a double check of the contents of the shipping container vs. the Chain-Of-Custody form(s). In addition, it is also useful as a double check for the packaging procedures (i.e. "Did I remember to put fresh ice in the cooler?"). The sample shipment checklist is completed for each shipping container. Refer to Figure 6.8-2 for a copy of the Sample Shipment Checklist. Always remember to contact the laboratory prior to shipment of samples.

Figure 6.8-2 Sample Shipment Checklist

OHM Corporation

SHIPMENT CHECK LIST

PROJECT NAME _____ PROJECT No.: _____

STREET ADDRESS _____ DATE: / / TIME: _____

CITY/STATE/ZIP _____

PHONE NUMBER ( ) - FAX NUMBER: ( ) -

SAMPLE CHECK LIST

	YES	NO	COMMENTS
SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE?	☐	☐	
ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE?	☐	☐	
HAS ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK?	☐	☐	
DO SAMPLE NUMBERS AND SAMPLE DESCRIPTION ON THE LABELS MATCH WITH THOSE ON THE COC?	☐	☐	
HAVE THE SAMPLES BEEN PROPERLY PRESERVED?	☐	☐	
HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY?	☐	☐	
DOES THE ANALYLICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK?	☐	☐	
HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION?	☐	☐	

PACKAGING CHECK LIST

	YES	NO	COMMENTS
HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG?	☐	☐	
HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROOF TAPE FROM THE INSIDE?	☐	☐	
HAS THE BOTTOM OF THE COOLER BEEN LINED WITH AT LEAST THREE INCHES OF CUSHIONING ABSORBANT PADS?	☐	☐	
HAVE ALL SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION?	☐	☐	
IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT?	☐	☐	
HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS BEEN PLACED AROUND AND ON TOP OF THE SAMPLES?	☐	☐	
HAS FRESH BLUE ICE BEEN ADDED TO THE COOLER THE DAY OF SHIPMENT?	☐	☐	
HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL?	☐	☐	
HAS THE COC BEEN PLACED IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER?	☐	☐	
HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID?	☐	☐	
HAS THE COOLER BEEN LABLED "THIS SIDE UP"?	☐	☐	
HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN/NA NUMBER AND PLACARD?	☐	☐	
HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES?	☐	☐	

PROBLEMS/RESOLUTIONS:

PREPARED BY: SIGNATURE:

Figure 6.8-3 Sample I-CHEM Custody Seal

CUSTODY SEAL

Date_____

Signature_____

I-CHEM
COMPANY
A NALGE COMPANY

90009

6.9 Final Report

The final report is a document that is developed upon the completion of work on a project site. The final report details specific occurrences of the project from beginning to the end. This document is similar in structure to the sampling plan. However, instead of telling a story of how the project will be completed, the final report tells a story of how the project was actually completed. The final report details any deviations from the original scope of work and why those deviations occurred. This also includes any problems or complications that may have arisen on site, what was done to correct those problems, and why.

The standard format to follow in completion of the final report is the same format used for generation of the sampling plan (section 6.1 Sample Plan Development). However, some sections need to be added due to changes in the scope of work. These changes will be site specific and should be approached on a case by case basis. Also refer to Section 6.11, Forms, for an example of a fill in the blank type of form for weekly reports.

6.10 Job Summaries

A Job Summary (or Project Summary) is a brief outline of the entire project. This outline should be limited to a few paragraphs and include information such as total number of samples obtained, total number of days on site, and total costs.

6.11 Forms

OHM uses several different types of forms for several different types of projects. On the following pages is a copy of the most commonly used forms. However, there may be specialized forms generated for specific project sites, which are not included among these.

OHM FORMS AND DATA SHEETS

7 EQUIPMENT

7.1 Contractor's Sampling and Analysis Plan (CSAP)

7.2 Sampler's Log Book

7.3 Sample Labels

7.4 Site Maps associated with the project

7.5 Camera

7.6 Chain-of-Custody forms

7.7 Any additional forms related to the project (i.e. Drum Logs, Well Logs, etc.)

7.8 Black ink pen

8 ATTACHMENTS

NONE

OHM Corporation

QUALITY POLICY AND

PROCEDURE APPROVAL

AND REVISION RECORD

Document # QP-605.9	Title Chain-of-Custody Documentation

APPROVAL

Name	Title	Signature	Date
R. Steven Shirley	QA/QC Officer		5/10/95
Guy Gallello, Jr.	Mngr. Field Tech.		5/10/95
Thomas E. Gran	Dir. Tech. Svcs.		5/10/95

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Chain-of-Custody Documentation **Document #:** QP-605.9

Date Issued: May 10, 1995 **Rev:** 0 **Date:** May 10, 1995

1.0 PURPOSE

1.1 To comply with state, federal, and customer requirements.

1.2 To establish chain-of-custody (COC) procedures which will ensure sample data is legally defensible.

1.3 Establish function-specific responsibilities for COC documentation.

2.0 SCOPE

2.1 These procedure should be followed for all samples or evidence collected on all OHM project sites.

3.0 RELATED DOCUMENTS

3.1 OHM Corporation, Field Sampling Manual, 1993.

3.2 U.S. EPA 1980d. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018, Municipal Environmental Research Laboratory, Cincinnati, OH.

3.3 U.S. EPA 1982a. Handbook for Sampling and Sample Preservation of Water and Wastewater. EPA-600/4-82-029, Environmental Monitoring and Support Laboratory, Cincinnati, OH.

3.4 U.S. EPA 1982d. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW846, Third Edition, Office of Solid Waste and Emergency Response, Washington, DC.

4.0 GENERAL INFORMATION

4.1 Because of the evidentiary nature of samples collected during investigation and remediation activities, the possession of samples must be traceable from the time the samples are collected until they are analyzed. To maintain and document sample possession, COC procedures are followed as described below.

4.2 A sample is under your custody if:

4.2.1 It is in your actual possession, or

4.2.2 It is in your view, after being in your physical possession, or

4.2..3 It was in your physical possession and then you locked it up to prevent tampering, or

4.2.4 It is in a designated secure area.

5.0 DEFINITIONS

5.1 Analyte - A physical or chemical parameter for which the sample will be analyzed.

5.2 Chain of Custody Form - This is a form which is used to track and document the custody of a sample from it's collection to it's analysis.

5.3 Composite Sample - A sample composed of combinations of more than one sample collected at various locations and/or points in time.

5.4 Custody - 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.

5.5 Grab Sample - A single sample representative of a specific location at a given point in time.

5.6 Preservative - A chemical added to the sample at the time of collection to prevent the degradation of the analyte due to physical, chemical, or biological actions

.

5.7 Project Location - The street address, city, and state in which the project is located.

5.8 Project Name - Name assigned by OHM. Generally the facility name or the city and state in which the project is located.

5.9 Project Number - A unique number assigned by OHM for the purposes of tracking costs purchases and employee's hours charged to the project.

5.10 Sample Date - The date when the sample was collected (month, day, year).

5.11 Sample Description - A general description of a sample should include the source of the sample, number of layers, physical state, matrix, color, clarity, grain size of each layer, the type of sample collected (grab or composite).

5.12 Sample Time - The time when the sample was collected. Military time should be used at all times.

5.13 Sampler - The person who actually collects the sample.

6.0 RESPONSIBILITIES

6.1 Senior Sampling Technologist is responsible for ensuring that all sampling technologists under his or her direction properly complete all COC in accordance with these procedures.

6.2 Sampling Technologists are responsible for properly filling out a COC form for samples they collect.

7.0 PROCEDURE

7.1 The following is a set of instructions detailing the proper manner in which to complete the COC form.

7.1.1 Project Name - Name assigned by OHM (generally the client's company name or the facility at which the work is being performed).

7.1.2 Project Location - City and state in which the project is located. Use street address if possible.

7.1.3 Project Number - Number assigned by OHM.

7.1.4 Project Contact - Usually an OHM employee who is responsible for over-seeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given (i.e. senior sampling technician or project chemist).

7.1.5 Project Telephone Number - Telephone number of OHM on-site office trailer or number where person responsible for samples (project contact) can be contacted. On a short term project, write none or put in the project manager's number.

7.1.6 Client Representative - The individual employed by our client to oversee and coordinate work performed by OHM on site (i.e., contract coordinator, OSC).

7.1.7 Project Manager/Supervisor - The name of the OHM designated project manager should be entered here. If the project does not have a project manager, such as an ERCS job, then the name of the site supervisor or response manager should be entered.

7.1.8 Sample Number - Number assigned (project number-sequential number) in the field during collection of samples. Continue numbering in sequence from last sample obtained; refer to project field sample log.

7.1.9 Date - Date on which sample is collected.

7.1.10 Time - Time at which sample is collected (24-hour time).

7.1.11 Composite/Grab - Check mark in the appropriate column to indicate whether the sample is a composite or grab.

7.1.12 Sample Description (Include Matrix and Point of Sample) - Indicate whether it is soil, liquid, air, oil, etc., along with any useful description, such as appearance (color, density, odor, etc.). Includes the location and designation, such as monitoring well number, soil sample coordinates, or EPA description number. This information must be the same as the sample label information.

7.1.13 Number of Containers - Number, size (capacity), and types of containers that are sealed and labeled for transfer to another location.

7.1.14 Analysis Desired (Indicate Separate Containers) - The name of the test (i.e., PCBs) or series of tests (VOAs) is to be entered on the diagonal lines. For each sample container designated in the number of containers, a check mark should appear in the column for the desired analysis.

7.1.15 Remarks - Enter sample specific instructions, cautions, or priorities (i.e., do cyanide test first on this sample or caution may contain hydrofluoric acid); also indicate preservation of sample (i.e., sulfuric acid added). Enter a sample specific comment (i.e., sample lost in shipping).

7.1.16 Item Number - Each sample number is considered a separate item. Use sequential number (1,2,3...). Item numbers begin with No. 1 on each form. Do not carry item numbers from one form to another. List items 1,2,3... that you accepted.

7.1.17 Transfers Relinquished By - Name of person and affiliation transferring or surrendering the sample to another person (do not use only the name of the organization).

7.1.18 Transfers/Accepted By - Person signing this part is responsible for the sample(s). In addition to the person's name, he should include his company name or agency(s) initial. Person accepting sample(s) is also responsible for making sure that all samples are accounted for when he signs an acceptance. If a common carrier is used, include the carrier name and bill-of-lading number.

7.1.19 Date - Date on which the sample is released to the next person.

7.1.20 Time - Time at which the sample is released to the next person.

7.1.21 Remarks - Enter general instruction or requests, such as, send additional report to:

7.1.22 Sampler's Signature - The signature of the individual performing, or having immediate oversight of the sampling should appear in this section.

7.2 The sample shipment checklist is primarily used as a double check of the contents of the shipping container vs. the COC form(s). In addition, it is also useful as a double check for the packaging

procedures (i.e. "Did I remember to put fresh ice in the cooler?"). The sample shipment checklist is completed for each shipping container. Refer to Attachment 9.1 for a copy of the Sample Shipment Checklist. Always remember to contact the laboratory prior to shipment of samples.

8.0 EQUIPMENT

* Chain-of-Custody forms

* Black ink pen

9.0 ATTACHMENTS

Attachment 9-1 Sample Shipment Checklist

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-606	Title Sample Packaging and Shipping

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									
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O									

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Sample Packaging and Shipping **Document #:** QP-606

Date Issued: **Rev:** DRAFT **Date:** 20 AUG 93

1.0 PURPOSE

The purpose of this procedure is to define the requirements necessary for sample packaging and information on chain-of-custody records used in sample transfer.

2.0 SCOPE

This procedure applies to the packaging, shipping and documentation of samples being transferred from the field to the laboratory for analysis. Specifically, this document outlines shipping and sample documentation procedures that are in accord with the U.S. Department of Transportation (DOT) and Hazardous Waste Remedial Actions Program (HAZRAP). This procedure is applicable to all samples taken from uncontrolled hazardous substance sites for analysis at laboratories away from the site; however, this procedure does not take precedence over region-specific or site-specific requirements for chain-of-custody.

If you are not absolutely positive if a sample is shipped correctly or if can be shipped by a particular mode call Tech. Services Findlay or the shipper before hand.

3.0 REFERENCES

3.1 HAZWRAP, July 1990. Quality Control Requirements for Field Methods DOE/HWP69/R1.

3.2 HAZWRAP, July 1988. Requirements for Quality Assurance of Analytical Data, DOE/HWP-65, Rev. 0, July 1988.

3.3 U.S. Department of Transportation, 1983. Hazardous Materials Regulations, 49 CFR 171-177.

3.4 United States Environmental Protection Agency, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

3.5 DANGEROUS GOODS REGULATIONS 34 Edition, Effective 1 Jan. 93, International Air Transport Association (IATA)

4.0 DEFINITIONS

Carrier - A person or firm engaged in the transportation of passengers or property.

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to the subsequent custodian. Attachment 9.5 shows a typical Chain-of-Custody Record. The Chain-of-Custody Record Form is a controlled document. One copy of the form must be retained in the project file.

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

- You possess the sample.
- It is in your view, after being in your physical possession.
- It was in your physical possession and then you locked it up to prevent tampering.

o You have designated and identified a secure area to store the sample.

Environmental Sample - low concentration sample typically collected off site and not requiring DOT hazardous waste labelling as a high hazard sample.

Hazardous Waste Sample - medium to high concentration sample (e.g., source materiaL sludge, leach ate) requiring DOT placarding and Contract Lab handling as a high hazard sample.

Hazardous Material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce ("commerce" here to include any traffic or transportation). Defined and regulated by DOT (49 CFR 173.2) and listed in (Attachment 9.1).

Hazardous Waste - Any substance listed in 40 CFR Subpart D (261.30 et seq) or 40 CFR otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under Subpart C (261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by EPA.

Marking- Applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof required to be placed outside containers of hazardous materials.

n.o.i. - Not otherwise indicated.
n.o.s. - Not otherwise specified.
ORM - Other regulated material.

Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 172, including Containers (other than freight containers or over packs), portable tanks, cargo tanks, tank cars, and multi-unit tank car tanks.

Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Radioactive - materials which spontaneously and continuously emit ionizing radiation which can be harmful to the health of humans and animals having a specific activity greater than 70k Bq/kg (0.002 uCi/g)

Reportable Quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous materials table (49 CFR 172.101). Indicates the reportable quantity of the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to 171.15-17 concerning hazardous materials incidents reports. If the material spilled is a hazardous waste, a report must always be filed, regardless of the amount, and must include a copy of the manifest. If the RQ notation appears, it must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which my be used for this purpose.

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

5.0 RESPONSIBILITIES

5.1 Field Operations Leader -Responsible for defining whether samples planned for collection are environmental or hazardous. Responsible for determining that samples are properly packaged and shipped, and for determining that the chain-of-custody procedures are implemented from the time the samples are collected to their release to the shippers.

5.2 Field Samplers - Responsible for implementing the packaging and shipping requirements and for initiating the chain-of-custody records until they are relinquished to another custodian, to the shipper, or to the carrier.

6.0 SAMPLE PACKAGING AND SHIPPING

Proper packaging and shipping procedures are followed in order to insure that all samples received are undamaged and free from cross contamination.

6.1 Sample Type Determination

Samples collected for shipment from a site should be classified as either environmental or hazardous material (or waste) samples. In general, environmental samples are collected off-site (for example, from streams, ponds, or wells) and are not expected to be grossly contaminated with high levels of hazardous materials.

On-site samples (for example, soil, water, and materials from drums or bulk storage tanks, obviously contaminated ponds, lagoons, pools, and leachates from hazardous waste sites) are considered hazardous. A distinction must be made between the two types of samples in order to:

1. Determine appropriate procedures for transportation of samples. If there is any doubt, a sample should be considered hazardous and shipped accordingly.

2. Protect the health and safety of laboratory personnel receiving the samples. Special precautions are used at laboratories when samples other than environmental samples are received.

6.2 Packaging and Shipping of Environmental Samples

6.2.1 Packaging

Environmental samples may be packaged following the procedures outlined in Section 6.3.6 for samples classified as "flammable liquids" or "flammable solids. Requirements for marking, labeling, and shipping papers do not apply.

Environmental samples may also be packaged without being placed inside metal cans as required for flammable liquids or solids:

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in cooler which has been lined with a large polyethylene bag.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Seal or close outside container.

6.2.2 Marking/Labeling

Sample containers must have a completed sample identification label on outside container and must be marked in the following manner:

- ORM-E NA 9188
- No DOT placard is required
- "Inside Packages Comply With Prescribed Specifications"
- "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.2.3 Shipping Papers

No DOT shipping papers are required. However, the appropriate chain-of-custody forms must be included with the shipment.

6.2.4 Transportation

There are no DOT restrictions on mode of transportation.

6.3 Determination of Shipping Classification for Hazardous Material Samples

Samples determined to be environmental samples will be shipped as such but, samples known or expected to contain hazardous materials, must be considered hazardous material samples and transported according to the requirements listed below.

6.3.1 Known Substances

If the substance in the sample is "known" it can be identified, packaged, labeled, and shipped according to the specific instructions for that material (if it is listed) in the DOT Hazardous Materials Table, 49 CFR 172.101.

Unz and Company have published the following steps to help in locating a proper shipping name from the Hazardous Materials Table, 48 CFR 172.101.

1. Look first for the chemical or technical name of the material, for example, ethyl alcohol. Note that many chemicals have more than one technical name; for example, perchloroethylene (not listed in 172.101) is also called tetrachloroethylene (listed in 172.101). It may be useful to consult a chemist for all possible technical names a material can have.

2. Look for the chemical family name. For example, pentyl alcohol is not listed, but the chemical family name is alcohol N.O.S. (not otherwise specified). If the chemical family name is not listed, then....

3. Look for a generic name based on end use. For example, Paint, n.o.s. or Fireworks, n.o.s. If a generic name based on end use is not listed, then....

4. Look for a generic family name based on end use. For example, Drugs, n.o.s. or Cosmetics, n.o.s. Finally if your material is not listed by a generic family name but you suspect or know the material is hazardous because it meets the definition of one or more hazard classes, then....

5. You will have to go to the general hazard class for a proper shipping name. For example, Flammable Liquid, n.o.s., or Oxidizer, n.o.s.

6.3.2 Unknown Substances

For samples of hazardous substances of unknown content, select the appropriate transportation category according to the DOT Hazardous Materials Classification (Attachment 9.1), a priority system of transportation categories. When shipping *unknowns* by Airborne (Federal Express) be sure to use correct markings, labeling and paperwork (Attachment 9.7).

The correct shipping classification for an unknown sample is selected through a process of elimination, utilizing (Attachment 9.1). Unless known or demonstrated otherwise (through the use of radiation survey instruments), the sample is considered radioactive and appropriate shipping regulations for "radioactive material" followed (Sec. 6.3.3).

If radioactive material is eliminated, the sample is considered to contain "Poison A" materials, the next classification on the list. DOT defines "Poison A" as extremely dangerous poisonous gases or liquids of such a nature that a very small amount of gas, or vapor of the liquid, mixed with air is dangerous to life. Most Poison A materials are gases or compressed gases and would not be found in drum-type containers. Liquid Poison A would be found only in closed containers; however, all samples taken from closed drums do not have to be shipped as Poison A, which provides for a "worst case" situation. Based upon information available, a judgement must be made whether a sample from a closed container is a Poison A (Sec. 6.3.4).

If Poison A is eliminated as a shipment category, the next two classifications are "flammable" or "nonflammable" gases (Sec. 6.3.5). Since very few gas samples are collected, "flammable liquid" would be the next applicable category. With the elimination of radioactive material, Poison A, flammable gas, and nonflammable gas, the sample can be classified as flammable liquid (or solid) and shipped accordingly (Sec.6.3.6). *These procedures would also suffice for shipping any other samples classified below flammable liquids in the DOT classification table (Attachment 9.1).* For samples containing unknown material, categories listed below flammable liquids/solids in (Attachment 9.1) are generally not used because showing that these materials are not flammable liquids (or solids) requires flash point testing, which may be impractical and possibly dangerous at a site. Thus, unless the sample is known to consist of material listed as *less* hazardous than flammable liquid (or solid) in (Attachment 9.1) it is considered a flammable liquid (or solid) and shipped as such. For any hazardous material shipment, utilize the shipping checklist (Attachment 9.3) as a guideline to ensure that all sample-handling requirements are satisfied.

6.3.3 Packaging and Shipping of Samples Classified as Radioactive (EXCEPTED)

6.3.3.1 Shipping of limited quantities of low level Radioactive materials as "Excepted" packages provided:

- the radiation level at any point on the external surface of the package does not exceed 5uSv/h (0.5 mrem/h)

- the non-fixed radioactive contamination on any external surface to the excepted package does not exceed the limits in Table 2.

- radioactive material whose activities do not exceed the relative exception limits may be transported as excepted packages (Table 3)(A_1 and A_2 values for most common radionuclides are found in IATA table 6.1B)

Excepted packages are **not** subject to the provisions relating to categorization of packages, packing, labeling, marking and other shipper's responsibilities, operator's responsibilities and packaging nomenclature, marking, requirements and tests **except** for the provisions relating to marking of gross mass, documentation completion, inspection and decontamination requirements, the reporting of dangerous goods accidents, incidents and other occurrences, general packaging requirements and any other special provisions. Excepted packages of radioactive materials are packaged just like an environmental sample unless, they posses any other dangerous characteristics, then they are subject to the regulations of that other dangerous characteristic.

These guidelines are for "Excepted packages" of radioactive materials. If a sample is higher than Excepted values will be subcontracted out, if on site call Tech. Support Findlay 1-800-537-9540 (Bill Thomas or Jack Herzig)

6.3.3.2 Packaging

Applying the word "radioactive" to a sample does not imply that it is in fact radioactive. The word prescribes the class of packaging according to DOT regulations.

1. Complete sample label and identification tag and attach securely to sample container.

2. Seal container and place in a 2-ml thick (or thicker) polyethylene bag, one sample per bag. Position identification tag so that it can be read through bag. Seal bag.

3. Place one or more sample containers into a strong outside container, such as a cooler or a DOT-approved fiberboard box. Surround cans with non-combustible, absorbent cushioning material for stability during transport.

4. A label must be placed inside the container so that upon opening it a person is made aware that there is radioactive material present. Mark containers as indicated in Paragraph 2 of section 6.3.3.3. Seal cooler for transport. Attachment 9.8 Sample Check List and Packing List can be used to determine if the sample is properly shipped.

6.3.3.3 Marking/Labeling

1. Use abbreviations only where specified.

   - "Radioactive, n.o.s. UN 2910"

Not otherwise specified (n.o.s.) is not used if the radioactive liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Uranium, RADIOACTIVE), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Radioactive, UN 2910" or "Radioactive, n.o.s. UN 2910"
   - Shippers and Laboratory, name and address.
   - No DOT placard is required on the outside container if it is an Excepted package
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.3.4 Shipping Papers

1. Use abbreviations only where specified. Complete the carrier provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed (one form may be used for more than one exterior container).

   - "Radioactive, n.o.s. UN 2910".
   - "Limited Quantity" (or "Ltd. Qty.).
   - "Cargo Aircraft Only" .
   - Net weight (wt) or net volume (vol), just before or just after "Radioactive n.o.s." by item, if more than one container is inside an exterior container.
   - "Environmental Samples" (if applicable).

2. Include Chain-of-Custody Record, properly executed and taped to inside lid of outside container (Attachment 9.5).

3. Excepted radioactive materials prepared for shipment must be certified as being acceptable for transportation by having a notice enclosed in or on the package, included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the statement

   "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for excepted radioactive material, limited quantity, n.o.s. UN2910"

4. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.3.5 Transportation

1. Transport Unknown hazardous substance samples classified as radioactive by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.4 Packaging and Shipping of Samples Classified as Poison "A"

This packaging, marking, labeling, and shipping method provides a worst-case procedure for materials classed as Poison A (49 CFR 173.328). In the absence of reliable data that exclude the possibility of the presence of Poison A chemicals or compounds (see Attachment 9.2), these procedures must be followed.

6.3.4.1 Packaging

Applying the word "poisonous" to a sample does not imply that it is, in fact, poisonous, or how poisonous. It describes the class of packaging according to DOT regulations.

1. Collect samples in a polyethylene or glass container with an outer diameter narrower than the valve hole on a DOT specification #3A1800 or #3AA1800 metal cylinder. To prevent leakage, fill container no more than 90% full. Seal sample container.

2. Complete sample label and identification tag and attach securely to sample container.

3. Attach string or flexible wire to neck of the sample container; lower it into metal cylinder partially filled with noncombustible, absorbent cushioning material (for example, diatomaceous earth or vermiculite). Place only one container in metal cylinder. Pack with enough absorbing material between the bottom and sides of the sample container and the metal cylinder to prevent breakage and absorb leakage. After the cushioning material is in place, drop the end of the string into the cylinder valve hole.

4. Replace valve, torque to 250 ft-lb (for 1-inch opening), and replace valve protector on metal cylinder, using Teflon tape.

5. Mark and label cylinder as described in Paragraph 1 of Section 6.3.4.2.

6. Place one or more cylinders in DOT-approved outside container.

7. Mark and label outside container and complete shipping papers as described below.

6.3.4.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the side of the cylinder or on a tag wired to the cylinder valve protector.

   - "Poisonous Liquid, n.o.s." or "Poisonous Gas, n.o.s. NA1955".

   - Laboratory name and address.

Not otherwise specified (n.o.s.) is not used if the poisonous liquid (or gas) is identified. Then the name of the specific material is listed before the category (for example, Arsine, Poisonous), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Poisonous Liquid, n.o.s." or "Poisonous Gas, n.o.s. NA 1955".
   - Laboratory name and address.
   - DOT placard "Poisonous Gas" (even if sample is liquid) on cylinder.
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides.

6.3.4.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - "Poisonous Liquid, n.o.s. NA1955".
   - "Limited Quantity (or Ltd. Qty.).
   - Net weight (wt) or net volume (vol), just before of after "Poisonous Liquid, n.o.s." of each cylinder, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with cylinder (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.4.4 Transportation

Transport unknown hazardous substance samples classified as Poison A only by ground transport or Government-owned aircraft. Do not use air cargo, other common-carrier aircraft or rented aircraft.

6.3.5 Packaging and Shipping of Samples Classified as a NONFLAMMABLE or FLAMMABLE GAS

6.3.5.1 Packaging

Applying the word "NONFLAMMABLE or FLAMMABLE GAS" to a sample does not imply that it is in fact a nonflammable or flammable gases. The word prescribes the class of packaging according to DOT regulations.

1. Collect sample in the Tedlar bag

2. The Tedlar bag should be labeled with a tag on a string to reduce the potential for contamination from adhesives on the back of sample labels. The sample tags should include all of the information normally placed on the sample label.

3. Place in a 2-ml thick (or thicker) polyethylene bag, one sample per bag. Position identification tag so that it can be read through bag. Seal bag.

