WORK/SAMPLING PLAN

Site Inspection of Site 21 -
Battery and Drum Disposal Area
Contract Task Order 0023

Naval Weapons Station
Yorktown, Virginia

Prepared for:

Naval Facilities Engineering Command
Atlantic Division
Norfolk, Virginia

Under:

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SECTION 1

INTRODUCTION

This work plan has been prepared by Roy F. Weston, Inc. (WESTON) for the Site Inspection (SI) of Site 21 at the Naval Weapons Station (WPNSTA), Yorktown, Virginia. Site 21 is a former battery and drum disposal area located in the Northeast portion of WPNSTA Yorktown (as shown in Figure 1). A more detailed site description is provided in the following section.

The objectives of this SI is to verify and quantify the existence of contamination at Site 21 caused by past disposal practices. This SI is being conducted according to requirements of federal facilities listed on the Federal Agency Hazardous Waste Compliance Docket under the Superfund Amendments and Reauthorization Act of 1986 (SARA).

According to SARA, each federal facility listed on the docket is required to perform a Preliminary Assessment, which includes discovery and notification of the site. For WPNSTA Yorktown, the initial assessment study (IAS) completed by C.C. Johnson & Associates and CH2M Hill in July 1984 is essentially equivalent to a PA. The IAS for WPNSTA Yorktown identified and evaluated 19 sites on the station, however, Site 21 was not included in the IAS, as it had not yet been discovered. The IAS recommended SI activities at the 19 sites at WPNSTA Yorktown; and these were subsequently performed and documented in the Dames & Moore, June 1986, Confirmation Study report. Although not formally presented in an IAS format, the discovery (PA) phase for Site 21 has been completed. Further investigation is warranted to satisfy analytical and site characterization requirements for an SI.

Incorporated into this work plan is a Sampling Plan describing the method, sequence, and rationale for conducting drilling and sampling at Site 21. Samples of subsurface soil, groundwater, and surface soil will be collected and analyzed for priority pollutant metals, target compound list - volatile organic compounds (TCL-VOCs), total petroleum hydrocarbons (TPH), and TCL-semivolatile organic compounds (TCL-SVOCs).

Also incorporated in this work plan is a Health and Safety Plan (HASP) that defines the health and safety requirements for conducting the SI at Site 21. The HASP presents the minimum requirements for health and safety that must be met by all personnel engaged in any site activity.

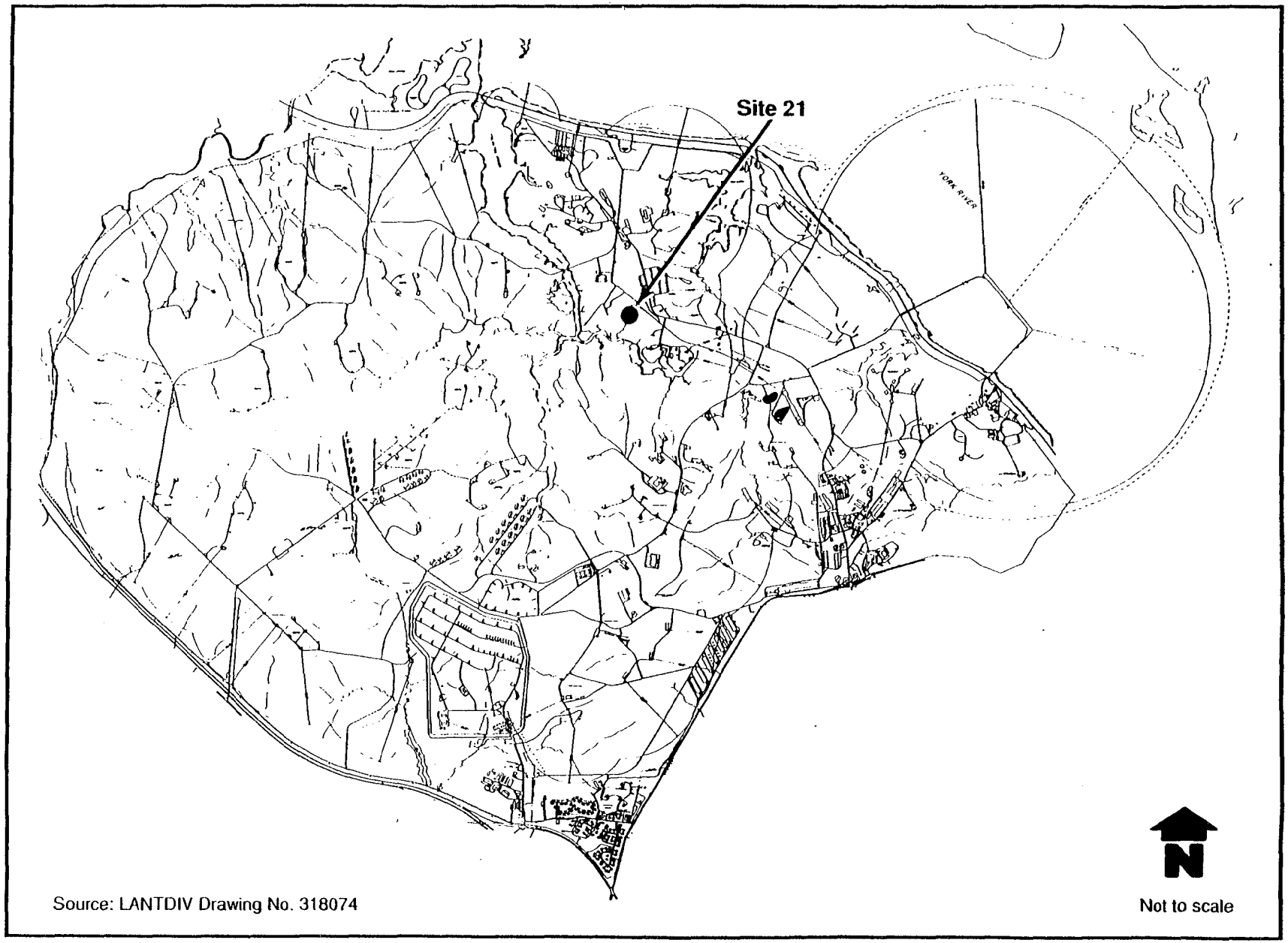


FIGURE 1 LOCATION OF SITE 21 AT WPNSTA

SECTION 2

SITE BACKGROUND AND PHYSICAL SETTING

2.1 SITE BACKGROUND

Site 21 is located on the WPNSTA Yorktown base which is a 10,000-acre facility located on the Virginia Peninsula, between the York and James River, adjacent to the York River (as shown in Figure 2). Bordering the facility on the west is the Naval Supply Center, Cheatham Annex; on the south is Route 17 and Interstate 64; and on the northeast is the York River and the Colonial Parkway.

WPNSTA Yorktown was established in 1918 (originally named the U.S. Mine Depot) to assist in the placement of mines in the North Sea during World War I. For 20 years after World War I the depot was active in weapons handling and storage. The facility was expanded during World War II to include three new TNT loading plants and a new torpedo facility. In 1944 and 1947, new laboratories were established for development and testing of high explosives and advanced weapons. The U.S. Mine Depot was renamed the U.S. Naval Weapons Station Yorktown in 1959. The purpose of the WPNSTA Yorktown today is to provide the U.S. Naval Fleet with advanced maintenance, production, and storage.

Site 21 is located in and adjacent to an intermittent stream valley to the southeast of Site 4 (as shown in Figure 3). Access to the dump site is by way of two unpaved, overgrown trails. Material at the site was dumped randomly on a hillside that slopes down to an intermittent stream. Surface water drainage from Site 21 appears to flow into the intermittent stream channel and ultimately into Felgates Creek located approximately 500 feet to the southwest of the site. This intermittent stream channel also receives surface water from the adjacent Site 4.

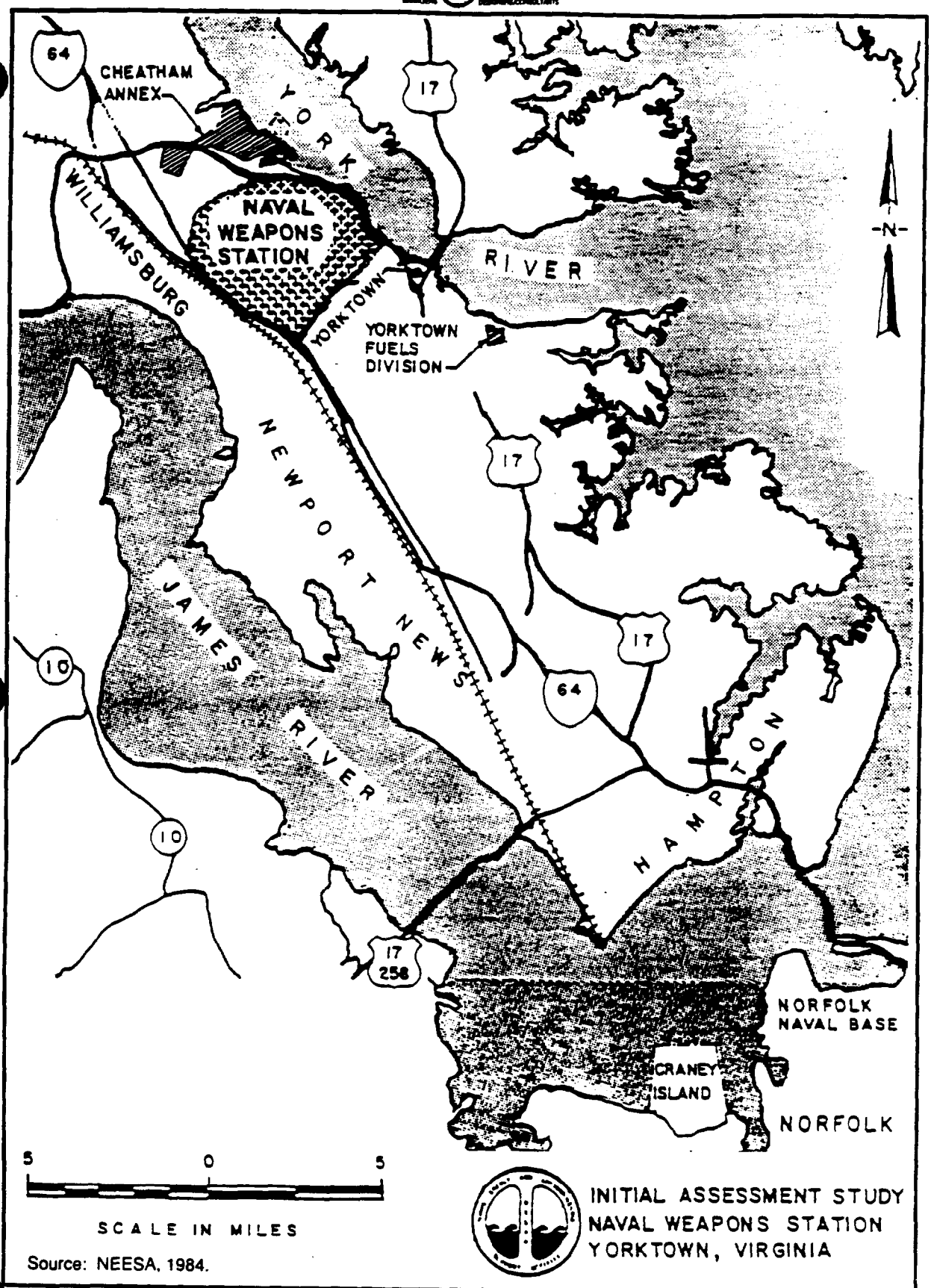
Observations of materials at the dump site include:

- drums and cans: 5 to 55 gallons (empty or filled with solids),
- cables, wires, rubber hoses,
- parabolic mirrors,
- scrap pipe and timber,
- decomposed military batteries, and
- light bulbs and ceramic insulators.

2.2 PHYSICAL SETTING

2.2.1 Climate

The following information was extracted from Versar (1991).



Source: NEESA, 1984.

FIGURE 2 VICINITY MAP, NAVAL WEAPONS STATION YORKTOWN, VIRGINIA

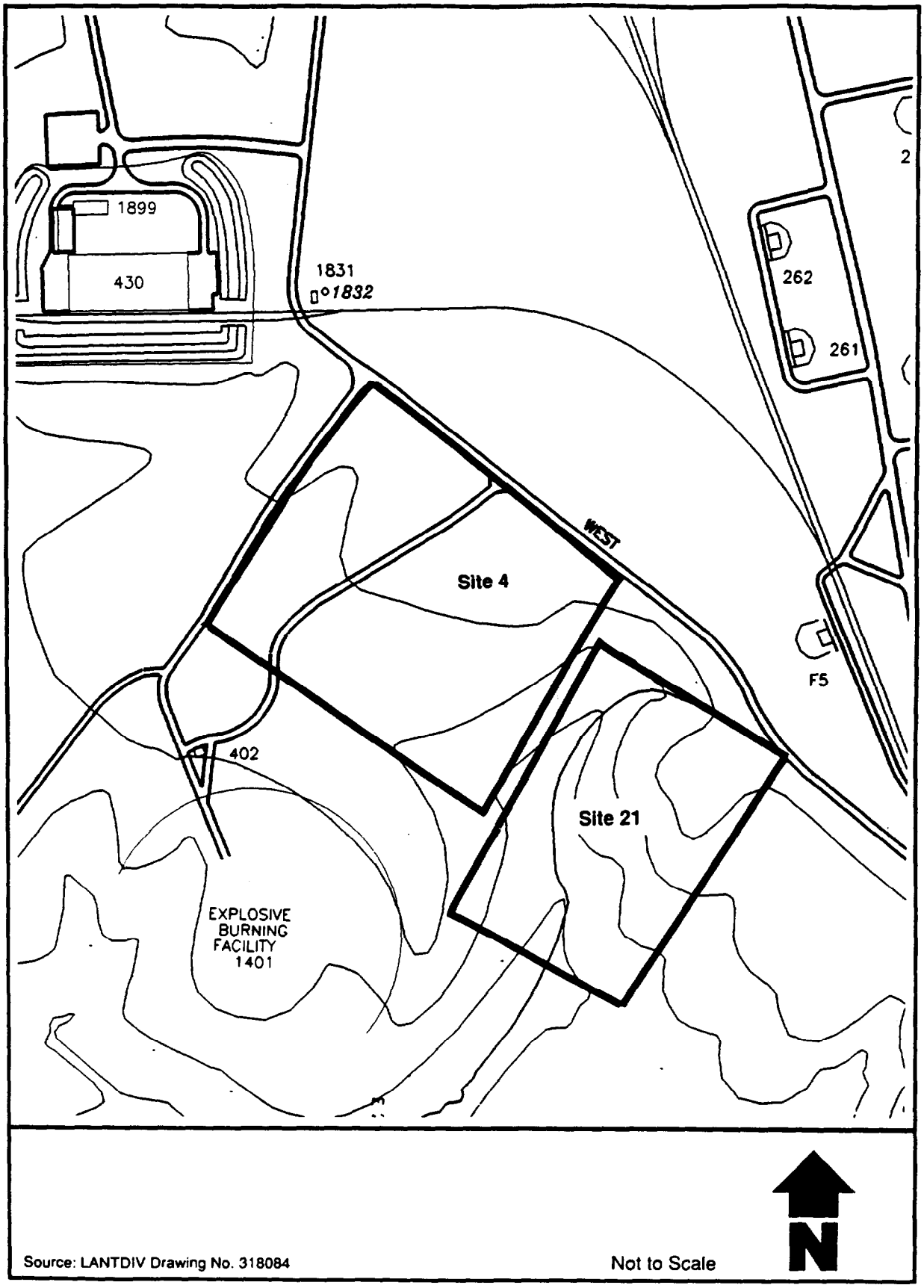


FIGURE 3 LOCATION OF SITE 21

"The climate of the Virginia Peninsula is moderate continental, with mild winters and long, warm summers. Average monthly temperatures in the area range from about 41°F in January to 79°F in July. Precipitation is well distributed throughout the year,with heaviest rains occurring in July and August. Prevailing winds are usually from the southwest, but northeasterly winds are common in some months. The average wind speed is 10.6 miles per hour (mph). Average annual net precipitation is approximately 45 inches."

2.2.2 Hydrogeology

WPNSTA Yorktown is located within the eastern portion Coastal Plain physiographic province. This province is characterized by unconsolidated sedimentary deposits of Cretaceous to Quaterny Age. Underlying these unconsolidated sediments is an eastward dipping basement comprised of igneous and metamorphic rock.

The unconsolidated sediments are comprised of alternating sequences of sand and clay deposits. In general, groundwater flows eastwardly through these sediments, the more permeable formations acting as aquifers and less permeable acting as aquitards. Table 1 outlines the hydrogeologic framework of the coastal plain physiographic province.

For the eastern part of the coastal plain, Laczniak and Meng (1988) note that groundwater increases in both dissolved solids and fluid potential with depth. In this portion of the Coastal Plain, regional groundwater flow systems discharge into the Atlantic Ocean and associated estuaries.

All proposed monitoring wells will be installed within the surficial water table aquifer (Columbia Group in Table 1). At Site 21, near surface groundwater flow should reflect topography with near surface groundwater flowing toward Felgates Creek. Because the water level in Felgates Creek is influenced by local tides, some tidal effect may be apparent for the groundwater levels in the vicinity of Site 21.

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TABLE 1
Hydrogeologic Units in the Coastal Plain, Virginia

Period	Epoch	Stratigraphic Formation	Hydrogeologic Unit
Quaternary	Holocene Pleistocene	Undifferentiated sediments	Columbia aquifer
Tertiary	Pliocene	Yorktown Formation	Yorktown confining unit
			Yorktown Eastover aquifer
	Miocene	Eastover Formation	
		St. Mary's Formation	St. Mary's confining unit
		Choptank Formation	
		Calvert Formation	Calvert confining unit
	Oligocene	Old Church Formation	Chickahominy-Piney Point aquifer
	Eocene	Chickahominy Formation	
		Piney Point Formation	
		Nanjemoy Formation	Nanjemoy-Marlboro confining unit
		Marlboro Clay	
	Paleocene	Aquia Formation	Aquia aquifer
		Brightseat Formation	Upper Potomac confining unit
			Upper Potomac aquifer
Cretaceous	Late Cretaceous	Equivalent of Black Creek Formation of North Carolina	Virginia Beach confining unit
			Virginia Beach aquifer
		Potomac Formation	Upper Potomac confining unit
			Upper Potomac aquifer
	Early Cretaceous		Middle Potomac confining unit
			Middle Potomac aquifer
			Lower Potomac confining unit
			Lower Potomac aquifer

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* Hydrogeologic units based on Harsh and Laczniak (1986).
* Table modified from Laczniak and Meng (1988).

SECTION 3

WORK PLAN RATIONALE

3.1 SOIL/GROUNDWATER SAMPLING

3.1.1 Objective

The objective of groundwater sampling is to determine if any contamination of groundwater has occurred at Site 21 as a result of past disposal practices.

The objectives of soil sampling are to:

- Establish contaminant concentrations with depth.
- Determine if and to what extent contamination of soils has occurred as a result of past disposal practices at Site 21.