4. Place sealed bag inside metal can and cushion it with enough noncombustible, absorbent material (for example vermiculite or diatomaceous earth) between the bottom and sides of the can and bag to prevent puncture. Pack one bag per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark can as indicated in Paragraph 1 of section 6.3.5.2, below.

5. Place one or more metal cans into a strong outside container, such as a picnic cooler or a DOT-approved fiberboard box. Surround cans with noncombustible, absorbent cushioning material and ice for stability and preservation during transport.

6. Securely close cooler and add security seals (See Attachment 9.8).

6.3.5.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the can.

   - - "NONFLAMMABLE GAS, UN 1956"or "NONFLAMMABLE GAS, n.o.s. UN 1956"

     - "FLAMMABLE GAS, UN 1954" or "FLAMMABLE GAS, n.o.s. UN 1954"

   - Shippers and Laboratory, name and address.

Not otherwise specified (n.o.s.) is not used if the compressed gas is identified. Then the name of the specific material is listed before the category (for example, Acetylene, Flammable Gas), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - - "NONFLAMMABLE GAS, UN 1956"or NONFLAMMABLE GAS, n.o.s. UN 1956"

     - "FLAMMABLE GAS, UN 1954"or "FLAMMABLE GAS, n.o.s. UN 1954"

   - Shippers and Laboratory, name and address.

   - DOT placard "NONFLAMMABLE,"or"FLAMMABLE GAS" on outside container

   - "Environmental Sample"

- "Inside Packages Comply With Prescribed Specifications"
- "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.5.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - "NONFLAMMABLE GAS, n.o.s. UN 1956"or "FLAMMABLE GAS, n.o.s. UN 1954"
   - "Limited Quantity (or Ltd. Qty.).
   - Net volume (vol), just before of after "NONFLAMMABLE or"FLAMMABLE GAS, n.o.s.", of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.5.4 Transportation

Transport of nonflammable and flammable gases samples are shipped as compressed gas and classified as either "NONFLAMMABLE"or"FLAMMABLE GAS".

1. Transport compressed gas hazardous substance samples classified as "NONFLAMMABLE"or"FLAMMABLE GAS" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.6 Packaging and Shipping of Samples Classified as Flammable Liquid (or Solid)

6.3.6.1 Packaging

Applying the word "flammable" to a sample does not imply that it is in fact flammable. The word prescribes the class of packaging according to DOT regulations.

1. Collect sample in the prescribed container with nonmetallic, Teflon-lined screw cap. To prevent leakage, fill container no more than 90% full. If an air space in the sample container would affect sample integrity, place that container within a second container to meet the 90% requirement.

2. Complete sample label and identification tag and attach securely to sample container.

3. Seal container and place in a 2-ml thick (or thicker) polyethylene bag, one sample per bag. Position identification tag so that it can be read through bag. Seal bag.

4. Place sealed bag inside metal can and cushion it with enough noncombustible, absorbent material (for example vermiculite or diatomaceous earth) between the bottom and sides of the can and bag to prevent breakage and absorb leakage. Pack one bag per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark can as indicated in Paragraph 1 of section 6.3.6.2, below.

5. Place one or more metal cans (or single 1-gallon bottle) into a strong outside container, such as a metal picnic cooler or a DOT-approved fiberboard box. Surround cans with noncombustible, absorbent cushioning material for stability during transport. Mark containers as indicated in 2 of section 6.3.6.2.

6.3.6.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either-hand printed or in label form, on the metal can (or 1-gallon bottle):

   - Laboratory name and address.

   - "Flammable Liquid, n.o.s. UN 1993", or "Flammable Solid, n.o.s. UN 1325"

Not otherwise specified (n.o.s.) is not used if the flammable liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

- o "Flammable Liquid, n.o.s. UN 1993", or "Flammable Solid, n.o.s. UN 1325"
- o Shippers and Laboratory, name and address.
- o DOT placard "Flammable Liquid" or "Flammable solid" on outside container
- o "Environmental Sample"
- o "Inside Packages Comply With Prescribed Specifications"
- o "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.6.3 Shipping Papers

1. Use abbreviations only where specified. Complete the carrier provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed (one form may be used for more than one exterior container).

- o "Flammable Liquid, n.o.s. UN 1993" or "Flammable Solid, n.o.s. UN 1325".
- o "Limited Quantity" (or "Ltd. Qty.).
- o "Cargo Aircraft Only" .
- o Net weight (wt) or net volume (vol), just before or just after "Flammable Liquid n.o.s." or "Flammable Solid, n.o.s., by item, if more than one metal can is inside an exterior container.
- o "Environmental Samples" (if applicable).

2. Include Chain-of-Custody Record, properly executed in outside container (Attachment 9.5).

3. "Limited Quantity" of "Flammable Liquid, n.o.s." is limited to one pint per inner container. For "Flammable Solid n.o.s.", net weight of inner container plus sample should not exceed one pound; total package weight should not exceed 25 pounds.

6.3.6.4 Transportation

1. Transport Unknown hazardous substance samples classified as flammable liquids by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.7 Packaging and Shipping of Samples Classified as an Oxidizer

6.3.7.1 Packaging

Applying the word "Oxidizer" to a sample does not imply that it is in fact an oxidizer. The word prescribes the class of packaging according to DOT regulations.

1. Place sealed container inside metal can and cushion it with enough noncombustible, absorbent material (for example vermiculite or diatomaceous earth) between the can and container to prevent breakage. Pack one container per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark can as indicated in Paragraph 1 of section 6.3.7.2, below.

2. Place one or more metal cans into a strong outside container, such as picnic cooler or a DOT-approved fiberboard box.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (Attachment 9.8).

6.3.7.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the can.

   - "Oxidizer, UN 1479" or "Oxidizer, n.o.s. UN 1479".
   - Shippers and Laboratory, name and address.

Not otherwise specified (n.o.s.) is not used if the oxidizing liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Oxidizer, UN 1479" or "Oxidizer, n.o.s. UN 1479".
   - Shippers and Laboratory, name and address.
   - DOT placard "Oxidizer" on outside container
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.7.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - "Oxidizer, n.o.s. UN 1479".
   - "Limited Quantity"(or Ltd. Qty.).
   - Net weight (wt) or net volume (vol), just before of after "Oxidizer, n.o.s." of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.7.4 Transportation

Transport oxidizing hazardous substance samples classified as "Oxidizer".

1. Transport oxidizing hazardous substance samples classified as "Oxidizer" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.8 Packaging and Shipping of Samples Classified as Corrosive, (Liquid and Solid)

6.3.8.1 Packaging

Applying the word "Corrosive" to a sample does not imply that it is in fact a corrosive. The word prescribes the class of packaging according to DOT regulations.

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in a cooler which has been lined with a large polyethylene bag.
   * Liquids must be packed in metal cans and labeled before being placed in outer container

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (See Attachment 9.8).

6.3.8.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the container.

   o Liquid- "CORROSIVE, UN 1760"or "CORROSIVE n.o.s. UN 1760"
     Solid- "CORROSIVE, UN 1759"or "CORROSIVE n.o.s. UN 1759"

   o Shippers and Laboratory, name and address.

Not otherwise specified (n.o.s.) is not used if the Corrosive liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Nitric acid, Corrosive), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Corrosive, UN 1759 or "Corrosive, n.o.s. UN 1759".
   - Shippers and Laboratory, name and address.
   - DOT placard "CORROSIVE" on outside container
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.8.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - Liquid- "Corrosive, n.o.s. UN 1760"

     Solid- "Corrosive, n.o.s. UN 1759"
   - "Limited Quantity (or Ltd. Qty.".
   - Net weight (wt) or net volume (vol), just before of after

"Corrosive, n.o.s.", of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.8.4 Transportation

Transport corrosive hazardous substance samples classified as "Corrosive"

1. Transport Corrosive hazardous substance samples classified as "Corrosive" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.9 Packaging and Shipping of Samples Classified as Poison B (Liquid and Solid)

6.3.9.1 Packaging

Applying the word "Poison" to a sample does not imply that it is in fact a poison. The word prescribes the class of packaging according to DOT regulations.

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in a cooler which has been lined with a large polyethylene bag.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (Attachment 9.8).

6.3.9.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the container.

   o Liquid- "Poison, UN 2810"or Poison, n.o.s. UN 2810"

     Solid- "Poison, UN 2811"or Poison, n.o.s. UN 2811"

Not otherwise specified (n.o.s.) is not used if the Poison B liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Phenol, Poison), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   o Liquid- "Poison, UN 2810 or Poison, n.o.s. UN 2810"

     Solid- "Poison, UN 2811 or Poison, n.o.s. UN 2811"

   o Shippers and Laboratory, name and address.

   o DOT placard "Poison" on outside container

   o "Environmental Sample"

- o "Inside Packages Comply With Prescribed Specifications"

- o "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.9.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - o Liquid- "Poison, n.o.s. UN 2810"
     Solid- "Poison, n.o.s. UN 2811"

   - o "Limited Quantity (or Ltd. Qty.)".

   - o Net weight (wt) or net volume (vol), just before of after "Poison, n.o.s.", of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.9.4 Transportation

Transport Poison B hazardous substance samples classified as "Poison".

1. Transport Poison B hazardous substance samples classified as "Poison" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.10.1 Packaging and Shipping of Samples Classified as Irritant

6.3.10.1 Packaging

Applying the word "Irritant" to a sample does not imply that it is in fact an irritant . The word prescribes the class of packaging according to DOT regulations.

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in a cooler which has been lined with a large polyethylene bag.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (Attachment 9.8).

6.3.10.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the container.

   - "Irritant, NA 1693" or "Irritant, n.o.s. NA 1693".

Not otherwise specified (n.o.s.) is not used if the Irritant is identified. Then the name of the specific material is listed before the category (for example, Chloroeacetophene, Irritant), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Irritant, NA 1693"or "Irritant, n.o.s. NA 1693".
   - Shippers and Laboratory, name and address.
   - DOT placard "Irritant" on outside container
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.10.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - "Irritant, n.o.s. NA 1693."
   - "Limited Quantity (or Ltd. Qty.).
   - Net weight (wt) or net volume (vol), just before of after "Irritant, n.o.s.,"of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.10.4 Transportation

Transport irritant hazardous substance samples classified as "Irritant".

1. Transport irritant hazardous substance samples classified as "Irritant" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.11 Packaging and Shipping of Samples Classified as Combustible Liquids

6.3.11.1 Packaging

Applying the word "Combustible" to a sample does not imply that it is in fact combustible. The word prescribes the class of packaging according to DOT regulations.

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in a cooler which has been lined with a large polyethylene bag.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (Attachment 9.8).

6.3.11.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the container.

   - "Combustible, NA 1993"or "Combustible, n.o.s. NA 1993".

   - Shippers and Laboratory, name and address.

Not otherwise specified (n.o.s.) is not used if the combustible liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   - "Combustible, NA 1993 or "Combustible, n.o.s. NA 1993)".
   - Shippers and Laboratory, name and address.
   - DOT placard "Combustible" on outside container
     - No label is required for containers under 110 gallons unless it contains hazardous combustibles
   - "Environmental Sample"
   - "Inside Packages Comply With Prescribed Specifications"
   - "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.11.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - "Combustible, n.o.s. NA 1993."
   - "Limited Quantity (or Ltd. Qty.).
   - Net weight (wt) or net volume (vol), just before of after "Combustible, n.o.s., of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.11.4 Transportation

Transport combustible hazardous substance samples classified as "Combustible".

1. Transport combustible hazardous substance samples classified as "Combustible" by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.3.12 Packaging and Shipping of Samples Classified as ORM's

6.3.12.1 Packaging

ORM's are materials not covered by any of the other categories in table 172.101. They are a catch all category. A material that falls under these other category it should be packaged as such. These are not unknowns.

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

2. Place sample in a cooler which has been lined with a large polyethylene bag.

3. Pack with enough ice, non combustible, absorbent, cushioning materials to preserve samples and minimize the possibility of the container breaking.

4. Seal large bag.

5. Securely close cooler and add security seals (Attachment 9.8).

6.3.12.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the outside of the container.

   o "ORM-B, n.o.s. NA 1760"
     "ORM-A, n.o.s. NA 1693"
     "ORM-E, n.o.s. NA 9188"

Not otherwise specified (n.o.s.) is not used if the ORM's liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

2. The outside of the cooler should be labeled in the following manner:

   o "ORM-B, n.o.s. NA 1760"
     "ORM-A, n.o.s. NA 1693"
     "ORM-E, n.o.s. NA 9188"

   o Shippers and Laboratory, name and address.

   o DOT placard "MISCELLANEOUS" on outside container

   o "Environmental Sample"

   o "Inside Packages Comply With Prescribed Specifications"

- o "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

6.3.12.3 Shipping Papers

1. Use abbreviations only as specified. Complete carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment 9.4). Provide the following information in the order listed. One form may be used for more than one exterior container.)

   - o "ORM-B, n.o.s. NA 1760"
     "ORM-A, n.o.s. NA 1693"
     "ORM-E, n.o.s. NA 9188"

   - o "Limited Quantity (or Ltd. Qty.).

   - o Net weight (wt) or net volume (vol), just before of after "ORM, n.o.s., of each container, if more than one is inside the outer container.

2. Include a Chain-of-Custody Record, properly executed, in container or with samples (Attachment 9.5).

3. Accompany shipping container to carrier and, if required, open outside container(s) for inspection.

6.3.12.4 Transportation

Transport of ORM's hazardous substance samples do not need to be classified on exterior labels.

1. Transport ORM's hazardous substance samples as environmental samples by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

6.4 Transport of Investigation and Remediation Wastes

6.4.1 The packaging, marking, labeling, and other shipping requirements will depend on the particular waste to be transported. Examples of wastes which may be generated during the site investigations are decontamination or cleaning solutions, contaminated disposable items, test pit spoils, drilling cuttings or fluids and contaminated monitoring well discharges. Waste materials from remediation include excavation spoils, overpacked drums and discharges from drained lagoons or tanks.

In many cases, wastes generated during site investigations will be disposed of on site. These relatively small volumes of waste will be dealt with as part of the waste to be cleaned up or isolated during remediation. This avenue should be pursued, if feasible, to avoid the inconvenience of transportation and disposal which are disproportionately expensive for small volumes. If such a solution is approved, materials should be properly bagged, drummed, covered, or otherwise contained at the end of each day.

Those materials which must be transported for treatment, storage, or disposal should be packaged, labeled and marked in accordance with applicable regulations.

Many wastes generated during site investigation and remediation activities will probably be adequately handled under the classification "ORM-E" (i.e., Other Regulated Materials, Type E, Sec. 6.3.12) . Types of wastes which would normally fall under this classification are contaminated disposable protective clothing and sampling equipment, spent soapy decontamination solutions and rinses, contaminated drilling cuttings or fluids and contaminated soils excavated during site investigations or remediations.

Spent solvents used for decontamination of sampling equipment (e.g., acetone or methanol) should be referenced by the actual product name. Liquids from drums or tanks should be specified as accurately as possible based on results of lab analysis or reliable records. If the liquid is known to be a solvent, organic liquid, or spent distillation bottoms, it should be referenced by its actual or generic name from the Hazardous Materials Table. In cases requiring emergency actions where the identity of a substance is not accurately know, place the substance in one of the general hazard classes in 49 CFR 173.2. The choice of class should be conservative; that is, use the highest priority class based on available information as described in Section 9.1.

7.0 Chain-of-Custody Guidelines

7.1 The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom. These procedures also provide an auditable trail for the evidence as it is moved and/or passes from the custody of one individual to another. In addition, procedures for consistent and detailed records facilitate the admission of evidence under Rule 803(b) of the Federal Rules of Evidence (P.L. 93-575).

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

7.2 Sample Identification

The following information will be written in the sample log book when in-situ measurements or samples for laboratory analysis are collected:

- project code;
- station number;
- location of Station;
- date and time of measurement;
- samples used (if any);
- field observations (include date and time);
- level of personnel protection (if required);
- equipment used to make physical measurements and collect samples; and
- calibration data for equipment used.

Measurements and observations shall be recorded using black, waterproof ink.

7.3 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling Plan. Each sample container is identified by a sample label. The sampler fills out the following information on the sample label:

Project	Work Assignment Number
Sample Number	The unique sample number identifying this sample
Date	A six-digit number indicating the month, day, and year of sample collection; e.g., 02/21/93
Time	A four digit number indication the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 pm)

Medium	Water, Soil, Sediment, Sludge, Leachate, etc.
Sample Type	Grab or Composite
Preservation	Type, quantity, and concentration of preservative added
Analysis	Same as in sample plan
Sampled by	Name of the sampler
Lab #	The receiving laboratory assigns the lab # to the sample label (this number is not to be used for on-site analyses)
Remarks	If for Contract Lab analysis, include the Contract Lab case of SAS number, and Contract Lab sample number from the traffic report. Also, pertinent observations of the sampler (e.g., sequence number for sequential samples).

Blank, duplicate, or field spike samples will not be identified as such on the label as this may compromise the quality control function.

7.4 Chain-of-Custody Procedures

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

7.4.1 Field Custody Procedures

1. Samples are collected as described in the Project Work Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label exactly matches those numbers on the sample log sheet and the Chain-of-Custody Record (Attachment 9.5).

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

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

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

7.4.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form (Attachment 9.5). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of Custody Record is filled out as follows:

1. Enter header information (project number and name, Contract Lab case No. or SAS No.). For each station number, enter date, time, composite/grab, station location, number of containers, analytical parameters, Shipment Record, and Sample Identification Tag Number

2. Sign, date, and enter the time under "Relinquished by" entry.

3. Make sure that the person receiving the sample signs for the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by. Receiving laboratory will sign "Received for Laboratory by" on the lower line and enter the date and time.

4. Enter the bill-of-lading or Federal Express airbill number under "Remarks or Reason for Change of Custody", if appropriate.

5. Place the original (top, signed copy) of the Chain-of-Custody Recorded Form in the appropriate sample shipping package. Retain a copy with field records.

6. Shipping containers should be secured to ensure samples have not been disturbed during transport by using nylon strapping tape and EPA custody seals. The custody seals should be placed on the containers so that they cannot be opened without breaking the seal.

7. Complete other carrier-required shipping papers.

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

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

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

7.4.3 Receipt for Samples Form

Whenever samples are split with a private party or government agency, a separate Receipt for Samples Record Form (see Attachment 9.6) is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the party of agency will require the signature of a representative of the appropriate party acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Received by space. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time. This form must be completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is retained by the Field Operations Leader.

8.0 EQUIPMENT

- Teflon and Nylon Strapping Tape
- C.O.C
- Vermiculite or Styrofoam Packaging Materials
- Sampling Gloves
- Reclosable Plastic Bags
- Permanent Felt Tip Marker
- Pen, Black Permanent Ink
- Shipping Coolers
- Ice or Blue Ice
- Label
- Placard
- Absorbent Pads
- Metal Cans

9.0 ATTACHMENTS

9.1 DOT Hazardous Materials Classification (49 CFR 173.2)

9.2 DOT List of Class ~A~ Poison (49 CFR 172.101)

9.3 Hazardous Material Shipping Checklist

9.4 Standard Industry Certification Form

9.5 Chain-of-Custody Record Form

9.6 Receipt For Samples Form

9.7 Federal Express Sample Shipment Example

9.8 Sample Check List & Packing

ATTACHMENT 9.1

ORDER OF DOT HAZARDOUS MATERIAL CLASSIFICATION (49 CFR 173.2)

1. Radioactive material-	demonstrated to be radioactive through the use if radiation survey instruments, having a specific activity greater than 0.002 microcuries per gram (uCi/g). SEC. 6.3.3
2. Poison A-	gasses or liquids of such a nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. SEC. 6.3.4
3. Flammable gas-	meets lower paragraph requirements, plus 13% or less by volume with air forms a flammable mixture. SEC. 6.3.5
4. Nonflammable gas-	material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70° F, or regardless of the pressure at 70° F, having an absolute pressure exceeding 104 p.s.i. at 130° F. SEC. 6.3.5
5. Flammable liquid-	any liquid having a flash point below 100° F. SEC. 6.3.6
6. Oxidizer-	substance which readily yields oxygen to stimulate the combustion of organic matter. SEC. 6.3.7
7. Flammable solid-	any solid material, other than explosives, which under normal conditions of transportation are liable to cause fires through friction, retained heat, or can be ignited readily and when ignited burns so vigorously as to create a serious transportation hazard, including water reactive and spontaneous combustibles. SEC. 6.3.6
8. Corrosive material- (liquid)	a material that causes visible destruction or irreversible alterations in human skin tissue at the site of contact or has a sever corrosion rate on steel. SEC. 6.3.8
9. Poison B-	materials which are know to be so toxic to man as to afford a hazard to health during transportation. SEC. 6.3.9
10. Corrosive material- (solid)	a material that causes visible destruction or irreversible alterations in human skin tissue at the site of contact or has a sever corrosion rate on steel. SEC. 6.3.8
11. Irritating material-	a liquid or solid substance which upon contact with fire or when exposed to air gives off dangerous or intensely irritating fumes. SEC. 6.3.10

ATTACHMENT 9.1 cont.

12.Combustible liquid-	any liquid that has a flash point at or above 100° F - no labeling is required for volumes of 110 gal. or less. SEC. 6.3.11
13. ORM-	Other Regulated Material SEC. 6.3.12 a) may pose an unreasonable risk to health, safety or property when transported b) does not meet any of the definitions of the other hazard classes specified
14. ORM-B	material (including a solid wet with water) capable of causing sing significant damage to a transport vehicle from leakage during transport
14. ORM-A	material which has an anesthetic, irritating, noxious, toxic, or other similar property and which can cause extreme annoyance during transportation
15. ORM-E	materials not covered in any other hazard class, but is subject to the requirements of C.F.R., like hazardous waste

ATTACHMENT 9.2

DOT LIST OF CLASS "A" POISON (49 CFR 172.101)

Arsine
Bromoacetone
Chloropicrin and methyl chloride mixture
Chloropicrin and nonflammable, nonliquified compressed gas mixture Cyanogen chloride
Cyanogen gas
Gelatin dynamite (H. E. Germaine)
Grenade (with Poison "A" gas charge)
Hexaethyl tetraphosphate/compressed gas mixture
Hydrocyanic (Prussic) acid solution
Hydrocyanic acid, liquefied Liquid
Insecticide (liquefied) gas containing (Poison "A" or Poison"B" material)
Methyldichloroarsine
Nitric oxide
nitrogen peroxide
nitrogen tetroxide
Nitrogen dioxide, liquid
Parathion/compressed gas mixture
Phosgene (diphosgene)

ATTACHMENT 9.3

HAZARDOUS MATERIALS SHIPPING CHECKLIST

Packaging

1. Check DOT 172.500 table for appropriate type of package for hazardous substance.
2. Check for container integrity, especially the closure.
3. Check for sufficient absorbent material in package.
4. Check for sample tags and log sheets for each sample, and chain-of-custody record.

Shipping Papers

1. Check that entries contain only approved DOT abbreviations.
2. Check that entries are in English.
3. Check that hazardous material entries are specially marked to differentiate them from any nonhazardous materials being set using same shipping paper.
4. Be careful that all hazardous classes are shown for multi class materials.
5. Check total amounts by weight, quantity, or other measures used.
6. Check that any limited-quantity exemptions are so designated on the shipping paper.
7. Offer driver proper placards for transporting vehicle.
8. Check that certification is signed by shipper.
9. Make certain that driver signs for shipment.

RCRA Manifest

1. Check that approved state/federal manifests are prepared.
2. Check that transporter has the following: valid EPA identification number, valid driver's license, valid vehicle registration, insurance protection, and proper DOT labels for materials being shipped.
3. Check that destination address is correct.
4. Check that driver knows where shipment is going.
5. Check that the driver is aware of emergency procedures for spills and accidents.
6. Make certain driver signs for shipment.
7. Make certain one copy of executed manifest and shipping document is retained by shipper.
8. Check that the authorized Base point-of-contact (2750 ABW/EMC) has signed the manifest.

TABLE 1			
MATERIAL	I.D. NUMBER	LABELING	FED. REG. # (49 CFR)
RADIOACTIVE MATERIAL	UN 2982	RADIOACTIVE	173.415-173.416
POISON A	NA 1955	POISONS GAS	173.328
FLAMMABLE GAS	UN 1954	FLAMMABLE GAS	173.302-173.305
NON-FLAMMABLE GAS	UN 1956	NON-FLAMMABLE GAS	173.302-173.305
FLAMMABLE LIQUID	UN 1993	FLAMMABLE LIQUID	173.119
OXIDIZER	UN 1479	OXIDIZER	173.154
FLAMMABLE SOLID	UN 1325	FLAMMABLE SOLID	173.154
CORROSIVE LIQUID	UN 1760	CORROSIVE	173.245a
POISON B	LIQUID UN 2810 SOLID UN 2811	POISON	173.344 LIQUID 173.365 SOLID
CORROSIVE SOLID	UN 1759	CORROSIVE	173.245b
IRRITANT	NA 1693	IRRITANT	173.382
COMBUSTIBLE LIQUIDS	NA 1993	COMBUSTIBLE *	173.118a
ORM-B	NA 1760	NONE	173.505
ORM-A	NA 1693	NONE	173.505
ORM-E	NA 9188	NONE	173.1300

* NO LABEL REQUIRED FOR VOLUMES OF 110 GAL. OR LESS

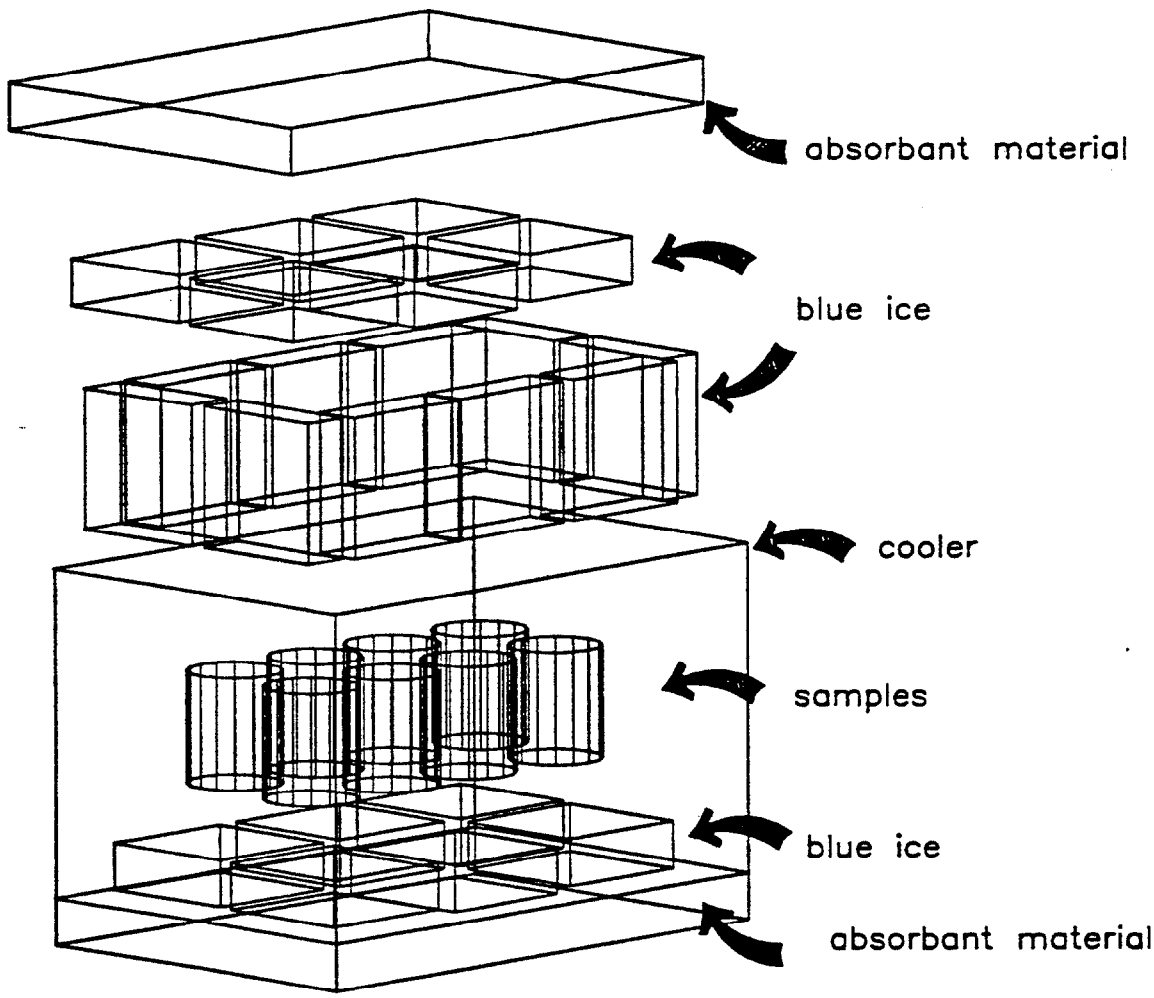
TABLE 2				
LIMITS OF NON-FIXED CONTAMINATION ON SURFACES				
Type of Surface	**Applicable limit of beta and gamma emitters and low toxicity alpha emitters**		**Applicable limit of all other alpha emitters**	
	Bq/cm²	**nCi/cm²**	**Bq/cm²**	**nCi/cm²**
External Surfaces of:				
- excepted packages	0.4	0.01	0.04	0.001
- other than excepted packages	4	0.1	0.4	0.01
External and Internal surfaces of overpacks and freight containers when used in the carriage of or when being prepared to carry:				
- loads including excepted packages and/or non-radioactive consignments	0.4	0.01	0.04	0.001
- loads consisting only of radioactive material in packages other than excepted packages	4	0.1	0.4	0.01

NOTE: The level of non-fixed radioactive contamination may be determined by wiping an area of 300 cm² (46 in²) of the surface concerned by hand with a dry filter paper, a wad of dry cotton wool or ant other material of this nature. The above limits are applicable when averaged over any area of 300 cm² (46 in²) of any part of the surface.

TABLE 3	
ACTIVITY LIMITS FOR EXCEPTED PACKAGES	
NATURE OF CONTENTS	**MATERIALS**
	PACKAGE LIMITS
	SOLIDS
Special Form	$10^{-3}A_1$
Other Forms	$10^{-3}A_2$
LIQUIDS	$10^{-4}A_2$
	GASSES
Tritium	$2X10^{-2}A_2$
Special Form	$10^{-3}A_1$
Other Forms	$10^{-3}A_2$

OHM Corporation

GUIDANCE FOR SAMPLE PACKAGING,



INSTRUCTIONS

Line the bottom of the cooler with absorbant material such as Sorbant Pads.
Place enough blue ice packs on the absorbant material to cover the bottom
Line all four side of the cooler with blue ice.
Place no more than eight 1-liter samples in the center of the blue ice.
Place sorbant material around the samples to avoid breakage.
Place enough blue ice packs to cover the top of the samples.
Fill the head space of the cooler with absorbant material.
Complete the OHM SHIPMENT CHECK LIST FORM prior to sealing cooler.
ICE MAY TO SUBSTITUTED FOR THE BLUE ICE BUT PRECAUTIONS MUST BE TAKEN TO ASSURE THAT THE SAMPLE LABELS REMAIN INTACT AND LEGIBLE

OHM Corporation

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 08/89

№ 125567

O.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

PROJECT NAME		PROJECT LOCATION
PROJ. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.
CLIENT'S REPRESENTATIVE		PROJECT MANAGER/SUPERVISOR

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)								REMARKS
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1					
2					
3					
4					

REMARKS

SAMPLER'S SIGNATURE

OHM Corporation

QUALITY POLICY AND

PROCEDURE APPROVAL

AND REVISION RECORD

Document #: QP-606.1	Title: Sample Packaging and Shipping of Environmental Samples

APPROVAL

Name	Title	Signature	Date
R. Steven Shirley	QA/QC Officer		5/10/95
Guy Gallello, Jr.	Mngr. Field Tech.		5/10/95
Thomas E. Gran	Dir. Tech. Svcs.		5/10/95

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
3									
4									
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8									
9									
10									
11									
12									

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Sample Packaging and **Document #:** QP-606.1

Shipping of Environmental Samples

Date Issued: May 10, 1995 **Rev:** 0 **Date:** May 10, 1995

1.0 PURPOSE

1.1 To comply with Department of Transportation (DOT) laws and regulations.

1.2 To establish procedures for the packaging, labeling, and shipment of environmental samples.

1.3 To establish function-specific responsibilities for the packaging, labeling, and shipment of environmental samples.

2.0 SCOPE

2.1 This procedure applies to the packaging and shipping of environmental samples for transfer from the field to a laboratory for analysis. Specifically, this document outlines shipping and sample documentation procedures that are in accordance with the U.S. Department of Transportation (DOT) and Hazardous Waste Remedial Actions Program (HAZRAP).

2.2 This procedure is applicable only for environmental samples. Environmental samples for this procedure are defined as samples of naturally occurring materials (i.e. soil, gravel, or rock; water from groundwater, a stream, or pond; or ambient air or absorbent tubes used in the collection of contaminates from air) which may have low levels of chemical contamination.

2.3 If the environmental sample is contaminated to the point where the sample takes on the hazardous characteristic of the chemical contaminant of concern, or in the best judgement of the sampler, it is likely that this sample may have the same hazardous characteristics as the chemical contaminant, then the sample is no longer considered an environmental sample and is to be packaged and shipped according to DOT regulations for that hazardous characteristic.

2.4 If you are not absolutely positive a sample is being shipped correctly, or if it can be shipped by a particular mode of transportation, call your Technical Service department.

3.0 REFERENCES

3.1 HAZWRAP, July 1990. Quality Control Requirements for Field Methods DOE/HWP69/R1.

3.2 HAZWRAP, July 1988. Requirements for Quality Assurance of Analytical Data, DOE/HWP-65, Rev. 0, July 1988.

3.3 U.S. Department of Transportation, 1983. Hazardous Materials Regulations, 49 CFR 171-177.

3.4 United States Environmental Protection Agency, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

3.5 DANGEROUS GOODS REGULATIONS 36 Edition, Effective 1 Jan. 95, International Air Transport Association (IATA)

4.0 GENERAL INFORMATION

4.1 Proper packaging and shipping procedures are followed in order to ensure that all environmental samples received are undamaged and free from cross contamination.

5.0 DEFINITIONS

5.1 Carrier - A person or firm engaged in the transportation of passengers or property.

5.2 Chain-of-Custody (COC) Record Form - A COC Record Form is a printed form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one

custodian to the subsequent custodian. Attachment 9.1 shows a typical COC Record. The COC Record Form is a controlled document. The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The COC procedures track the evidence from the time and place it is first obtained to the courtroom. These procedures also provide an auditable trail for the evidence as it is moved and/or passed from the custody of one individual to another. In addition, procedures for consistent and detailed records facilitate the admission of evidence under Rule 803(b) of the Federal Rules of Evidence (P.L. 93-575).

5.3 Custodian - The person responsible for the custody of samples until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under your custody if:

5.3.1 You possess the sample.

5.3.2 It is in your view, after being in your physical possession.

5.3.3 It was in your physical possession and then you locked it up to prevent tampering.

5.3.4 You have designated and identified a secure area to store the sample.

5.4 Environmental Sample - Sample of a naturally occurring material such as soil, gravel, or rock; water from groundwater, a stream, or pond; or ambient air or absorbent tubes used in the collection of contaminates from air which may have low levels of chemical contamination, but do not take on the hazardous characteristics of the chemical contaminant as defined by 49 CFR 171.8, 49 CFR 172.101, or 49 CFR Part 173 or 173.2a.

5.5 Hazardous Waste Sample - Medium to high concentration sample (e.g., source material sludge, leachate) requiring DOT placarding and Contract Lab handling as a high hazard sample.

5.6 Hazardous Material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce ("commerce" here to include any traffic or transportation). Defined and regulated by DOT (49 CFR 173.2) and listed in Attachment 9.2.

5.7 Hazardous Waste - Any substance listed in 40 CFR Subpart D (261.30 et seq) or 40 CFR otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under Subpart C (261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by the EPA.

5.8 Marking - Applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof are required to be placed on the outside of the containers of hazardous materials.

ID - 8027

5.9 Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 172.

DOT-approved fiberboard box or other approved DOT shipping container

5.10 Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Class 9, Miscellaneous Dangerous Goods

5.11 Reportable Quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous Materials Table (49 CFR 172.101). Indicates the reportable quantity of

the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to CFR 171.15-17 concerning hazardous materials incidents reports. The RQ notation must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which my be used for this purpose.

6.0 RESPONSIBILITIES

6.1 The sample team leader is responsible for defining whether samples planned for collection are environmental or hazardous. Responsible for determining that samples are properly packaged and shipped, and for determining that the COC procedures are implemented from the time the samples are collected to their release to the shippers.

6.2 The sample technologist is responsible for implementing the packaging and shipping requirements and for initiating the COC records until they are relinquished to another custodian, to the shipper, or to the carrier.

7.0 PROCEDURE

7.1 Environmental Sample Type Determination

7.1.1 In general, environmental samples are collected from natural matrices such as soil, streams, ponds, or wells and are not contaminated to the point that the samples meet the DOT or EPA definition of a hazardous waste.

7.1.2 If the sample, to the sampler's best judgement has the characteristics of a hazardous material, it is to be shipped in accordance to the suspected characteristic hazard that best represents the sample in accordance to 49 CFR 172.101 (c) (ii).

7.2 Packaging and Shipping of Environmental Samples

7.2.1 Assure that the environmental sample is collected in a container which meets the requirements specified for laboratory analyses and that it is appropriately labeled.

7.2.2 Assure that the container is tightly sealed.

7.2.3 Place the sample container in two Ziplock bags and seal the bags.

7.2.4 Wrap the sample in bubble wrap.

7.2.5 Place the sample in a cooler or other approved DOT shipping container lined with a large polyethylene bag.

7.2.6 Pack the container with enough ice to maintain the appropriate temperature.

7.2.7 Seal the polyethylene bag.

7.2.8 Seal the cooler lid.

7.2.9 Seal cooler drain and lid with duct tape.

7.2.10 Place four signed custody seals over the cooler lid.

7.3 The shipping containers must have an identification label on the outside and must be marked in the following manner:

7.3.1 Proper Shipping Name: Other Regulated Substances

7.3.2 Hazard Class Label: Class 9

7.3.3 UN/NA Number: ID 8027

7.3.4 DOT Placard: None required

7.3.5 "Inside Packages Comply With Prescribed Specifications"

7.3.6 "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

7.4 The following shipping papers are to accompany the container:

7.4.1 DOT shipping papers: Bill-of-Lading or Airbill.

7.4.2 A COC Record Form (See Attachment 9.1).

7.4.2.1 One copy of the COC form must be retained in the project file.

7.5 Transfer of Custody and Shipment

7.5.1 When transferring the possession of samples, the individuals relinquishing and receiving the sample(s) will sign, date, and note the time on the COC Record.

7.5.2 Sign, date, and enter the time under "Relinquished by" entry.

7.5.3 Make sure that the person receiving the sample(s) signs for the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by."

7.5.3.1 Common carriers will usually not accept responsibility for handling COC Record Forms; this necessitates packing the record in the sample container (enclosed with the other documentation in a plastic Ziplock bag). As long as custody forms are sealed inside the sample container and the custody seals are intact, commercial carriers are not required to sign off on the custody form.

7.5.4 Enter the bill-of-lading or Federal Express airbill number under "Remarks or Reason for Change of Custody", if appropriate.

8.0 EQUIPMENT

* Teflon and Nylon Strapping Tape

* COC Record Form

* Vermiculite or Styrofoam Packaging Materials

* Sampling Gloves

* Reclosable Plastic Bags

* Permanent Felt Tip Marker

* Black Permanent Ink Pen

* Shipping Cooler or other DOT-approved shipping container

* Ice or Blue Ice

* Hazard Class Label

* Placard

* Absorbent Pads

9.0 ATTACHMENTS

9.1 Chain-of-Custody Record Form

9.2 DOT Hazardous Materials Classification (49 CFR 173.2)

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-608	Title Drum Sampling

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
B									
C									
D									
E									
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O									

form # qp608

OHM Corporation

STANDARD OPERATING PROCEDURES

Title: Drum Sampling **Document #:** QP-608

Date Issued: **Rev:** 2.1 **Date:** 13 OCT 93

1 PURPOSE

1.1 To provide general reference information for use in planning for and implementing sampling programs involving the moving and/or opening of closed containers on uncontrolled hazardous substance sites.

1.2 To provide guidelines for primary and secondary staging.

1.3 To provide guidelines for opening containers.

1.4 To provide guidelines for sampling material in containers.

1.5 To discuss site organization, protective clothing, worker protection and other safety procedures.

2 SCOPE

2.1 This guideline is applicable to opening and sampling of closed containers (120 gallon or less) on uncontrolled hazardous substance sites. Bulk tanks such as railroad tank cars, large above- and below-ground tanks (with a capacity of more than 120 gallons), and tank trailers are not considered in this procedure.

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3 REQUIREMENTS

3.1 Strict adherence to safety precautions cannot be overemphasized when handling and sampling drums.

3.2 Hazards encountered when sampling drums include:

- Fires
- Explosions
- Toxic vapor generation

3.3 Scenarios involving drums encountered in the field may include drums that are:

- Unmarked
- Mislabeled
- Bulging
- Buried
- Deteriorated
- Leaking

Consequently, such drums may require handling to accommodate sampling. Because the condition of the drum and its contents dictate how drums are handled and sampled, no single procedure can be written to cover all possibilities.

3.4 This procedure lists general guidelines that should be used when developing an onsite drum handling/sampling procedure. The procedure developed should be based on all available information and revised as more information becomes available. When implementing the procedure, common sense and good judgement are important.

3.5 Consult OSHA regulations (29 CFR Sections 1910 and 1926) for established general requirements and standards for storing, containing, and handling chemicals and containers, and for maintaining equipment used for handling materials.

3.6 Consult EPA regulations (49 CFR 265) for requirements pertaining to the types of containers, maintenance of containers and containment structures, and design and maintenance of storage areas.

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4 REFERENCES

4.1 Cassis, Jo, et al., 1985. Guidance Document for Cleanup of Surface Tank and Drum Sites. Prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.

4.2 Hazardous Waste Operations and Emergency Response, December 1988. IT Corporation, Knoxville, TN.

4.3 Martin, F.M., Lippitt, J.M., Prothero, T.G., 1987. Hazardous Waste Handbook for Health and Safety, Butterworth Publishers, p. 167-177.

4.4 NIOSH, OSHA, USCG, & USEPA, October 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

4.5 NUS Corporation, 1983. Operating Guidelines Manual.

4.6 OHM Compatibility Manual, 1992.

4.7 USEPA, 1986. Drum Handling Practices at Hazardous Waste Sites, EPA/-600/2-86/013.

5 DEFINITIONS

5.1 Air Reactive Wastes - Some chemicals, such as white phosphorus or barium oxide, react with the oxygen in the air, while others, such as sodium, potassium and various metal hydrides, react with the moisture or water vapor in the air. Many of these compounds can react ex[plosively when they come in contact with air or water.

5.2 Container - Defined as any drum, bottle, can, bag, etc., with a capacity of 120 gallons (450 liters) or less.

5.3 Dosimeter - A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements.

5.4 Exotic Metal Drums - (i.e. aluminum, nickel, stainless steel, or other unusual metals). Very expensive drums that usually contain an extremely dangerous material.

5.5 Glass Thief - A glass tube 4 feet long and 3/4 inches in diameter, used for taking samples from drums. The tube is usually broken up and disposed of in the drum following sampling.

5.6 LEL - (Lower explosive limit) An air monitoring device can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air which can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.

5.7 Laboratory Packs - Such drums are commonly used for disposal of expired chemicals and process samples from laboratories, hospitals and similar institutions. Bottles in the laboratory pack may contain incompatible materials and may not be packed in absorbent material. They may contain radioisotopes, shock sensitive, highly volatile, highly corrosive, or very toxic exotic chemicals. Laboratory packs have been the primary ignition sources for fires at some hazardous waste sites.

5.8 Monitox - A portable warning device used for detecting specific toxic gases found in the surrounding air (i.e. H_2S, HCl, Cl, HCN and $COCl_2$).

5.9 PID - (photoionization detector) A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.

5.10 Polyethylene or PVC-lined Drums - Often contains strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill.

5.11 Shock Sensitives - A chemical which may undergo a very rapid chemical transformation, with the simultaneous production of large quantities of heat and gases, if introduced to shock (i.e. friction).

5.12 Single-Walled Drums Used as a Pressure Vessel - These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. Such drums may contain reactive, flammable, or explosive substances.

5.13 Vapor Control - The use of an LEL, PID, Monitox, or any other air monitoring device to assure the quality of air meets all safety requirements.

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6 RESPONSIBILITIES

6.1 Manager, Technical Field Services

The manager of field technical services will:

- Act as project coordinator for field technical personnel
- Review and update procedures in the sampling and field analytical manuals as required.

6.2 Project Chemist

The project Chemist will:

- Manage the mobile laboratory or the shift so that the data generated meets the required levels of certification
- Implement sample acquisition numbering system

6.3 Chemists

The chemists will:

- Carry out compatibility tests
- Carry out approved analytical procedures and maintain sample analysis tracking forms

6.4 Sample Technicians

The sampling technicians will be responsible for:

- Carrying out all drum sampling in accordance to approved procedures and methodologies as defined in the CSAP
- Generate trip blanks, equipment blanks, and acquire replicate samples as defined in the CSAP
- Record all field data in Log Books and complete Drum Inventory logs.
- Reporting unusual conditions encountered to supervision.
- Fill out COC forms.

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7 PROCEDURE

7.1 Introduction

The guidance presented is based on field experience in working with containers on uncontrolled hazardous substance sites and on information contained in USEPA and other goverment agency publications. It will be evident that in many cases hard and fast rules cannot be given, and professional judgement is required because uncontrolled variables are involved. For example, no one can be absolutely certain of any assessment of the potential contents of a container. Labels cannot be absolutely trusted; only educated guesses can be made by a thorough review of all available background data, such as potential sources of the wastes. The following topics will be covered in the paragraphs to follow:

- Risks
- Site Preparation and Survey
- Handling, Primary Staging and Numbering
- Radiological Survey
- Drum Opening
- Second Radiological Survey
- Problem Containers
- Sampling
- Resealing and Secondary Staging
- Sample Control
- Blending Wastes
- Safety

Figure 7.1-1 demonstrates a flow chart for drum handling on a typical hazardous waste project.

During many drum projects, several phases will be in progress simultaneously. Air monitoring, dust control, and organic vapor control operations should be in progress throughout the course of the project.

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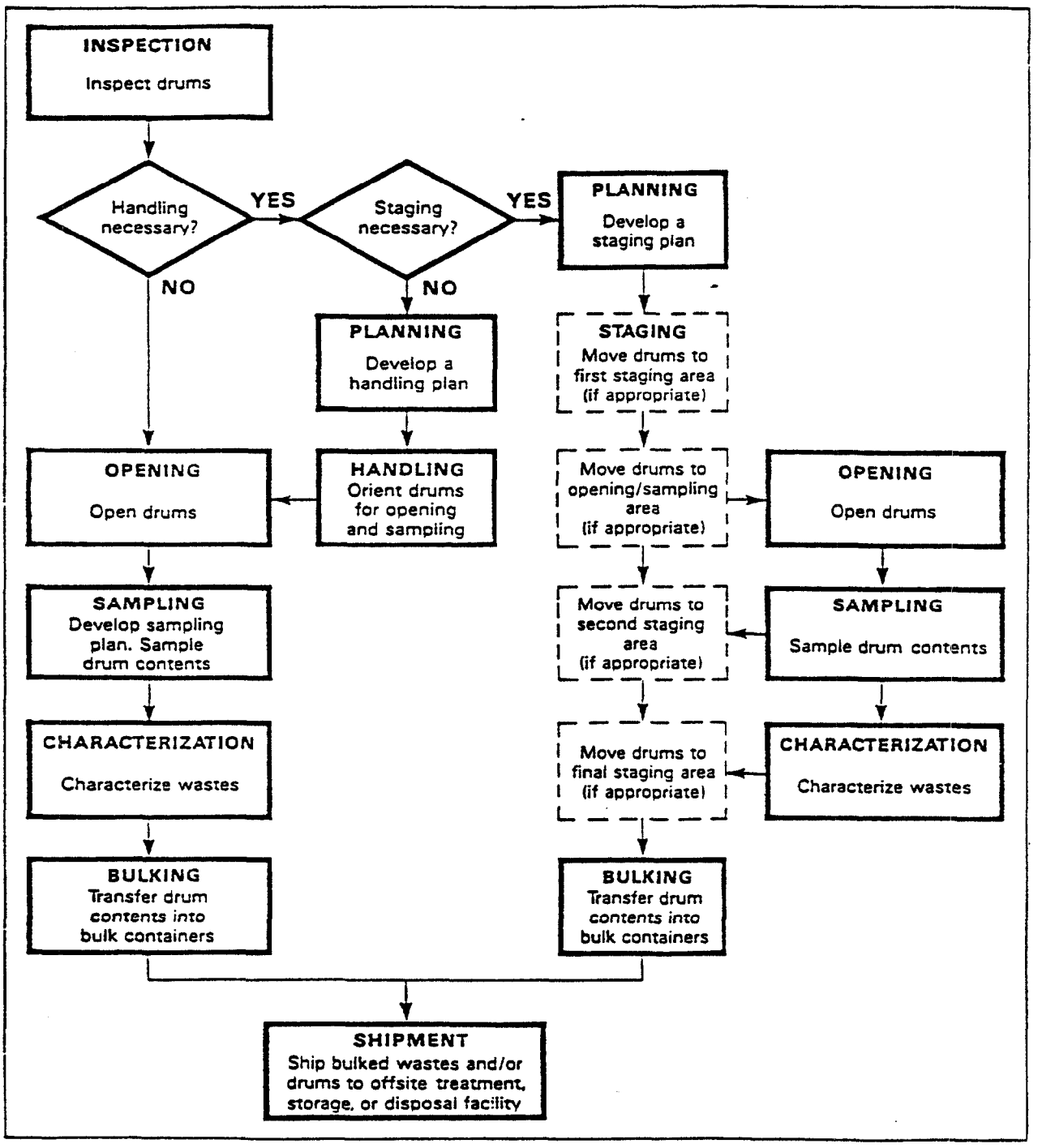
Figure 7.1-1, Flow chart for drum handling on typical hazardous waste projects



7.2 Risks

Three basic risks are involved in moving and opening closed containers:

- Exposure of personnel to toxic materials
- Fire
- Explosion

7.2.1 Exposure of personnel to toxic materials.

The first risk can be reasonably eliminated through the use of proper skin and respiratory protection equipment. The use of level B protection with splash guard (i.e. Tyvek and Saran suits with face shield) acceptably reduces the risk of a worker being injured by toxic vapors, mists, or splashes.

7.2.2 Fire

In the same way, standard fire prevention procedures can be used to reduce the fire hazard through the use of detector instruments and proper equipment. These include the use of non sparking tools and intrinsically safe radios, pumps, and other equipments as well as the staging of fire fighting equipment and the elimination of any other possible ignition sources. Piles of sand and lime (for neutralization and suffocation) will be on hand at the site in case of a fire.

7.2.3 Explosion

The explosive risk however, is not as easily handled, and thus is the primary consideration in any container-opening operation. Even if no solid evidence of the presence of explosives is found during the preliminary data collection, one can never be certain that explosives have not been disposed of at the site. In order to provide the same reasonable level of protection against this risk as against toxic exposure and fire, a very cautious approach, such as the one recommended in this guideline, should be used (see section 7.8.4, Drums Containing Explosive or Shock Sensitive Waste).

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7.3 Site Preparation and Survey

Proper site preparation involves, among other things, construction of primary and secondary staging areas. Proper staging areas reduce the amount of cleanup required because of inevitable spills and leaking drums.

Preliminary surveys at project sites for organic vapors, explosivity, and radiation should be completed for all drum projects. This survey will aid in identifying site specific hazards and development of work zones. In addition, materials (such as drums) which require special handling can be identified.

7.4 Handling, Primary Staging and Numbering of Drums

Personnel involved in handling and transporting containerized waste will work in teams containing no fewer than two people. Visual contact will be maintained between members of the working team at all times. All team members will be able to communicate between themselves and with the Site Health and Safety Officer by intrinsically safe two-way radios at all times on the work site.

7.4.1 Checklist

Prior to physically handling a drum or other container, the following preliminary classifications checklist must be reviewed and each response noted in a field notebook:

1. Is the drum radioactive?
2. Does the drum exhibit leakage or deterioration, i.e., is it unsound?
3. Does the drum exhibit apparent internal pressure?
4. Is the drum empty?
5. Does the drum contain markings which would indicate that the contents are potentially explosive?

The results of the preliminary classification checklist dictate which specific procedures will be followed in handling, opening, and sampling the drum.

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7.4.2 Handling

The handling, movements and transport of drums and other containers should be by use of mechanical equipment only; no drums should be handled manually. Remote drum handling equipment may consist of a grappler equipped backhoe or front-end loader. Drum transportation should be with front-end loaders or fork lifts with modified carrying platforms. Portions of equipment that contact drums or canisters should be constructed of non-ferrous metals or contact portions should be coated or lined to preclude spark generation. Handling and transport equipment must be equipped with full frontal and side splash and explosion shields. Class ABC fire extinguishers will be fitted to the body of each piece of equipment.