3.1.2 Soil Boring and Monitoring Well Locations

At Site 21 three soil borings (located in Figure 4) will be drilled and sampled for analysis of priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs. Borings will be drilled until groundwater is encountered. Soil samples will be taken from each of the borings just above the water table and near the ground surface (top 6 to 12 inches of boring).

After the completion of the three borings, three groundwater monitoring wells will be installed at the locations of the soil borings. Groundwater samples will be collected and analyzed for priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs. The monitoring wells installed in the soil borings will provide groundwater samples upgradient, sidegradient, and downgradient to the site, and will aid in developing groundwater contours for the site. At Site 21 groundwater flow should reflect topography and flow towards Felgates Creek. These groundwater monitoring wells will be used to help determine the extent, if any, of groundwater contaminant migration towards Felgates Creek.

3.1.3 Surface Soil Sampling

At Site 21, 4 surface soil samples will be taken from the top 6 inches of the soil surface and analyzed for priority pollutant metals, TLC-VOCs, TPH, and TCL-SVOCs. These four surface soil locations will be determined in the field based on visual observations of suspected contamination (staining, artifacts, etc.) and topography. The surface soil samples can help quantify the contamination that is present at the soil surface and exposed directly to the environment (animals, humans, and other living organisms). The surface soil samples will also help quantify the potential contamination to the surface water and, potentially, to groundwater caused by surface runoff.

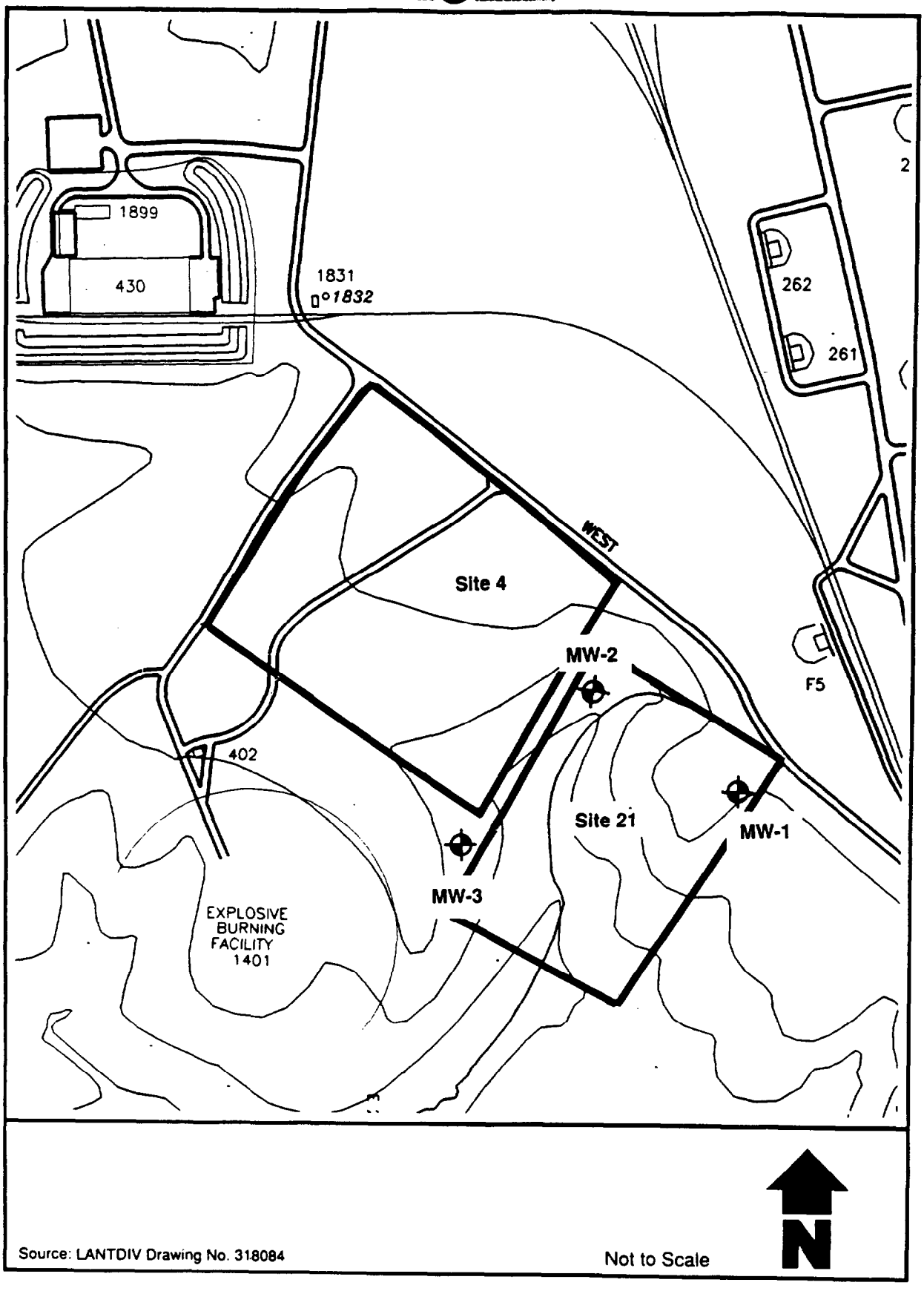

FIGURE 4 LOCATION OF SOIL BORINGS/MONITOR WELLS

SECTION 4

FIELD SAMPLING PLAN

This Field Sampling Plan has been developed for Site 21 of the Naval Weapons Station (WPNSTA), Yorktown, Virginia. The purpose of this plan is to identify the specific field investigation, sampling, and analysis procedures that will be used during the Site Inspection (SI) activities at Site 21. The Field Sampling Plan is based upon the activities outlined in Section 3. The Field Sampling Plan should be used concurrently with the Health and Safety, and laboratory Quality Assurance Plans which have been developed specifically for the Site 21 SI.

4.1 PROJECT DESCRIPTION

The objective of this SI is to verify and quantify the existence of contamination of Site 21. In order to accomplish this objective, sampling data will be gathered and evaluated.

4.2 FIELD ACTIVITIES

This section outlines the procedures the contractor will follow when conducting the SI field activities at Site 21. These activities were presented in Section 3 and will be discussed in more detail in the following subsections. Any deviations from these procedures that are necessitated by field conditions will be properly documented, approved by the Navy, and presented as an addendum to the Field Sampling Plan.

4.2.1 Monitoring Well Installation

4.2.1.1 Objective

The primary objective of installing three monitoring wells at Site 21 is to determine if any groundwater contamination has occurred from past disposal practices at the site. The objective will be accomplished through installing and sampling the three monitoring wells. The monitoring wells will be installed as shown in Figure 4. Section 4.3 gives detailed procedures for sampling.

4.2.1.2 Preparatory Activities

- A subcontractor who is licensed to install wells in the State of Virginia will be contracted to perform the drilling and monitoring well construction.
- LANTNAVFACENGCOM (Atlantic Division Naval Facilities Engineering Command) will approve all staked well locations prior to drilling.
- An approved water source for the driller's use in drilling and decontamination activities will be designated by WPNSTA Yorktown.
- A bulldozer will be used to clear any areas prior to drilling activities.

4.2.1.3 Field Equipment

- All equipment, materials, and manpower necessary to drill and construct the monitoring wells will be provided by the subcontractor.
- Decontamination equipment.
- Personal protective equipment.
- Sample equipment and packaging materials.
- Stakes and flagging.
- Field notebook.

The subcontractor will containerize all decontamination equipment, rinse water, drill cuttings, etc., and will retain on-site awaiting laboratory analysis. Solids and liquids will be containerized separately. Rinse water and well development water will be containerized separately where possible. WPNSTA Yorktown will be responsible for containerized material disposal.

4.2.1.4 Health and Safety

It is anticipated that this activity will be conducted in Level D protective equipment with potential upgrade based on volatile organics, flammable vapors and gases, and dust levels. See the site Health and Safety Plan provided in Appendix A.

4.2.1.5 Subcontractor Coordination

The Project Geologist is responsible for subcontractor coordination during field activity. All drilling activities will be performed under the supervision of the Project Geologist or designee.

4.2.1.6 Soil Boring

Soil samples will be collected and described from a split spoon. Soil samples for chemical analysis will be taken from spoons just above the water table and near the ground surface (as described previously). Soil samples for lithologic characterization will be collected using continuous split spoons. Blow counts will be recorded for each split spoon. A 4-¼-inch inside diameter hollow-stem auger will be employed to overdrill the borehole advanced with the split spoons.

Augers and split spoons will be decontaminated after every use. Augers will be pressure washed with water from an approved water source. Split spoons will be washed with water, rinsed with dilute nitric acid solution, again rinsed with water, rinsed with methanol or hexane, followed by a final rinse with deionized water. Air monitoring with an HNu and CGI will be required during all soil boring activities (as described in Appendix A).

4.2.1.7 Monitoring Well Construction

The materials and methods used in the construction of the three monitoring wells will be similar to those as follows:

- The well will be installed inside of the augers.
- Well depths will be approximately 15 feet, 25 feet, and 40 feet, respectively.
- Well casing will be pre-cleaned 2-inch inside diameter (ID) Schedule 40 PVC with flush threaded joints.
- Well screen will be pre-cleaned ten foot section of 2-inch ID Schedule 40 PVC with slotted openings of 0.01-inch slot size.
- The bottom of the well screen will be outfitted with a PVC end cap.
- Screen filter pact material will be #2 Virginia Sand. It will extend from total depth to at least 1 foot above the well screen and will be compatible with the screen and the aquifer material. The final depth to the top of the sand pack will be measured and recorded.
- A bentonite seal comprised of hydrated bentonite pellets will be placed directly atop the sand pack. The minimum thickness of the bentonite seal will be 1 foot. The final depth to the top of the bentonite seal will be measured and recorded.
- Annular grout will be composed of 20:1 cement/bentonite slurry or volclay grout. Grout composition and manner of emplacement will be recorded.
- The top of the monitoring well casing will be outfitted with a PVC slip-cap and labeled with the well identification.
- A 6-inch inside diameter steel protective casing will be installed over the 2-inch PVC well casing and will include a locking cap. All locks will be same keyed. Keys will be provided to LANTDIV and WPNSTA Yorktown.
- All wells will be identified in raised letters on the protective steel cover.
- Four steel protective posts will be installed surrounding each well.
- All drill cuttings will be contained on-site in 55-gallon drums until they are determined to be non-hazardous and an appropriate disposal method is approved by the State of Virginia. All drill cuttings will be placed near the well site for subsequent disposal by WPNSTA Yorktown.

During installation, the drill casing will be extracted in a manner which ensures that a continuous placement of sand pack, bentonite seal, and grout is installed. Any abandoned hole will be grouted in the same manner following receipt of approval from WPNSTA Yorktown. Installed wells will be checked when the grout has set for grout subsidence. If this occurs, the depression will be filled with a similar grout mix and the process repeated until firm grout remains at ground surface.

4.2.1.7.1 Well Development

In order to remove drilling fluid and cuttings from within the well, to set the sand pack around the screen, and to optimize the efficiency of the well, all wells will be developed after the grout has set (at least 24 hours after well completion). The following guidelines will be followed:

- Well development will proceed until specific conductivity, temperature and pH have stabilized (defined as less than 10% difference between consecutive measurements). At a minimum, the well will be developed until five times the standing water volume in the well, which includes the screen and casing plus saturated annulus (assuming 30 percent porosity), is removed or the well is bailed or pumped dry. All spent well development water will be containerized.

- The following data will be recorded as part of well development:

  - Water levels at start and finish.
  - Open depth to bottom of well.
  - Type of bailers or pumps used.
  - Time development started and finished.
  - Description of sediments being flushed out of wells and other physical changes in water.
  - Total amount of water removed from each well.
  - Specific conductivity, temperature, and pH will be measured at the start, twice during, and at the conclusion of development (defined as less than 10% difference between consecutive measurements).

4.2.2 Geologic Classification

Log sheets prepared for the drilling will include the lithologic description and, at least, the following procedural descriptions:

- Depth to first and subsequent water encountered, along with the method of determination.
- Description of drill rig configuration, manufacturer, model, pump type, bit type, rod sizes, and tool specifications.
- All special problems/events encountered at a site, i.e., lost auger, tools, hole collapse, grinding sounds, rig heaving, etc.

Log sheets will be included in the final reports.

4.3 SAMPLING ACTIVITIES

The sampling activities to be conducted at Site 21 are summarized in Table 2.

4.3.1 Groundwater Sampling

4.3.1.1 Objective

Groundwater sampling will be used to determine if any groundwater contamination has occurred as a result of past disposal practices at Site 21.

4.3.1.2 Sampling Locations

One round of groundwater sampling will be conducted at each of the three new monitoring wells installed at Site 21. The locations of these wells are shown in Figure 4.

4.3.1.3 Analytical Parameters

The groundwater samples taken from the three new monitoring wells will be analyzed for priority pollutant metals (total and dissolved), TCL-VOCs, TPH, and TCL-SVOCs. See the laboratory Quality Assurance Plan (QAP) for methods of analysis.

4.3.1.4 Preparatory Activities

The preparatory activities involve assembling the equipment, containers, and paperwork necessary for sampling.

Sampling containers and preservative requirements are presented in Table 3. The sampling bottles will be received pre-cleaned from the laboratory.

Table 2

Site 21 Sampling Summary

Media	Locations	Number of Samples: Environ.	Dupl.	Rinse Bl.	Trip Bl.	Field Bl.	Analysis
Groundwater	MW-1 thru MW-3	3	1	2	1*	1	- Priority Pollutant metals (total and dissolved) - TCL-VOCs - TPH - TCL-SVOCs
Surface Soil	To be determined	4	1	1	0	0	- Priority Pollutant metals - TCL-VOCs - TPH - TCL-SVOCs
Subsurface Soil	S1-NG thru S3-WT	6	1	1	1*	1	- Priority Pollutant metals - TCL-VOCs - TPH - TCL-SVOCs
	Total	13	3	4	2	2	

Notes: * Trip blanks are analyzed for VOCs only.
NG = Near Ground (top 6 inches to 12 inches).
WT = Above Water Table.

4.3.1.5 Field Equipment

Equipment used in the field consists of the following:

- Dedicated bailers of Teflon.
- Braided polyethylene cord.
- Water level probe and ruler.
- Sample bottles with preservative and packaging and shipping materials.
- Filtration equipment, including 0.45 μm cellulose ester membrane filters.
- Nitric acid, 10% solution and methanol or hexane solution.
- Deionized water.
- Field logbook.
- pH meter.
- Specific conductivity/temperature meter.
- Personal protective equipment.
- Plastic sheeting.
- Bucket and alconox for decontamination of water level probe.
- Air monitoring equipment (HNu and CGI).

4.3.1.6 Health and Safety

It is anticipated that personnel will collect samples in Level D safety attire, using latex gloves to collect samples. Air monitoring with an HNu and CGI will be required during all groundwater sampling activities. Refer to the Health and Safety Plan in Appendix A for specific guidelines.

4.3.1.7 Specific Protocols

All groundwater samples will be collected after the wells have been properly developed. All wells will be purged 5 volumes or until well is purged dry twice, prior to sampling.

4.3.1.7.1 Groundwater Sampling Procedures

Procedures for sampling wells are as follows:

- Measure and record the depth from the top of the casing to the top of the water. All measuring devices used in the well will be thoroughly rinsed with distilled water prior to use.

- Measure the depth from the top of the casing to the bottom of the well casing (total depth of cased hole). Determine the height and volume of standing water.

- Remove and containerize a quantity of water from the well equal to 5 times the calculated volume of water in the well casing. Such purging is necessary to meet static-condition sampling requirements.

- If a well goes dry during purging or bailing and recovery takes longer than 4 hours, allow the well to recover to 90% of the original water level and again empty the well.

- Record temperature, pH, and specific conductance measurements at least three times during purging of each well. Forward the information to the Navy, along with the cumulative water purged prior to each reading and the total water purged from the well prior to groundwater sampling.

- Obtain a sample for chemical analysis.

- Use a dedicated stainless steel or Teflon bottom filling bailer to obtain the sample. Attach a braided polyethylene cord to the steel leader which will be attached to the bailer and slowly lower the bailer into the well. After the bailer has filled, slowly raise the bailer from the well. Do not allow the bailer or the cord to touch the ground.

- Fill the two 40 ml septum vials for TCL-VOCS analysis first, ensuring no bubbles. Subsequently containerize the samples for TCL-SVOCs , TPH and total metals in the appropriate containers.

- Collect groundwater for filtering in an unpreserved, laboratory provided container. Filter the sample using a 0.45μm cellulose ester membrane filter. The filtered sample will be containerized in the pre-preserved (HNO_3) one-liter polyethylene bottle and labeled for dissolved metals analysis.

- Label the sample bottle with an indelible marker, recording the well location, sampler initials, time, analysis, and preservative. Seal sample bottles with chain-of-custody tape.

- Following sampling, place all bottles in a plastic Ziploc bag to guard against any bottle leakage during shipment and put them in a temperature-controlled (4°C) chest surrounded by vermiculite and ice.

- Deliver all groundwater samples to the laboratory as soon as possible.

- Decontaminate the sampling bailer or pump using an alconox wash, water rinse, nitric acid rinse, water rinse, hexane or methanol rinse, and deionized water rinse after sampling to prevent cross contamination between sampling wells. Materials incidental to sampling, such as tubing, will also be decontaminated prior to re-use. Dispose of the braided polyethylene cord appropriately after each well. Sampling equipment will be protected from the ground surface by clean plastic sheeting. No sampling will be accomplished when wind-blown particles may contaminate the sample or sampling equipment.

- A rinsate blank will be performed to verify the effectiveness of the decontamination procedures. Rinse blanks will be collected by pouring analyte-free laboratory-grade water over decontaminated equipment and collecting the water in a sample container. The rinse blank will be analyzed for priority pollutant metals (total and dissolved), TCL-VOCs, TPH, and TCL-SVOCs. One rinse blank will be submitted for this activity.

- A field blank will be performed to verify the lack of contamination in water used for decontamination. Field blanks will consist of samples of the water used for steam cleaning and the deionized water used as a final decontamination rinse. The field blanks will be analyzed for priority metals (total and dissolved), TCL-VOCs, TPH, and TCL-SVOCs.

- Field duplicate samples will be collected to demonstrate the reproducibility of the sampling technique. One field duplicate sample will be collected for each matrix sampled. The field duplicates will be analyzed for priority pollutant metals (total and dissolved), TCL-VOCs, TPH, and TCL-SVOCs. Duplicate samples will be labeled with a different number than their corresponding samples.

- Trip blanks, provided by the laboratory, will be shipped with the samples for each activity. Trip blanks will be analyzed for TCL-VOCs only.

- Record any pertinent sample observations (color, odor, etc.) in the logbook.

Following sampling, the well cap will be replaced, and the well will be locked and returned to its original condition. The Health and Safety Plan will be followed for the sampling and decontamination of equipment (see Appendix A). Decontamination will include washing down all equipment with an alconox wash and rinsing with dilute nitric acid followed by water.

4.3.1.7.2 Sample Preservation Procedures

To prevent or retard the degradation/modification of chemicals in samples during transportation and storage, the groundwater samples will be preserved and stored as outlined in Table 3.

All groundwater samples for priority pollutant metals analysis will be preserved with nitric acid to pH <2 and kept cool at 4°C using ice. All samples to be analyzed for TPH will be preserved with hydrochloric acid and kept cool at 4°C using ice.