7.4.2.1 Minimize Handling

When possible, drums or other containers to be sampled should be opened and sampled in place to minimize handling. However, when drums are stacked or are close together, they may have to be moved to prevent sympathetic detonation of, or chemical reaction with, other drums around the one being opened. The main criterion is distance to other drums--a reasonable distance should be maintained to keep the drum to be opened segregated from the others.

7.4.2.2 Handling Special Drums

Drums or containers exhibiting the following characteristics require special treatment in handling and sampling:

- Drums containing Biohazards
- Leaking or deteriorated drums
- Bulging drums
- Drums containing explosive or shock-sensitive waste
- Drums containing radioactive waste
- Laboratory packs (in drums)
- Gas cylinders (in drums)

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7.4.3 Primary Staging of Drums

There are three important aspects of primary staging:

- o Staging configuration
- o Numbering
- o Overpacking leakers

7.4.3.1 Staging Configuration

A staging configuration must allow the samplers reasonable access to each drum for inspection, sampling, and overpacking, if necessary, while economizing on space. Drums are staged in rows, two wide, with isle space between rows. According to the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, "In all staging areas, stage the drums two wide in two rows, per area, and space these rows 7 to 8 feet apart to enable movement of the drum handling equipment." Figure 7.4-1 demonstrates the possible staging areas at a hazardous waste site.

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Figure 7.4-1 Drum staging layout for hazardous waste site

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7.4.3.2 Numbering

Accurate numbering is critical. Mistakes in numbering, such as missing numbers or double numbering, are minimized by numbering after primary staging. (It is highly recommended that drums are not numbered prior to staging.) To avoid problems, empty containers (not removed from the staging area prior to sampling) should be numbered and recorded on drum inventory logs as empty. Note: Drum numbering should be strictly numerical.

If the drums are numbered in the staging area as they are staged, the marking on the drums and whether or not they are empty may be recorded in a log book. Drum log sheets may then be partially filled out in advance. This will make the sampling more efficient.

7.4.3.3 Overpacking Leakers

Personnel in the staging area should watch for leaking drums. These must be overpacked promptly, and the spill should be cleaned up immediately.

7.4.4 Containers Located Inside Buildings

Containers that are inside warehouses, basements, or other buildings must be moved outside before they can be opened. Adequate ventilation is critical for container-opening operations.

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7.5 Radiological Survey

The personnel conducting radiological surveys will have a basic knowledge of the radiological survey meter used and of radiation types.

7.5.1 Types of Radiation

There are three types of radiation which might be encountered in the field:

1. Alpha (α), which is stopped by clothing or a sheet of paper. While alpha radiation is the least penetrating type, it can be very dangerous if alpha-emitting radionuclides are ingested, inhaled, or enter the body through a puncture wound.

2. Beta (β), which is stopped by the steel wall of a drum.

3. Gamma (γ) or X-ray, which is only stopped by lead shielding, thick concrete, or steel.

7.5.2 Types of Radiation Probes

The type of radiation detected depends on the probe being used. Three types of probes and their detection capabilities are:

1. The metal-bodied probe with side window, and a sliding cover for that window, detects beta and gamma radiation. When the window is closed, beta radiation is shut out, and only gamma radiation is detected.

2. The probe with the end window detects alpha, beta, and gamma radiation.

3. The "pancake" probe detects alpha, beta and gamma radiation.

7.5.3 Survey Meters

The survey meters OHM uses measure radiation in units of millirems per hour (mr/hr). The dose that one is exposed to is calculated by multiplying the hours of exposure by the average measured level of exposure, by the use of a personal dosimeter, or by a film badge.

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7.5.4 Background Level for Gamma Radiation

The background level for gamma radiation is between 0.008 and 0.02 mr/hr. Occasionally, the needle will briefly jump above this level, but it should not stay there.

7.5.5 Radiation Areas Defined

The Nuclear Regulatory Commission defines a radiation area to be one in which the radiation levels are at 5 mr/hr or greater or an area where one can accumulate 100 millirems of exposure in 5 days of normal work in the area. A high-radiation area has radiation at levels greater than 100 mr/hr.

When abnormally high readings are obtained, ranging from 0.2 to 2.0 mr/hr, one must first ascertain that this is not caused by a malfunction in the unit. If the readings are not caused by a malfunction one should follow the guidelines in table 7.5-1 below.

Table 7.5-1
Dosimeter Readings

Reading	Action
< or = 2 mrem/hr	Radiation above background levels (0.01-0.02 mrem/hr) signifies the possible presence of radiation sources. Continue investigation with caution.
> 2 mrem/hr	Potential radiation hazard. Contact Site Health and Safety Officer and Site Supervisor immediately.

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7.6 Drum Opening

7.6.1 Opening Area

The drum opening area should be physically separated from the drum removal and drum staging operations. There should be adequate distance between the drum opening and the removal and staging operations to prevent a chain reaction or fire during the drum opening procedure.

7.6.2 Caterpillar 215 Grappler

Drum opening is normally accomplished with a Caterpillar 215 grappler using a brass-tipped punch. A remote drum punching unit may also be used on smaller drum projects. At all times the staging area should be clear of personnel on the ground during punching operations. Extreme caution should always be taken when drum punching/opening is being performed. **AT NO TIME SHOULD DRUMS BE PUNCHED MANUALLY BY HAND USING HAND HELD TOOLS!** Drums that have been placed inside overpack drums upside down will need to be punched to obtain sample(s) of both liquids in them and any settled solids.

7.6.3 Opening by hand

OHM procedures prohibit the opening of drums containing unknown materials by hand. The drums will be opened by using a remote air operated punch or by the method described above.

For drums where there is clear information on the container itself or where other information exists, such as drum inventory records with drum numbers and drums that are numbered, opening the containers by hand can be done. This must be done carefully and should be preceded by careful screening for drums containing shock-sensitive materials and for drums that are obviously bulged (i.e., pressurized). Before opening drums by hand, the onsite H&S Officer and the Project Chemist need to be consulted.

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7.6.4 Opening Other Types of Containers

The following guidelines are offered for other types of containers:

1. Ring-closed, open-top drums - Loosen the ring and then remove it remotely by means of a rope. If it is necessary to cut the ring, do so near the bolt or clamp/lever so that there will be a place to attach the rope.

2. Glass carboys or jugs with lapped/ground-glass stopper or plastic cap - Slowly release any retaining wire and vent any pressure. Remove the stopper or cap by hand only.

3. Fiberpacks or corrugated cardboard containers - Release the locking ring and remove the ring and lid by hand.

4. Plastic or polyethylene carboys and plastic-lined drums (when necessary) - Use a non-sparking aluminum, brass, Ampco metal or copper/beryllium alloy bung wrench of the proper size. Do not use a bung wrench on any distended drums of this type; remote methods will be applied.

5. Plastic Kraft paper, burlap, or cloth bags - Use a trowel or sampling trier. The bags should be resealed or placed in an overpack.

7.7 Second Radiological Survey

After the drums are open, another radiological survey should be conducted. This is necessary because the drum tops block out all forms of radiation except gamma radiation.

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7.8 Problem Containers

Special handling techniques are required for containers which may expose personnel to particularly hazardous conditions. These techniques are described in general below (information derived from Reference 4.1), although site-specific conditions may require the development of specialized methods. The following are considered to problem containers:

- o Drums Containing Biohazards
- o Leaking or Deteriorated Drums
- o Bulging Drums
- o Drums Containing Explosive or Shock Sensitive Waste
- o Drums Containing Radioactive Waste
- o Packaged Laboratory Wastes (Laboratory Packs)
- o Air Reactive Wastes (in drums)
- o Gas Cylinders (in drums)

7.8.1 Drums Containing Biohazards

A biohazard is defined by the Biohazards Committee of the American Industrial Hygiene Association (AIHA), is "an agent that is biological in nature, capable of self-reproduction, and has the capacity to produce deleterious effects upon other biological organisms, particularly humans." Biological agents or substances which could be biohazardous substances, are but not limited to the following:

- Infectious or parasitic agents
- Non-infectious microorganisms (such as some fungi, yeasts and algae)
- Plants and plant products
- Animals and animal products which can cause occupational disease

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Recognition is the key to avoiding disease contaminated biological waste. Be aware that this may take the form of cultured animal cells, infected clinical specimens (tissues, fluids, etc.), or tissues from experimental animals (including animal dander). Open drums should be examined for evidence of biological material such as:

- Gauze
- Hypodermic syringes
- Petri dishes
- Cultures
- Blood
- Animal tissues
- Waste from orthopedic casts (may be gray, crumbly solids resembling a type of insulation).

Biological waste that has been prepared for incineration or for autoclaving may be packaged in red plastic bags or may be contained in plastic bags that are marked with the universal biohazard symbol (one ring with three interlocking "C"-shaped rings on top). Biohazards such as research bacterial cultures may be sent through the mail if they are packaged in a mailing tube. It is conceivable that either type of packaging could be found on a hazardous waste project.

If a biohazard or possible biohazard is identified, seal the drum and immediately notify the Site Safety Officer and the Site Supervisor.

7.8.2 Leaking or Deteriorated Drums

1. The contents of drums that exhibit leakage or apparent deterioration such that movement will cause rupture (determined by the HSO) must immediately be transferred to a repack drum. Equipment, including transfer pumps used in the repack operation must be of explosion-proof construction.

2. Leaking drums containing sludges or semi-solids, drums that are structurally sound but which are open and contain liquid or solid waste, and drums which are deteriorated but can be moved without rupture must be placed in overpack containers. Make certain that representative samples are obtained from overpacked drums.

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7.8.3 Bulging Drums

1. Drums which potentially may be under internal pressure, as evidenced by bulging, must be sampled in place. Extreme care shall be exercised when working with and adjacent to potentially pressurized drums.

2. Should movement of a pressurized drum be unavoidable, handle only by a grappler unit constructed for explosive containment. The bulging drum should be moved only as far as necessary to allow seating on firm ground or it should be carefully overpacked.

3. Openings into pressurized drums shall be plugged and the bung holes fitted with pressure venting caps set at 5 psi release.

7.8.4 Drums Containing Explosive or Shock Sensitive Waste

1. If drums containing wastes that have been identified by sampling, or are suspected by visual examination to be explosive in nature are found, the Project Manager and the HSO must be notified immediately, before the drums are handled in any way.

2. If the Project Manager and the HSO approve handling of these drums, they shall be handled with extreme caution. Initial handling shall be by a grappler unit constructed for explosive containment. Drums shall be palletized prior to transport to a high hazard interim storage and disposal area.

3. If at any time during remedial activities, an explosive, pursuant to provisions of Title 18, U.S. Code, Chapter 40 (Importation, Manufacturer, Distribution, and Storage of Explosive Materials, 1975 Explosives List) is identified, it should be secured and the appropriate state and federal agencies notified.

4. Identification of an explosive substance during the course of a remedial action is usually based on the experience of the on-site personnel. Potentially explosive material usually may be identified by their physical characteristics such as texture, color density, etc. as well as the way they are packaged. Most explosives are solids. In some cases they are packaged in water-tight containers to exclude water while in other cases they are packaged wet to preclude explosion.

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5. Prior to handling or transporting drums containing explosive wastes, personnel working in the area shall be removed to a safe distance (as determined by the HSO). Continuous contact with the communication base shall be maintained until handling or transporting operations are complete. An audible siren signal system, shall be used to signify the commencement and completion of explosive waste handling or transporting activities.

7.8.5 Drums Containing Radioactive Waste

7.8.5.1 Handling and Transporting Radioactive Waste Drums

Drums containing radioactive wastes shall not be handled until radiation levels have been determined by an initial field survey which is recorded in a field notebook. The survey shall include background levels, direct gamma readings and laboratory analysis of drum surface wipe samples.

Depending on the level of radiation encountered, handling and transport may require special shielding devices to protect personnel. Following handling and transport, equipment used shall be surveyed by the HSO and decontaminated to background levels prior to recommencing work. Surveys shall also be made of the ground surface in the vicinity of original drum storage to identify potential soil contamination by spilled or leaked radioactive waste. Prior to recommencing work in the area, radioactive soil areas shall be isolated to prevent tracking of radioactive contaminants about the site, and workers who entered the area should have their gloves and boots surveyed for radiation.

7.8.5.2 Opening Drums Containing Radioactive Waste

After the containers are opened, another radiological survey will be conducted. This is necessary because the drum tops block out all forms of radiation except gamma radiation.

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7.8.6 Packaged Laboratory Wastes (Laboratory Packs)

If drums known or suspected of containing discarded laboratory chemicals, reagents or other potentially dangerous materials in small volume, or individual containers are found, the Project Manager is to be notified immediately, before the drums or containers are moved or opened.

Lab pack drums are easily identified by the presence of vermiculite or other packaging material. If a drum contains such material, there is a good possibility that the drum is a lab pack drum. Further investigation may reveal that the drum also contains smaller containers inside such as:

- Sample jars
- Metal shipping containers
- Specially sealed packages
- Sealed 5 gallon buckets

If the Project Manager and the HSO approve the handling of these containers, they shall be handled with extreme caution. Until otherwise categorized, they shall be considered to be explosive or shock-sensitive wastes. Initial handling shall be by a grappler unit constructed for explosive containment. Drums shall be palletized and overpacked, if required, prior to transport to the Laboratory Pack staging area for sorting, identification, repacking and/or stabilization.

Prior to handling or transporting Laboratory Packs from the existing drum area, personnel working in the immediate area shall be removed to a safe distance. Continuous contact with the communication base shall be maintained until handling or transporting operations are

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complete. An audible siren signal system, similar to that employed in conventional blasting operations will be used to signify the commencement and cessation of Laboratory Pack handling or transporting activities.

7.8.7 Air Reactive Wastes

1. If the presence of air reactive substance is verified or even suspected, the material should be immediately segregated and transported to a separate high hazard interim storage and disposal area.

2. Air reactive wastes may be discovered during opening or sampling operations. Air reactive substances are routinely packaged in special containers or packages that keep the material from making contact with the air. They may be stored under water or some other liquid to minimize air contact. They may also be found in sealed ampoules, corrugated drums, stainless steel canisters, sealed aluminum containers or specially lined drums.

7.8.8 Gas cylinders

1. Gas cylinders, when encountered, should be stored and disposed of on a special case by case basis depending on the integrity of the cylinders and type of substance they may contain.

7.9 Sampling

7.9.1 Required Equipment

- 1 12-column book
- 2 OHM record books
- 1 utility knife
- 1 brass bung wrench
- 1 brass screwdriver
- 1 stainless-steel trowel
- 2 pair Wizard cut-proof glove liners
- 2 1/2 inch drive ratchet wrenches with 15/16 inch sockets
- 2 polyethylene squirt bottles
- Level B protective equipment

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- 1 radiation detector with thin window "pancake probe"
- 1 H_2S monitox with gas generator
- 1 HCN monitox with gas generator

7.9.2 Expendables per Hundred Drums

- 120 drum log sheets
- 120 8 oz. jars with Teflon liners
- 200 tongue depressors
- 120 11-mm dip tubes
- 400 pair sample gloves
- 5 mean streaks
- 4 rolls paper towels
- 2 trash bags
- 12 chain-of-custody forms
- 1 Liter of Isopropanol (Pesticide Grade)
- 1 Liter of Hexane (Pesticide Grade)

7.9.3 Sampling Procedures

(See sections 7.9.3.1 - 7.9.3.2 for additional information on sampling solids, semisolids and liquids)

All drums and mechanical equipment should be grounded prior to the commencement of sampling. If the bung or container lid can be removed, sample contained liquids using a glass thief, which shall then be broken and discarded within the barrel. A barrel that has a badly rusted bung, or that cannot be sampled as above such as a drum placed into an overpack upside down, shall be safely entered with a hydraulic penetrating device operated remotely (see Section 7.6). All openings shall be plugged except during sampling operation.

The steps to be followed in sampling are as follows:

1. Record any markings, special drum conditions, and type of opening on the Drum Inventory Log (see section 7.9.4.1). Locate the general area on a sketch of the site.

2. Stencil an identifying number on the drums and record in logbook. Consult the sampling plan for identifications.

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3. Make certain that the drum/container is set on a firm base, preferably in a fully upright position.

4. Open the drum / container as described in Section 7.6.

5. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum.

6. Allow the waste in the drum to reach its natural level in the tube. Cap the top of the sampling tube with a tapered stopper, ensuring liquid does not come into contact with stopper.

7. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Release the stopper and allow the glass thief to drain completely into the sample container.

8. Deliver 100 to 250 ml of the sample to a clean, wide-mouth, 500-ml (1-pt) glass sample jar. If the sample is not free flowing and is taken through a bung opening, repeated sampling may be necessary.

9. Place the used sampling tube, along with paper towels or waste rags used to wipe up any spills, into an empty metal barrel for subsequent disposal. If glass tubing has been used, it may be broken and left inside the drum being sampled.

10. Close the sample container cover tightly and place the prelabeled and tagged sample container in a carrier.

11. Replace the bung or lids or place a plastic cover over the drum/container.

12. Measure the sample for radioactivity and record results in a field notebook.

13. Fill out Chain-of-Custody Record and carefully pack samples. The finished package will be padlocked or custody-sealed for shipment to the laboratory. The preferred procedure includes the use of a custody seal across filament tape that is wrapped around the package at least twice. The custody seal (paper, plastic, or metal) is folded over and stuck to itself so that the only access to the samples is by cutting the filament tape or breaking the seal to unwrap the tape. The seal is signed before the package is shipped.

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14. Complete the appropriate shipping forms. Drum samples are always considered to be high-hazard samples.

7.9.3.1 Sampling Solids and Semisolids

Solids in drums are sampled by scooping the material up with the jar or with a tongue depressor. Often the material must first be broken up with a brass hammer or brass hammer and chisel, or a piece must be cut off with a razor knife. It is sometimes necessary to sample the material with the use of a trier. This sampling device is often not used however, due to the substantial increase in time necessary to obtain the samples and because of the time required to decontaminate the trier. Tongue depressors must be disposed after each use. Nonexpendable sampling tools must be decontaminated between drums.

7.9.3.2 Sampling Solids Underneath Liquids

Sludges or solids underneath a liquid may be sampled by forcing the pipette into it. If the sludge does not run out into the jar, shaking the pipette or tapping it against the side of the bottle may loosen the sample. If this fails, one may break the pipette and put the pieces which have the solid in them in the bottle.

When pipettes are used for sampling, samplers should wear Wizzard glove liners (stainless steel mesh glove liners designed to prevent cuts which could be caused by sharp objects such as broken glass tubing).

7.9.4 Post Sampling Procedures

After the sample has been taken, the outside of the bottle will be wiped off and labeled with the drum number. The drum number will also be written on the lid of the bottle. All sampling data and observations will be recorded on the drum inspection log.

After a group of drums have been sampled, the samples will be collected. The sampling trash, sample gloves, paper towels, etc., will be collected and bagged for disposal. The sampling pipettes will be collected and packaged for disposal.

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7.9.4.1 Drum Inventory Log

The field data gathered during the drum sampling activities will be recorded on a Drum Inventory Log sheet (See Figure 7.9-1). The following is a list of the information needed for the form.

- Drum Number--Numbers only; at least 3 digits in length (001).
- Project Number--Assigned by OHM to each project.
- Page of --If the drum log is accompanied by Material Safety Data Sheets (MSDS) or other information, then the total number of pages is required. Mostly, will be page 1 of 1.
- Project Location--Name assigned by OHM (generally the client company's name and/or street address of the facility/site).
- Project Contact--The OHM employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist, or site supervisor).
- Phone--Site phone or number of the supporting OHM office.
- Logger--Name of individual responsible for filling in the sampling portion of the Drum Inventory Log.
- Sampler--Name of individual(s) responsible for obtaining the sample.
- Weather--Weather conditions during sampling (e.g., temperature and/or precipitation).
- Date--Date when sample is collected.
- Time--Time when sample is collected.
- Drum Type--Place an "x" in the box or boxes which best describe the drum type and materials of construction.

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- Lid Type--An "x" should appear in the box that describes the type of closure on the container.

- Drum Condition--Place an "x" in the box indicating the integrity of the drum. "Meets DOT specifications" means the drum can be shipped according to Department of Transportation (DOT) regulations.

- Drum Size--Place an "x" in the box indicating the volume of drum when full. If the drum is overpacked, the inner drum volume should be indicated, not the size of the overpack.

- Drum Contents--Place an "x" in the box indicating the volume of waste contained in the drum.

- Overpacked--An "x" should appear in the "yes" box if the container was overpacked, along with an "x" in the box which states the type of overpack utilized.

- Layers--This designates the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."

- Physical State--Place an "x" in the box indicating the actual physical state of each layer.

- Color--The standard color description for each layer of the sample should be written in. **The only acceptable color descriptions are as follows.**

blue	(blu)	white	(wht)	black	(blk)
red	(red)	cream	(crm)	orange	(org)
pink	(pnk)	yellow	(ylw)	gray	(gry)
colorless	(cls)	amber	(amb)	purple	(prp)
green	(grn)	brown	(brn)	green-blue	(gbl)
tan	(tan)				

- Clarity--An "x" should appear in the box indicating the clarity of each layer of the sample.

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- Layer Thickness--Record the thickness of each layer in inches, an estimate of how deep the layer is.

- pH--Record pH measurement in standard units (SU); 0 to 14.
- PID--Record the results for vapor analysis by photoionization detector (PID). The PID scale reads in ppm (0 to 2,000).

- Dosimeter--The results of the field radiation survey is recorded in this space. The dosimeter's scale units are in millirems per hour (mr/hr or mrem/hr).

- Other--This space is for additional analysis which may take place. The information should include the equipment used, the parameter being measured, and its concentration. Example: Drager tube - HCN - 5 ppm

- DOT Haz--Hazard category from placards or stencils on drum. Example: Corrosive Liquid

- UN/NA--Space for any UN or NA numbers which are stenciled or written on the drum. These numbers are always prefixed by either UN or NA.

- MFG Name--Name, address, and telephone number of the company producing or distributing the chemical/product. If the space provided is inadequate, indicate that the information continues on the back of the log, and do so.

- Chemical Name--Any chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the drum. Indicate whether the information was printed on a label or stenciled or handwritten on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log, and do so.

- Additional Information--This space is for additional information or comments for which no specific space is designated. It can include unusual comments or problems such as the contents are too hard to sample, drum color, or that colored crystals have formed on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log.

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Figure 7.9-1 Drum Inventory Log Sheet

OHM Corporation

DRUM INVENTORY LOG

DRUM NO. _____
PROJECT NUMBER _____
PAGE _____ OF _____

PROJECT LOCATION _____ LOGGER _____ DATE _____
PROJECT CONTACT _____ SAMPLER _____ TIME _____
PHONE _____ WEATHER _____

Drum Type: FIBER ☐ STEEL ☐ POLY ☐ STAINLESS STEEL ☐ NICKEL ☐
POLY-LINED ☐ RINGTOP ☐ CLOSED TOP ☐ OVERPACKED ☐

DRUM CONDITION: MEET DOT SPEC. ☐ GOOD ☐ FAIR ☐ POOR ☐

Drum Size: 85 ☐ 55 ☐ 42 ☐ 30 ☐ 16 ☐ 10 ☐ 5 ☐ OTHER ☐

DRUM CONTENTS: AMOUNT FULL ☐ 3/4 ☐ 1/2 ☐ 1/4 ☐ <1/4 ☐ MT ☐

	PHYS. STATE				COLOR	CLARITY			LAYER THICKNESS
LAYERS	LIQUID	SOILD	GEL	SLUDGE	USE STD COLORS	CLEAR	CLOUDY	OPAQUE	INCHES
T									
M									
B									

FIELD ANALYSIS

pH _____ SU PID _____ ppm
DOSIMETER _____
OTHER _____

DRUM LABELS/MARKINGS

DOT HAZ _____ UN/NA _____

MFG NAME _____
CHEMICAL NAME _____
ADDITIONAL INFORMATION _____

LABORATORY COMPATABILITY DATA

☐ MARK IF PHYSICAL STATE AND COLOR MATCHES THE ABOVE INFORMATION. IF NOT, STOP ANALYSIS AND NOTIFY PROJECT CONTACT. FURTHER WORK WILL NOT BE PAID FOR.

COMPATABILITY CAT: _____
ANALYSTS: _____
DATE PERFORMED: _____

RADIATION: POS ☐ NEG ☐ _____ MREM/HR

	PHYS. STATE				COLOR	CLARITY			WATER SOL.	REACT	pH	HEX. SOL	PER	OXID	CN	SUL	BIEL-STEIN	FLASH POINT	PCBs (25ppm)	PCB TEST COMP
LAYERS	LIQUID	SOILD	GEL	SLUDGE	USE STD COLORS	CLEAR	CLOUDY	OPAQUE	SOLUBILITY SPSI DENSITY H OR L	A=AIR W=WATER	STD. UNIT	S OR I	+ OR −	+ OR −	+ OR −	+ OR −	+ OR −	<60°C + OR −	+ OR −	NUMBER
T																				
M																				
B																				

COMMENTS: _____

PCB CONC. _____ PPM FLASH POINT _____ °C COMPATABILITY COMP. BULK # _____
DATA REVIEWER: _____ DATA REVIEW DATE: _____
FIELD REVIEWER: _____ FIELD REVIEW DATE: _____

TRANSFER NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1				
2				
3				

F-212 10-10-90

7.9.5 Sample Preservation and Packing Procedures for Drummed Waste Samples

1. No preservatives shall be used.

2. Place sample in a zip lock plastic bag.

3. Place each bagged container in a 1-gallon covered can containing absorbent packing material. Place lid on can.

4. Mark the sample identification number on the outside of the can.

5. Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved. Depending on mode of transportation and type of material being transported, additional packaging requirements may apply.

7.9.6 Decontamination Procedures

All sampling equipment used in obtaining samples from containers will be either dedicated (disposable) or pre-cleaned or decontaminated by the following procedures:

- Thoroughly scrub with a brush using a detergent (Alconox) and hot water solution to remove large particles.
- Thoroughly rinse the detergent solution off the equipment with tap water.
- Rinse the equipment with deionized water.
- Solvent clean the equipment with pesticide grade isopropanol.
- Solvent clean the equipment with pesticide grade Hexane.
- Air dry the equipment before use.

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7.9.7 Sampling for Enforcement

When considering sampling for enforcement, priority will be given in the following order:

1. Those marked with known hazardous materials (trade name, chemical name, empirical formula) or hazardous labeling.

2. Those isolated by themselves or material contained in an exotic metal container (e.g., aluminum, nickel, monel alloy or stainless steel).

3. Unmarked drum piles or stacks. These should be sampled randomly among the various distinguishable drum lots.

7.9.8 Sampling for Site Characterization

When sampling for site characterization purposes, a concerted effort should be made to distinguish drum lots and to get a good drum count among the lots. Sampling should occur in the following order:

1. A drum that appears to be characteristic and in the center of all the major drum lots

2. Drums in as many of the smaller lots as practical.

Also, if practical, duplicate samples should be taken on major drum lots at either end of a lot to see if the wastes appear to be characteristic all the way through.

7.9.9 Sampling at Abandoned Waste Sites

On most abandoned waste sites, there is usually, though not always, some organization or pattern to the way the material was placed on the site. The pattern is occasionally as detailed as finding the flammable solvents in one area, acids in another, cyanide in another, recoverable metals in a fourth, and so on. Some disposal facilities stencil control numbers on drums to indicate specific lots. Often, if the site was poorly run, the only indication that a group of drums is related will be their color, size, or type.

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7.9.10 General Information

Typically, waste is shipped to sites in 55-gallon drums on trucks. About 60 to 80 drums are delivered from a given load, depending on the weight of the load. During the initial site inspection, one should look for distinguishing features in an attempt to define the different lots of drums on the site. Often the trade name, chemical name, or empirical formula will be written on the drum. Another distinguishing feature would be drums of exotic metal such as aluminum, nickel, Monel, stainless steel, etc. A manufacturing facility will use a specified DOT coded drum, a strange drum size, or a drum with an unusual configuration or adaptation for a particular process line (center of drum head fill bung, double-sided fill/vent bungs, etc.).

At almost every site that has been receiving waste, there is an isolated group of containers. Approach these with care and try to determine why they were segregated.

In any lot of drums there is sometimes encountered an unusual or out-of-place container. This oddball container will not fit the pattern, color, size, etc., of those around it (e.g., it may be the only distended drum among undistended drums or a lined drum among unlined drums).

On a site where many different types of containers are present, they should be sampled in the following order, based on what they can be expected to contain and in increasing order of hazard.

1. Paper, plastic, cloth, and burlap bags.

2. Glass carboys and jugs (except chemical reagent or laboratory-packed bottles).

3. Fiberboard drums.

4. Plastic and polyethylene carboys and containers.

5. Plastic-lined steel drums.

6. Steel drums.

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7. Exotic metal drums.

8. Odd containers (distended, isolated, etc.).

7.10 Resealing and Secondary Staging

All containers opened for sampling need to be resealed to prevent the escape of vapors and possible reactions from rainwater, air and so on. The resealing methods will depend on the opening methods used and include the following:

1. Replacing the bung, screw cap, etc.

2. Replacing the lid and retaining ring.

3. Placing the drum in an overpack (larger drum) when it cannot be resealed by any other method.

4. If a hole is drilled, use of a special rubber or plastic plug. A drum bonnet should be used to ensure that rainwater does not seep around the plug.

It is important to note that these resealing methods are for the purpose of preventing leakage from the container while it is in storage on the site. If the container is to be moved off the site, DOT regulations regarding transportation and sealing of drums will apply.

Once the drum is sampled and resealed, it should be left where it cannot react with other containers on the site. For a small number of drums, the storage areas may be the staging and opening area. In any event, the sampled drums should be placed in an area away from other groups of containers on the site. The reason is that slowly progressing chemical reactions can start when a container is opened and the contents exposed to air or the disturbance caused by handling the drum. Such a reaction could take hours or even days to occur. Another reason for the segregation and identification of drums for recovery is for use as evidence.

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7.11 Sample Control

The Technical Services Representative on site is responsible for the identification, preservation, packaging, handling, shipping, and storage of samples obtained from the site. All samples must be readily identifiable and retain the in-situ characteristics to be determined through testing. All samples collected from containers to be analyzed for compatibilities will be validated through the preparation of a drum log. At the conclusion of the daily sampling operations for containerized waste, it is the responsibility of the Technical Services Representative to review each sample with its respective drum log to assure the documentation is complete and accurate. His signature verifying the sample has been checked must appear in the "Field Reviewer" space prior to sending samples to the laboratory. In addition, these samples will be validated through the following steps:

- Sample Containers--Samples taken from containers to be the analyzed for compatibilities will be placed into a clean 8-ounce glass bottle and secured with a Teflon-lined lid.

- Sample Number--Each sample will be labeled and uniquely identified in accordance with the numbering system used for this job.

- Sample Label--Each sample label will be legibly completed and affixed to the sample container. The label will include the name of the sampler, date and time of collection, place of collection, unique sample ID number, analysis required, preservatives added, and type of sample (grab or composite).

- Field Log--All sample collection data and field observations for each sample will be recorded on a drum inventory log (see section 7.9.4.1).

- Chain-of-Custody Procedures--All samples taken on the site will be verified through chain-of-custody procedures. The procedures followed will be in accordance with USACE Sampling Handling Protocols and USEPA procedures.

- Sample Preservation--Samples taken from containers to be analyzed for compatibility will not be preserved.

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- o Sample Shipment--Samples taken from containers to be analyzed for compatibilities will be packaged in their original shipping container or the sample bottles and transported to the laboratory.

7.12 Waste Blending

A waste blending test is used to determine if the drums included in a wastestream are truly compatible. Whether the wastes are to be blended on site or to be sent in drums to a disposal facility, a waste blending test must be performed for waste profile purposes. Section 8.0 of the OHM Compatibility Manual outlines waste blending procedures used by OHM. Waste blending is most often performed by the on-site Chemist. However, situations arise when the Sample Technologist is asked to determine which compatibility groups can be blended. Refer to section 8.0, Waste Blending, in the Compatibility Manual prior to test blending any materials. A waste Blending Test chart is found in the Compatibility Manual.

When using the Waste Blending Test Chart, the first step is to locate the compatibility groups (which are to be test blended) on the chart. The next step is to move to the group which appears first on the chart and follow the row number down until the other compatibility group is reached. For example the supervisor of project (x) is planning to mix acid liquids with the water reactives on site. The supervisor wants to know if this will be a safe combination. The first step is to locate acids and water reactives on the chart. Once the two groups have been located, the next step is to determine which group is listed first on the chart. The acids groups is listed first. The next step is to follow column one down to the water reactive group. The chart lists the combination to be (I,V,E). The final step is to determine what the letter combination means (this can be found on the upper right portion of the chart). The I is for Incompatible, the V is for Violent Reaction, and the E is for Explosive Mixture. Therefore, it would **not** be a good idea to blend these compatibility categories.

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7.12.1 Disposal of Blended Waste

Samples of the blended waste to be sent off-site for laboratory analysis for disposal parameters will be shipped by the following procedures:

- The lids of the sample jars will be sealed with tape.
- The sample container will be placed inside two 4-mil plastic, protective bags.
- The sealed sample will be place in a metal paint can.
- The samples will be placed into a cooler and packed with blue ice to maintain their temperature at 4 degrees Celsius.
- Bubble pack or other insulating packing material will be placed into empty spaces in the cooler.
- The cooler will be sealed, addressed, identified, and placarded according to the nature of the hazards associated with the materials being shipped.

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8 EQUIPMENT

8.1 Spill control kit
8.2 Drum over-packs
8.3 Drum grappler
8.4 Drum opening equipment suitable for the respective drum types
8.5 LEL/O_2 meter
8.6 HNU portable organic vapor analyzer
8.7 Fire extinguisher, Class A, B and C, 12 lb. capacity
8.8 Ionizing radiation detectors (Rad meters) with thin window "pancake probe"
8.9 Personal protective equipment.This may include: Robar or Tingley boots, Tyvek and/or Saran protective suit with hood, acid jacket and pants, vinyl booties, vinyl sample gloves, nitrile outer gloves, hard hat with splash shield and SCBA or airline units.
8.10 Plexiglass shielding
8.11 Rolls of plastic sheeting (Visqueen)
8.12 Sampling equipment

8.12.1 Equipment and supplies needed for drum sampling (per 100 drums)

- 120 drum log sheets
- 120 8oz jars with Teflon lined lids
- 200 tongue depressers
- 120 11mm dip tubs
- 400 pair sample gloves
- 5 mean streaks
- 4 rolls of paper towels
- 2 trash bags
- 12 chain-of-custody forms
- 1 Liter of isopropyl alcohol (Pesticide Grade)
- 1 Liter of hexane (Pesticide Grade)

8.12.2 Equipment and supplies generally needed per drum job

- 1 12-column book
- 2 OHM record books
- 1 utility knife
- 1 brass bung wrench
- 1 brass screwdriver

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- 1 stainless steel trowel
- 2 pair wizard cut-proof glove liners
- 2 1/2-inch drive ratchets with 15/16-inch sockets
- 2 polyethylene squirt bottles
- 1 H_2S monitox with gas generator
- 1 HCN monitox with gas generator

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9 ATTACHMENTS

NONE

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STANDARD OPERATING PROCEDURE

Title: Using The Disposable EnCore™ Sampler **Document #:** QP-

Date Issued: March 13, 1998 **Rev:** 0 **Date:** March 13, 1998

1.0 PURPOSE

1.1 To provide general information and procedure for using the Disposable EnCore Sampler to obtain soils for volatile analysis.

1.2 These protocols are intended to meet the requirements issued in the EPA's Determination of Volatiles in Soil – Directive for Change released on December 22, 1997.

2.0 SCOPE

2.1 The Disposable EnCore Sampler is a volumetric sampling system designed to collect, store, and deliver soil samples which require no headspace. The cartridges come in two sizes for sample volumes of approximately 25 or 5 grams. The cartridge uses three o-rings to produce the headspace-free state. At no time shall the o-rings be removed or disturbed. The associated device is the EnCore™ T-Handle Sampling Tool which is used with the EnCore cartridges.

2.2 The cartridges are sealed in airtight packaging and should only be used once.

3.0 RELATED DOCUMENTS

3.1 IT Field Sampling Manual

3.2 United States Environmental Protection Agencies Directive For Change in Determination of Volatiles in Soil, December 22,1997.

4.0 GENERAL INFORMATION

4.1 Guidelines for assembling the Disposable EnCore Sampler.

4.1.1 Prior to taking the sample, the Sample Technician will test the plunger for free movement by pushing the plunger rod down until it rests against the tabs.

4.1.2 The locking lever on the EnCore T-Handle must be depressed as the cartridge is inserted. Line up the slots on the cartridge with the locking pins in the T-Handle. Plunger end first, insert cartridge into T-Handle with locking tabs aligned and twist cartridge clockwise locking the cartridge in place.

4.1.3 The device is now ready to use. If faulty components are detected during assembling process discard cartridge and assemble device with new cartridge.

4.2 Guidelines for taking a sample with the Disposable EnCore Sampler.

4.2.1 Holding the device with the T-Handle up and the cartridge down, insert the sampling device into the soil. The coring body must be full. This can be checked by making sure the plunger end is seen in the viewing hole. Withdraw sampling device from soil and wipe of excess dirt from cartridge body.

4.2.2 The cartridge core is capped while it is still on the T-Handle. Push or twist cap on until the groves are seated over the ridge of the coring body (see Figure9-1).

4.2.3 The EnCore Sampler is not designed to store solvent or free product. Soil conditions with heavy latent solvents may require different sampling techniques due to the potential interaction with the coring body.

4.3 Guidelines for preparing the sampler for shipment

4.3.1 Remove the capped sampler by pushing down locking lever on T-Handle and twisting and pulling sampler from T-Handle. The plunger is locked by rotating plunger rod until the wings rest against the tabs (see Figure9-1). Attach the label and seal the cartridge in the EnCore sampler bag.

4.4 Guidelines for decontaminating the sampler

4.4.1 The EnCore is a disposable sampling device. The cartridge or coring body itself will not need any decontamination. The T-Handle, if excessive soil contact occurs will be decontaminated.

Decontaminate in accordance to IT SOP QP-602 and the project CSAP

5.0 DEFINITIONS

5.1 Representativeness - The sample should possess the same qualities or properties (which are relevant to the investigation) as the whole of the material under investigation.

5.2 Grab Sample- A single sample representative of a specific location at a given point in time.

6.0 RESPONSIBILITIES

6.1 Sample Technician is responsible for all sample collection, documentation, and decontamination.

7.0 PROCEDURE

7.1 Procedure for using the Disposable EnCore Sampler.

7.1.1 Locate the desired sample point.

7.1.2 Assemble the EnCore Sampler by inserting and locking the cartridge into the T-Handle.

7.1.3 Insert the device into the sample point location.

7.1.4 Look into the viewing hole to make sure the plunger o-ring is visible indicating the sample is full.

7.1.5 Cap the cartridge insuring that the cap is properly locked over the plunger.

7.1.6 Remove cartridge from T-Handle by depressing locking lever and twisting cartridge off.

7.1.7 Lock the plunger rod into place by twisting rod until wings rest on tabs.

7.1.8 Label and seal cartridge into the EnCore Sample bag. Complete all chain-of-custody documents and record sample data in the field logbook in accordance with IT SOPs and the project SAP.

7.1.9 Samples should be prepared for shipment as described in IT SOPs or the specific project SAP.

8.0 EQUIPMENT

* EnCore Sampler cartridge
* EnCore T-Handle Sampling Tool
* Disposable sample gloves

Disposable En Core™ Sampler

En Novative Technologies, Inc.
1241 Bellevue Street
Green Bay, WI 54302
Telephone: 920-465-3960 • Toll Free: 1-888-411-0757
Fax: 920-465-3963

SAMPLING PROCEDURES

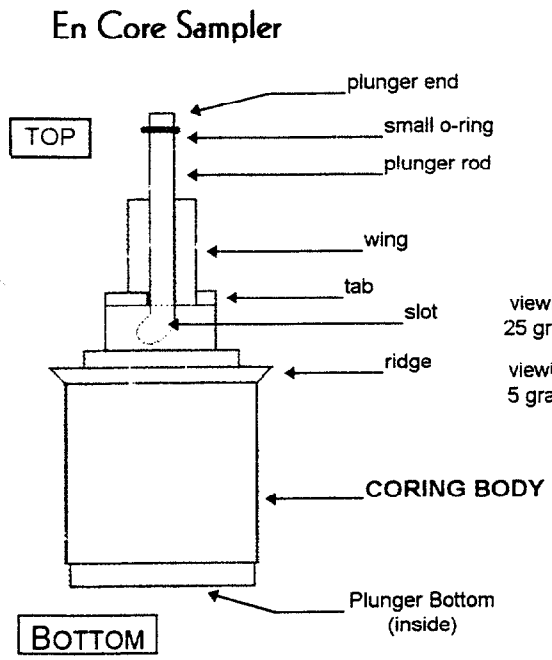
USING THE En Core™ T-HANDLE

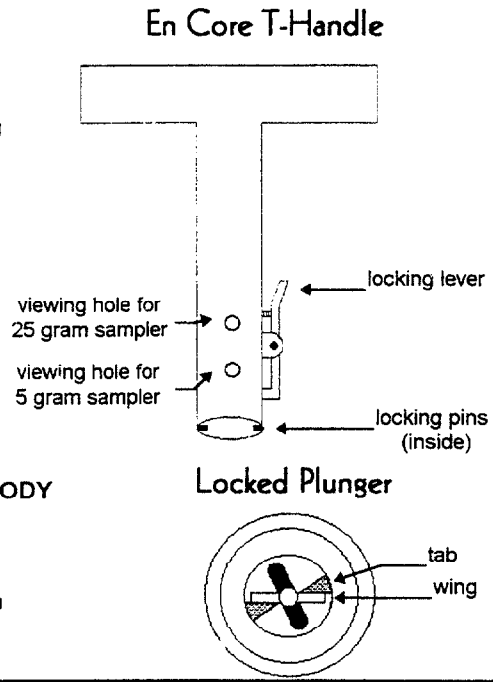
NOTE:

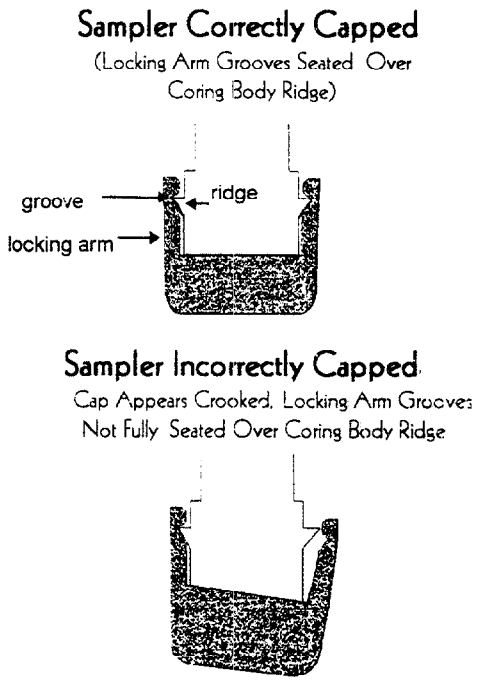
1. En Core Sampler is a SINGLE USE device. It cannot be cleaned and/or reused.

2. En Core Sampler is designed to store soil. Do not use En Core Sampler to store solvent or free product!

3. En Core Sampler must be used with En Core™ T-Handle and/or En Core™ Extrusion Tool exclusively. (These items are sold separately.)







BEFORE TAKING SAMPLE:

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

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

TAKING SAMPLE:

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

4. Cap coring body while it is still on T-handle. *Push and twist* **cap** over bottom until **grooves** on **locking arms** seat over **ridge** on coring body. CAP MUST BE SEATED TO SEAL SAMPLER (see diagram).

PREPARING SAMPLER FOR SHIPMENT:

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

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

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

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

Figure 9-1 Disposable EnCore™ Sampler.

ATTACHMENT 2
STANDARD OPERATING PROCEDURE

Composite Shallow Soil Sampling

I. Purpose

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

II. Scope

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

III. Equipment and Materials

- Sample jars.
- A hand auger or other device that can be used to remove the soil from the ground. Only stainless steel, teflon, or glass materials should be used.
- A stainless steel spatula should be used to remove material from the sampling device.
- Stainless steel bowls
- Supply of clean latex gloves
- Unpainted wooden stakes or pin flags
- Vermiculite
- Fiberglass measuring tape (at least 200 feet in length)

IV. Procedures and Guidelines

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

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

1. For samples on a grid:

   a. Use measuring tape to locate the center of each sampling area on the first grid line as prescribed in the sampling plan. As each point is located, drive a numbered stake in the ground and record its location on the site map and in the logbook.

   b. Proceed to sample the areas on the grid line. Areas will be sampled by compositing soil from 5 locations within the composite area, as described below.

   c. Measure to location where next grid line is to start and stake first sample. For subsequent samples on the line take two orthogonal measurements: one to the previous grid line, and one to the previous sample on the same grid line.

   d. Proceed to sample the points on the grid line as described in IVC below.

   e. Repeat 1c and 1d above until all samples are collected from the area.

2. For non-grid samples:

   a. Use steel measuring tape to position sampling point at location described in the sampling plan by taking two measurements from fixed landmarks (e.g., corner of house and fence post).

   b. Note measurements, landmarks, and sampling point on a sketch in the field notebook, and on a site location map.

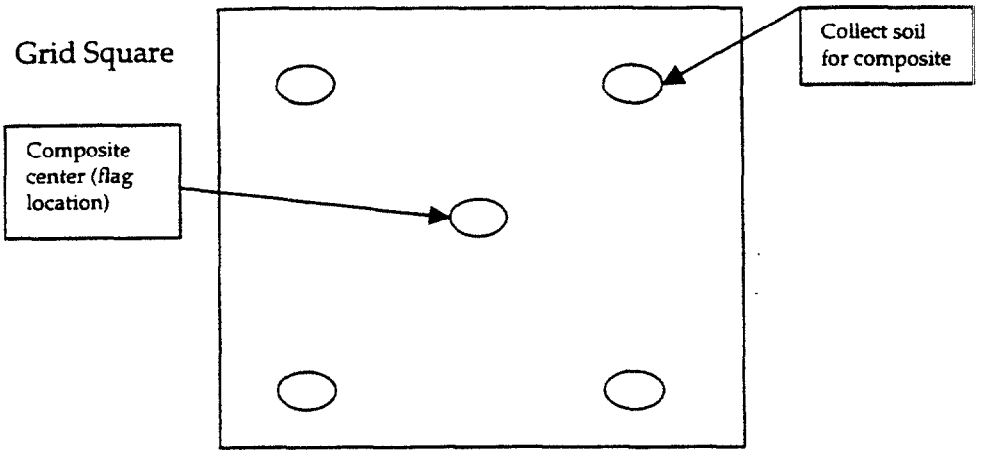
   c. Proceed to sample as described in IVC below.

   d. Repeat 2a through 2c above until all samples are collected from the area.

C. Do not locate samples in debris, tree roots, or standing water. If an obstacle prevents sampling at a measured grid point, move as close as possible, but up to a distance of one half the grid spacing in any direction to locate an appropriate sample.

D. To collect samples:

1. If necessary, use a decontaminated stainless steel scoop/trowel to scrape away surficial organic material (grass, leaves, etc.) adjacent to the stake. Collect soil from 5 locations within the composite sample area as shown:



Grid squares are as marked on Figure 2 of the Confirmatory Sampling Plan. For wall samples, composites will be collected from a wall section 25 feet in length. Surface samples (outside the excavation areas) will be composited from a square measuring 25 feet on each site.

2. Obtain soil sample by scooping soil from each of the 5 locations using the augering scoop/trowel, starting from the surface and digging down to a depth of about 6 inches.

3. Take an OVM reading of the sampled soil and record the response in the field notebook. Also record lithologic description and any pertinent observations (such as discoloration) in the logbook.

4. Empty the contents of the scoop/trowel into a decontaminated stainless steel pan.

5. Repeat this procedure at each of the 5 locations until sufficient soil is collected to meet volume requirements.

6. Mix soil thoroughly in the stainless steel pan using the sample trowel.

7. Transfer sample for analysis into appropriate containers with a decontaminated utensil.

8. Mark the sample number on the stake and leave stake in place.

V. Attachments

None.

VI. Key Checks and Items

- Phthalate-free latex or surgical gloves and other personal protective equipment.
- Decontaminate utensils before reuse (see SOP Decon, Master Project Plans for Environmental Investigations at NAS Patuxent River)

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document #	Title:
QP-609	Surface Soil Sampling

APPROVAL

Name	Title	Signature	Date
Willis Moody	Super. QA/QC		12/17/93
G. J. Herzig	Mngr. Field Tech.		12/17/93
Terry Sole	Dir. Tech. Svcs.		12/17/93

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
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OHM Corporation

Title: Surface Soil Sampling	Document #: QP-609	
Date Issued: 17 January, 1994	Rev: 0	Date: 17 December 1993

1.0 PURPOSE

1.1 To describe procedures for the collection of representative surface soil samples.

1.2 To describe procedures which minimize the exposure of sample technicians to contaminants.

2.0 SCOPE

2.1 This procedure provides information on proper equipment and techniques for surface soil sampling.

2.2 Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques and by listing supplies and equipment needs.

3.0 RELATED DOCUMENTS

For a more in-depth discussion of soil sampling methods, refer to *Preparation of Soil Sampling Protocol: Techniques and Strategies*, (EPA 600/4-83-020) by Dr. Benjamin J. Mason, prepared under contract to the USEPA, Environmental Monitoring Systems Laboratory-Las Vegas, NV, August 1983. This report discusses in detail the factors that influence the selection of a particular sampling scheme or the use of a particular sampling method with a strong emphasis on statistical design and data analysis. Another source, *Soil Sampling Quality Assurance User's Guide*, (EPA 600/4-84-043) by Dr. Delbert S.Barth and Dr. Benjamin J. Mason, prepared by the Environmental Research Center, University of Nevada, Las Vegas under a cooperative agreement with the USEPA (May 1984), will also be helpful.

4.0 GENERAL INFORMATION

4.1 Soils are often non-homogeneous and distribution of contaminants in a soil is often non-uniform. To offset these during sampling the following are accomplished.

4.1.1 Collect samples with high volume-to-surface area ratios.

4.1.2 Use a systematic (grid pattern) approach to sample collection.

4.1.3 Maintain a detailed record during sampling operations, particularly noting location, depth, and characteristics such as grain size, color and odor, and/or readings obtained on field monitoring equipment.

4.2 Soil sampling equipment needs to meet the following general requirements.

4.2.1 Materials of construction shall be stainless steel, plastic or teflon coated steel. Chrome plated or nickel plated steel should not be used. Brass sampling tools can be used for certain sampling operations as long as the brass (copper + zinc alloy) is non-contaminating and non-reactive to the sample medium.

4.2.2 Materials of construction shall be compatible with and non-reactive to compounds of interest.

4.2.3 Materials of construction will not leave residues in samples that will interfere with analyses of samples.

4.3 Soil bioactivity and problems with volatilization of organic compounds from the soil require that the following be accomplished for soil samples immediately after collection.

4.3.1 Tightly seal containers.
4.3.2 Refrigerate samples to ~4° C.
4.3.3 Remove samples from exposure to sunlight.

5.0 DEFINITIONS

5.1 Soil Sample - A sample of the soil taken to determine what type and quantity of contamination has been released into the soil.

5.2 Environmental Sample - low concentration sample typically collected off-site and not requiring DOT hazardous waste labeling as a high hazard sample.

6.0 RESPONSIBILITIES

6.1 Field Operations Leader

The Field Operations Leader is responsible for the overall safety of the sampling operation. This includes informing and obtaining help from local authorities if necessary, selection of sample points, and halt of operations if necessary.

6.2 Sampling Technician

6.2.1 The Sampling Technicians are responsible for the following.

6.2.2 Reading and implementing project sampling plans.

6.2.3 Accumulating and dispatching appropriate supplies and equipment to accomplish the sampling objectives.

6.2.4 Locating and marking sampling points.

6.2.5 Decontaminating field sampling gear in a correct and appropriate manner consistent with site requirements.

6.2.6 Collecting, preserving, and packaging soil samples.

6.2.7 Maintaining sampling records, sampling logs, data sheets, and maps.

6.2.8 Filling out Chain-of-Custody forms.

6.2.9 Maintaining physical custody of samples until they are transferred off-site or to an on-site laboratory.

7.0 PROCEDURE

7.1 Surface Soil Sampling QA/QC

7.1.1 Quality control samples will be taken at the discretion of the client and OHM management. Often, provisions for quality control sampling will be included in the project CSAP.

7.1.2 Types of Quality Control samples that may be taken during a surface soil sampling effort could include Matrix Spike/Matrix Spike Duplicates, Field Spikes, Duplicates, and/or Split Samples.

7.2 Preliminary Assessment/Site Inspection

7.2.1 The preliminary assessment of existing data should be consulted in planning a surface soil sampling operation. Of special importance are items that can be used to characterize the types of hazardous materials present at the site (e.g., generator records, manifests, inventories, personal interview, and monitoring data).

7.2.2 In general, the preliminary assessment and site inspection should have been completed prior to sampling. Field characterization should help to establish ambient conditions and identify potential hot spots. This information is to be plotted on the site sketch. Observations from maps and aerial photographs can also be used in compiling the site sketch.