4.3.1.7.3 Sample Identification and Management Procedures

All groundwater samples collected at Site 21 will be identified and documented by procedures outlined below. The samples collected will be labeled at the time of collection. The label will indicate sample location, date and time of sampling, sampler initials, preservative, and analyses to be run on the sample. It will be covered with waterproof

Table 3

Groundwater Containers, Preservation, and Holding Time

Analysis	Container	Volume	Preservative	Holding Time (days)
Metals	Polyethylene bottle	1 liter	HNO_3 to pH<2 Cool, 4°C	180
Volatiles	Glass vial with teflon-lined Septa	2-40 ml	HCL Cool, 4°C	14
Semivolatiles	Glass with teflon-lined lid	1 liter	Cool, 4°C	Extract within 7 days, analyze 40 days
Total Petroleum Hydrocarbons	Glass	1 liter	HCL Cool, 4°C	28

Analytical methods from SW846.

transparent tape to protect it from water attack. Field sample numbers for monitoring wells will be MW-1 through MW-3.

The chain-of-custody form will be completed prior to sealing the cooler. One copy of the chain-of-custody form is retained by the sampling team, and the other copies are placed in a plastic Ziploc bag and taped to the inside of the cooler lid. The cooler will be secured with packing tape (preferably fiber-type) and will be sealed with a custody seal as part of the chain-of-custody process. The seal is placed on the cooler so that opening the cooler will cause the seal to break.

Samples will be immediately transported from Site 21 to the contractor's laboratory to meet the specified holding times. All analyses of samples will be conducted at this laboratory.

Sampling containers and preservative requirements are presented in Table 3. The sampling bottles will be received pre-cleaned and pre-preserved from the laboratory.

4.3.2 Soil Sampling

4.3.2.1 Objective

Soil sampling of the surface soils will be conducted to evaluate the quantity of contamination directly exposed to living organisms and determine the potential contamination threat to surface water and groundwater due to surface runoff. Subsurface soil sampling will be performed to see if any soil contamination has occurred from Site 21 dumping operations.

4.3.2.2 Sampling Locations

Four surface soil samples will be collected at locations determined in the field at Site 21.

Two subsurface soil samples will also be collected from each borehole in which the groundwater monitoring wells are to be installed (as shown in Figure 4). Two split-spoons per boring (one near ground surface and one above the water table) will be collected for laboratory analysis.

4.3.2.3 Analytical Parameters

Each of the surface soil samples will be analyzed for priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs. This will be accomplished by using the methods of analysis identified in the QAP.

The subsurface samples from the borings will also be analyzed for priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs using methods of analysis identified in the QAP.

4.3.2.4 Preparatory Activities

The preparatory activities involve assembling the equipment, containers, and paperwork necessary for sampling. Actual sampling locations will be staked in the field during site reconnaissance.

Sampling containers and preservative requirements are presented in Table 4. The sampling bottles will be received precleaned from the laboratory.

4.3.2.5 Field Equipment

Equipment to be used for surface soil sampling includes:

- Disposable stainless steel scoopulas.
- Sample bottles and packaging and shipping materials.
- Field logbook and chain of custody forms.
- Personal protective equipment.
- Stainless steel buckets, long-handled brushes, and alconox.
- Dilute nitric acid solution (10%), hexane or methanol, and deionized water.

4.3.2.6 Health and Safety

It is anticipated that personnel will collect samples in Level D safety attire. Air monitoring with an HNu, RAM or Mini-RAM, and CGI will be required during all soil sampling activities. Refer to the Health and Safety Plan in Appendix A for specific guidelines.

4.3.2.7 Specific Protocols

Each soil boring subsurface sample will be taken at the depths previously discussed in Section 3.1.2. Each surface soil sample will be taken from the top 6 inches of the soil surface as stated in Section 3.1.3.

4.3.2.7.1 Soil Sampling Procedures

The surface soil samples will be collected with a stainless steel trowel and placed directly into sample bottles without disturbing the sample. Duplicate samples will be collected in the same manner adjacent to the first sample.

The soil boring subsurface samples will be collected with a split spoon sampler and put into sample bottles without disturbing the sample. For duplicate samples, the soil in the split spoon sampler will be divided equally.

Table 4

Soil Sample Containers, Preservation, and Holding Time

Analysis	Container	Volume	Preservative	Holding Time (days)
Metals	Amber glass bottles with Teflon-lined top	8 ounces	Cool, 4°C	180
Volatiles	Glass jar with teflon-lined Septa	4 ounces	Cool, 4°C	14
Semivolatiles	Glass jar with Teflon-lined lid	8 ounces	Cool, 4°C	Extract within 14 days, analyze 40 days
Total Petroleum Hydrocarbons	Glass	8 ounces	Cool, 4°C	28

Analytical methods from SW846.

The actual procedures that will be implemented in the field are as follows:

- Obtain soil samples near the ground surface and above the water table via subsurface soil boring samples.
- Record depth of sample and visual observations in the field notebook.
- Examine and record in the field notebook soil cover textures, color, and description of materials excavated.
- Label the sample bottles and record all information in the field notebook.
- Following sampling, place all bottles in a plastic Ziploc bag to guard against any bottle leakage during shipment and then put them in a temperature-controlled (4°C) chest surrounded by vermiculite and ice. Seal sample bottle with chain-of-custody tape.
- Deliver all soil samples to the laboratory as soon as possible.

4.3.2.7.2 Sample Preservation and Holding Time Requirements

To prevent or retard the degradation/modification of chemicals in samples during transportation and storage, the samples will be stored as indicated below. Specific quality assurance/quality control procedures that will be followed during the Site Inspection at Site 21 are presented in the site QA/QC plan (authored and controlled by the subcontracted analytical laboratory). For soil sampling all samples should be kept cool at approximately 4°C. This requirement will be attained by keeping the samples on ice.

4.3.2.7.3 Sample Identification and Management Procedures

All soil samples collected at Site 21 will be identified and documented by the procedures outlined below.

The samples collected will be labeled at the time of collection. The label indicates location, date and time of sampling, sampler initials, preservative, and analysis to be run on the sample. Identification of sampling locations will be recorded with an indelible marker and/or the label will be covered with waterproof transparent tape to protect it from water attack. The surface soil samples will be labelled SS-1 through SS-4. The subsurface soil boring samples will be labelled to correspond to the monitoring well and location of sample (NG = Near Ground, WT = Above Water Table). They will be labelled S1-NG through S3-WT.

Following sampling, the samples will be placed in coolers and surrounded by vermiculite and ice.

The chain-of-custody form will be completed prior to sealing the cooler. One copy of the chain-of-custody form is retained by the sampling team, and the other copies are placed in a plastic Ziploc bag and taped to the inside of the cooler lid.

The cooler will be secured with packing tape (preferably fiberglass-type) and will be sealed with a custody seal as part of the chain-of-custody process. The seal is placed on the cooler so that opening the cooler will cause the seal to break.

Samples will be immediately transported from Site 21 to the contractor's laboratory to meet the specified holding times.

APPENDIX A

HEALTH AND SAFETY PLAN
FOR
SITE 21

SITE HEALTH AND SAFETY PLAN (HASP) FORM

Prepared By Mike Ervine Date 9/16/91 W.O. # 6629-01-03

I. General Information

A. Project Identification

1. Division DATD 2. Department/Office Concept/Glenloch

4. Site Name Yorktown NWS Site 21 5. Client Baker

6. Work Location Address _____ Yorktown VA
(Street Address) (City) (State) (Zip)

B. Site History

1. Describe briefly Forested area used for past dumping of batteries and some dry cleaning agents.

C. Scope of Work

1. Describe briefly Drilling monitor wells and sampling soil, groundwater, and surface soil sampling.

( ) Site Visit only, Site HASP not necessary, list personnel here & sign-off below:

_____, _____, _____, _____

D. Hazard Assessment and Regulatory Status

1. Indicate Yes (Y)/No (N) to types of hazards anticipated. (Y) Physio-chemical; Toxic Chemical - Levels (N) >TLV-TWA, (N) >TLV-STEL, (N) >IDLH; (Y) Bio-Hazards; (N) Radiation; (Y) Physical; (N) Construction type; (N) Industrial type; (N) Nuclear Industry type

2. Site Regulatory Status: CERCLA/SARA - ( ) U.S. EPA, ( ) State, ( ) NPL Site; RCRA - ( ) U.S. EPA, ( ) State; OSHA - ( ) 1910, ( ) 1926, ( ) State; NRC - ( ) 10 CFR 20; Other Fed. Agency - ( ) DOE, ( ) USATHAMA, ( ) Air Force;

Based on the Hazard Assessment and Regulatory Status, determine the Standard HASP(s) applicable to this project. Indicate below which Standard Hasp will be used and append the appropriate pages of this Form along with the Standard Plan.

3. Standard Plan to be used: ( ) Stack Test ( ) Air Emissions ( ) Asbestos ( ) Industrial Hygiene ( ) Life Systems ( ) Hazardous Mat. ( ) Construction ( ) NRC/DOE ( ) USATHAMA ( ) Air Force

D. Review and Approval Documentation

1. Reviewed By: a. P.M. Judith A McCarthy Date 9/16/91
b. P.D. _____ Date _____
c. DSO/RSO _____ Date _____
d. SHSC _____ Date _____

2. Approved BY: _____ Date _____
( ) a. Corporate Health and Safety Director (CHSD)
( ) b. DSO/RSO (Only with specific delegation by CHSD)

Project Start Date 9/30/91 ;End Date 2/92. **This Site HASP must be Reissued/Reapproved for any activities conducted after: Date** _____
Amendment Date(s) 1._____ 2._____ 3._____ 4._____ 5._____

VII. HEALTH AND SAFETY PLAN APPROVAL/SIGN OFF FORMAT

1. Site Name Yorktown NWS Site 21 2. WO# 6629-01-02

Work Location Address Yorktown VA
(Street Address) (City) (State) (Zip)

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

Site Safety Co-ordinator	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
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Name	Signature	Date
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SECTION 1

SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.1 INTRODUCTION

The following Health and Safety Plan (HASP) defines the health and safety requirements for the site characterization study at Site 21 at the Naval Weapons Station (WPNSTA), Yorktown, Virginia. It presents the minimum requirements for health and safety that must be met by all personnel engaged in site operations. This HASP does not in any way relieve contractors from responsibility for the health and safety of their personnel. Contractors shall be required to review site conditions and work to be performed to determine specific health and safety requirements for their personnel. Any authorized site visitors (e.g., WPNSTA Yorktown personnel or others) shall be required to comply with the approved HASP to gain entry.

All personnel engaged in site operations must have a minimum of 40 hours of health and safety training and have the knowledge to perform assignments without endangering themselves or others. All personnel are required to have undergone annual refresher training.

This HASP has been written to be consistent with all applicable federal, state, and local health and safety requirements. Specific references consulted in assembling the HASP include:

- 29 CFR 1910 and 1926 (Occupational Safety and Health Administration (OSHA) General Industry and Construction Standards, respectively)
- 40 CFR 260-270 (U.S. Environmental Protection Agency (EPA) Solid Waste Standard)

The objective of the characterization effort is to determine the extent and magnitude of priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs contamination on Site 21, and to determine whether this contamination has infiltrated the groundwater. This plan specifically covers the following tasks:

- Installation of groundwater monitoring wells.
- Drilling soil borings.
- Collection of subsurface soil, groundwater, and surface soil samples.

1.2 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

Site 21 is located on the WPNSTA Yorktown base which is a 10,000-acre facility located on the Virginia Peninsula, between the York and James River, adjacent to the York River (as shown in Figure A-1). Bordering the facility on the west is the Naval Supply Center,

Cheatham Annex; on the south is Route 17 and Interstate 64; and on the northeast is the York River and the Colonial Parkway.

Site 21 is located in and adjacent to an intermittent stream valley to the southeast of Site 4 (as shown in Figure A-2). Access to the dump site is by way to two unpaved, overgrown trails. Observations of materials at the dump site include:

- Drums and cans: 5 to 55 gallons (empty or filled with solids).
- Cables, wires, rubber hoses.
- Parabolic mirrors.
- Scrap pipe and timber.
- Decomposed military batteries.
- Light bulbs and ceramic insulators.

Surface water drainage from Site 21 appears to flow into the intermittent stream channel and ultimately into Felgates Creek located approximately 500 feet to the southwest of the site. This drainage route is similar for the adjacent Site 4. Groundwater, subsurface soil, and surface soil samples will be analyzed for priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs.

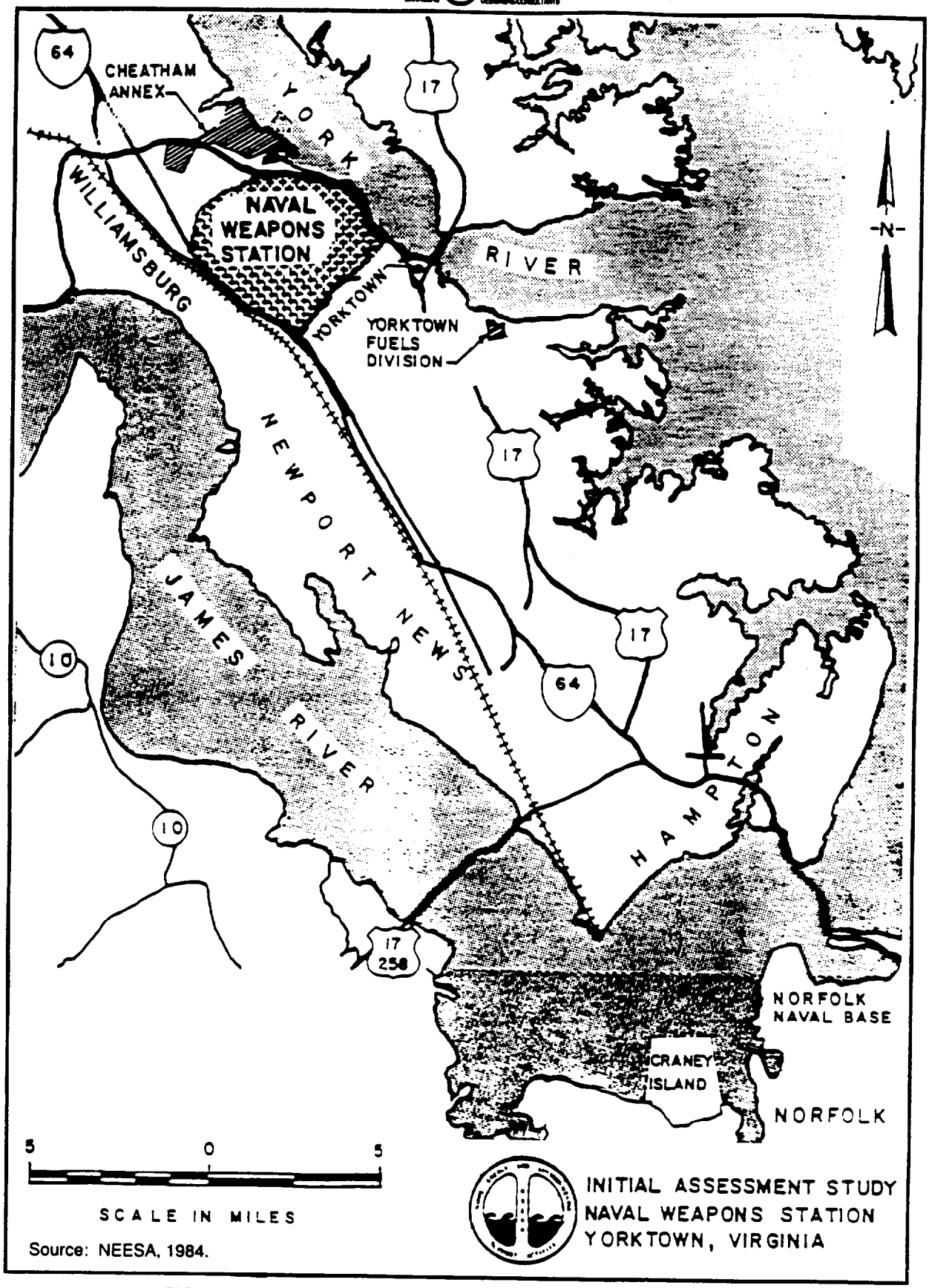


FIGURE A1 VICINITY MAP, NAVAL WEAPONS STATION YORKTOWN, VIRGINIA

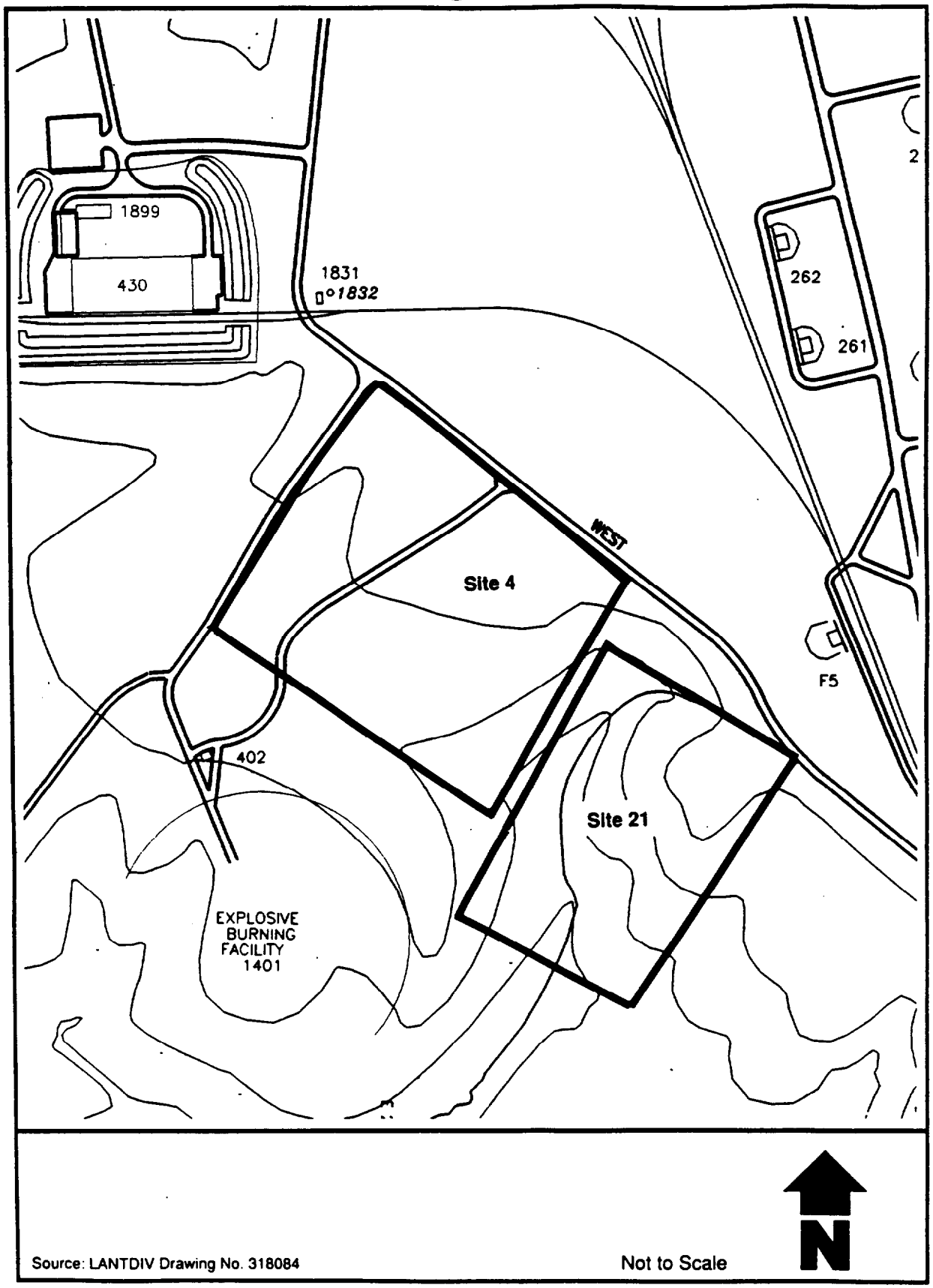


FIGURE A-2 LOCATION OF SITE 21

SECTION 2

STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

Personnel shall be aware of the site organization and the responsibilities and qualifications of each organization member. Figure A-3 presents a diagram of the staff organization for the site characterization. The general responsibilities of each are discussed below.

In general, personnel shall possess the necessary qualifications consisting of sufficient knowledge gained through experience and training to effectively execute the duties of their position.

2.1 ENGINEER-IN-CHARGE/ENVIRONMENTAL PROTECTION SPECIALIST

At the top of the site organizational structure are the Engineer-in-Charge (EIC) and Environmental Protection Specialist (EPS). Both the EIC and the EPS are representatives of LANTNAVFACENGCOM and are the primary offsite contacts.

2.2 PROJECT TEAM LEADER

The Project Team Leader (PTL) is a WESTON employee and represents the highest level of authority on site. The PTL is responsible for reporting to the contracting officer/ environmental coordinator, directing response operations, controlling site activities, and acting as the authority behind implementation of the site health and safety program.

2.3 SITE SAFETY AND HEALTH OFFICER

The site safety and health officer (SSHO) from WESTON reports directly to the PTL and is responsible for implementing the health and safety program in the field. The SSHO directly advises the PTL on all aspects of health and safety on site and advises the PTL to cease or change operations in the event that worker or public safety or health are threatened. Depending upon the activities being conducted on-site, the PTL may also function as the SSHO in certain situation.

2.4 FIELD TEAM LEADER

The Field Team Leader (FTL) from WESTON reports directly to the PTL and may serve as PTL in the absence of the PTL. The FTL is responsible for day-to-day field operations and communications on-site.

2.5 WORK PARTY

The work party is responsible for completion of onsite tasks and for complying with all aspects of the site health and safety program.

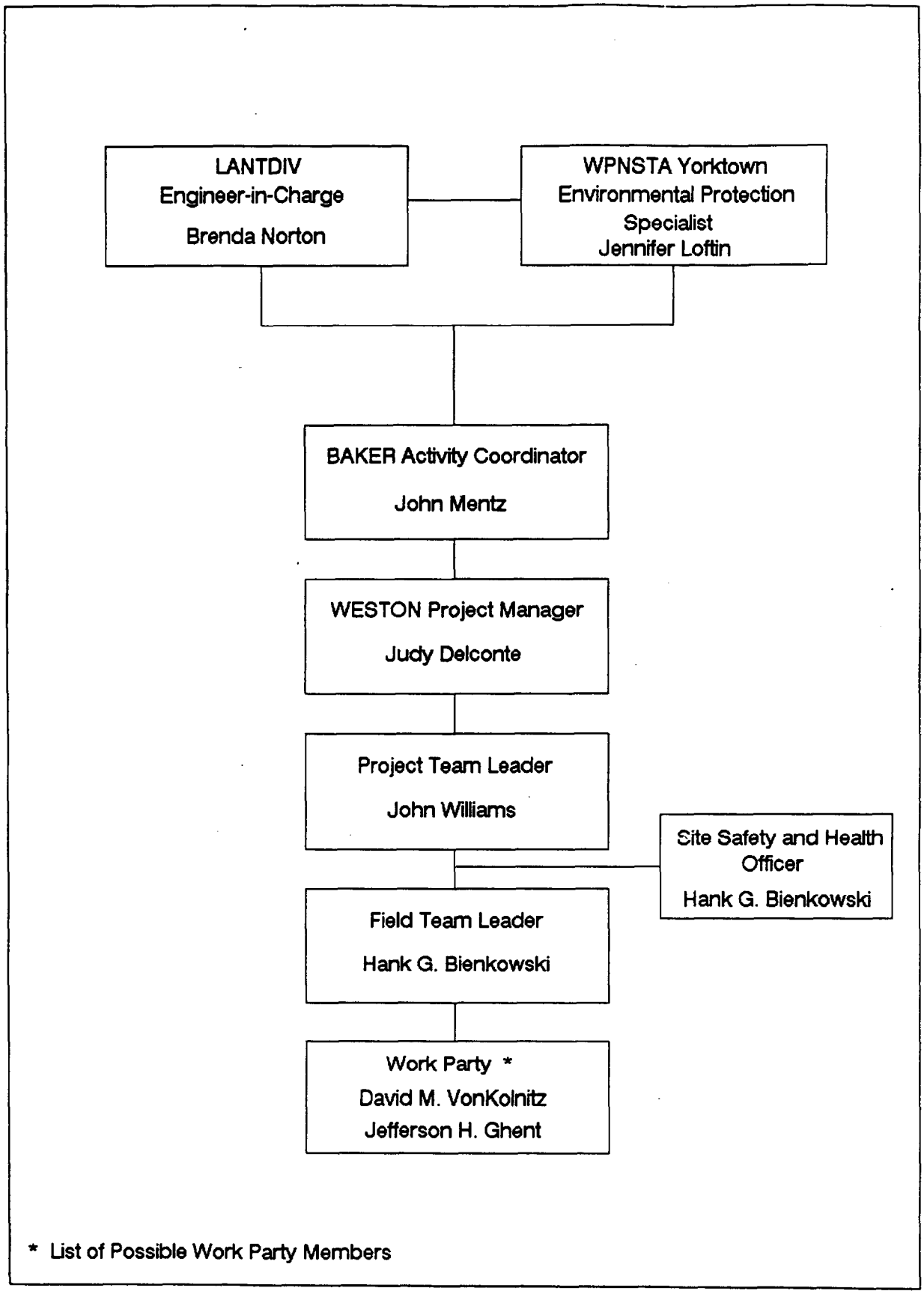


FIGURE A-3 STAFF ORGANIZATION

SECTION 3

HAZARD ASSESSMENT

Personnel shall be aware of any chemical, physical, and biological hazards associated with each task. The chemical hazards are associated with those materials that are known to be onsite, and those that may be encountered during intrusive activities. The physical hazards are those associated with drill rig operations and general site conditions in rural settings. Due to the distance between the site and the nearest potential offsite receptor, risks to offsite personnel are considered negligible.

3.1 CHEMICAL HAZARDS

Potential chemical hazards of concern at Site 21 are priority pollutant metals, TCL-VOCs, TPH, and TCL-SVOCs. Exposure to these potential chemical hazards could occur through direct skin contact, inhalation, and ingestion. The sources of these potential hazards appear to have been randomly dumped on the site. Some of these sources are decomposed military batteries and chemical storage drums and cans. Specifically found at the site were Le Clanche and Burgess batteries. The chemical hazards associated with these batteries include magnesium dioxide, ammonium chloride, zinc chloride, carbon black, zinc, and graphite. Material Safety Data Sheets (MSDS) for the Le Clanche and Burgess batteries are attached to this document as Appendix C.

3.2 PHYSICAL HAZARDS

Physical hazards of concern at Site 21 are associated with general construction operations and site conditions. The physical hazards are listed in Table A-1. The critical monitoring and control technique for physical hazards is personal awareness. A site-specific orientation will be given to all site personnel and will discuss physical hazards and the entire Health and Safety Program. This training will ensure that all personnel are knowledgeable in the protection/monitoring plan. It is extremely important for site personnel to be constantly aware of site conditions and to inform fellow workers, especially the SSHO, of any significant occurrences. An example of a condition that may have significant impact would be the discovery of an equipment malfunction or an unsafe act. Another condition that continually impacts personnel is the weather. WESTON standard operating practices are attached as reference sources in Appendix B.

3.3 BIOLOGICAL HAZARDS

Biological hazards which may be encountered at Site 21 consist of Flora and Fauna as discussed below.

Hazardous Flora

Numerous plant species can pose a threat to sensitive site personnel. The poisonous effects of contact with these indigenous plants can be prevented by covering as much exposed skin

TABLE A-1

Physical Hazards of Concern

Hazard	Description	Procedures Used to Monitor Hazard
Weather	Work will be performed outdoors. Hot temperature, cold temperature, thunderstorms.	Visual observations, buddy system, radio system, radio forecasts. An approaching storm, or a sudden rise in ambient temperature would require personnel to react accordingly.
Heat Stress	Heat stress results from the use of protective clothing in hot (>70°F) weather.	Implement monitoring/prevention program.
Noise	Associated with use of heavy equipment: drill rigs, backhoes, compressor lines, etc.	Awareness. Use following rule of thumb: If normal conversation is interrupted by noise requiring personnel to raise their voices in order to hold a conversation at arm's length, hearing protection is required.
Heavy Equipment	Drilling rigs, back hoes, and station equipment pose a threat to limbs and have crush potential.	Awareness. Head protection with hard hat. Use buddy system and "watch" person.
Electrical Shock	Underground/overhead power lines.	Facility engineering should be notified prior to working Electrical blueprints/plans should be consulted to locate underground cables. All equipment should maintain a 10 foot distance from lines.
Lifting	Associated with use of equipment: hand augers, containers, sampling equipment, and clothing.	Use proper lifting procedures.
Slip and Fall	Outdoor terrain and restrictive clothing may cause loss of footing.	Personnel awareness. Walk slowly and carefully.
Steam Cleaning	Drilling rigs will be steam cleaned during decontamination.	Personnel awareness. Use caution around area when decontamination is in progress.

as possible when working in densely wooded areas. Any rash or other skin irritation should be reported to the SSHO.

Indirect hazards may also occur as site personnel cut into the dense underbrush. Workers should be extremely cautious when cutting brush with machetes or chainsaws and avoid contact with resins and saps.

Hazardous Fauna

Site 21 is located in an area abundant with animal life. Site personnel should be trained to differentiate between dangerous species and non-dangerous species. All wildlife should be avoided if possible because many wild animals have the potential to carry rabies.

The major biological hazard on Site 21 is the abundance of poisonous snakes. The following species have been identified in the area: Copperhead, Canebreak Rattlesnake, and the Water Moccasin. All personnel should protect themselves from snakes by maintaining an awareness of their surroundings. Minimal protection from bites will be provided by wearing high-top, steel-toe leather boots.

Additionally, insects are a source of irritation and danger. Mosquitos can distract workers and potentially cause accidents as well as inject workers with microorganisms. All site personnel should use insect repellant, and perfumes and deodorants should be avoided. Contact with other dangerous insects such as: bees, wasps, hornets, spiders, chiggers, fleas and particularly ticks, is likely. All site workers should perform tick checks on each other periodically and at the end of the day. All insect bites should be reported to the SSHO.

All site personnel should be screened to identify specific allergies to insect bites.

SECTION 4

PROTECTION MEASURES

The following subsections describe specific procedures that will be implemented in order to monitor and protect personnel onsite.

4.1 ACTION LEVELS

WESTON will utilize a conservative approach with respect to action levels for breathing zone conditions for volatile organics, flammable vapors and gases, and particulate dust. This is in accordance with established industry standards and will account for potential unknowns that may be encountered during intrusive activities. The breathing zone is defined as the lowest vertical space (height) where personnel are inhaling.

Air monitoring shall be conducted using the HNu photoionization detector for volatile organics, RAM or Mini-RAM (real-time aerosol monitors) for total, organic and inorganic dusts, and Combustible Gas Indicator (CGI) for flammable vapors and gases.

The following action levels will apply to volatile organic monitoring as detected by the HNu photoionization detector:

Instrument Reading (ppm)	Primary Level of Protection/Action
<1	Level D
1-50	Level C
>50	Stop work/exit site/decision to proceed or upgrade to Level B will be made by SSHO and Corporate HSD

Particulates in the breathing zone will be controlled with either water or geotextile materials or both. When dust control is not possible/feasible, Level C will be used and unprotected skin areas (wrists, head) will be covered by tape, hood, etc. Level C protection will be required for any activity onsite if the soil is dry and dusty conditions prevail. An action level of 1 mg/m^3 of particulates in air detected by the RAM or Mini-RAM will trigger a need for Level C protection.

The CGI will be used to assess the explosive potential and the risk of working on Site 21 (quantitative only). The level of protection will be Level D as long as the CGI measures less than 10% LEL. If the CGI measures greater than or equal to 10% LEL in the atmosphere, the level of protection will be upgraded to Level C. If a reading of greater than 25% LEL is measured, a stoppage of work and exit of the site is required.

The air monitoring instruments shall be calibrated according to manufacturers instructions prior to field use. Re-calibration of the instruments shall be performed pre- and post-monitoring each day that the instrument is used. The initial calibration shall be recorded on a tag attached to the instrument. Daily calibration checks, areas where used, instrument settings, and readings obtained shall be recorded in the site health and safety logbook. The battery in each instrument shall be recharged after use to maintain a good charge.

4.2 LEVELS OF PROTECTION

The primary level of protection to be utilized during the Site 21 Site Inspection will be Level D. Additionally, if site conditions pose an inhalation hazard, respiratory protection will be required. This will warrant changing the level of protection to level C. All protection level changes will be made by the SSHO and will be recorded in the site health and safety logbook. A memorandum explaining the upgrade shall be prepared by the SSHO for inclusion in the project files.

Level D is being utilized for drilling under the pretense that the following conditions are observed at the site:

- Drilling is conducted along the periphery of the site (i.e., not in the center of debris).
- A bulldozer is used to clear site areas prior to drilling.
- Monitoring is conducted as described earlier.

If these conditions are not met, Level C will be required.

The following specifies each level of protection:

LEVEL D

- Cotton coveralls.
- Steel-toe and shank boots.
- Latex boot covers.
- Latex surgical undergloves.
- Work gloves.
- Hardhat (when overhead hazard is possible).
- NIOSH/MSHA-approved eye protection.

LEVEL C

- Cotton coverall (or equivalent WORK uniform).
- Steel-toe and shank boots.
- Latex boot covers.
- Saranex disposable coverall with hood (splash hazards).*
- Tyvek disposable coverall with hood (dust hazards).*

- Full-face (NIOSH/MSHA-approved) air-purifying respirator with general organic vapor/high-efficiency particulate filter cartridge.
- Latex (surgical) undergloves.
- Nitrile or Neoprene overgloves.
- Viton inner gloves when contact with oil materials or high concentrations of a liquid matrix is possible.
- Hardhat.

*Note: Decision to wear Saranex or Tyvek will depend upon site conditions and will be made by the SHSC on consultation with the Project Safety Officer.

4.3 WORK PRACTICES

As required by 29 CFR 1910 Subpart I, the use of a respirator by personnel with facial hair that obstructs the seal between the respirator and the face shall not be permitted. Personnel who must use respirators shall report to the site with clean-shaven faces.

Good hygiene shall be practiced by all site personnel. This includes:

- Eating, drinking, and smoking in the Exclusion Zone and Contamination Reduction Zone shall not be permitted.
- Showering at the end of each day's activities.
- Changing from work clothes into street clothes at the end of the work day.

4.4 SAFETY MEETINGS

The SSHO shall conduct a safety meeting prior to initiating the scheduled activities and weekly thereafter. The safety meeting shall include topics such as:

- Evacuation routes
- Warning signals
- Maintaining line-of-sight and communications
- Rehearsal of the scheduled activities
- Hospital routes
- Locations of safety equipment
- Previous violations of the safety plan
- Cold and heat stress provisions
- Work zones

All safety meetings shall be documented in the site health and safety logbook. Meeting participants shall be required to sign an attendance sheet.

In the event that upgraded respiratory protection is warranted, the SSHO shall conduct a safety briefing regarding the upgrade. The SSHO shall also conduct additional safety briefings if repeated violations of this plan are observed.

4.5 RESPIRATORY FIT TESTING

Site participants qualified for respirator use shall demonstrate to the SSHO that they have been fit-tested in the past year. The fit test protocol shall include exposure to isoamyl acetate (banana oil) or stannous chloride smoke (an irritant). Fit-testing shall be performed as outlined in OSHA's General Industry Standard (For example: 29 CFR 1910.1025 (Lead); 1910.1028 (Benzene)).

SECTION 5

MEDICAL SURVEILLANCE

Onsite personnel shall participate in a medical surveillance program equivalent to the requirements specified in 29 CFR 1910.120 (f) and American National Standards Institute (ANSI) Z-88.6. The examination shall include:

- Complete medical and work histories
- Physical examination
- Pulmonary function tests (FVC and FEV1)
- Chest X-ray (every 2 years)
- EKG
- Visual acuity
- Audiometry
- Urinalysis
- Blood chemistry, including hematology, serum analyses, and heavy metals toxicology

The examination protocols and the evaluation of results shall be overseen by a licensed physician certified in Occupational Medicine by the American Board of Preventive Medicine or a licensed physician who by necessary training and experience is board eligible. Records of the examinations shall be retained by the employer for at least 30 years after the end of the employment period.

Personnel and visitors entering the exclusion zone shall be required to provide written documentation to the SSHO that required medical examinations have been performed (baseline, annual, and termination).

A medical examination shall be given to any individual who experiences any illness or injury while on the job. Tests shall be administered at the discretion of the attending physician. This examination shall take place as soon as possible after the illness or injury and in no case shall personnel be allowed to start work at the site without first obtaining clearance to return to full work duties from the examining physician.

SECTION 6

SITE CONTROL

Personnel shall be aware of site control measures to minimize contamination of personnel and spread of contamination outside the exclusion zone. These measures attempt to control contamination through defining of the work zones and establishing decontamination procedures. The following discussion defines the different work zones in general and describes their purpose.

- Exclusion Zone (EZ) - the area known or suspected of being contaminated or containing uncontrolled hazardous materials.

- Contamination Reduction Zone (CRZ) - the area where personnel and equipment exiting the EZ are decontaminated. Also serves as a buffer between the EZ and SZ.

- Support Zone (SZ) - the area outside the EZ and CRZ used for project management and coordination, and storage of equipment and vehicles.

The EZ shall be established to include the entire area in question. The exclusion zone shall be surrounded with temporary fencing (at a minimum, Safety Barricade or Safety Grid fencing) or make use of existing fencing to preclude unauthorized access and to restrict personnel passage to the CRZ.

The CRZ shall be located upwind of the disposal area on Site 21, and sized to provide for easy but controlled site access and egress by personnel and equipment. The CRZ shall consist of an area to drop equipment, plastic bags to dispose protective clothing, adequate soap and water for personnel and equipment decontamination, and a means of capturing washwater resulting from decontamination. A first-aid kit, fire blanket and fire extinguisher (ABC-type) shall be located on the clean side of the CRZ.