7.3 Site Preparation

Proper site preparation involves setting up the decon area, equipment storage area, sample storage area (if necessary), and preparation of sampling equipment (i.e., assembly of equipment, decontamination of equipment).

7.4 Location of Sampling Points

Prior to preparations for sampling and actual sample collection, sampling points are to be measured, located, and marked with surveyors stakes or flags. Measurements from a minimum of three location are obtained for ease in relocating these exact sample locations at a further time. A site map will be generated detailing measurements from sample locations to fixed reference points. This will increase the efficiency of the sample collection process. In addition, it will aid others in relocation of sampling points at a later date.

7.5 Sampling Procedures

The steps to be followed in surface soil sampling are as follows:

- Determine the number and location of desired samples along with the location of duplicate samples.

- Don correct sample gloves and excavate a hole, 3 to 4 inches deep, with the decontaminated shovel or stainless steel spoon/spatula at the first sample location.

- Don clean sample gloves, and scrape the side of the hole with a tongue depressor or stainless steel spoon/spatula to expose a fresh surface. This eliminates the possibility of cross contamination from material below.

- Discard the first tongue depressor or stainless steel spoon/spatula, and use a new one to dig material from the top 2 inches of soil and transfer it into the sample jar. If the soil is too hard for this, chip the sample out with a clean chisel hammer or similar tool. After a small pile of loosened soil has accumulated, use a tongue depressor, spoon/spatula or trowel and put the material into the open sample jar.

- After obtaining an adequate sample volume, seal the jar and label the sample container. Apply a custody seal if one is required. Then record the pertinent information in the field logbook.

- Place used expendables in a trash bag. Decontaminate any non-disposable tools as described below.

- Repeat steps 2 through 6 until all samples have been taken.

7.6 Sampling Equipment Decontamination

7.6.1 When dedicated equipment is not used for sampling, the sampling plan should include procedures for disassembly and cleaning of equipment befog each use.

7.6.2 Inorganic Constituents

If the constituents of interest are inorganic, the following steps will be followed:

- Wash with Alconox and tapwater
- Rinse with tapwater
- Rinse with dilute (0.1N) hydrochloric acid or nitric acid.
- Rinse with tapwater
- Rinse with distilled water or deionized water

NOTE: Dilute hydrochloric acid is generally preferred to nitric acid when cleaning stainless steel because nitric acid may oxidize stainless steel.

7.6.3 Organic Constituents

If the constituents of interest are organic, the following steps will be followed:

- Wash equipment with Alconox and tapwater
- Rinse with tapwater
- Rinse with distilled water
- Rinse with pesticide free grade isopropanol

8.0 EQUIPMENT

The materials required to perform soil sampling may include the following.

- Chisel head hammer, 24 oz. (Forestry Suppliers P/N 33349)
- Scoop, plastic (VWR P/N 56920-025 or 56920-036)
- Trowel, pointing, steel (Forestry Suppliers P/N 53717)
- Spoon/spatula, stainless steel (VWR P/N 57952-107)
- Tongue depressors, wood (VWR P/N 62505-006)
- Clean shovel, steel (Local Purchase)
- Sample Containers, Precleaned Glass or Plastic of appropriate size.
- Sample labels (OHM Supplied)
- Custody seals (If required for project)
- Sample gloves, latex or nitrile (PVC may not be acceptable)
- Trash bags, 30 gallon, heavy duty (Local Purchase)
- Nitric Acid, trace metal grade (VWR P/N JT9598-0)**
- Hydrochloric Acid, trace metal grade (VWR P/N JT9530-0)**
- DI Water (Local Purchase)
- Isopropyl Alcohol (2-Propanol)(VWR P/N JT9334-3)
- Alconox Detergent (VWR P/N 21835-032)

- Scrub brushes and source of tap water (Local Purchase)
- Wash buckets or tubs/pans, ~5-gal. size (Local Purchase)
- Field logbooks (Sample Logbook and Field Sampler's Notebook)
- 200 ft. tape, Lufkin 1708D (Forestry Suppliers P/N 39961)
- Surveyor stakes (Forestry Suppliers P/N 39514)
- Marking pens, such as Sharpies and Mean Streaks
- Chain-of-custody Forms
- Compass, Silva (Type 3, 7, 20) (Forestry Suppliers or Local Purchase)
- Other OHM or site specific forms as required per FSQAP
- Calculator, pocket size (Local or Individual Purchase)
- Mechanical pencil and graph paper (Local or Individual Purchase)
- Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

None

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-609	Title Surface Soil Sampling

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
B									
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form # qp012-2 rev a

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Surface Soil Sampling **Document #:** QP-609

Date Issued: **Rev:** 02 **Date:** 12 OCT 93

1.0 PURPOSE

1.1 To describe procedures for the collection of representative surface soil samples.

1.2 To describe procedures which minimize the exposure of sample technicians to contaminants.

2.0 SCOPE

2.1 This procedure provides information on proper equipment and techniques for surface soil sampling.

2.2 Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques and by listing supplies and equipment needs.

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3.0 RELATED DOCUMENTS

For a more in-depth discussion of soil sampling methods, refer to Preparation of Soil Sampling Protocol: Techniques and Strategies, (EPA 600/4-83-020) by Dr. Benjamin J. Mason, prepared under contract to the USEPA, Environmental Monitoring Systems Laboratory--Las Vegas, August 1983. This report discusses in detail the factors that influence the selection of a particular sampling scheme or the use of a particular sampling method with a strong emphasis on statistical design and data analysis. Another source, Soil Sampling Quality Assurance User's Guide, (EPA 600/4-84-043) by Dr. Delbert S. Barth and Dr. Benjamin J. Mason, prepared by the Environmental Research Center, University of Nevada, Las Vegas under a cooperative agreement with the USEPA (May 1984), will also be helpful.

4.0 GENERAL INFORMATION

Soils are often non-homogeneous and distribution of contaminants in a soil is often non-uniform. To offset these during sampling work the following are accomplished.

1.0 Collect samples with high volume-to-surface area ratios.

2.0 Use a systematic (grid pattern) approach to sample collection.

3.0 Maintain a detailed record during sampling operations, particularly noting location, depth, and characteristics such as grain size, color and odor, and/or readings obtained on field monitoring equipment.

Soil sampling equipment needs to meet the following general requirements.

1.0 Materials of construction shall be stainless steel, plastic or teflon coated steel. **DO NOT USE** chrome or nickel plated steel. Brass sampling tools can be used for certain sampling operations if no compatibility problems exist.

2.0 Materials of construction shall be compatible with and non-reactive to compounds of interest.

3.0 Materials of construction will not leave residues in samples that will interfere with analyses of samples.

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Soil bioactivity and problems with volatilization of organic compounds from the soil require that the following be accomplished for soil samples immediately after collection.

1.0 Tightly seal containers.

2.0 Refrigerate samples to ~4° C.

3.0 Remove samples from exposure to sunlight.

5.0 DEFINITIONS

5.1 Soil Sample- A smaple of the soil taken to determine what type and quantity contamination has been released in to the soil.

5.2 Environmental Sample - low concentration sample typically collected off site and not requiring DOT hazardous waste labelling as a high hazard sample.

6.0 RESPONSIBILITY

6.1 Field Operations Leader

The Field Operations Leader is responsible for the overall safety of the sampling operations. This includes informing and obtaining help from local authorities if necessary, selection of sample points, and halt of operations if necessary.

6.2 Sampling Technicians

The Sampling Technicians are responsible for the following.

1.0 Reading and implementing project sampling plans.

2.0 Accumulating and dispatching appropriate supplies and equipment to accomplish the sampling objectives.

3.0 Locating and marking sampling points.

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4.0 De-conning of field sampling gear in a correct and appropriate manner consistent with site requirements.

5.0 Collecting, preserving and packaging soil samples.

6.0 Maintaining sampling records, sampling logs, data sheets and maps.

7.0 Filling-out Chain-of-Custody forms.

8.0 Maintaining physical custody of samples until they are transfered off-site or to an on-site laboratory.

7.0 PROCEDURE

7.1 Surface Soil Sampling QA/QC

Quality control samples will be taken at the discretion of the client and OHM management. Often, provisions for quality control sampling will be included in the project CSAP.

Types of Quality Control samples that may be taken during a surface soil sampling effort could include Matrix Spike/Matrix Spike Duplicates, Field Spikes, Duplicates, and/or Split Samples.

7.2 Preliminary Assessment / Site Inspection

The preliminary assessment of existing data should be consulted in planning a surface soil sampling operation. Of special importance are items that can be used to characterize the types of hazardous materials present at the site (e.g., generator records, manifests, inventories, personal interview, and monitoring data).

In general, the preliminary assessment and site inspection should have been completed prior to sampling. Field characterization should help to establish ambient conditions and identify potential hot spots. This information is to be plotted on the site sketch. Observations from maps and aerial photographs can also be used in compiling the site sketch.

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7.3 Site Preparation

Proper site preparation involves setting up the decon area, equipment storage area, sample storage area (if necessary), and preparation of sampling equipment (i.e., assembly of equipment, decontamination of equipment).

7.4 Location of Sampling Points

Prior to preparations for sampling and actual sample collection, sampling points are to be measured, located, and marked with surveyors stakes or flags. Measurements from a minimum of three location are obtained for ease in relocating these exact sample locations at a further time. A site map will be generated detailing measurements from sample locations to fixed reference points. This will increase the efficiency of the sample collection process. In addition, it will aid others in relocation of sampling points at a later date.

7.5 Sampling Procedures

The steps to be followed in surface soil sampling are as follows:

1. Determine the number and location of desired samples along with the location of duplicate samples.

2. Dig a hole, 3 to 4 inches deep, with the deconned shovel or stainless steel spoon/spatula at the first sample location.

3. Don clean sample gloves, and scrape the side of the hole with a tongue depressor or stainless steel spoon/spatula to expose a fresh surface. This eliminates the possibility of cross contamination from material below.

4. Discard the first tongue depressor or stainless steel spoon/spatula, and use a new one to dig material from the top 2 inches of soil and transfer it into the sample jar. If the soil is too hard for this, chip the sample out with a clean screwdriver or similar tool while holding the open sample jar directly below where you are chipping.

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5. After obtaining an adequate sample volume, seal the jar and label the sample. Then record the pertinent information in the field logbook.

6. Place used expendables in a trash bag. Decontaminate any tools used with soap, water, and appropriate solvent rinses.

7. Repeat steps 2 through 6 until all samples have been taken.

7.6 Sampling Equipment Decontamination

When dedicated equipment is not used for sampling, the sampling plan should include procedures for disassembly and cleaning of equipment befor each use.

7.8.1 Inorganic Constituents

If the contituents of intrest are inorganic, the following steps will be followed:

1) Wash with detergent
2) Rinse with tap water
3) Rince with dilute (o.1n) hydrochloric acid or nitric acid.
4) Rince with tap water
5) Rince with distilled water or deionized water

NOTE: Dilute hydrochloic acid is generally preferred to nitric acid when cleaning stainless steel because nitric acid may oxidize stainless steel.

7.8.2 Organic Constituents

If the contituents of intrest are organic, the following steps will be followed:

1) Wash equipment with detergent
2) Rince with tap water
3) Rince with distilled water
4) Rince with pesticide free grade isopropanol

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8.0 EQUIPMENT

The materials required to perform soil sampling may include the following.

- Soil sampling device:
  - Scoop or trowel
  - Soil auger
  - Clean stainless steel spoons/spatulas (VWR Scientific)
  - Tongue depressors (VWR Scientific)
- Clean shovel
- Stainless Steel Mixing Bowl (Cole-Parmer Catalogue No. L-07300-50, or Equivalent)
- Sample Containers, Precleaned Glass or Plastic of appropriate size.
- Sample labels
- Sample gloves, latex or PVC
- Trash bags
- Decontamination Supplies
  - DI Water
  - Isopropyl Alcohol
  - Alconox Detergent
  - Scrub brushes and source of tap water
  - Wash buckets or tubs/pans
- Field logbooks
- 100 ft tape measure
- Surveyors stakes and/or flags
- Marking pens, such as Sharpies and/or Mean Streaks
- Chain of Custody Forms
- Other OHM forms as required per SOP's or CSAP
- Calculator, pencil and paper

Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

NONE

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QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-610	Title **Sample Preservation and Holding Times**

APPROVAL

Name	Title	Signature	Date
Willis Moody	Super. QA/QC	Willis R. Moody	7/6/94
G. J. Herzig	Mngr. Field Tech.	G J Herzig	7/6/94
Terry Sole	Dir. Tech. Svcs.	Terry Sole	7/6/94

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Sample Preservation and Holding Times **Document #: QP-610**

Date Issued: July 6, 1994 **Rev:** 03 **Date:** July 6, 1994

1.0 PURPOSE

To describe the procedure for preserving samples including data on sample containers, sample volume, preservatives and holding times.

2.0 SCOPE

In preparation for a sampling event, information on the types of sample containers needed, the amount of sample volume needed, the preservatives required and the holding times for each medium under investigation needs to be known. Table 4-1 of this Standard Operating Procedure describes the sample volumes, sample containers, preservation necessary, and holding times for various organic and inorganic parameters.

3.0 RELATED DOCUMENTS

3.1 "Characterization of Hazardous Waste Sites, a Methods Manual, Volume two; Available Sampling Methods (2nd Edition)", EPA-600/4-84-076

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4.0 GENERAL INFORMATION

4.1 SAMPLE CONTAINERS

Polyethylene, polypropylene, Teflon, and glass with Teflon-lined lids are acceptable sample containers. OHM's sample containers are precleaned to EPA Protocol A. When using precleaned containers, the certificate of analysis and/or any other documentation should be placed with the project files for reference if questions should arise at a later time. Note: When sampling for parameters with the prefix "Bio" contact the designated laboratory to determine if the sample containers need to be sterile. If sterile containers are necessary, then special arrangements will have to be made (i.e. the laboratory will need to provide sample containers).

4.2 SAMPLE VOLUMES

Table 4-1 describes the minimum volume necessary for analysis of specified parameters. This should not be confused with the recommended sample container. This information is pertinent because one should always plan on taking four times the minimum required volume. Although the required sample container often meets or exceeds that volume (4 x minimum volume) it is sometimes necessary to obtain additional sample to meet that volume. For example; a sample obtained for Volatile Organics would need to be 160ml but the required sample container is a 40ml VOA vial. Therefore, it would be necessary to obtain four 40ml VOA vials of the sample.

4.3 PRESERVATION

Preservation requirements for water and wastewater samples are also provided in Table 4-1. More detail concerning these requirements may be found in the specific analytical procedures. Preservation of product, oils, and solids is usually cooling to 4°C (if required). Liquid samples of product (unknown materials) and oils should never have preservative liquids added to them. This could result in violent reactions of incompatible chemicals.

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4.4 HOLDING TIMES

The maximum holding times, for specified parameters, are detailed in Table 4-1. If the holding times are exceeded, the validity of the sample is diminished. Contact the designated laboratory to ensure that the samples can be analyzed within the holding time. Laboratories are often overloaded with samples and will not be able to meet some analytical requirements (i.e. 24-Hour holding times, 48-Hour holding times, etc.). **Always contact the laboratory prior to shipment of samples.**

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TABLE 4-1

Note:

HDPE = High-Density Polyethylene Bottles
B.R. = Boston Round
CWM = Clear Wide Mouth
A.J. = Amber Jug

* = Solid Waste Method (SW-846)
** = Water/Wastewater Method (EPA-600)

PARAMETERS	MINIMUM SAMPLE VOLUME	HOLDING TIME	CONTAINER	CLEANED TO EPA PROT.	PRESERVATIVE
ACIDITY	** 100ml	14 Days	**250ml HDPE	C	Cool to 4°C
ACROLEIN & ACRYLONITRILE	* 5 grams ** 40ml	14 Days	* 4oz. CWM ** 40ml VOA	* B ** B	.008%, $NA_2S_2O_3$, pH 4.5
ALKALINITY	** 100ml	14 Days	**250ml HDPE	C	Cool to 4°C
AMMONIA	** 500ml	28 Days	**1L HDPE	C	Cool to 4°C, $H_2SO_4 < 2$
BENZIDINES	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM ** 2-1/2L A.J.	* A ** A	.008, $NA_2S_2O_3$, Cool to 4°C
BETA	* 100 grams ** 1L	6 Months	*8oz HDPE **2L HDPE	* A ** C	$HNO_3 < 2$
BIOCHEMICAL OXYGEN DEMAND (CARBONACEOUS)	** 1L	48 Hours	**2L HDPE	C	Cool to 4°C
BIOCHEMICAL OXYGEN DEMAND	** 1L	48 Hours	**2L HDPE	C	Cool to 4°C
BROMIDE	** 100ml	28 Days	**250ml HDPE	C	None Required
CHEMICAL OXYGEN DE-MAND	** 50ml	28 Days	**125ml HDPE	C	Cool to 4°C, $H_2SO_4 < 2$
CHLORIDE	* 10grams ** 50ml	28 Days	*4oz. CWM **125ml HDPE	* A ** C	None Required
CHLORINATED HERBICIDES	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	Cool to 4°C

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PARAMETERS	MINIMUM SAMPLE VOLUME	HOLDING TIME	CONTAINER	CLEANED TO EPA PROT.	PRESERVATIVE
CHLORINATED HYDROCARBONS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	Cool to 4°C
CHLORINE (TOTAL RESIDUAL)	** 200ml	Analyze Immediately	**500ml HDPE	C	None Required
CHROMIUM VI	* 10 grams ** 100ml	24 Hours	*8oz. CWM **250ml HDPE	* A ** C	Filter immediately Cool to 4°C
COLIFORM, FECAL & TOTAL	* n/a ** 100ml	6 Hours	*4oz. CWM **250ml HDPE	* A ** C	.008%,$NA_2S_2O_3$, Cool to 4°C
COLOR	** 50ml	48 Hours	**125ml HDPE	C	Cool to 4°C
CYANIDE (TOTAL & AMENABLE)	* 10 grams ** 500ml	14 Days	*4oz. CWM **1L HDPE	* A ** C	NaOH to pH 12, .6g Asbc. Acid
DIOXINS & FURANS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	.008%,$NA_2S_2O_3$
DISSOLVED METALS	** 200ml	6 Months	**500ml HDPE	C	Filter Immediately $HNO_3 < 2$
FECAL STREPTOCOCCI	** 100ml	6 Hours	**250ml HDPE	C	.008%,$NA_2S_2O_3$, Cool to 4°C
FLUORIDE	** 300ml	28 Days	**500ml HDPE	C	None Required
HALOETHERS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz CWM **2-1/2L A.J.	* A ** A	.008%,$NA_2S_2O_3$, Cool to 4°C
HARDNESS	** 100ml	6 Months	**250ml HDPE	C	$HNO_3 < 2$, $H_2SO_4 < 2$
HAZARDOUS WASTE CHARACTERIZATION	* 200 grams	14 Days	*8oz CWM	A	None Required
HYDROGEN ION (pH)	* 100 grams ** 25ml	Analyze Immediately	*4oz. CWM **60ml HDPE	* A ** C	None Required
KJELDAHL AND ORGANIC NITROGEN	** 500ml	28 Days	**1L HDPE	C	Cool to 4°C, $H_2SO_4 < 2$
MERCURY	* 10 grams ** 100ml	28 Days	*8oz. CWM **250ml HDPE	* A ** C	$HNO_3 < 2$
METALS (EXCEPT CHROMIUM VI & MERCURY)	* 10 grams ** 200ml	6 Months	*8oz. CWM **500ml HDPE	* A ** C	$HNO_3 < 2$
NITRATE	* 10 grams ** 100ml	48 Hours	*8oz. CWM **250ml HDPE	* A ** C	Cool to 4°C
NITRATE-NITRITE	* 10 grams ** 100ml	28 Days	*8oz. CWM **250ml HDPE	* A ** C	Cool to 4°C, $H_2SO_4 < 2$

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PARAMETERS	MINIMUM SAMPLE VOLUME	HOLDING TIME	CONTAINER	CLEANED TO EPA PROT.	PRESERVATIVE
NITRITE	* 10 grams ** 50ml	48 Hours	**125ml HDPE	C	Cool to 4°C
NITROAROMATICS & ISOPHORONE	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz CWM **2-1/2L A.J.	* A ** A	.008%,$NA_2S_2O_3$, Dark
NITROSAMINES	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM ** 2-1/2L A.J.	* A ** A	.008%, $NA_2S_2O_3$, Dark
NONHALOGENATED VOLATILE ORGANICS	* 5 grams ** 40 ml	14 Days	*4oz. CWM **40ml VOA	* B ** B	Cool to 4°C
OIL & GREASE/TPHC	* 10 grams ** 1L	28 Days/14	*2L CWM **2L CWM	* A ** A	Cool to 4°C, HCl < 2
ORGANIC CARBON	* 10 grams ** 25ml	28 Days	* 4oz. CWM **125ml HDPE	* A ** C	Cool to 4°C, HCL/H_2SO_4 < 2
ORTHOPHOSPHATE	** 50ml	48 Hours	**125ml HDPE	C	Filter Immediately Cool to 4°C
OXYGEN, DISSOLVED PROBE	** 300ml	Analyze Immediately	**300ml BOD	**300ml BOD btl. (wh.)	None Required
PCB's	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	Cool to 4°C
PESTICIDES, CHLORINATED	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	Cool to 4°C, pH 5-9
PHENOLICS	* 10 grams ** 100ml	28 Days	*8oz. CWM **1L B.R.	* A ** A	Cool 4°C, H_2SO_4 < 2
PHENOLS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM ** 2-1/2L A.J.	* A ** A	.008%, $NA_2S_2O_3$, Cool to 4°C
PHOSPHORUS (TOTAL)	** 50ml	28 Days	**125ml HDPE	C	Cool to 4°C
PHOSPHORUS (ELEMENTAL)	** 50ml	48 Hours	**1L B.R.	A	Cool to 4°C
PHTHALATE ESTERS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM ** 2-1/2L A.J.	* A ** A	Cool to 4°C
POLYNUCLEAR AROMATIC HYDROCARBONS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*8oz. CWM **2-1/2L A.J.	* A ** A	.008%,$NA_2S_2O_3$, Dark
PURGEABLE AROMATIC HYDROCARBONS	* 5 grams ** 40ml	14 Days	* 4oz. CWM ** 40ml VOA	* B ** B	.008%, $NA_2S_2O_3$, HCL<2
PURGEABLE HALOCARBONS	* 5 grams ** 40ml	14 Days	* 4oz. CWM ** 40ml VOA	* B ** B	.008%, $NA_2S_2O_3$

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PARAMETERS	MINIMUM SAMPLE VOLUME	HOLDING TIME	CONTAINER	CLEANED TO EPA PROT.	PRESERVATIVE
RADIOLOGICAL TEST GROSS ALPHA	* 100 grams ** 1L	6 Months	*8oz HDPE **2L HDPE	* A ** C	$HNO_3 < 2$
RADIUM (TOTAL)	* 100 grams ** 1L	6 Months	*8oz. HDPE **2L HDPE	* A ** C	$HNO_3 < 2$
RESIDUE (VOLATILE)	** 100ml	7 Days	**250ml HDPE	C	Cool to 4°C
RESIDUE (NON-FILTERABLE)	** 100ml	7 Days	**250ml HDPE	C	Cool to 4°C
RESIDUE (FILTERABLE)	** 100ml	7 Days	**250ml HDPE	C	Cool to 4°C
RESIDUE (TOTAL)	** 100ml	7 Days	**250ml HDPE	C	Cool to 4°C
RESIDUE (SETTLEABLE)	** 1L	48 Hours	**Imhoff Cone	C	Cool to 4°C
SEMI-VOLATILE ORGANICS	* 10 grams ** 1L	7 Days to Ext. 40 Days aft ex	*16oz. CWM **2-1/2L Jug	* A ** A	Cool to 4°C
SILICA	** 50ml	28 Days	**125ml HDPE	C	Cool to 4°C
SPECIFIC CONDUCTANCE	* 100 grams ** 100ml	28 Days	*8oz. CWM **250ml HDPE	* A ** C	Cool to 4°C
SULFATE	* 10 grams ** 50ml	28 Days	*4oz. CWM **125ml HDPE	* A ** C	Cool to 4°C
SULFIDE	* 100 grams ** 500ml	7 Days	*8oz CWM **1L HDPE	* A ** C	ZnAc plus NaOH 9
SULFITE	** 50ml	Analyze Immediately	**125ml HDPE	C	None Required
SURFACTANTS	** 250ml	48 Hours	**500ml HDPE	C	Cool to 4°C
TCLP EXTRACTION	* 100 grams	7 Days to Ext. 40 Days aft ex	*2.5L CWM	A	None Required
TCLP SAMPLE	* 100 grams	7 Days to Ext. 40 Days aft ex	*16oz. CWM	A	None Required
TEMPERATURE	** 1L	Analyze Immediately	**2L HDPE	C	None Required
TOX TOTAL ORGANIC HALOGENS	* 10 grams ** 250ml	7 Days to Ext. 40 Days aft ex	*4oz. CWM **16oz. B.R.	* B ** A	$H_2SO_4 < 2$, Cool to 4°C
TPH by IR	** 2L	Amanlyze Immediately	** 1L CWM	C	Cool to 4°C 1:1 HCl < 2
TURBIDITY	** 100ml	48 Hours	**250ml HDPE	C	Cool to 4°C
VOLATILE ORGANICS	* 5 grams ** 40ml	14 Days	*4oz. CWM **40ml VOA	* B ** B	Cool to 4°C

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PARAMETERS	MINIMUM SAMPLE VOLUME	HOLDING TIME	CONTAINER	CLEANED TO EPA PROT.	PRESERVATIVE
WINKLER D.O.	** 300ml	8 Hours	**300ml BOD	**300ml BOD btl. (wh.)	Fix on site/store dark

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OHM Corporation

QUALITY POLICY AND

PROCEDURE APPROVAL

AND REVISION RECORD

Document # QP-613	Title Pile Sampling

APPROVAL

Name	Title	Signature	Date
Willis Moody	Super. QA/QC		8/2/94
G. J. Herzig	Mngr. Field Tech.		8/2/94
Terry Sole	Dir. Tech. Svcs.		8/2/94

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Pile Sampling **Document #:** QP-613

Date Issued: August 2, 1994 **Rev.** 0 **Date:** August 2, 1994

1.0 PURPOSE

1.1 The purpose of this procedure is as follows:

1.1.1 Detail the procedures for collecting soil pile samples.

1.1.2 Define the methods for finding soil pile volumes.

1.1.3 Identify and quantify the equipment and supplies required for pile sampling

1.1.4 Identify unique safety problems associated with pile sampling

2.0 SCOPE

2.1 This procedure will apply to the following sampling activities.

2.1.1 Sampling of excavated soil that has been stockpiled.

2.1.2 Sampling of stockpiled soil that has undergone fixation treatment

2.1.3 Sampling of stockpiled waste materials.

2.1.4 Sampling of stockpiled raw materials that are not necessarily waste materials

3.0 RELATED DOCUMENTS

3.1 Surface Soil Sampling SOP, OHM QP-609

3.2 ASTM E-300, Standard Practice for Sampling Industrial Chemicals

3.3 Preparation of Soil Sampling Protocol: Techniques and Strategies, (EPA 600/4-83-020), Dr. Benjamin J. Mason, Prepared under contract to the USEPA, Environmental Monitoring Systems Laboratory-Las Vegas, August 1983

3.4 Soil Sampling Quality Assurance User's Guide, (EPA 600/4-84-043), Dr. Delbert S. Barth and Dr. Benjamin J. Mason, Prepared by the Environmental Research Center, University of Nevada, Las Vegas under a cooperative agreement with the USEPA, May 1984

4.0 GENERAL INFORMATION

4.1 Soils are often non-homogeneous and distribution of contaminants in a soil is often non-uniform. To offset these during sampling the following are accomplished.