The SZ shall be located near to, and also upwind of Site 21 to minimize potential exposures to site-associated contaminants. It shall be positioned and sized to provide adequate space for the staging and support activities.

Communications shall be established and maintained during site activities. A telephone or cellular phone shall be easily accessible to site personnel.

During working hours, the contractor shall be responsible for site security and access control. After hours, WPNSTA Yorktown security shall be relied upon. Signs reading "Danger-Hazardous Area - Unauthorized Persons Keep Out" shall be posted around the area.

SECTION 7

PERSONNEL AND EQUIPMENT DECONTAMINATION

Personnel shall be aware of procedures used to decontaminate EZ personnel, equipment, and sampling containers. Disposable personal protective equipment and other items shall be placed in heavy duty plastic bags and properly disposed of. Specific decontamination procedures are presented below.

7.1 PERSONNEL PROCEDURES

7.1.1 Level C Personnel Decontamination

- Step 1: Equipment drop (if any used).
- Step 2: Remove boot covers; dispose of in disposable container.
- Step 3: Remove outer gloves; dispose of in disposable container.
- Step 4: Remove protective clothing; dispose of in disposable container.
- Step 5: Wash inner surgical gloves.
- Step 6: Remove respirator; sanitize prior to reuse.
- Step 7: Remove inner gloves; dispose of in disposable container.
- Step 8: Wash and rinse hands.

7.1.2 Level D Personnel Decontamination

- Step 1: Equipment drop (if any used).
- Step 2: Remove boot covers; dispose of in disposable container.
- Step 3: Remove outer gloves; dispose of in disposable container.
- Step 4: Remove coverall (if worn); dispose of in disposable container.
- Step 5: Remove inner gloves; dispose of in disposable container.
- Step 6: Wash and rinse hands.

7.2 EQUIPMENT DECONTAMINATION

Since equipment and vehicle decontamination is difficult, unnecessary equipment and vehicles shall not be brought into the EZ. Should decontamination be necessary, detergent and water shall be used with a long-stemmed brush to remove potential contamination from areas contacting surfaces of the EZ (i.e., tires, equipment bases, shovels). Electrically-powered equipment shall be de-energized prior to contact with water. Care shall be exercised to capture potentially contaminated washwater for subsequent testing and proper disposal. Systems for containing decontamination washwater include permanent decontamination pads with sumps, commercially-available temporary decontamination pads, and kiddy-pools (for smaller equipment).

7.3 SAMPLE CONTAINER DECONTAMINATION

Sample containers shall be laboratory cleaned prior to use. Following sample collection and closure of the container, the outside of the container shall be wiped clean. The sample container shall then placed into shipping containers located in the CRZ. Once filled, the shipping containers shall be retrieved from the clean side and sealed for shipment. A warning to laboratory personnel of potential container contamination shall be included with the chain-of-custody sheets.

SECTION 8

FIRST AID AND EMERGENCY RESPONSE EQUIPMENT AND PROCEDURES

Although accidents can be minimized through safe work practices, there is always a potential for their occurrence. Site personnel shall be familiar with the various contingency measures should an accident occur. What follows is a list of emergency telephone numbers, directions to the local hospital, and an emergency response plan (ERP) conforming to the requirements of 29 CFR 1910.120. The provisions of the ERP are primarily applicable to large scale emergencies which cannot be safely handled by contractor procedures and work practices discussed in the previous sections.

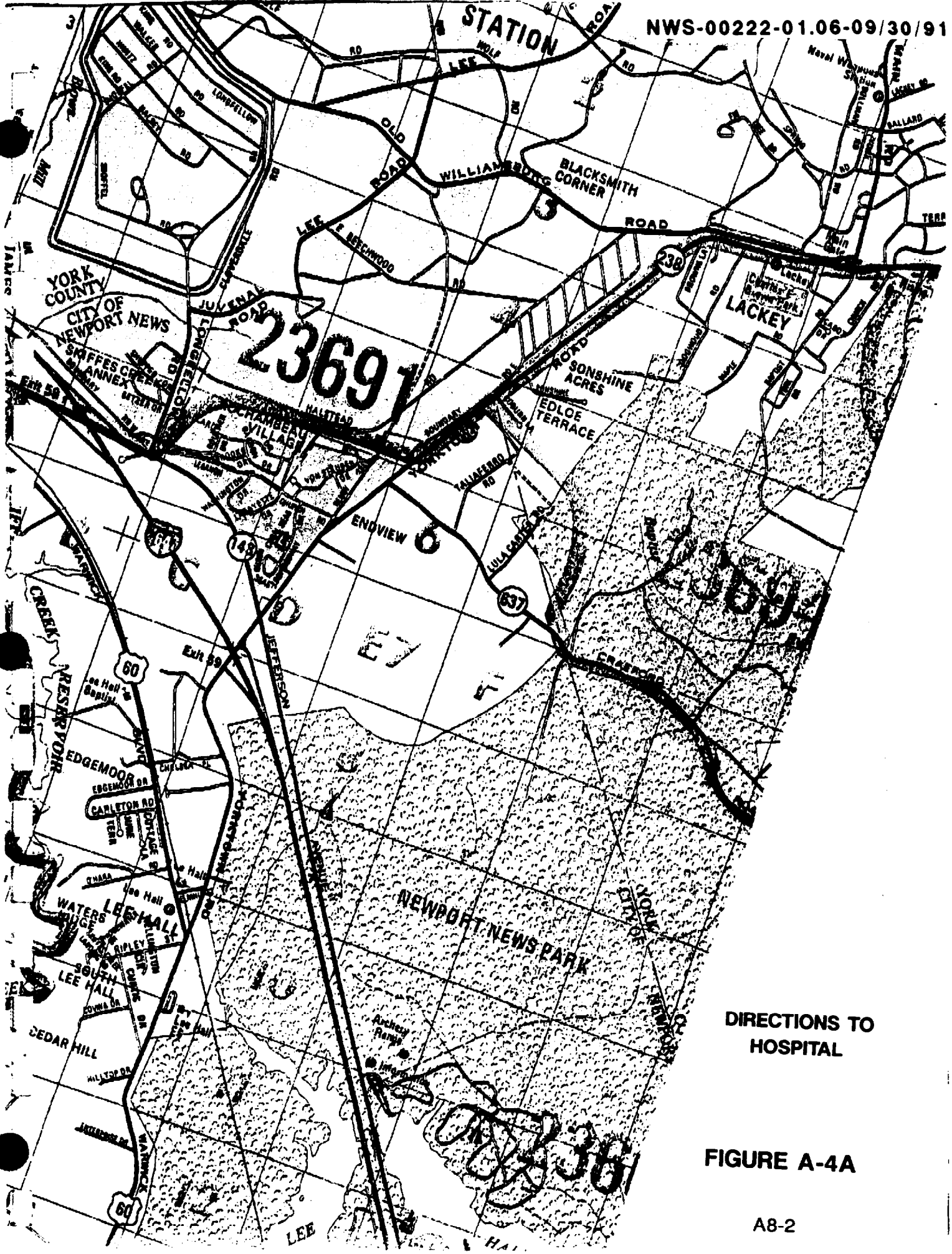
8.1 EMERGENCY TELEPHONE NUMBERS

Table A-2 lists important emergency telephone numbers. These numbers shall be posted near telephones close to the site.

8.2 ROUTE TO HOSPITAL

Injured personnel shall be taken to Mary Immaculate Hospital located at 800 Densigh Blvd., Newport News. The hospital is approximately 15 miles away with a travel time of approximately 20 minutes (see Figure A-4). Directions to the hospital are as follows:

> Exit NWS onto Route 143. Route 143 south to Denbigh Blvd. Left onto Denbigh Blvd. Hospital is on the right.



DIRECTIONS TO HOSPITAL

FIGURE A-4A

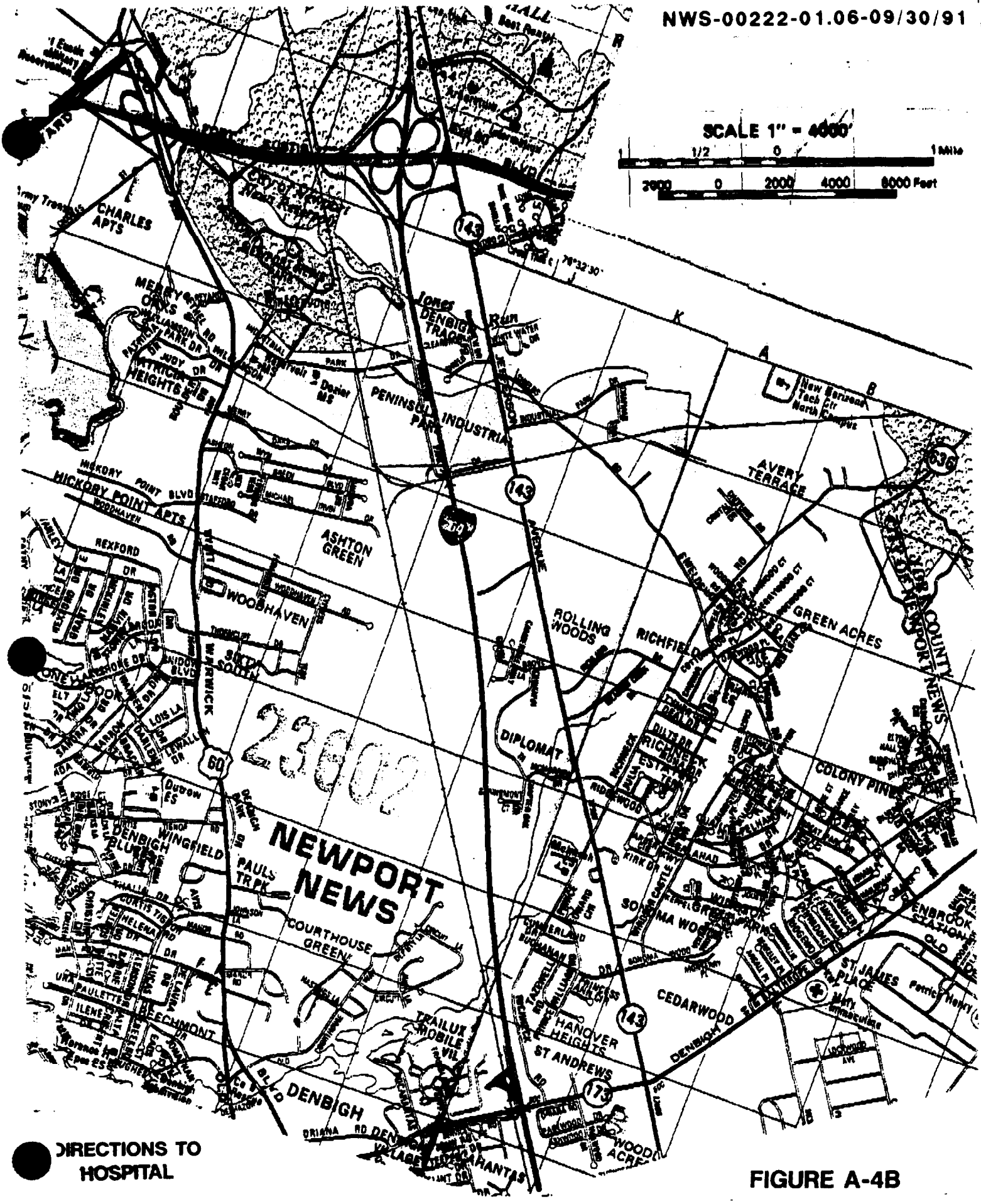

SCALE 1" = 4000'
1/2 0 1 Mile
2000 0 2000 4000 8000 Feet
CHARLES APTS
MERRY OAKS
PATRICK HEIGHTS
HICKORY POINT APTS
ASHTON GREEN
REXFORD
WOODHAVEN
WARWICK
SOUTH SOUTH
ROLLING WOODS
RICHFIELD
AVERY TERRACE
GREEN ACRES
DIPLOMAT
COLONY PINES
NEWPORT NEWS
COURTHOUSE GREEN
PAULS TRPK
DENBIGH BLUFF
WINGFIELD
BEECHMONT
TRAILUX MOBILE VIL
HANOVER HEIGHTS
ST ANDREWS
CEDARWOOD
ST JAMES PL
DENBROOK STATION
BLVD DENBIGH
23602
143
60
173
664
DIRECTIONS TO HOSPITAL

FIGURE A-4B

TABLE A-2

Emergency Telephone Numbers

Incident	Contact	Phone Number
Fire/Explosion	Newport News Fire Department NWS Fire Department	247-2578 887-7343
Personal Injury	Ambulance	911
Injury Off-Site	Ambulance	911
Spill/Release	Hazardous Materials Response Glenn Markwith, NWS Yorktown	(804) 887-4881 or (804) 887-4788
Additional Phone Numbers		
Naval On Scene Commander	Fire Department Chief Nelson	887-4333
Engineer-In-Charge	Brenda Norton	(804) 445-4801
Project Team Leader (PTL) and Site Safety and Health Office (SSHO)	Hank Bienkowski	(215) 430-5108
Physical Security	Police	911, VA State 380-1188
Mary Immaculate Hospital	800 Denbigh Blvd. Newport News, VA	(804) 886-6000

8.3 EMERGENCY RESPONSE PLAN

8.3.1 Pre-Emergency Planning and Coordination with Outside Parties

Prior to beginning field activities, the following individuals shall be made aware of site activities:

- WPNSTA Yorktown Commanding Officer
- WPNSTA Yorktown Safety
- WPNSTA Yorktown Police Department
- WPNSTA Yorktown Fire Department
- LANTDIV

This action shall insure that WPNSTA Yorktown's emergency response mechanisms are aware of field activities and ready to respond should conditions so warrant.

Site personnel shall be made fully aware of the provisions of the emergency response plan. This awareness training shall be conducted by the SSHO prior to the commencement of site activities during the site-specific training. Emergency phone numbers shall be posted at all phone locations surrounding the field site.

8.3.2 Personnel Roles, Lines of Authority, and Communication

During mobilization the location of the nearest telephone will be identified and listed in the health and safety plan. Personnel witnessing an accident become the first step in the emergency response cascade. These individuals shall find the nearest telephone and from the posted emergency telephone list, contact the appropriate responding WPNSTA Yorktown element. Once contact is made, witnessing personnel shall stay on the telephone to provide the responding WPNSTA Yorktown elements with additional data. In no case shall witnessing personnel attempt to fight a major fire, conduct a rescue in an unsafe environment, or conduct a cleanup of a major spill.

8.3.3 Emergency Recognition and Prevention

Recognition and prevention of emergency conditions are duties of every individual on site. While the objective of the HASP is to provide site personnel with the necessary information to prevent emergencies from arising, the basic principles of emergency recognition shall be initially covered during the 40 hour training required by 29 CFR 1910.120 and reviewed during the offsite training, site-specific training, and follow-up training.

8.3.4 Safe Distances and Places of Refuge

Prior to the commencement of site activities, the SSHO shall select a location at an appropriate distance from the site where personnel can gather in the event of an emergency requiring evacuation of the site. This location shall be pointed out to site personnel during the site-specific training.

During accidents involving a fire, spill or potentially explosive materials, site personnel shall turn off any running equipment and evacuate the site by the nearest means of egress. Since in emergency situations, speed is often of greatest importance, personnel in the EZ need not pass through the CRZ and go through a formal decontamination. Once they arrive at a safe location, a formal decontamination can then be undertaken.

8.3.5 Site Security and Control

In the event of a fire, explosion, or major chemical spill, site security and control functions shall be assumed by the Naval On Scene Commander.

8.3.6 Evacuation Routes and Procedures

During accidents requiring site evacuation, personnel shall exit the site by the nearest means of egress. Once off the site, personnel shall assemble at a location designated by the SSHO and be counted. Any missing personnel shall be brought to the attention of the responding WPNSTA Yorktown elements.

8.3.7 Decontamination Procedures

During accidents involving injury to personnel inside the EZ, a decision shall be made by the SSHO as to whether or not an individual's injury allows for formal decontamination as outlined in Section 7. If the injury is minor, the individual shall be brought through the CRZ and undergo formal decontamination. If the injury is major or life-threatening, the individual shall be wrapped in impervious material (i.e., plastic) and transported to the hospital. Hospital and ambulance personnel shall be informed that the individual may be potentially contaminated so that appropriate measures can be taken to prevent cross-contamination.

8.3.8 Emergency Medical Treatment and First Aid

During site activities, at least one individual certified in first aid/adult CPR shall be present. During an accident involving injury to site personnel, this individual shall not attempt emergency medical procedures other than first aid unless specifically directed by a licensed physician.

8.3.9 Emergency Alerting and Response Procedures

As discussed in Section 8.1, emergency telephone numbers shall be located at all phones surrounding the site. In the event of an emergency, witnessing personnel shall contact the

appropriate WPNSTA Yorktown responding element. WPNSTA Yorktown responding elements shall then assume control of the incident and institute response procedures. In no case shall site personnel attempt to assist in the response by fighting a major fire, conducting a rescue in an unsafe environment, or conducting a clean-up of a major spill.

8.3.10 Critique of Response and Follow-up

Following an accident involving a recordable accident or injury, the SSHO shall prepare an incident report, within two working days. The report shall be submitted to the CO and PTL for review. A copy shall be kept in the project file.

8.3.11 PPE and Emergency Equipment

Site emergency equipment shall consist of fire extinguishers (ABC-type), a first aid kit, and inert absorbent for small spills. Site PPE is discussed in Section 4. This equipment shall be easily accessible by site personnel and inspected regularly. WPNSTA Yorktown responding elements shall provide their own equipment for handling large-scale emergencies.

SECTION 9

STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

Personnel shall be aware of the proper procedures and work practices to follow in order to protect themselves from the specific chemical, safety, and/or biological hazards associated with the site activities. Specific "safe-work" procedures are discussed below. Also attached to this document (as Appendix B) is Health and Safety Operating Procedures. Topics covered in Appendix B are:

- Noise Protection
- Inclement Weather
- Hot Processes - Steam
- Hot Processes - LT^3 and Transportable Incinerator
- Heat Stress Prevention and Monitoring
- Manual Lifting and Handling of Heavy Objects
- Heavy Equipment Operation - General
- Heavy Equipment Operation - Drill Rigs
- Materials Handling
- Hazardous Materials Use and Storage
- Fire Extinguishers Required and Requirements
- Utilities
- Electrical Safety
- Hand and Power Hand Tools
- Illumination

9.1 BUDDY SYSTEM

The "buddy system" insures that no individual may enter the EZ without another individual being present. The logic behind the buddy system is that should one individual have an accident, another individual is always present to render assistance or obtain emergency personnel. During Level C and D activities, the minimum number of personnel in the EZ shall be two. One of these individuals shall be the SSHO.

9.2 EATING, DRINKING, AND SMOKING PRECAUTIONS

Since ingestion is a potential contaminant exposure pathway, eating, drinking, and smoking shall be prohibited in the EZ and CRZ. Site personnel working in the EZ shall complete the required personnel decontamination upon exiting and prior to eating, drinking, or smoking.

9.3 IGNITION SOURCES

Fires and explosions require fuel, air (oxygen) and an ignition source (heat). The first two are not easily controlled. Consequently, while working onsite where a fire hazard may be present, potential ignition sources must be kept out of the area.

Open flames, lit cigarettes, hot surfaces, or other potential ignition sources shall be excluded from Site 21, as it is in the "restricted" area of WPNSTA Yorktown. Equipment used shall be certified by the manufacturer as being "explosion proof" (designed for Class 1, Division 1 use). Equipment used to handle waste containers and to clean-up spills shall be constructed of non-sparking materials. Portable fire-extinguishers (ABC-type) shall be readily accessible to extinguish small fires and shall be mounted on vehicles. For large fires, emergency response personnel shall be contacted.

Prior to initiating activities involving potential ignition sources (i.e., welding or operating a fork-lift, etc.), personnel shall request a "hot work" permit from the SSHO. The SSHO will obtain clearance from the WPNSTA Yorktown Fire Department after it has been verified that conditions are safe for such activities to commence (i.e., no explosive or flammable conditions exist).

9.4 POTENTIALLY HAZARDOUS NOISE

Certain equipment used at the site may generate potentially hazardous noise. Hearing protective devices, such as ear plugs or muffs, shall be available when noise may be a problem. In particular, hearing protective devices shall be made available when noise levels, as measured using a Type 2 Sound Level Meter, are greater than or equal to 85 decibels A-weighted (dBA) to ensure compliance with the Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.95. Noise levels shall be evaluated at the start of on-site activities and periodically as determined by the SSHO.

9.5 ILLUMINATION

Illumination provided by sunlight shall be adequate for work activities conducted during daylight hours. However, some work activities may be performed at night because of the short daylight hours. In this case, explosion-proof auxiliary lighting shall be provided to not less than five foot candles in general site areas as required by 29 CFR Part 1910.120.

9.6 HEAT STRESS

Persons working in chemical protective clothing and environments where high temperatures and humidity may be encountered, are potentially subject to heat stress. Exposure to such conditions may result in heat cramps, heat exhaustion, and heat stroke. Determination of ambient conditions and the potential for heat stress shall be made using approved techniques.

Heat cramps are muscular pains and spasms due to heavy exertion. They usually involve the abdominal muscles or legs.

Heat exhaustion occurs as a result of excessive sweating. Blood flow to vital organs is reduced causing the body to go into shock. Signs and symptoms are cool, pale, and moist skin, heavy sweating, dilated pupils, headache, nausea, dizziness, and vomiting. Body temperature should be nearly normal. Heat stroke is a life threatening condition resulting from a shut-down of the bodily temperature-control system. Signs and symptoms are hot, red skin, and very small pupils. Body temperature may be elevated sometimes as high as 105°F.

To prevent such effects, a number of procedures shall be implemented. Should activities commence during hot weather, workers shall be initially allowed to acclimatize. Acclimatization usually consists of working for only a portion of the first workday followed by gradually increasing the duration of work on subsequent days. Whenever possible, activities associated with the greatest potential for heat stress shall be scheduled for the early morning, evening, or night to avoid the hottest portion of the day.

Personnel shall be required to pre-load with fluids (preferably water) and to take fluids periodically prior to and throughout the workday. Personnel shall also take frequent rest breaks in a cool area.

The SSHO shall be familiar with the signs and symptoms of heat stress. Periodic checks of the heat stress status of personnel shall be conducted by the SSHO. Techniques for evaluating the heat stress status of personnel include measuring oral temperature, pulse-rate, and body weight and then comparing these measurements with baseline measurements obtained prior to commencement of the days activities. Significant differences would signal a potential heat-stress condition.

Should an individual present with any symptoms of heat stress, the victim shall be removed to a cool area and first aid administered. This shall be followed by removal of the victim to a medical facility for further treatment or observation.

9.7 FIRE EXTINGUISHERS

Portable fire extinguishers (ABC-type) shall be readily accessible to site personnel. The SSHO shall train the site personnel as to their proper use. Daily inspections of the fire extinguishers shall be conducted by the SSHO to insure that they are adequately charged. A record of the inspection shall be kept in the site health and safety log.

9.8 WATER AND SANITATION

The contractor shall provide an adequate supply of potable water in the support zone. The container used to dispense drinking water shall be capable of being tightly capped, clearly marked as to the nature of its contents, and shall not be used for any other purpose. Single service cups shall be supplied with a receptacle for disposing of used cups. The contractor shall also provide a portable toilet facility located near the work area.

9.9 ROUTINE SAFETY INSPECTIONS

The SSHO shall conduct routine safety inspections of the site. Hazardous conditions shall be noted, transmitted to all site personnel and mitigated, if possible. A record of the safety inspection shall be documented in the site health and safety log.

SECTION 10

LOGS, REPORTS, AND RECORDKEEPING

Recordkeeping is an important facet of maintaining an accurate account of site activities. Recordkeeping shall be a regular and orderly process. The types of recordkeeping to be maintained during closure activities are discussed below.

10.1 HEALTH AND SAFETY LOGBOOK

The SSHO shall maintain a health and safety logbook (H&S log) into which health and safety-related notations including daily inspection records and personnel training records shall be made. All monitoring data conducted for health and safety purposes shall also be included. The H&S log shall be signed at the completion of each day's activities by the SSHO. At the completion of closure activities, the H&S log shall be placed into the project file to become part of the project record.

In addition, an OSHA 200 Log shall be maintained on site by the SSHO.

10.2 MEDICAL MONITORING

Copies of personnel certification of medical fitness shall be retained in the project files. Any injury reports, monthly personal exposure records, and results of job-termination physicals shall be retained in the project file and the personnel file for a period of 30 years.

10.3 VISITOR LOG

All visitors to the site will have been safety trained and medically cleared prior to visiting the site, and shall be required to sign an attendance sheet maintained at the site by the SSHO. The attendance sheets shall be retained in the project file.

10.4 INCIDENT REPORTS

Incident reports shall be prepared by the SSHO. The originals shall be submitted to the PTL for review and/or action. Copies shall be supplied to the CO. Incident reports shall also be included in the project file.

10.5 WPNSTA YORKTOWN ACCESS

WPNSTA Yorktown shall have access to the project records, including those pertaining to site health and safety, during normal working hours.

Other interested parties shall request this information through WPNSTA Yorktown.

APPENDIX B

HEALTH AND SAFETY OPERATING PROCEDURES

APPENDIX B

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Health and Safety Plan Operating Procedures

Field Operating Procedure - Fld01 - NOISE PROTECTION

Noise is defined as unwanted sound. Noise can cause sudden traumatic hearing loss, long term more slowly occurring sensory-neural hearing loss which is irreversible, disruption of communication and masking of warning devices and alarms, increased stress levels and effects on the cardio-vascular and nervous systems. These latter two effects may occur at levels below that which cause damage to hearing and in situations where the conditions are more or less constant and daily.

OSHA regulations generally apply to 8 hour exposures and consider 85 dBA as an action level for a Hearing Conservation Program.

Where feasible, noise exposure will be controlled by engineering controls. Where high noise levels are encountered and where engineering controls are infeasible or until engineering controls can be accomplished, hearing protection devices will be used for worker protection from noise induced hearing loss.

Some of the sources of noise on hazardous materials, construction and industrial sites of a magnitude to cause hearing damage are: compressor motors, drill rig engine, hammer blows (from split spoon or other), compressor motors, compressed air, compressed water, and heavy equipment. The list is not all inclusive.

Any sound level surveys indicating noise levels of 85 dBA or above, or, in the absence of sound level measuring instrumentation, any noise/sound preventing normal vocal discussion between two individuals at arms length distance will dictate the need for hearing protection.

Hearing protection will be afforded by either disposable ear plugs or ear muffs. Administrative time control is not an acceptable method for preventing noise exposure since extreme noise for a short duration can cause severe, permanent hearing loss.

In addition to these protocols, WESTON's Hearing Conservation Program includes physical examination and audiometric testing during annual medical monitoring.

The selection, use, maintenance and control of hearing protection is further defined in the WESTON Personnel Protective Equipment Program.

Health and Safety Plan Operating Procedures

Field Operating Procedure - Fld02 - INCLEMENT WEATHER

HAZARD

Hot weather (ambient temperatures over 70° F), cold Weather (ambient temperature levels below 40° F), rain, snow, ice and lightning are examples of inclement weather which may be hazardous or add risk to WESTON work activities. Heat Stress and cold stress are covered under separate Standard Procedures. Heat and cold stress must be identified as hazards in pre-project evaluations, listed as such in site specific HASP's with the Standard Procedures incorporated.

Heat, rain, cold, snow, ice and lightning are also inclement weather conditions which represent hazards and increased risk of performing WESTON work activities.

Extremes of heat, cold and humidity as well as rain, snow and ice affects monitoring instrument response and reliability, respiratory protection performance, and chemical protective clothing materials.

Heat

Heat stress is addressed in separate WESTON Standard Procedures. Heat represents additional hazards and increased risks. Hot dry weather increases risk of soil drying, erosion and dust dispersion which may represent or increase risk of exposure and environmental impact of a toxic hazards. Hot weather will increase pressure on closed containers and rate of volatization, potentially increasing risk of toxic exposure or flammable/explosive atmospheres.

Rain, Wet Weather and High Humidity

Rain and wet conditions increase slipping and tripping hazards, braking distances of vehicles and chance of slippage of other braking devices on augurs, drills, etc. Rain fills holes and obscures trip and fall hazards and increases risk of electrical shock when working with electrical equipment. Rain changes soil conditions in trenching and excavating activities forming quicksand, weakening walls and increasing risk of cave-in. Vehicles become stuck in mud and tools slip on wet surfaces.

Cold, Snow and Ice

In addition to cold stress, which is covered in a separate Standard Procedure, cold weather affects vehicle operation by causing window frosting, increased difficulty of starting and braking. Ice and snow accumulates on windows and obscures vision.

Cold weather causes icing of roadways, driveways, parking areas, general work places, ladders, stairs and platforms which are wet.

Ice is not always as obvious as snow or rain and requires special attention.

Snow increases risk of slipping when walking, climbing steps and ladders, working at elevation and of accidents when driving vehicles or operating heavy equipment. Heavy snow may cause electric lines to sag or break and use of electric equipment in snow increases risk of electric shock. Snow hides pot holes and mud, which can result in vehicles getting stuck or persons falling when stepping onto or into hidden holes. Snow also may cover water, drums or containers sharp metal or sticks which can cause falls or punctures.

Lightning

Lightning represents a hazard of electrical shock which is increased when working in flat open spaces, elevated work places ore working near tall structures or equipment such as stacks, radio towers and drill rigs. Lightning has caused of chemical storage tank fires.

RECOGNITION AND RISK ASSESSMENT

There are few actual OSHA rules to apply to the conditions covered in this procedure, however, under the "General Duty Clause", they must be addressed in safety programs.

Heat, rain, cold, snow, ice and lightning are natural phenomena which complicate work activities and add or increase risk. In the planning stages of a project and safety plan, these elements must be considered as physical hazards. Risk assessment can be accomplished in part in the development stages of a project, by listing as possible the most likely conditions i.e. rain and lightning in late spring, summer and early fall or in lightning prone areas, cold snow and ice in winter, etc. but the true determination of risk must often be made on site by the Site Health and Safety Coordinator. It is important that the SHSC is alert to these hazards, does not take them simply as a matter of fact and has time to notice them.

The few OSHA regulations which apply to inclement weather conditions include:

- Monitoring equipment and PPE must be maintained in proper working order and used according to manufacturers instructions.
- Walkways, stairs, ladders, elevated workplaces and scaffold platforms must be kept free of mud, ice and snow,
- Vehicles used in rain or cold weather must have windshield wipers and defrosters with windows kept clear of obstruction,
- Equipment requiring Roll-Over Protection must have seat belts,
- Containers of hazardous substance must be remotely opened if pressure is suspected.
- Employees must be protected from airborne contaminants using Engineering Controls such as wetting dry soil to prevent particle dispersion and providing local ventilation to reduce volatile air contaminants to safe levels, or if engineering controls are infeasible, using prescribed PPE

Additional procedures for protection during inclement weather, include:

- Required conformance with traffic laws, including maintaining speed within limits safe for weather conditions and wearing seat belts at all times.

- Using a walking stick or probe to test footing ahead of persons walking where there is standing water or snow to protect the walker against stepping into pot holes or onto puncture hazards or buried containers or other potentially structurally unsound surfaces.

- Prior to using vehicles or equipment in off-road work, walking the work area or intended travel way when puddles or snow may obscure pot holes, puncture hazards or buried containers or other potentially structurally unsound surfaces.

- Arrange to have winches, come-alongs or other mechanical assistance available when vehicles work in areas where there is increased risk of getting stuck. Cable or rope and mechanical equipment used for pulling stuck vehicles must be designed for the purpose, of sufficient capacity for the load and be inspected regularly and before use to ensure safety. **Manually pushing stuck vehicles is to be avoided.**

- Prior to working in areas or beginning projects in times when there is an increased likelihood of lightning or which increase the potential for lightning striking personnel, steps must be taken to predict the occurrence of lightning strikes, including:

- Checking with Client Management to determine if there is any pattern or noted conditions which predict lightning or if there are structures which are prone to lightning strikes. Arrange for client notification when there is increased potential for lightning activities. Ensure that clients include WESTON workers in lightning contingency plans.

- Monitoring Weather Reports.

- Noting Weather Changes and conditions which produce lightning

- Stopping work in open areas, around drill rigs or other structures which may attract lightning, on or in water and in elevated work places when lightning strikes are sighted or thunder is heard near a work site.

Much of the responsibility for protection from inclement weather hazards falls upon the SHSC. The SHSC must recognize the inclement weather hazards affecting site for which he is responsible and complete the pre site activity risk assessment when inclement weather occurs. The SHSC must recognize which weather conditions affect instrument and PPE function and constantly remind site workers of the effects and need for more careful attention to check-out, donning and Doffing and monitoring of function and integrity. The SHSC must make decisions on the proper safety procedures to use if work must continue or to stop work if the risk is too great. **Corporate Health and Safety must be notified of all instances of need to stop work for safety reasons including inclement weather.**

Health and Safety Plan Operating Procedures

Field Operating Procedure - Fld03 - HOT PROCESSES - STEAM

HAZARD

Steam may be present in many forms and circumstances in WESTON work. It is the hottest form of water and as such represents severe thermal burn hazard. It may condense and leave wet work surfaces and will displace oxygen in enclosed areas. The heat and high humidity associated with steam affect instrument and PPE function.

Manufacturing, Energy Production and Laboratory/Research facilities

Steam may be conveyed at high or low pressure in manufacturing, energy production and laboratory/research facilities. Exposed surfaces of lines are hot and represent thermal burn hazards from contact. Even line insulation can be hot if wet or otherwise damaged. Steam lines are often covered with asbestos containing materials which represents a corollary toxic hazard. Steam lines are prone to leakage and are often vented and may release steam suddenly and noisily. Steam at high or low pressure can very quickly cause severe burns. The noise from high pressure steam vents can startle workers causing them to slip and fall. Leakage from condensate traps or lines themselves can also represent slip and fall hazards. Steam lines are often enclosed in pipe runs, tunnels or are underground. These areas must be considered as potential confined spaces. Enclosed areas around steam lines or areas around large steam using equipment may also represent increased risk of heat stress.

Steam Cleaning Equipment

Steam is often used in equipment decontamination and may be used in site remediation. Steam cleaning equipment has the same hazards as facility steam lines in that there are hot surfaces to contact, the steam itself is a thermal burn hazard, steam cleaners are often augmented by high pressure and in enclosed areas steam may displace oxygen and increase heat stress risk.

RECOGNITION AND RISK ASSESSMENT

The presence of steam lines and use of steam equipment must be recognized at the onset of a project. Facility or appropriate utility management must be contacted before site work begins to determine whether there are steam hazards in WESTON work areas. At the earliest opportunity, work areas must be surveyed for the presence of all "utilities" including steam.

When steam hazards are identified, an assessment of risk of contact must be made and appropriate Safeguards added to the Safety Plan. This assessment must take into account the likelihood of surface contact, high pressure venting, accidental release, leakage and condensation, adequacy and type of insulation, elevation of ambient heat and presence of confined areas.

PREVENTION AND PROTECTION PROGRAMS

The most effective method of preventing exposure and protecting workers from adverse effects of exposure to steam or steam lines is use of engineering controls. Guards or barriers placed between workers and steam jets or lines and directing vents away from work areas to minimize chance of contact, placing drip pans or sumps and slip resistant grating under condensate traps and where condensation or leaks wet work area floors or walkways and ensuring wet work areas are dried to prevent slips and falls and ventilation to reduce heat stress and ensure adequate oxygen are examples of engineering controls.

WESTON work assignments, clients and work places do not always allow for the protection of workers from steam by engineering controls. Work often involves close proximity with utilities in the normal course of facilities, clients who need our support in implementing safety practices and facilities which due to time, spill, release, fire or explosion are not in ideal states of repair.

A most important element of the Health and Safety Plan for these instances is recognition and careful assessment of risk of exposure and communication to all workers of the sources and points of exposure and of appropriate protection protocols.

In these instance protection will in much part be afforded by use of personnel protection and good work practices.

Contact

Whenever possible, guards and barriers preventing contact with steam lines or equipment must be left in place and workers must not pass.

When it is necessary to remove guards or work in close proximity to steam lines or equipment, wearing work clothes with long sleeves and long pants legs, heat insulated work gloves and leather safety shoes or boots will reduce the risk of contact. Prior to beginning work near a steam line check for sign of leakage and have someone familiar with the lines or equipment point out potential leak points and any pressure vents. If steam lines are at or above eye level and subject to leakage or there are pressure vents, wearing of hard hats and face shields will reduce the risk of contact with hot surfaces as well as drips of hot water and steam sprays.

Steam Jennies and other steam cleaning equipment use steam and often high pressure to increase cleaning power and reduce liquid waste production. The bodies of steam jennies are hot and not well protected. Workers can also be exposed to steam at the cleaning nozzles. Workers must be trained in the proper use of and safety practices prior to being assigned to use steam cleaning equipment.

Safety practices to be included in the training are:

- o Avoid contact with the surfaces of the equipment
- o Always work so Steam spray is directed away from the body
- o Do not hold equipment being steamed
- o Wear appropriate Personal Protective Equipment, (kept dry)*
  - o Long sleeved and pant legged clothing (with rain gear)*
  - o Leather work safety boots (with rubber boots over)*
  - o Heat insulating gloves (with rubber gloves over)*
  - o Face Shield

* As Necessary

Steam equipment users must be cautioned that PPE will provide protection from incidental contact, but may not protect for prolonged periods.

High pressure systems can also cause bruising if directed at the body and can project particles able to penetrate PPE.

Slips and Falls

Steam may condense and fall or leak from steam lines and equipment forming puddles and making floors, stairs, ladders and platforms slippery. Steam cleaning will also produce wet working surfaces with increased risk of slip and fall hazards. These conditions must be identified in pre and preliminary site safety surveys and included in the physical hazard recognition portion of the Site Specific Health and Safety Plan. During the preliminary Site Safety Survey, the risk of employees having to work in areas where steam leakage or use occurs must be made and appropriate Safety procedures must be instututed including:

- o Drying wet surfaces immediately upon notice
- o Placing drip pans under vents or leaks to prevent water from accumulating in general work areas
- o Construcing sumps with slip resistant gratings, placing slip resistant mats or floor boards where leakage or use of steam results in wet work surfaces
- o checking ladders and stairs prior to ascending and descending and plattforms prior to occupancy to identify the presence of slipping hazards and using extra caution
- o wear shoes or boots which are slip resistant in water, and if working in wet soil, have soles which will not accumulate mud and increase risk of slipping

Workers must be trained in recognizing these hazards and use of the appropriate protection. Workers must also be cautioned that in cold weather, steam can condense and the resultant water freeze often very imperceptable so tha climbing ladders and stairs as well as flat work surfaces become trecherous.