4.1.1 Collect samples with high volume-to-surface area ratios.

4.1.2 Use a systematic (grid pattern) approach to sample collection.

4.1.3 Maintain a detailed record during sampling operations, particularly noting location, depth, and characteristics such as grain size, color and odor, and/or readings obtained on field monitoring equipment.

4.2 Soil sampling equipment needs to meet the following general requirements.

4.2.1 Construction materials will be stainless steel or plastic. Chrome or nickel plated steel or brass should not be used. Brass sampling tools are usable if they are non-reactive/non-contaminating to the sample medium.

4.2.2 Materials of construction shall be compatible with and non-reactive to compounds of interest.

4.2.3 Materials of construction will not leave residues in samples that will interfere with analyses of samples.

4.3 Soil bioactivity and problems with volatilization of organic compounds from the soil require that the following be accomplished for soil samples immediately after collection.

4.3.1 Tightly seal containers.

4.3.2 Refrigerate samples to ~4° C.

4.3.3 Remove samples from exposure to sunlight.

4.4 Pile Sampling QA/QC

4.4.1 Quality control samples will be taken at the discretion of the client and OHM management. Provisions for quality control sampling are usually included in the CSAP.

4.4.2 Types of Quality Control samples that might be taken during a pile sampling operation can include Matrix Spike/Matrix Spike Duplicates, Field Spikes, Duplicates, and/or Split Samples. The number and types of QA/QC samples will vary according to the required contract specific data quality objective level as illustrated in Table 4.1.

4.4.3 For most projects it is recommended that for every ten (10) samples one duplicate sample should be collected for analysis.

4.5 Pile Sampling Precautions

4.5.1 In order to collect samples that accurately represent levels of contamination found in the pile, a grid will usually need to be developed. This may require the use of mathematical formulas, a calculator, and various measurement techniques to determine the height, and length and width of the pile.

4.5.2 Other methods of sampling a pile are to divide the pile into sections and grid sample each section, or to take a set number of samples for every (x) number of cubic yards of soil (i.e. ten samples for every 500 yd^3 of soil in the pile).

TABLE 4.1

Specific Data Quality Objectives

	SAMPLE TYPE	LEVEL C METALS	LEVEL C ORGANICS	LEVEL D METALS	LEVEL D ORGANICS	LEVEL E METALS	LEVEL E ORGANICS
FIELD QC	Trip Blank	NA	1/cooler	NA	1/cooler	NA	1/cooler
	Equipment Rinsate (1)	1/day	1/day	1/day	1/day	1/day	1/day
	Field Blank	*	*	*	*	*	*

	Field Duplicate (2)	10%	10%	10%	10%	5%	5%
LAB QC	Method Blank Spikes	1/batch	1/batch	CLP	CLP	1/batch	1/batch
	Matrix Spike	5%	5%	CLP	CLP	NA	NA
	Matrix Spike Duplicate	5%	5%	CLP	CLP	NA	NA
	Blanks	10%	10%	CLP	CLP	NA	NA
	Method Blank (3)	1/batch	1/batch	1/batch	1/batch	1/batch	1/batch
	Duplicate	5%	5%	10%	10%	5%	5%

(1) Samples are collected daily; however, only samples from every other day are analyzed. Other samples are held and analyzed only if evidence of contamination exists.

(2) The duplicate must be taken from the same sample which will become the laboratory matrix/spike duplicate of organics or for the sample used as a duplicate in organic analysis.

(3) Method blank taken through digestion

* 1 per source/event for all levels and all analytes.

CLP - Follows current CLP method requirements. For methods not defined in the CLP, the blank, blank spike, matrix spike, and matrix spike duplicate shall be performed for every 20 samples (5%)

4.5.3 The problems associated with developing a grid to sample a pile can be eliminated by obtaining a sample from every (y) number of buckets that are placed onto the pile (i.e. one 8oz sample collected from every 3 Trackhoe buckets emptied into the pile). These samples can be stored on ice and composited daily. When excavation is completed there should be a good representation of the concentrations of soil in the pile. However, compositing of samples is **NOT** to be done if analyses for volatile organic compounds will be performed on the samples.

4.5.4 Soil piles may be physically unstable. Precautions may need to be taken so that sampling can be **safely** accomplished. This in effect may limit the ways in which a pile can be sampled.

4.6 Preparation for Sampling

4.6.1 Whenever a pile sampling project is performed, it is always necessary to obtain measurements of the pile(s) which are used for calculating the volume of the pile(s). Two methods are used for pile volume calculations. One method is for conical or pyramidal piles and the other is for elongated or prism shaped piles.

4.6.2 Volume of Conical or Pyramidal Pile

4.6.2.1 Measure height and base parameters (i.e. length/width for rectangle, radius of circle, etc.) of

pile.

4.6.2.2 Determine area of base of pile. If base of pile is irregularly shaped divide into regularly shaped areas and figure separately. Add areas together to obtain total area of base.

Square/Rectangle: $A = L \cdot W$

Circle: $A = \pi \cdot r^2$

Ellipse: $A = \pi \cdot a \cdot b$

Triangle: $A = \frac{1}{2} B \cdot h$

Where:

A = Area of the base of the pile

L = Length of one side of a square or rectangle

W = Width of other side of rectangle

π = 22/7 or 3.14

r = radius of circle

a = ½ of semi-minor axis

b = ½ of semi-major axis

B = Base length of triangle

h = Distance from base to top of triangle perpendicular to base.

4.6.2.3 Determine volume of pile. For all base shapes use the following equation:

$V = \_ A \cdot H$

Where:

V = Volume of pile

A = Area of the base of the pile

H = Height to apex of the pile

NOTE: If the top of the pile is not complete, estimate height to apex from top of pile. Determine volume of pile as if it were complete to estimated apex. Determine volume of missing top part in the same manner. Subtract missing top from estimated total pile volume to obtain actual pile volume.

4.6.3 Volume of an Elongated or Prism Shaped Pile

4.6.3.1 Divide pile into uniform shaped (along length) body and sides. Measure pile accordingly (length of body, height, dimensions of sides).

4.6.3.2 Determine the area of the face of the body by defining it's shape and then using the formula for that shape.

Triangular Area = ½ B · h

Semicircular Area = ½ $\pi \cdot r^2$

Where:

B = Base of triangle, width of pile

h = Height of triangle/pile

π = 22/7 or 3.14

r = Radius of circle, height of pile

4.6.3.3 Determine volume of the body of the pile. For all face shapes use:

V = A · L

Where:

V = The volume of the body of the pile

A = The area of the face of the body

L = The length of the body

4.6.3.4 Determine the volume of the sides of the pile.

The sides of the pile can be treated as conical shaped piles and their volumes determined as such. The volumes of the sides can then be added to the volume of the body of the pile to find the total volume of the pile.

TV = VB + VS1 + VS2

Where:

TV = Total volume of pile

VB = Volume of body of pile

VS1 = Volume of one side of pile

VS2 = Volume of other side of pile

4.6.4 Volume of Irregularly Shaped Piles

4.6.4.1 Many piles will not exhibit dimensions exactly the same as those described above. These piles should be divided into more regularly shaped sections and their volumes determined independently. These separated volumes can then be added to obtain the total volume of the pile.

5.0 DEFINITIONS

5.1 Environmental Sample - low concentration sample typically collected off site and not requiring DOT hazardous waste labelling as a high hazard sample.

5.2 Hazardous Waste Sample - medium to high concentration sample (e.g., source material, sludge

leachate) requiring DOT labelling and Contract Lab handling as a high hazard sample.

5.3 Ellipse - a closed symmetrical figure bounded by a curve like an elongated circle.

5.3.1 Semi-major axis - a line segment from the center of the ellipse to its boundary along the longest dimensions.

5.3.2 Semi-minor axis - a line segment from the center of the ellipse to the its boundary along the dimension perpendicular to the longest one.

5.4 Regularly shaped areas - all those areas which shape can be approximated by the following: rectangle, circle, triangle and ellipse.

6.0 RESPONSIBILITIES

6.1 Field Operations Leader

6.1.1 The Field Operations Leader is responsible for the overall safety of the sampling operation. This includes informing and obtaining help from local authorities if necessary, selection of sample points, and halt of operations if necessary.

6.2 Sampling Technicians

6.1.2 The Sampling Technicians are responsible for the following.

6.1.1 Reading and implementing project sampling plans.

6.1.2 Accumulating and dispatching appropriate supplies and equipment to accomplish the sampling objectives.

6.1.3 Locating and marking sampling points.

6.1.4 Decontamination of field sampling gear in a correct and appropriate manner consistent with site requirements.

6.1.5 Collecting, preserving and packaging soil pile samples.

6.1.6 Maintaining sampling records, sampling logs, data sheets, and maps.

6.1.7 Filling-out Chain-of-Custody forms and appropriate log books.

6.1.8 Maintaining physical custody of samples until they are transferred off-site or to an on-site laboratory.

7.0 PROCEDURES

7.1 Sampling Procedures

7.1.1 As with soil sampling, soil or waste pile samples can be collected at the surface or at depth, and different equipment will be required in each instance. Surface samples can be collected most efficiently with a trowel or scoop. For samples at depth, a decontaminated bucket auger may be required to advance the hole, then another decontaminated auger used for sample collection. For a sample core, waste pile samplers or grain samplers may be used.

7.1.2 Surface Soil Samples

7.1.2.1 Locate the sample point and clear away surface debris. Mark the sampling point with a surveyor's stake if possible.

7.1.2.2 Collect an adequate volume of soil or waste material from a depth of 0-6 inches using a shovel to initially open up the pile surface and then using a trowel or scoop to obtain the actual sample material.

7.1.2.3 Immediately transfer the material to a sample container and seal the container.

7.1.3 Surface Soil Core Samples

7.1.3.1 For a core sample from the surface proceed as in 1.0 and 2.0 above and then use a waste pile sampler, trier or tube corer to obtain a sample in place of using the trowel.

7.1.3.2 Transfer the sample directly into the sample container, or use a decontaminated trowel, tongue depressor or spatula for transfer if necessary. A wide mouth bottle is preferable for containing the sample, as it requires less disturbance of the sample being transferred into it.

7.1.4 At Depth Soil Samples

7.1.4.1 Locate the sample point and clear away surface debris.

7.1.4.2 Use a shovel to initially open up the pile surface and then use a decontaminated bucket auger to advance the hole to the desired sampling depth.

7.1.4.3 Use another decontaminated bucket auger or suitable sampling device to collect the sample, and, if necessary, a decontaminated spatula or trowel to transfer the sample into the sample bottle.

7.1.4.4 For samples at depths greater than three feet, a hand operated hammer and extension rod may be utilized with a split spoon sampler for sample collection. Upon retrieval the split spoon is opened, its contents logged, if necessary, and the sample materials immediately transferred into a sample bottle using a decontaminated spatula, spoon, tongue depressor or trowel.

7.1.5 Sample Homogenization

7.1.5.1 For some types of soil samples it is desirable to thoroughly homogenize the collected sample. This can be done by using a large stainless steel mixing bowl and spoon. The sample is stirred and mixed and then placed in a sample container. The project CSAP will usually detail whether this needs to be done or not. **DO NOT HOMOGENIZE SAMPLES THAT WILL BE ANALYZED FOR VOLATILE ORGANIC COMPOUNDS.**

7.2 Sampling Equipment Decontamination

7.2.1 When disposable equipment is not used for sampling, the equipment must be cleaned prior to usage, after each usage, and before usage at another sample point.

7.2.2 Inorganic Constituents

7.2.2.1 If the constituents of interest are inorganic, the following steps will be followed:

7.2.2.1.1 Wash with Alconox and tapwater

7.2.2.1.2 Rinse with tapwater

7.2.2.1.3 Rinse with dilute (10%) hydrochloric acid or nitric acid.

7.2.2.1.4 Rinse with tapwater

7.2.2.1.5 Rinse with distilled water or deionized water

NOTE: Dilute hydrochloric acid is generally preferred to nitric acid when cleaning stainless steel because nitric acid may oxidize stainless steel.

7.2.3 Organic Constituents

7.2.3.1 If the constituents of interest are organic, the following steps will be followed:

7.2.3.1.1 Wash equipment with Alconox and tapwater

7.2.3.1.2 Rinse with tapwater

7.2.3.1.3 Rinse with distilled water

7.2.3.1.4 Rinse with pesticide free grade isopropanol

8.0 EQUIPMENT

8.1 The materials required to perform soil pile sampling may include the following.

8.1.1 Soil sampling devices:

* Corer, tube type, 18" (Forestry Suppliers P/N 77019)

* Trier (See Attachment 9.1)

* Waste Pile Sampler (See Attachment 9.1)

* Split Spoon w/hammer + extension rods (See Attachment 9.2)

* Bucket auger, 3 1/4", with handle and ext. rods (AMS brand)

* Scoop, plastic (VWR P/N 56920-025 or 56920-036)

* Trowel, pointing, steel (Forestry Suppliers P/N 53717)

* Spoon/spatula, stainless steel (VWR P/N 57952-107)

* Tongue depressors, wood (VWR P/N 62505-006)

* Clean shovel, steel (Local Purchase)

* Sample Containers, Precleaned Glass or Plastic of appropriate size.

* Sample labels (OHM Supplied)

* Custody seals (If required for project)(OHM Supplied)

* Sample gloves, latex or nitrile (PVC may not be acceptable)

* Trash bags, 30 gallon, heavy duty (Local Purchase)

8.1.2 Contamination Supplies

* Nitric Acid, trace metal grade (VWR P/N JT9598-0)**

* Hydrochloric Acid, trace metal grade (VWR P/N JT9530-0)**

* DI Water (Local Purchase)

* Isopropyl Alcohol (2-Propanol)(VWR P/N JT9334-3)

* Alconox Detergent (VWR P/N 21835-032)

* Scrub brushes and source of tap water (Local Purchase)

* Wash buckets or tubs/pans, ~5-gal. size (Local Purchase)

* Field logbooks (Sample Logbook and Field Sampler's Notebook)

* 200 ft. tape, Lufkin 1708D (Forestry Suppliers P/N 39961)

* Surveyors stakes (Forestry Suppliers P/N 39514)

* Marking pens, such as Sharpies and Mean Streaks

* Chain-of-custody Forms (OHM Supplied)

* Compass, Silva (Type 3, 7, 20) (Forestry Suppliers or Local Purchase)

* Other OHM or site specific forms as required per CSAP

* Calculator, pocket size (Local or Individual Purchase)

* Mechanical pencil and graph paper (Local or Individual Purchase)

8.3 Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

Figure 9-1 Trier and Waste Pile Sampler

Figure 9-2 Split Spoon Sampler

Figure 9-3 Tube-type Corer and Bucket Auger

Figure 9.1 Trier and Waste Pile Sampler

Figure 9.2 Split Spoon Sampler

Figure 9.3 Tube-type Corer and Bucket Auger

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-613	Title Pile Sampling

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Pile Sampling **Document #:** QP-613

Date Issued: **Rev.** 02 **Date:**12 OCT 93

1.0 PURPOSE

The purpose of this procedure is as follows:

1.0 Describe the requirements for collecting soil pile samples.

2.0 Define the methods for finding soil pile volumes.

2.0 SCOPE

The following information outlines the general procedures for collecting samples from soil piles and other waste material piles, equipment necessary for sampling, and the collection of a representative sample of the material. Also presented will be factors for consideration when formulating a sampling plan.

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3.0 RELATED DOCUMENTS

3.1 Surface Soil Sampling SOP, OHM QP-609

3.2 ASTM E-300, Standard Practice for Sampling Industrial Chemicals

3.3 Preparation of Soil Sampling Protocol: Techniques and Strategies, (EPA 600/4-83-020), Dr. Benjamin J. Mason, Prepared under contract to the USEPA, Environmental Monitoring Systems Laboratory-Las Vegas, August 1983

3.4 Soil Sampling Quality Assurance User's Guide, (EPA 600/4-84-043), Dr. Delbert S. Barth and Dr. Benjamin J. Mason, Prepared by the Environmental Research Center, University of Nevada, Las Vegas under a cooperative agreement with the USEPA, May 1984

4.0 GENERAL INFORMATION

Soils are often non-homogeneous and distribution of contaminants in a soil is often non-uniform. To offset these during sampling work the following are accomplished.

1.0 Collect samples with high volume-to-surface area ratios.

2.0 Use a systematic (grid pattern) approach to sample collection.

3.0 Maintain a detailed record during sampling operations, particularly noting location, depth, and characteristics such as grain size, color and odor, and/or readings obtained on field monitoring equipment.

Soil sampling equipment needs to meet the following general requirements.

1.0 Materials of construction shall be stainless steel, plastic or teflon coated steel. **DO NOT USE** chrome or nickel plated steel. Brass sampling tools can be used for certain sampling operations if no compatibility problems exist.

2.0 Materials of construction shall be compatible with and non-reactive to compounds of interest.

3.0 Materials of construction will not leave residues in samples that will interfere with analyses of samples.

Soil bioactivity and problems with volatilization of organic compounds from the soil require that the following be accomplished for soil samples immediately after collection.

1.0 Tightly seal containers.

2.0 Refrigerate samples to ~4° C.

3.0 Remove samples from exposure to sunlight.

4.1 Pile Sampling QA/QC

Quality control samples will be taken at the discretion of the client and OHM management. Provisions for quality control sampling will be included in the CSAP.

Types of Quality Control samples that might be taken during a pile sampling operation can include Matrix Spike/Matrix Spike Duplicates, Field Spikes, Duplicates, and/or Split Samples.

4.2 Pile Sampling Precautions

1. Sampling from a pile is somewhat more complex than surface soil sampling or subsurface soil sampling because both techniques may be used. In order to collect samples that accurately represent levels of contamination found in the pile, a grid may need to be developed. This may require the use of mathematical formulas, a calculator, and various measurement techniques to determine the height, and length and width of the pile.

2. Other methods of sampling a pile are to divide the pile into sections and grid sample each section, or to take a set number of samples for every (x) number of cubic yards of soil (i.e. ten samples for every 100 yd^3 of soil in the pile).

3. The problems associated with developing a grid to sample a pile can be eliminated by obtaining a sample from every (y) number of buckets that are placed onto the pile (i.e. 1 8oz sample collected from every 3 Trackhoe buckets emptied into the pile). These samples can be stored on ice and composited daily. When excavation is completed there should be a good representation of the concentrations of soil in the pile. However, compositing of samples is **NOT** to be done if analyses for volatile organic compounds will be performed on the samples.

4. Soil piles may be physically unstable. Precautions may need to be taken so that sampling can be **safely** accomplished. This in effect may limit the ways in which a pile can be sampled.

4.3 Preparation for Sampling

Whenever a pile sampling project is performed, it is always necessary to obtain measurements of the pile(s) which are used for calculating the volume of the pile(s). Two methods are used for pile volume calculations. One method is for conical or pyramidal piles and the other is for elongated or prism shaoed piles.

4.3.1 Volume of Conical or Pyramidal Pile

Step 1. Measure height and base parameters (i.e. length/width for rectangle, radius of circle, etc.) of pile.

Step 2. Determine area of base of pile. If base of pile is irregularly shaped divide into regularly shaped areas and figure separately. Add areas together to obtain total area of base.

Square/Rectangle:	$A = L \cdot W$
Circle:	$A = \pi \cdot r^2$
Ellipse:	$A = \pi \cdot a \cdot b$
Triangle:	$A = ½ B \cdot h$

Where:

A = Area of the base of the pile
L = Length of one side of a square or rectangle
W = Width of other side of rectangle
π = 22/7 or 3.14
r = radius of circle
a = ½ of semiminor axis
b = ½ of semimajor axis
B = Base length of triangle
h = Distance from base to top of triangle perpendicular to base.

Step 3. Determine volume of pile. For all base shapes use the following equation:

$$V = \frac{1}{3} A \cdot H$$

Where:

V = Volume of pile
A = Area of the base of the pile
H = Height to apex of the pile

NOTE: If top of pile is not complete, estimate height to apex from top of pile. Determine volume of pile as if it were complete to estimated apex. Determine volume of missing top part in the same manner. Subtract missing top from estimated total pile volume to obtain actual pile volume.

4.3.2 Volume of an Elongated or Prism Shaped Pile

Step 1. Divide pile into uniform shaped (along length) body and sides. Measure pile accordingly (length of body, height, dimensions of sides).

Step 2. Determine the area of the face of the body by defining it's shape and then using the formula for that shape.

Triangular Area = $\frac{1}{2} B \cdot h$
Semicircular Area = $\frac{1}{2} \pi \cdot r^2$

Where:
B = Base of triangle, width of pile
h = Height of triangle/pile
π = 22/7 or 3.14
r = Radius of circle, height of pile

Step 3. Determine volume of the body of the pile. For all face shapes use:

$$V = A \cdot L$$

Where:

V = The volume of the body of the pile
A = The area of the face of the body
L = The length of the body

Step 4. Determine the volume of the sides of the pile.

The sides of the pile can be treated as conical shaped piles and their volumes determined as such. The volumes of the sides can then be added to the volume of the body of the pile to find the total volume of the pile.

$$TV = VB + VS1 + VS2$$

Where:

TV = Total volume of pile
VB = Volume of body of pile
VS1 = Volume of one side of pile
VS2 = Volume of other side of pile

4.3.3 Volume of Irregularly Shaped Piles

Many piles will not exhibit dimensions exactly the same as those described above. These piles should be divided into more regularly shaped sections and their volumes determined independently. These separated volumes can then be added to obtain the total volume of the pile.

5.0 DEFINITIONS

5.1 Environmental Sample - low concentration sample typically collected off site and not requiring DOT hazardous waste labelling as a high hazard sample.

5.2 Hazardous Waste Sample - medium to high concentration sample (e.g., source material, sludge leachate) requiring DOT labelling and Contract Lab handling as a high hazard sample.

5.3 Ellipse - a closed symmetrical figure bounded by a curve like an elongated circle.

5.3.1 Semimajor axis - a line segment from the center of the ellipse to its boundary along the longest dimensions.

5.3.2 Semiminor axis - a line segment from the center of the ellipse to the its boundary along the dimension perpendicular to the longest one.

5.4 Regularly shaped areas - all those areas which shape can be approximated by the following: rectangle, circle, triangle and ellipse.

6.0 RESPONSIBILITIES

6.1 Field Operations Leader

The Field Operations Leader is responsible for the overall safety of the sampling operations. This includes informing and obtaining help from local authorities if necessary, selection of sample points, and halt of operations if necessary.

6.2 Sampling Technicians

The Sampling Technicians are responsible for the following.

1.0 Reading and implementing project sampling plans.

2.0 Accumulating and dispatching appropriate supplies and equipment to accomplish the sampling objectives.

3.0 Locating and marking sampling points.

4.0 De-conning of field sampling gear in a correct and appropriate manner consistent with site requirements.

5.0 Collecting, preserving and packaging soli pile samples.

6.0 Maintaining sampling records, sampling logs, data sheets and maps.

7.0 Filling-out Chain-of-Custody forms.

8.0 Maintaining physical custody of samples until they are transfered off-site or to an on-site laboratory.

7.0 PROCEDURE

7.1 Sampling Procedures

As with soil sampling, soil or waste pile samples can be collected at the surface or at depth, and different equipment will be required in each instance. Surface samples can be collected most efficiently with a trowel or scoop. For samples at depth, a decontaminated bucket auger may be required to advance the hole, then another decontaminated auger used for sample collection. For a sample core, waste pile samplers or grain samplers may be used.

7.1.1 Surface Soil Samples

At the desired location, clear surface debris. Collect the adequate volume of waste from a depth of 0-6 inches using a trowel, scoop or auger. For a core sample from the surface use the waste pile sampler, trier, or other listed corer/sampler. Transfer the sample directly into the sample container, or use a decontaminated trowel or spatula for transfer if necessary. A wide mouth bottle is preferable for containing the sample, as it requires less disturbance of the sample being transferred into the bottle.

7.1.2 At Depth

At the sampling location, advance the hole to the desired sampling depth with a decontaminated bucket auger or power auger. Use another decontaminated bucket auger or corer/sampler to collect the sample, and, if necessary, a decontaminated spatula to transfer the sample into the sample bottle. For samples at depths greater than three feet, a hand operated hammer and extension rod may be utilized with a split spoon sampler for sample collection. Upon retrieval the split spoon should be opened, its contents logged if necessary, and immediately transferred into a sample bottle using a decontaminated spatula or spoon.

8.0 Equipment

The materials required to perform soil pile sampling may include the following.

- Pile sampling device:
  - Scoop or trowel
  - Waste pile sampler
  - Sampling trier
  - Soil auger
  - Grain sampler
  - Split spoon sampler
  - Soil coring device (e.g. Shelby tube)
- Clean shovel
- Clean stainless steel spoons/spatulas (VWR Scientific)
- Stainless Steel Mixing Bowl (Cole-Parmer Catalogue No. L-07300-50, or Equivalent)
- Tongue depressors (VWR Scientific)
- Sample Containers, Precleaned Glass or Plastic of appropriate size.
- Sample labels
- Sample gloves, latex or PVC
- Trash bags
- Decontamination Supplies
  - DI Water
  - Isopropyl Alcohol
  - Alconox Detergent
  - Scrub brushes and source of tap water
  - Wash buckets or tubs/pans
- Field logbooks
- 100 ft tape measure
- Surveyors stakes and/or flags
- Marking pens, such as Sharpies and/or Mean Streaks
- Chain of Custody Forms
- Other OHM forms as required per SOP's or CSAP
- Calculator, pencil and paper

Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

NONE

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-628	Title Augers

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
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SHALLOW HAND AUGER SAMPLING

Shallow surface soil sampling can either be done with a hollow stem auger or a bucket auger. Both means are sufficient and use is dependent upon preference or site specific procedures.