Asbestos

Steam lines and equipment, especially if older, are often insulated with asbestos containing material. Prior to working on steam equipment, determine by questioning knowledgeable people or testing whether insulation material contains asbestos. It is particularly important to determine if the material is friable (could be crumbled easily) and whether it has been damaged to the point where fibers may be released.

If it is determined that the insulation does contain asbestos or it can not be ruled out, work must proceed in strict conformance with WESTON procedures and OSHA regulations. The Industrial Hygiene or Asbestos Management Sections, must be consulted for guidance and the Site Specific Health and Safety Plan must be approved for work with asbestos by Corporate Health and Safety.

Noise

Steam equipment often has associated high noise levels and high pressure vents can suddenly produce very loud noises. High noise areas and presence of pressure vents must be identified in the pre and preliminary Site Safety survey. Workers must be alerted to the possible loud noise of vents and must be provided with appropriate hearing protection when noise levels exceed limits in accord with the WESTON Hearing Conservation Program.

Heat, High Humidity and Moisture

Steam equipment use will often increase the ambient air temperature and humidity adding to risk of heat stress. The potential for elevated heat levels must be identified in pre and preliminary site safety surveys and Heat Stress Prevention measures consistent with WESTON's Standard Safety Procedures must be instituted.

Workers must keep feet dry to prevent immersion or trench foot. See Heat and Cold Stress Prevention Procedures.

Heat, High Humidity and Moisture will affect the function and reliability of many monitoring instruments. Instruments must be used according to Manufacturers directions and appropriate response factors or pre conditioners applied. SHSC's must recognize when conditions will make instruments unusable. DSO's, RSO's or Corporate Health and Safety must be contacted when on-site instruments are determined to be unusable for any purpose.

Heat, high humidity and moisture will affect performance of respirators, particularly APR cartridges and canisters, and chemical protective clothing, making rubbery materials pliable and inelastic and penetrating seams of stitched coveralls. Workers must be alerted to increased likelihood of respirator and protective clothing break through. Inspection, doffing and donning procedures must be modified to take these effects into account.

Confined Spaces

Steam or heat from steam released in poorly ventilated areas may reduce oxygen levels and create a Confined Space situation. In the pre and preliminary site safety survey, areas where WESTON will work, which contain steam lines or other steam equipment must be assessed to ensure there is adequate ventilation to provide sufficient oxygen and determine whether WESTON's activities will add to the potential for decreased Oxygen levels.

If it can not be reliably ascertained that there will be adequate Oxygen, WESTON's Confined Spaces Entry procedures must be instituted.

Steam line galleries and underground steam line tunnels are considered confined spaces.

ealth and Safety Plan Operating Procedures

Field Operating Procedure - Fld04 - HOT PROCESSES - LT^3 AND TRANSPORTABLE INCINERATOR

HAZARD

The primary Hot Process Hazards associated with the LT^3 Unit are contact with hot surfaces, hot hydraulic line fluids and low pressure steam produced from the moisture content of soils.

Hot surfaces on the rotary kiln, secondary combustion chamber, hot screw conveyor, and cross-over duct outer surfaces, refractory in the kiln, SSC and cross-over duct, hot fluid in lines running near hot surfaces, molten slag and stack gases represent Hot Process Hazards on the Mobile Incinerator. Visual observation of the flame in the rotary kiln also is a Hot Process Hazard of this technology. The fall of refractory during maintenance and repair is also a hazard.

RECOGNITION AND RISK ASSESSMENT

The Hot Process Hazards of these two technologies have been identified in the development stage and assessment of risk has resulted in a number of built in safeguards such as engineering design and controls and personnel protective procedures which are incorporated into Safety Plans for the two units. Site/Project HASPs are developed for each use of the units to augment the general Safety Procedures established in development of the technology.

PREVENTION AND PROTECTION PROGRAMS

Prevention and Protection Programs related to the Hot Process Hazards of the LT^3 and Transportable Incinerator include:

- Guarding of Hot Surfaces to minimize risk of contact. Guards must be kept in place except when maintenance or repair is required and must be replaced immediately after maintenance or repair work is completed.
- Wearing heat insulated clothing when performing maintenance, repair or other work requiring or increasing risk of contact with hot surfaces.
- Wearing face shields and head protection when working around pressurized lines such as the hydraulic lines on the LT^3.
- Low pressure steam in the LT^3 and refractory absorption of combustion products and confinement in both units represent confined spaces hazards. Adapted Confined Spaces Entry procedures, requiring standard cool down times, accomplishing as much internal work on the combustion chambers as possible from outside, working from top to bottom when refractory must be repaired or removed and shoring or bracing overhead refractory are used when work must be done inside the units.
- Special lens plates in viewports or polarized glasses are used for viewing the rotary kiln flame.

Health and Safety Plan Operating Procedures

Field Operating Procedure - Fld05 - Heat Stress Prevention and Monitoring

Heat stress may occur at any time work is being performed at elevated temperatures. Wearing of chemical protective clothing, which may result in decreasing natural body ventilation, increases the risk of heat stress.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur, ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital.

Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management. In general:

- Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable 4-ounce cups, and water that is maintained at 50 - 60°F. Urge workers to drink 1 to 2 of these cups of water every 20 minutes for a total of 1 to 2 gallons per day. Provide a cool area for rest breaks. Discourage the intake of coffee during working hours. Monitor for signs of heat stress.
- Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.
- Provide cooling devices to aid natural body ventilation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
- In extremely hot weather, conduct field activities in the early morning and evening.
- Ensure that adequate shelter is available to protect personnel against heat as well as cold, rain, snow, etc. which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.
- In hot weather, rotate shifts of workers wearing impervious clothing.
- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

The following is a discussion of specific results of heat stress:

1.0 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body; the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- Symptoms - Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; unconsciousness or coma.

- Treatment - Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

2.0 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- Symptoms - Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

- Treatment - Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about 1 to 2 gallons per day.

3.0 Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- o Symptoms - Acute painful spasms of voluntary muscles, e.g., abdomen and extremities.

- o Treatment - Remove victim to a cool area and loosen clothing. Have patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be 1 to 2 gallons per day.

4.0 Heat Rash

Heat Rash is caused by continuous exposure to heat and humid air and aggravated chafing clothes. The condition decreases ability to tolerate heat.

- o Symptoms - Mild red rash, especially in areas of the body that come into contact with protective gear.

- o Treatment - Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

5.0 Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70°F.

- o Measure Heart Rate - Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beat/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.

- o Measure Body Temperature - When ambient temperatures over 90°, body temperatures should be measured with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should be shortened by 33%, while the length of the rest period stays the same. If the OT exceeds 99.6°F at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F.

o Physiological Monitoring Schedule - The following Suggested Frequency of Physiological Monitoring Schedule for Fit and Acclimated Workers shall be used as a guideline:

Temperature	(Level D)	(Level C)
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-32.2°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Measure the air temperature with a standard thermometer. Esti fraction of sunshine by judging what percent the sun is out.

100% sunshine = no cloud cover = 1.0
50% sunshine = 50% cloud cover = 0.5
0% sunshine = full cloud cover = 0.0

Adjusted temp. = actual temp. + 13 X (% sunshine factor).

The length of work period is governed by Frequency of Physiolog Monitoring. The length of the rest period is governed physiological parameters (heart rate and oral temperature). example, if an individual's heart rate exceeds 110 beats/minute at beginning of the rest period, that individual will remain on rest- until his/her heart rate drops well below 110 beats/minute and t next work period (=duration of time before suggested physiolog monitoring) is decreased by 33%.

Health and Safety Plan Operating Procedures

Field Operating Procedure - Fld10 - MANUAL LIFTING AND HANDLING OF HEAVY OBJECTS

HAZARD

Improper lifting can result in cuts, pinches, crushing and serious back, abdomen, arm and leg muscle and joint injury.

Even "light" objects, lifted improperly, can contribute to injury causing cuts, and muscle injuries.

Cuts, Pinching and Crushing

Splinters, slivers and sharp edges on objects to be lifted can result in cuts. Heavy objects can pinch or crush fingers, toes, arms and legs between the object and nearby objects, walls, tables, counters, railings and obstructions or if dropped. Insects or other biological hazards on or under objects to be lifted can result in bites or scratches. Contamination of objects can lead to chemical or radioactive materials exposure.

Muscle and Joint Injuries

Muscle and joint injuries occur when objects to be lifted are too heavy or awkward, in restricted access areas or are lifted improperly.

Lifting tasks, which are awkward and repetitive, involving even light objects can lead to nerve and joint damage.

RECOGNITION AND HAZARD ASSESSMENT

The need for manual lifting must be identified as a physical hazard when project tasks specifically require manual handling or use of heavy equipment and safe lifting techniques, as follows, must be instituted.

- Plan any lifting task, noting:
  - Contact hazards - Check each object before lifting for presence of splinters, slivers, sharp edges or parts, cracks and loose joints, signs of biological hazards, chemical or radioactive material contamination.
  - Weight of object - Unless involved in weight training, recommended safe lifting weights for an average man or woman are 50 & 35 pounds respectively.
  - Size and shape of object - large and oddly shaped objects are more difficult to lift even within safe weight limits due to imbalanced center of gravity.
  - Area in which lifting is to be done - Check for pinch points such as other objects close by and that there is room for safe lifting.
  - Conditions under which lifting is to be accomplished - Check for wet or slippery surfaces. Also consider level of protection to be used and that level B or A protection may add up to 40 lbs to be lifted as well as restricting range of motion & adding to area restriction by increasing bulk.
  - Route to be traveled if lifting involves carrying - Check walking and working surfaces for slip and trip hazards, note ramps, changes on level of elevation, ladders or stairways which need to be negotiated.

PREVENTION AND PROTECTION PROGRAMS

- Identify the potential for contact hazards on objects to be lifted before lifting. Check each object before lifting, remove any noted hazards as feasible, wear gloves (at a minimum cotton), leather or kevlar, chemical resistant, etc., depending on the nature of the hazard. Also wear safety boots, coveralls and chemical protection as appropriate.

- Avoid contact with cracks or loose joints or cover if hands or body can come into contact to reduce hazards of pinching.

- Workers must know their lifting limitations, plan lifting, keep themselves reasonably in shape and get help if uncertain that they can lift safely, and, Managers must plan and allow for safe lifting. **Safe lifting takes time.**

  - Lifting an object from the floor
    - determine that object is within safe weight limit,
    - check for contact hazards,
    - check floor for slip hazards,
    - check that there is ample space between the object to be lifted and other objects to avoid pinching or crushing,
    - check that there is ample room to squat, lift, turn or maneuver without twisting the back or other muscles or joints,
    - walk the intended route of travel to identify, and remove slip and fall hazards, if possible,
    - identify changes in elevation, steps, ramps, stairs and ladders which must be negotiated,
  - To lift objects which are square or rectangular in shape or form:
    - place one foot slightly in front of the other,

      squat as close to the object as possible,

      grasp one of the top corners away from the body and the opposite bottom corner closest to the body,

      Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight and tuck in the chin,

      Test to be sure the object is loose from floor and will lift without snagging,

      straighten the legs, keeping the back bone straight, pull the object into the body & stand up slowly and evenly without jerking or twisting,

      if turning or change of direction is required, turn with feet without twisting the torso and step in the direction to travel,

      To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object & the surface on which the object is set.

This system, at first feels and seems awkward. Workers must be trained and have the opportunity to use the system with lighter objects before performing heavy lifting. For other shaped objects, the only modification needed should be hand hold position.

When two or more persons are lifting, have a plan and set signals so lifting occurs simultaneously.

Do not carry objects in a manner which obstruct vision in line of travel and of feet and footing.

Carry objects so one hand is free for travel on stairs or there is unobstructed view of footing and two hands are free for travel on ladders.

MANUAL HANDLING OF HEAVY OBJECTS

HAZARD

Manual maneuvering or handling of heavy objects without actually lifting is often required on hazardous materials, RCRA facilities and Construction sites. This often involves moving drums or other containers. Manual handling of heavy objects, even when not actually lifting, can pose all of the hazards of lifting including, cuts, pinches, bruises, crushing, muscle and joint strain, hazardous material and biological hazard contact.

RECOGNITION AND RISK ASSESSMENT

The need for manual handling of heavy objects must be addressed in the planning stages of a project HASP. Drums and other containers which must be maneuvered, for access to information or sampling locations, which are inaccessible to mechanical handling equipment, require manual handling and special precautions. When handling of heavy objects does not actually involve lifting, workers can handle heavier objects, even those weighing several hundred pounds, safely if proper techniques are used. In may instances, the procedures involve balancing and taking advantage of the shape of the object.

PREVENTION AND PROTECTION PROGRAMS

Prior to performing manual handling, it must be determined that it can be done safely and that mechanical assistance is infeasible.

Mechanical equipment or assistance such as dollies, carts, come-alongs or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The minimum protection for manual handling is heavy cotton or leather gloves, Safety boots and coveralls. Metatarsel guards, chemical protective clothing and metal mesh or kevlar gloves must be used as risk of heavy items falling, hazardous materials contact and sharp edges, splinters or slivers increases.

Workers must be aware of there handling capacities and work within their capacities.

Objects to be manually handled must be checked prior to beginning movement for contact hazards and ensure handling will not trap hands, arms legs or feet between the object and other objects, walls, or railings.

Round or cylindrical objects may be rolled if rolling will not damage the structural integrity. Rolling must be controlled by chutes, tag-lines or other means of limiting acceleration. Workers must not be positioned down hill from rolled objects. Use of the legs for pushing and tag-line control of rolled objects must be stressed.

Cylindrical objects, such as drums which must remain upright, are handled manually by slightly tilting the object using the legs for control and balancing the object on the bottom edge. The handler then walks beside the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus, maintaining the balance and a steady controlled forward motion. Motion must be controlled so that stopping walking and moving the hands will stop forward motion.

Prior to moving cylindrical objects in this way, the route of travel must be walked to identify and changes of elevation, pot holes or other obstructions which could cause the object to snag, tip or get out of control.

Flat, square or rectangular objects are most easily handled using make-shift rollers or skids to break the friction with the resting surface and pushing, using the legs.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD22a - Heavy Equipment Operation - General

Related SPOPS: FLD23 - Cranes
FLD24 - Aerial Lifts/Manlifts
FLD34 - Utilities
FLD35a - Electrical Safety - General
FLD35b - Electrical Safety - High Voltage

Machinery and Mechanized Equipment Safety

A. General

Before any machinery or mechanized equipment is placed in use, it will be inspected and tested by a competent mechanic and certified to be in safe operating condition.

The employer will designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests will be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.

Preventative maintenance procedures recommended by the manufacturer will be followed.

Any machinery or equipment found to be unsafe will be deadlined and its use prohibited until unsafe conditions have been corrected.

Inspections or determinations of road conditions and structures will be made in advance to assure that clearances and load capacities are safe for the passing or placing of any machinery or equipment.

Machinery and mechanized equipment will be operated only by designated personnel. Equipment deficiencies observed at any time that affect their safe operation will be corrected before continuing operation.

Seats or equal protection will be provided for each person required to ride on equipment.

Getting off or on any equipment while it is in motion is prohibited.

Machinery or equipment requiring an operator will not be permitted to run unattended.

Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.

MACHINERY AND MECHANIZED EQUIPMENT SAFETY (Continued)

All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Exemption:

Equipment designed to be serviced while running.

All repairs on machinery or equipment will be made at a location which will provide protection from traffic for repair persons.

Heavy machinery, equipment, or parts thereof which are suspended or held apart by slings, hoists, or jacks also will be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

Stationary machinery and equipment will be placed on a firm foundation and secured before being operated.

All points requiring lubrication during operation will have fittings so located or guarded to be accessible without hazardous exposure.

When necessary, all mobile equipment and the operating area will be adequately illuminated while work is in progress.

Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shut-off which will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

All towing devices used on any combinations of equipment will be structurally adequate for the weight drawn and securely mounted.

Persons will not be permitted to get between a towed and towing piece of equipment until the towing equipment has been stopped.

All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, will have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set.

MECHANICAL AND MECHANIZED EQUIPMENT SAFETY (Continued)

Lift trucks, stackers, etc., will have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also will be clearly shown on the vehicle. The ratings will not be exceeded.

Steering or spinner knobs will not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering handwheel to spin. When permitted the steering knob will be mounted within the periphery of the wheel.

All industrial trucks in use will meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation, defined in ANSI B56.1, Safety Standards for Powered Industrial Trucks.

The installation of live booms on material and personnel hoists is prohibited.

The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.

Personnel will not work or pass under the buckets or booms of loaders in operation.

Cranes and any other equipment used for lifting must be inspected as required and records of inspection must be maintained.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD22b - Heavy Equipment Operation - Drill Rigs

Related SPOPS: FLD23 - Cranes
FLD24 - Aerial Lifts/Manlifts
FLD34 - Utilities
FLD35a - Electrical Safety - General
FLD35b - Electrical Safety - High Voltage

Drill Rig Safety

WESTON will use the Drilling Safety Guide prepared by delegations of the Diamond Core Drilling Manufacturers Association and the National Drilling Contractors Association as published by the National Drilling Federation as the basic Safety Programs for all activities involving drill rigs or similar apparatus for the purpose of well installation or soil borings.

Copies of this document are available from Corporate Health and Safety.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD29 - Materials Handling

Related SPOPSFLDs - FLD02 - Inclement Weather
- FLD22 - Heavy Equipment Operation
- FLD23 - Lifting Equipment Operation

GENERAL MATERIALS HANDLING AND STORAGE SAFETY

Materials must stacked and stored as to prevent sliding or collapsing.

Flammables and oxidizers must be stored in separate non-smoking areas and flammable gases must be stored away from combustible materials.

Tractor trailers must be chocked during loading and unloading. Deck plates and positive anchor systems must be used for delivery to elevated platforms at trailer floor level if unloaded by fork lifts. Trailers detached from tractors must have additional support if fork lifts will enter or unstability of load represents hazard of front wheels collapsing.

Riders are prohibited on the outside of materials handling equipment.

Cranes and any other equipment used for lifting must be inspected as required and records of inspection must be maintained.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD30 - Hazardous Materials Use and Storage

Related SPOPSFLDs - FLD21 - Explosives
FLD31 - Fire Prevention/Response Plans
FLD32 - Fire Extinguishers Required

Hazardous Materials Storage

A. Flammable Liquids

Flammable liquids shall be stored in approved containers in flammable storage cabinets or store rooms, or 25 feet from any other storage or office area or any ignition sources.

Fuels shall be separated from oxidizers and corrosives must be separated from flammables and stored in approved cabinets or store rooms or separated by 25 feet from other storage areas or buildings.

Approved grounding and bonding procedures shall be used for transfer of flammable liquids from one container to another.