Hollow Stem Augers

- Place visqueen around sample location to prevent cross-contamination.
- Locate the desired sample point and clear the surface area of debris with a clean shovel. Position the decontaminated auger on the sample point.
- Rotate the auger in such a manner that it enters the material being sampled, periodically removing accumulated soils. Once the auger has reached the desired depth it is pulled straight out.
- Lower corer into borehole, take care not to scrape the borehole sides. Force corer into soil, twist out and discard top of soil. Place remaining core in sample jar for grab sample or stainless steel bowl for mixing of a composite sample.
- Once appropriate sample volume has been achieved, place sample into sample jar with a teflon or stainless steel spoon. Check that a Teflon liner is present in the sample bottle cap. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach, supplemented by a minimal holding time.
- Label the sample bottle with the appropriate sample tag. Be sure to label the tag carefully and clearly. Complete all chain-of-custody documents and record sample date in the field logbook.
- After each use the auger must be decontaminated following site acceptable procedures.

Bucket Auger

- Locate the desired sample point. Clean the area of surface debris with a clean shovel.
- Position the decontaminated bucket auger on the sample point.
- Rotate the bucket auger in such a manner that it enters the material being sampled.

- Once the bucket auger has reached the desired depth it is pulled straight out.
- Use a tongue depressor to discard the top one inch of material from the bucket auger.
- Using a clean tongue depressor, remove the sample from the bucket auger and place it into the appropriate sample container.
- After each use the bucket auger must be decontaminated by site acceptable procedures.

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Augers

Document #: QP-628

Date Issued:

Rev: 02

Date: 26 OCT 93

1.0 PURPOSE

To provide general information and operating procedures for auger sampling devices.

2.0 APPLICABILITY

Augers are useful in combination with split spoon sampling devices. Augers are most commonly used to increase the size of a hole in order to drive a split spoon sampler to the next depth interval. However, one type of auger, the bucket auger, can be used for collection of samples. Although the bucket auger would be a poor choice when sampling for volatile compounds, it is a good choice for depth based composite sampling of a pile.

3.0 RELATED DOCUMENTS

3.1 ASTM E 300-73

4.0 GENERAL INFORMATION

4.1 Cross contamination is more of a problem when using the bucket auger than it is with most other soil sampling methods.

4.2 The auger must be decontaminated before and after each use.

5.0 DEFINITIONS

5.1 Composite Sample - Combination of more than one sample collected at various sampling locations and/or different points in time.

5.2 Cross Contamination -- The introduction of contaminants into the sample through the sampling and/or sample-handling procedures which can cause an otherwise representative sample to become nonrepresentative.

5.3 Equipment (field) Blanks - Samples used to verify cleanliness of the sampling equipment. The piece of equipment in question is used to take a sample of distilled or deionized water. One per analyte per piece of equipment per day is recommended.

5.4 Grab Sample - A single sample representative of a specific location at a given point in time.

5.5 Representativeness - The sample should possess the same qualities or properties (which are relevant to the investigation) as the whole of the material under investigation.

6.0 RESPONSIBILITY

The Sample Technician is responsible for sample collection, documentation and equipment decontamination when soil auger are used.

7.0 PROCEDURE

7.1 Soil Sample Auger

The soil sample auger is a screw-or-worm type instrument useful for taking samples of compacted materials. The procedure for taking samples with a soil sample auger is as follows:

7.1.1 Locate the desired sample point.

7.1.2 Position the decontaminated auger on the sample point.

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7.1.3 Rotate the auger in such a manner that it enters the material being sampled.

7.1.4 Once the auger has reached the desired depth it is pulled straight out.

7.1.5 Use a tongue depressor to discard the top one inch of material from the auger.

7.1.6 Using a clean tongue depressor, remove the sample from the auger and place it into the appropriate sample container.

7.1.7 After each use the auger must be decontaminated following site acceptable procedures.

7.2 Bucket Auger

The bucket auger is used for sampling in soil that is not too rocky or too hard. The procedure for taking samples with a bucket auger is as follows:

7.2.1 Locate the desired sample point.

7.2.2 Position the decontaminated bucket auger on the sample point.

7.2.3 Rotate the bucket auger in such a manner that it enters the material being sampled.

7.2.4 Once the bucket auger has reached the desired depth it is pulled straight out.

7.2.5 Use a tongue depressor to discard the top one inch of material from the bucket auger.

7.2.6 Using a clean tongue depressor, remove the sample from the bucket auger and place it into the appropriate sample container.

7.2.7 After each use the bucket auger must be decontaminated by site acceptable procedures.

8 EQUIPMENT

- Required auger
- Tongue depressors
- Appropriate decontamination supplies

9 ATTACHMENTS

NONE

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-636	Title Hand Corer

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Hand Corer **Document #:** QP-636

Date Issued: **Rev:** 02 **Date:** 26 OCT 93

1.0 PURPOSE

1.1 To provide general information and procedures for a hand corer.

2.0 SCOPE

2.1 The hand corer is used for collecting near surface soil samples.

3.0 RELATED DOCUMENTS

NONE

4.0 GENERAL INFORMATION

4.1 The hand corer can be modified by the addition of a handle to facilitate driving the corer (see figure 1.0) and a check valve on top to prevent washout during retrieval through an overlying water layer.

4.2 This device has the advantage of collecting a relatively undisturbed sample which can be used to profile stratification in the sample, that is the result of changes in the deposition of contaminants.

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4.3 Some hand corers can be fitted with extension handles which allow the collection of samples underlying a shallow layer of liquid.

4.4 Most corers can also be adapted to hold liners generally available in brass, polycarbonate plastic, or Teflon. Care should be taken to choose a material which will not compromise the intended analytical procedures.

5.0 DEFINITIONS

5.1 Composite Sample - Combination of more than one sample collected at various sampling locations and/or different points in time.

5.2 Cross Contamination -- The introduction of contaminants into the sample through the sampling and/or sample-handling procedures which can cause an otherwise representative sample to become nonrepresentative.

5.3 Equipment (field) Blanks - Samples used to verify cleanliness of the sampling equipment. The piece of equipment in question is used to take a sample of distilled or deionized water. One per analyte per piece of equipment per day is recommended.

5.4 Grab Sample - A single sample representative of a specific location at a given point in time.

5.5 Representativeness - The sample should possess the same qualities or properties (which are relevant to the investigation) as the whole of the material under investigation.

5.6 Sludge - Semi-dry materials ranging from dewatered solids to high viscosity liquids. Frequently, sludges form as a result of settling of the higher density components of a liquid.

6.0 RESPONSIBILITY

6.1 The Sample Technician is responsible for all sample collection, field documentation and equipment decontamination.

7.0 PROCEDURE

7.1 Inspect the corer to make sure it is precleaned. If not, do not use it. Proceed to section 7.8 and start over. Then proceed to first sample location.

7.2 Force the corer in with a smooth, continuous motion.

7.3 Twist the corer, then withdraw it in a single smooth motion.

7.4 Remove the nosepiece, and withdraw the sample into a stainless steel or plastic tray.

7.5 Transfer the sample into an appropriate precleaned sample bottle with a stainless steel lab spoon, wooden disposable tongue depressor or equivalent tool.

7.6 Check that a Teflon liner is present in the sample bottle cap. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach, supplemented by a minimal holding time.

7.7 Label the sample bottle with the appropriate sample tag. Be sure to label the tag carefully and clearly. Complete all chain-of-custody documents and record sample date in the field logbook.

7.8 Decontaminate sampling equipment after use and between samples. Decontamination procedures will usually, but not always, be site specific. See the site CSAP for more detail.

8.0 EQUIPMENT

- Hand corer
- Decontamination solutions (see CSAP)
- Any modification equipment (i.e. handle, check valve, extensions, etc.)
- Sample jars precleaned (8oz, 16oz or 32oz) w/teflon lined lids. (OHM stock)
- Stainless steel tray (VWR 62687-069)
- Polyethylene tray (VWR 62686-320)
- Wooden tongue depressers

9.0 ATTACHMENTS

Figure 1.0 Hand Corer

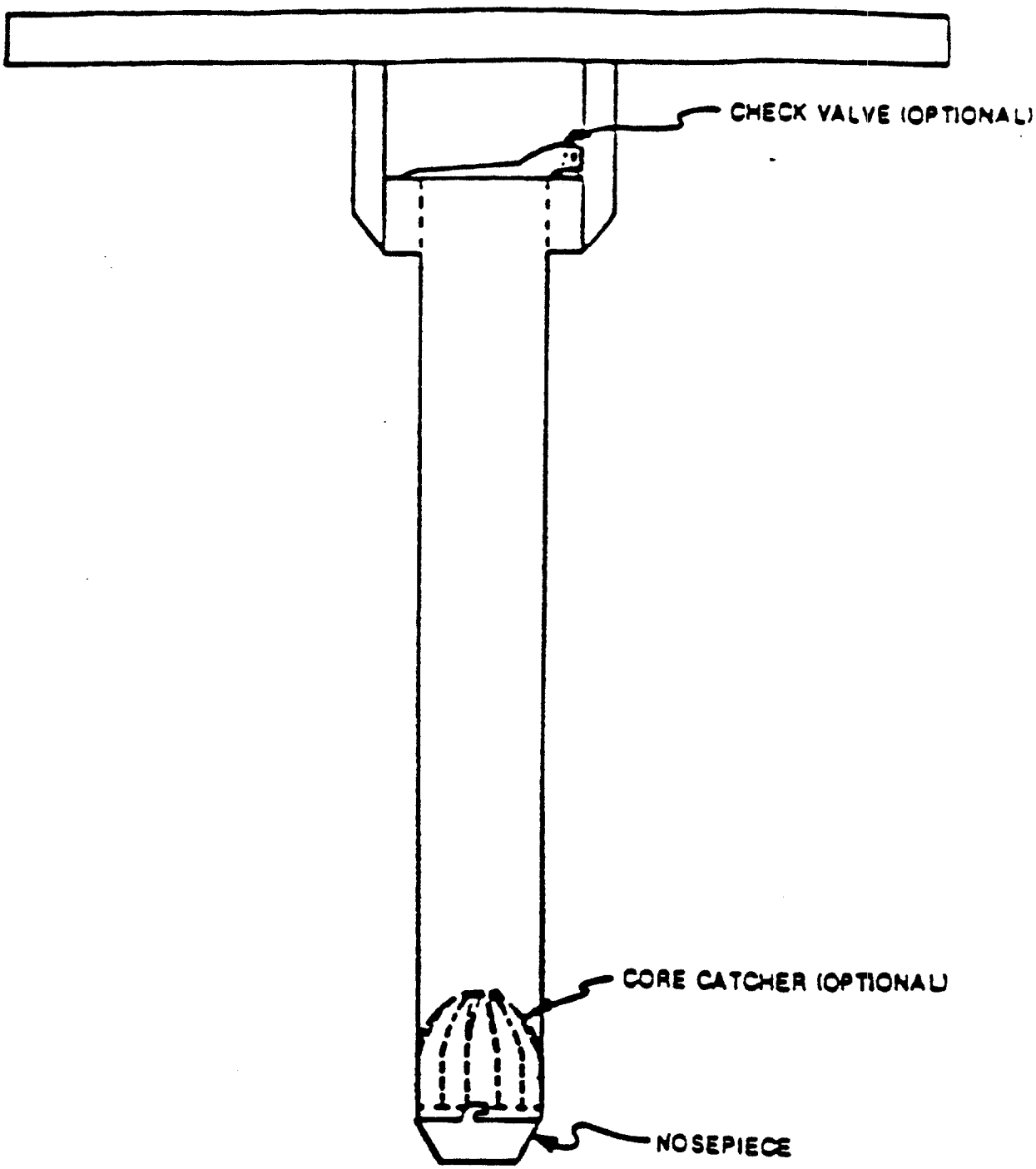

Figure 1.0

HAND CORER

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-703	Title Decontamination Procedures

APPROVAL

Name	Title	Signature	Date

REVISION RECORD

Ltr.	Date	Change Description	Initials						
A		issue	-	-	-	-	-	-	-
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form # qp012-2 rev a

OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Decontamination Procedures **Document #:** QP-703

Date Issued: **Rev:** 02 **Date:** 27 OCT 93

1.0 Purpose

1.1 To provide guidelines for decontaminating equipment used in drilling and sampling operations.

2.0 Scope

2.1 Define the proper methods of decontaminating the Hollow Stem Augers used in the drilling operation.

2.2 Define the proper methods to decontaminate the split-spoon sampler and other similar sampling devices such as a trier, hand corer or hand auger.

3.0 Related Documents

NONE

4.0 General Information

4.1 Decontamination procedures vary depending on the contaminates and the equipment involved and on what is acceptable practices for a given site or project.

4.4 All augers used on a site shall be decontaminated after each usage and before leaving the project site.

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4.6 Split-spoons and similar devices are to be decontaminated between each sample taken and prior to leaving the site.

4.7 Drilling rigs should be decontaminated prior to leaving the project site.

5.0 Definitions

6.0 Responsibility

6.1 The driller is responsible for decontaminating equipment used on-site.

6.2 The sample technicians are responsible for decontaminating sampling equipment used on-site except for equipment associated with a drill rig and the drill rig itself.

7.0 Procedure

7.1.1 Set up a decontamination pad using 2" x 10" x 10' pieces of lumber, visqueen and a tarp.

7.1.1.1 Nail four of the 2"x 10"x 10' together making a square.

7.1.1.2 Lay two layers of visqueen over the form, ensuring the visqueen is extended past the wood form. The visqueen is to contain the decon water.

7.1.1.3 Place a tarp inside the form on top of the visqueen. The tarp will protect the visqueen from tearing.

7.1.1.4 Place saw horses or pallets on top of the tarp. These will be used as a work surface.

7.1.2 Remove all excess mud and debris from the augers or sampling gear using a putty knife or similar tool.

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7.1.3 Set up the Steamer.

7.1.3.1 Connect the garden hose and turn on the water (steamers will not work without water pressure in the feed line)

7.1.3.2 Connect the electrical power to the unit (some steamers provide their own power source).

7.1.4 Place the augers to be steamed on the pallets or sawhorses with six inches of space between the augers.

7.1.5 Turn on the steamer. Be sure to turn the steamer water pump on and make sure that the water is circulating through the machine before turning on the burner. Allow steam to come out of the wand before cleaning the augers.

7.1.6 Steam the augers, rods and center bits till all the visual dirt and debris is removed from the augers. Be sure to steam the inside of the augers.

7.1.7 Remove the clean augers and replace them with dirty augers and repeat steps 4 to 6 until all the items are decontaminated.

7.1.8 Shutdown the steamer.

7.1.8.1 Turn the burner off and allow the pump to remain running.

7.1.8.2 Check the temperature of the water after about five minutes, if the water is cool turn off the pump (Keep the pump on till the water is cool, damage could occur to the burner unit if shut-down hot).

7.1.9 Drum the water generated by steaming by using a garden hose type centrifugal pump. Pump the water from the decon pad to a storage drum. Mark and label it appropriately.

7.1.10 When finished with decontaminating activities for the project, drum the visqueen and tarp and mark the drum accordingly. The wooden frame should not be contaminated and can be placed in a non-hazard dumpster.

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7.1.10.1 Disconnect the water and power from the steamer and roll the hoses and cords and store them for demobilization.

7.2 Split-spoon or Sampling Equipment Decontamination

7.2.1 Disassemble the split-spoon or sampling device into its component parts.

7.2.2 Fill two five-gallon buckets with water. Place a small amount of Alconox detergent in the first bucket (this will be the wash bucket).

7.2.3 Using a long handle scrub brush wash the components of the split-spoon till all visible signs of contamination are removed.

7.2.4 Rinse the split-spoon components using the clean water bucket.

7.2.5 Take the rinsed components and using a squeeze bottle filled with clean deionized or distilled water, rinse the spoon parts again, allowing the water to drain into the first rinse bucket.

7.2.6 Rinse the spoon components with the proper organic solvent using a teflon squeeze bottle and allow to dry. The solvent most commonly used will be isopropanol, but others such as hexane or acetone may be used. Site specific requirements will determine solvent needs.

7.2.7 Package the clean parts in plastic or aluminum foil and store securely until they are used again.

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8.0 Equipment and Supplies

8.1 350,000 BTU Steamer, 100'-200'of 12 or 14 Gauge Ext. cord, 100'-150' of 3/4" garden hose

8.2 4 - 5 gallon buckets, several pallets, small centrifugal ~1/2 HP water pump for use with garden hose, 2 - 25" 3/4"garden hoses

8.3 2 long handled scrub brushes, small hand brushes, several sawhorses, several long handled beaker brushes, 1" putty knives

8.4 4 - 2" x 10" x 10' boards, nails (8d), roll of visqueen, 10'X10' tarp

8.5 Carton of Alconox detergent

8.6 Case of proper solvent(s) (you may need more than one kind for a site)

8.7 4 - Boxes of sample gloves (PVC, Latex, Nitrile)

8.8 10 gallons of commercial DI or distilled water

8.9 Several drums for waste solids and waste water storage

8.10 Labels and marking pens to mark drums correctly

8.11 Several rolls of heavy gauge aluminum foil

9.0 Attachments

NONE

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APPENDIX D

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

Figure 6.8-3 Sample I-CHEM Custody Seal

CUSTODY SEAL

Date_____

Signature_____

I-CHEM

COMPANY

A NALGE COMPANY

90009

M Corporation

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 08/89

№ 125567

.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

ECT NAME		PROJECT LOCATION	
. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.	
NT'S REPRESENTATIVE		PROJECT MANAGER/SUPERVISOR	

SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)								REMARKS

NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1					
2					
3					
4					

REMARKS

SAMPLER'S SIGNATURE

6.4 Sample Labels

Figure 6.4-1 below shows an example of an OHM sample label.

Figure 6.4-1

Sample Label

JOB #: 417 Sample #: 001
DATE: 6-20-01 TIME: 1631
SAMPLE: Water from treatment pool #2
H_2SO_4 Added - TPHC
TAKEN BY: BS
WITNESS: EB

The following information is recorded on the label at a minimum:

- JOB NUMBER
- SAMPLE NUMBER - Number assigned (i.e. job number - sequential number) in the field during collection of samples. Note: Continue numbering in <u>sequence</u> from the <u>last</u> sample obtained; refer to field sample log.
- DATE - Month, day, year
- TIME - Military time (1000, 1400, 2320)
- SAMPLE - Description of sample (include matrix, point of sample, and preservatives used - if any).
- ANALYTE - Analysis which will be performed (if more than one analysis is being done on samples from that job).
- TAKEN BY - Initials of person taking sample

OHM Corporation

QUALITY POLICY AND

PROCEDURE APPROVAL

AND REVISION RECORD

Document #: QP-606.1	Title: Sample Packaging and Shipping of Environmental Samples

APPROVAL

Name	Title	Signature	Date
R. Steven Shirley	QA/QC Officer		5/10/95
Guy Gallello, Jr.	Mngr. Field Tech.		5/10/95
Thomas E. Gran	Dir. Tech. Svcs.		5/10/95

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Sample Packaging and **Document #:** QP-606.1

Shipping of Environmental Samples

Date Issued: May 10, 1995 **Rev:** 0 **Date:** May 10, 1995

1.0 PURPOSE

1.1 To comply with Department of Transportation (DOT) laws and regulations.

1.2 To establish procedures for the packaging, labeling, and shipment of environmental samples.

1.3 To establish function-specific responsibilities for the packaging, labeling, and shipment of environmental samples.

2.0 SCOPE

2.1 This procedure applies to the packaging and shipping of environmental samples for transfer from the field to a laboratory for analysis. Specifically, this document outlines shipping and sample documentation procedures that are in accordance with the U.S. Department of Transportation (DOT) and Hazardous Waste Remedial Actions Program (HAZRAP).

2.2 This procedure is applicable only for environmental samples. Environmental samples for this procedure are defined as samples of naturally occurring materials (i.e. soil, gravel, or rock; water from groundwater, a stream, or pond; or ambient air or absorbent tubes used in the collection of contaminates from air) which may have low levels of chemical contamination.

2.3 If the environmental sample is contaminated to the point where the sample takes on the hazardous characteristic of the chemical contaminant of concern, or in the best judgement of the sampler, it is likely that this sample may have the same hazardous characteristics as the chemical contaminant, then the sample is no longer considered an environmental sample and is to be packaged and shipped according to DOT regulations for that hazardous characteristic.

2.4 If you are not absolutely positive a sample is being shipped correctly, or if it can be shipped by a particular mode of transportation, call your Technical Service department.

3.0 REFERENCES

3.1 HAZWRAP, July 1990. Quality Control Requirements for Field Methods DOE/HWP69/R1.

3.2 HAZWRAP, July 1988. Requirements for Quality Assurance of Analytical Data, DOE/HWP-65, Rev. 0, July 1988.

3.3 U.S. Department of Transportation, 1983. Hazardous Materials Regulations, 49 CFR 171-177.

3.4 United States Environmental Protection Agency, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

3.5 DANGEROUS GOODS REGULATIONS 36 Edition, Effective 1 Jan. 95, International Air Transport Association (IATA)

4.0 GENERAL INFORMATION

4.1 Proper packaging and shipping procedures are followed in order to ensure that all environmental samples received are undamaged and free from cross contamination.

5.0 DEFINITIONS

5.1 Carrier - A person or firm engaged in the transportation of passengers or property.

5.2 Chain-of-Custody (COC) Record Form - A COC Record Form is a printed form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one

custodian to the subsequent custodian. Attachment 9.1 shows a typical COC Record. The COC Record Form is a controlled document. The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The COC procedures track the evidence from the time and place it is first obtained to the courtroom. These procedures also provide an auditable trail for the evidence as it is moved and/or passed from the custody of one individual to another. In addition, procedures for consistent and detailed records facilitate the admission of evidence under Rule 803(b) of the Federal Rules of Evidence (P.L. 93-575).

5.3 Custodian - The person responsible for the custody of samples until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under your custody if:

5.3.1 You possess the sample.

5.3.2 It is in your view, after being in your physical possession.

5.3.3 It was in your physical possession and then you locked it up to prevent tampering.

5.3.4 You have designated and identified a secure area to store the sample.

5.4 Environmental Sample - Sample of a naturally occurring material such as soil, gravel, or rock; water from groundwater, a stream, or pond; or ambient air or absorbent tubes used in the collection of contaminates from air which may have low levels of chemical contamination, but do not take on the hazardous characteristics of the chemical contaminant as defined by 49 CFR 171.8, 49 CFR 172.101, or 49 CFR Part 173 or 173.2a.

5.5 Hazardous Waste Sample - Medium to high concentration sample (e.g., source material sludge, leachate) requiring DOT placarding and Contract Lab handling as a high hazard sample.

5.6 Hazardous Material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce ("commerce" here to include any traffic or transportation). Defined and regulated by DOT (49 CFR 173.2) and listed in Attachment 9.2.

5.7 Hazardous Waste - Any substance listed in 40 CFR Subpart D (261.30 et seq) or 40 CFR otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under Subpart C (261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by the EPA.

5.8 Marking - Applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof are required to be placed on the outside of the containers of hazardous materials.

ID - 8027

5.9 Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 172.

DOT-approved fiberboard box or other approved DOT shipping container

5.10 Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Class 9, Miscellaneous Dangerous Goods

5.11 Reportable Quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous Materials Table (49 CFR 172.101). Indicates the reportable quantity of

the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to CFR 171.15-17 concerning hazardous materials incidents reports. The RQ notation must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which my be used for this purpose.

6.0 RESPONSIBILITIES

6.1 The sample team leader is responsible for defining whether samples planned for collection are environmental or hazardous. Responsible for determining that samples are properly packaged and shipped, and for determining that the COC procedures are implemented from the time the samples are collected to their release to the shippers.

6.2 The sample technologist is responsible for implementing the packaging and shipping requirements and for initiating the COC records until they are relinquished to another custodian, to the shipper, or to the carrier.

7.0 PROCEDURE

7.1 Environmental Sample Type Determination

7.1.1 In general, environmental samples are collected from natural matrices such as soil, streams, ponds, or wells and are not contaminated to the point that the samples meet the DOT or EPA definition of a hazardous waste.

7.1.2 If the sample, to the sampler's best judgement has the characteristics of a hazardous material, it is to be shipped in accordance to the suspected characteristic hazard that best represents the sample in accordance to 49 CFR 172.101 (c) (ii).

7.2 Packaging and Shipping of Environmental Samples

7.2.1 Assure that the environmental sample is collected in a container which meets the requirements specified for laboratory analyses and that it is appropriately labeled.

7.2.2 Assure that the container is tightly sealed.

7.2.3 Place the sample container in two Ziplock bags and seal the bags.

7.2.4 Wrap the sample in bubble wrap.

7.2.5 Place the sample in a cooler or other approved DOT shipping container lined with a large polyethylene bag.

7.2.6 Pack the container with enough ice to maintain the appropriate temperature.

7.2.7 Seal the polyethylene bag.

7.2.8 Seal the cooler lid.

7.2.9 Seal cooler drain and lid with duct tape.

7.2.10 Place four signed custody seals over the cooler lid.

7.3 The shipping containers must have an identification label on the outside and must be marked in the following manner:

7.3.1 Proper Shipping Name: Other Regulated Substances

7.3.2 Hazard Class Label: Class 9

7.3.3 UN/NA Number: ID 8027

7.3.4 DOT Placard: None required

7.3.5 "Inside Packages Comply With Prescribed Specifications"

7.3.6 "THIS SIDE UP" on top of container and upward-pointing arrows on all four sides

7.4 The following shipping papers are to accompany the container:

7.4.1 DOT shipping papers: Bill-of-Lading or Airbill.

7.4.2 A COC Record Form (See Attachment 9.1).

7.4.2.1 One copy of the COC form must be retained in the project file.

7.5 Transfer of Custody and Shipment

7.5.1 When transferring the possession of samples, the individuals relinquishing and receiving the sample(s) will sign, date, and note the time on the COC Record.

7.5.2 Sign, date, and enter the time under "Relinquished by" entry.

7.5.3 Make sure that the person receiving the sample(s) signs for the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by."

7.5.3.1 Common carriers will usually not accept responsibility for handling COC Record Forms; this necessitates packing the record in the sample container (enclosed with the other documentation in a plastic Ziplock bag). As long as custody forms are sealed inside the sample container and the custody seals are intact, commercial carriers are not required to sign off on the custody form.

7.5.4 Enter the bill-of-lading or Federal Express airbill number under "Remarks or Reason for Change of Custody", if appropriate.

8.0 EQUIPMENT

* Teflon and Nylon Strapping Tape

* COC Record Form

* Vermiculite or Styrofoam Packaging Materials

* Sampling Gloves

* Reclosable Plastic Bags

* Permanent Felt Tip Marker

* Black Permanent Ink Pen

* Shipping Cooler or other DOT-approved shipping container

* Ice or Blue Ice

* Hazard Class Label

* Placard

* Absorbent Pads

9.0 ATTACHMENTS

9.1 Chain-of-Custody Record Form

9.2 DOT Hazardous Materials Classification (49 CFR 173.2)