Areas where flammable liquids are stored or flammable vapors may be released must be evaluated and classed by hazard class, group and location (Division) according to the National Electric Code and electrical equipment use must conform to these codes.

All tanks, containers, and pumping equipment, portable or stationary, used for the storage or handling of flammable and combustible liquids will be listed by UL or FM or approved by the MSHA.

As a minimum, a 10 lb fire extinguisher appropriate for the type of fire which could occur must be within 50 feet of any accumulation of 5 gallons or more of flammable liquids or gases.

B. Cylinders

- Cylinders must be stored upright and/or secured to prevent their falling over. The supplier of gas must be consulted prior to storing gas cylinders in other than an upright position.
- Cylinder caps must be in place, when cylinders are not in use.
- Cylinders should be stored out of direct sunlight.
- Cylinders containing fuels, e.g. acetylene, must be separated from oxidizers, e.g. oxygen, carbide, by 20 feet or a five (5) foot high fire wall with a minimum 1/2 hour fire resistance if outside or 1 hour rating if inside.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD32 - Fire Extinguishers Required and requirements

Related SPOPSFLDs - FLD09 - Hot Work (Permits)
FLD21 - Explosives
FLD22 - Heavy Equipment Operation
FLD30 - Hazardous Materials Use and Storage
FLD31 - Fire Prevention/Protection/Response Plans
FLD36 - Welding, Cuting and Burning

Related SPOPSPRGs - PRG05B - Contingency Plans Fires and Explosions

FIRE EXTINGUISHERS REQUIRED AND REQUIREMENTS

Fire extinguishers appropriate in size and classification shall be present, readily accessible and ready for use in all areas where there is potential for fires.

Fire extinguishers must be used in conjunction with an emergency response or contingency plan.

Health and Safety Plans must identify number, type and location of all fire extinguishers related to a specific project

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD34 - Utilities

Related SPOPSFLDs - FLD02 - Excavating and Trenching
FLD03 - Hot Processes - Steam
FLD22a - Heavy Equipment Operation - General
FLD22b - Heavy Equipment Operation - Drill Rigs
FLD23 - Lifting Equipment Operation
FLD35a - Electrical Safety - General
FLD35b - Electrical Safety - High Voltage

A. Survey for and Identification of Utilities

Prior to beginning work on site or in or around facilities, or buildings or other structures which could be served by or connected to utilities, a search must be conducted by the SHSC, ideally in association with someone familiar with the facility to identify any overhead, underground and in-workplace utilities such as:

- electrical lines and appliances,
- gas lines,
- pipelines,
- steam lines,
- water lines,
- sewer lines, and
- pressured air lines.

The location of any utility which could pose a risk to workers must be communicated to all workers during site safety indoctrination. Utilites should be marked or access otherwise restricted to avoid chance of accidental contact.

Utilities shall be considered "live" or active until a reliable source has documented them to be otherwise.

A. Overhead Utilities

1.0 Operations Adjacent To Overhead Power Lines

- Overhead transmission and distribution lines will be carried on towers and poles which provide safe clearance over roadways and structures.
- Clearances will be adequate for the movement of vehicles and for the operation of construction equipment.

Overhead or above ground electric lines shall be considered "live" or active until a reliable source has documented them to be otherwise.

Elevated work platforms, ladders, scaffolding, man-lifts, drill or vehicle superstructures shall be erected a minimum of 20 feet (The actual distance is dependant upon the voltage of the line) from overhead electrical lines until the line is de-energized, grounded or shielded and a competent electrician has certified that arcing can not occur between the work place or superstructure.

2.0 Other Overhead or In-Workplace Utilities

Workers must be instructed to use care in working under or around utilities to avoid hot surfaces, loud noises, pressured gases or air, leaking of pipelines, discharge of steam or hot liquids and must work to prevent accidental contact with or breakage.

B. Underground Utility Searches

No excavating, drilling, or boring shall be done until a thorough underground utility survey, conducted by knowledgeable persons or agencies has been made and it is found safe to begin.

Even when a search is completed, drilling, boring and excavation should commence carefully until past the depth at which such utilities are usually located.

All underground utilities shall be considered "live" or active until reliable sources demonstrate otherwise.

The SHSC is responsible for ensuring underground utility searches are performed and procedures are conformed with.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD35a - Electrical Safety - General

Related SPOPSFLDs - FLD02 - Inclement Weather
FLD08 - Confined Spaces Entry
FLD25a - Portable Ladders
FLD25b - Fixed Ladders
FLD26a-d - All Forms of Scaffolding
FLD34 - Utilities
FLD35b - Electrical Safety - General
FLD38 - Hand and Power Tools

IV. Electrical Safety

Work areas shall be checked for the presence of high voltage and other hazardous electricity sources. Sources shall be labelled and work areas provided with shielding or located at sufficient distance from the sources to prevent contact or arcing to personnel or equipment.

Locate and ensure there will be no adverse contact with overhead utilities, prior to positioning or moving any elevated work platform or rig superstructure.

When high voltage electrical service is required for site or project activities, service shall be connected by certified electricians in accordance with all applicable local and National Electric Codes.

Ground Fault Circuit Interrupters shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.

Electric lines, cables and extension cords must be appropriately guarded and maintained in good condition.

No work will be done on electric lines or electrically activated equipment, until the verification that service has been de-energized and/or the system has been locked and tagged out and each worker doing the work has sole possession of a key to a lock on the lock-out hasp.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD38 - Hand and Power Hand Tools

Related SPOPS: FLD01 - Noise
FLD02 - Inclement Weather
FLD08 - Confined Spaces
FLD09 - Hot Work
FLD10 - Heavy Manual Lifting/Moving
FLD11 - Housekeeping
FLD16 - Copmpressed Gases
FLD22a - Heavy Equipment Operation
FLD24 - Aerial Lifts/Manlifts
FLD29 - Materials Handling
FLD30 - Hazardous Materials Use/Storage
FLD31 - Fire Prevention/Response Plan Required
FLD32 - Fire Extinguishers Required
FLD34 - Utilities
FLD35a - Electrical Safety - General
FLD35b - Electrical Safety - High Voltage
FLD38 - Hand and Power Hand Tools

Work with other than the simplest non-powered hand tool shall be performed only by those persons competent by reason of formal training or documented experience.

In addition to the above related Physical Hazard Safety Procedures the following procedures must be followed:

XV. HAND AND POWER TOOLS SAFETY

Unsafe hand tools shall not be issued or used. All hand tools will be kept in good repair and used only for the purpose for which they were designed. Wrenches with sprung jaws where slippage could occur, impact tools with mushroomed heads and wooden handled tools with cracks or splinters are examples of unsafe hand tools.

Tools having defects that will impair their strength or render them unsafe will be tagged or made inoperable and removed from service.

Guards must be in place during operatio on all power tools designed to accomodate them. Guards and safety devices must remain in place on power tools unless removed according to manufacturers instruction for maintenance by a competent person and must be replaced before use. Belts, gears, shafts, drums, fly wheels, chains or other rotating, reciprocating or moving parts exposed to employee contact or representing other hazard must be guarded.

Proper PPE must be used when operating power tools or hand tools which may produce projectiles, cuts or abrasions, dusts, fume, mists or light or which pose a risk of harm to arms, legs, or feet if dropped.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD38 - Hand and Power Hand Tools (Continued)

Throwing tools or materials from one location to another, from one person to another, or dropping them to lower levels, is not permitted.

Only nonsparking tools will be used in locations where sources of ignition may cause a fire or explosion.

Power tools will be inspected, tested, and determined to be safe for operation prior to use. Continued periodic inspections will be made to assure safe operating condition and proper maintenance.

Electric powered tools must be approved double insulated or grounded in accordance with 1926.404.

Rotating or reciprocating portable power tools will have a constant pressure switch that will shut off the power when the tool is released by the operator. A portable power tool may have a lock-or control provided turn-off can be accomplished by a single motion of the same finger or fingers that turned it on.

Hydraulic fluid used in powered tools will retain its operating characteristics at the most extreme temperatures to which it will be exposed.

Manufacturers' safe operating pressures for hydraulic hoses, valves, pipes, filters and other fittings will not be exceeded.

All hydraulic or pneumatic tools which are used on or around energized lines or equipment will have nonconducting hoses having adequate strength for the normal operating pressures.

Loose and frayed clothing, loose long hair, dangling jewelry, rings, chains, and wrist watches will not be worn while working with any power tool or machine.

All woodworking tools and machinery will meet applicable requirements of ANSI 01.1, Safety Code for Woodworking Machinery.

Extension cords:

- Must meet UL or other rating criteria according to OSHA.
- Use will be limited to essential tasks.
- Must be tested for continuity before each use and must be connected to grounded outlets or ground fault current interrupters must be used.
- Must be inspected daily for loose insulation, broken or missing plugs, bared wires, etc.
- Grounding of outlets used for portable tools must be confirmed before use.
- Must not be allowed to become tripping or slipping hazards.
- Must not be used for lifting, tying off and shall be disconnected by pulling on the plug.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD38 - Hand and Power Hand Tools (Continued)

Any piece of equipment used for lifting materials or personnel shall be used and maintained in strict accordance with manufacturers directions and applicable OSHA regulations.

Load Limits will be visibly posted on all lifting devices.

Only operators with demonstrated competence shall be permitted to operate lifting devices.

Lifting machinery and all elements of equipment involved in lifting or supporting loads must be inspected prior to use and at a minimum monthly. Inspections must be performed by a competent person and must be documented.

Health and Safety Plan Operating Procedures

Field Operating Procedure - FLD39 - Illumination

Related SPOPSFLDs - FLD08 - Confined Spaces Entry
FLD10 - Rough Terrain
FLD11 - Housekeeping
FLD13 - Neighborhood
FLD14 - Remote Areas
FLD18 - Using Boats
FLD22a-b - Heavy Equipment Operation
FLD23 - Lifting Equipment Operation
FLD33 - Demolition
FLD38 - Hand and Power Tools

VII. ILLUMINATION

Minimum lighting levels for general construction work areas is 5 foot- candles intensity. Recommended illumination levels for other tasks are listed below:

Foot-Candles	Area of Operation
5	General Construction Area Indoor: Warehousing areas, corridors, hallways, exits Tunnels, shafts and general underground work areas
10	Tunnel and shaft heading when drilling, mucking, scaling, General construction plant and shops
30	First Aid Stations, infirmaries and offices

APPENDIX C

MATERIAL SAFETY DATA SHEETS

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VARIOUS MANUFACTURERS, FOR NAVMINEWARENGACT
MSDS for BATTERY, DRY,CARBON ZINC, DISCHARGED

* - Site Specific Information

NO Site Specific Information on file for this Chemical

2 - General Information DISCHARGED BATTERY, DRY, CARBON-ZINC

MANUFACTURER'S NAME:
NAVAL MINE WARFARE ENGINEERING ACTIVITY
CODE 60, BUILDING 1859
YORKTOWN, VA. 23691-5076
(804) 887-4830 OR AUTOVON: 953-4830

CHEMICAL NAME AND SYNONYMS: DISCHARGED BATTERY, CARBON-ZINC
Battery, Dry Cell, LeClanche Cell, BA-44, Mk 105-0, Mk 106-1, Mk 107-0/1, Mk 108-0/1, Mk 109-0/1, Mk 110-0/1, Mk 111-0/1, Mk 112-0/1, Mk 113-0, Mk 114-0, Mk 115-0/1, Mk 116

CHEMICAL FAMILY:
MIXTURE

DATE OF PREPARATION:
8 FEBRUARY 1991

PREPARED BY:
Ann Allen, Code 63, Naval Mine Warfare Engineering Activity

DISCLAIMER:
The information provided below is believed to be accurate and represents the best information available to us for the hazardous materials in this assembly. However, we make no warranty, express or implied, with respect to such information and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

3 - Hazardous Ingredients

MATERIAL	APPROXIMATE %	TLV	(Units)	
Mercury	0.01	0.05	mg/m3	
Zinc Chloride	4.0	1.0	mg/m3	(fume)
Ammonium Chloride	4.0	10.0	mg/m3	(fume) * LECLANCHE
Manganese Dioxide	29.0	5.0	mg/m3	
Carbon Black	11.0	3.5	mg/m3	
Graphite	UNK	15	mppcf	
Manganese	UNK	5.0	mg/m3	
Zinc Oxide	UNK	5.0	mg/m3	
Ammonia	UNK	35.0	mg/m3	

3 - Hazardous Ingredients (continued)

- Physical Data

BOILING POINT:
> 212 F
VAPOR PRESSURE(mm Hg):
Not known
VAPOR DENSITY (AIR = 1):
> 1
SPECIFIC GRAVITY (H2O=1):
> 1
PERCENT VOLATILE BY VOLUME (%):
Not known
EVAPORATION RATE (Butyl Acetate = 1):
< 1
SOLUBILITY IN WATER:
Negligible
APPEARANCE AND ODOR:
Black solid granules with possible ammonia odor, encased in battery assembly

- Fire and Explosion Hazard Data

FLASH POINT (METHOD USED):
Not known
FLAMMABLE LIMITS:
LEL: Not known UEL: Not known
EXTINGUISHING MEDIA:
In bulk storage use CO2, foam or dry powder. Water may cause electrical shorts.
SPECIAL FIRE FIGHTING PROCEDURES:
In bulk storage areas, wear self-contained breathing apparatus and protective clothing to avoid inhalation and contact with hazardous decomposition products.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Cells may rupture when exposed to excessive heat.

Health Hazard Data

THRESHOLD LIMIT VALUE:
See Section 3, Hazardous Ingredients. Manganese and zinc chloride are experimental mutagens and tumor producers and zinc chloride is an experimental teratogen.

EFFECTS OF OVEREXPOSURE:
In a fire situation, cells may release hazardous substances.
ACUTE OVEREXPOSURE:

VARIOUS MANUFACTURERS, FOR NAVMINEWARENGACT
SDS for BATTERY, DRY,CARBON ZINC, DISCHARGED

6 - Health Hazard Data (continued)

INHALATION - May cause irritation or metal fume fever in a fire situation.
INGESTION - Ingredients are poiseneus.
CONTACT - Materials may cause skin or eye irritation by vapor or direct contact.
HRONIC OVEREXPOSURE:
Not likely under normal use.
MEDICAL CONDITIONS GENERALLY AGRRAVATED BY EXPOSURE:
Respiratory infections and diseases. Skin diseases.

EMERGENCY AND FIRST AID PROCEDURES:
INHALATION:
Remove to fresh air, use artifical respiration if needed. Seek medical attention.
EYES:
Flush at least 15 minutes with fresh running water, occasionally lifting upper and lower eyelid. Seek medical attention.
SKIN:
Thoroughly was affected area until no trace of material remains.
INGESTION:
Not likely under normal use. If ingestion should occur, get immediate medical attention. Drink large quantities of water.
E OSURE IN A FIRE:
Remove victim from fire hazard area to fresh air. Seek medical attention.

7 - Reactivity Data

STABILITY:
Stable

CONDITIONS TO AVOID:
Excessive heat and fire (heating above 160 F), charging

INCOMPATIBILITY (MATERIALS TO AVOID):
Keep away from water.
HAZARDOUS DECOMPOSITION PRODUCTS:
In a fire situation, mercury vapor, ammonium chloride, ammonia, nitrous oxides, chlorine, manganese, zinc oxide and zinc zinc chloride fumes may be emitted.
HAZARDOUS POLYMERIZATION:
No

CONDITIONS TO AVOID:
None known

8 - Spill or Leak Procedures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Batteries are a dry solid and can be handled easily with shovels or similar equipment. When accumulating large quantities of undischarged batteries for disposal pack in non-conductive insulating material.
AVOID HEAT AND WATER.
Use rubber gloves for cleaning up spills or handling internal parts of cells. Use adequate ventilation and avoid contact of cell internal components with skin or eyes.

ASTE DISPOSAL METHOD:
Dispose of in accordance with all Federal, State, and Local regulations. Disposal by landfill may be illegal in some areas.

9 - Special Protection Information

ESPIRATORY PROTECTION (SPECIFY TYPE):
None needed under normal use
NTILATION:
None needed
OTECTIVE GLOVES:
None required under normal use; use rubber gloves to handle internal cell components.
E T PROTECTION:
None required under normal use. If cells must be opened, wear protective goggles.
HER PROTECTIVE EQUIPMENT:
None required under normal use

10 - Special Precautions DISPOSE IAW ALL REGULATIONS

CAUTIONS TO BE TAKEN IN HANDLING AND STORING:
Do not store unpackaged cells together so contacts can touch. This situation will result in cell shorting and heat build-up.

ER PRECAUTIONS:
Do not charge, overheat (greater than 160 F), or open cells. Avoid contact with water.

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VARIOUS MANUFACTURERS FOR NAVMINEWARENGACT
MSDS for BATTERY, DRY, CARBON-ZINC, UNDISCHARGED

1 = Site Specific Information

NO site Specific Information on file for this Chemical

2 = General Information UNDISCHARGED BATTERY, DRY, CARBON-ZINC

MANUFACTURER'S NAME:
NAVAL MINE WARFARE ENGINEERING ACTIVITY
CODE 63, BUILDING 1989
YORKTOWN, VA. 23691-5076
(804) 887-4930 OR AUTOVON: 953-4930

CHEMICAL NAME AND SYNONYMS: UNDISCHARGED BATTERY, CARBON-ZINC
Battery, Dry Cell,Leclanche Cell, BA-44, Mk 105-0, MK 106-1,
Mk 107-0/1, Mk 108-0/1, Mk 109-0/1, Mk 110-0/1, Mk 111-0/1,
Mk 112-0/1,Mk 113-0,Mk 114-0, Mk 115-0/1, Mk 116

CHEMICAL FAMILY:
MIXTURE

DATE OF PREPARATION:
8 FEBRUARY 1991

PREPARED BY:
Ann Allen, Code 63, Naval Mine Warfare Engineering Activity

DISCLAIMER:
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3 - Hazardous Ingredients

MATERIAL	APPROXIMATE %	TLV (Units)	
Mercury	0.01	0.05 mg/m3	
Zinc Chloride	4.0	1.0 mg/m3	(fume)
Ammonium Chloride	4.0	10.0 mg/m3	(fume) * LECLANCHE
Manganese Dioxide	29.0	5.0 mg/m3	
Carbon Black	11.0	3.5 mg/m3	

4 - Physical Data

BOILING POINT:
> 212 F
VAPOR PRESSURE(mm Hg):
Not known
VAPOR DENSITY (AIR = 1):
> 1
SPECIFIC GRAVITY (H2O=1):
> 1

PERCENT VOLATILE BY VOLUME (%):
Not known
EVAPORATION RATE:
< 1
SOLUBILITY IN WATER:
Negligible
APPEARANCE AND ODOR:
Black solid granules with possible slight ammonia odor, encased in battery assembly

5 - Fire and Explosion Hazard Data

FLASH POINT (METHOD USED):
Not known
FLAMMABLE LIMITS:
LEL: Not known UEL: Not known
EXTINGUISHING MEDIA:
In bulk storage use CO2, foam or dry powder. Water may cause electrical shorts.
SPECIAL FIRE FIGHTING PROCEDURES:
In bulk storage areas, wear self-contained breathing apparatus and protective clothing to avoid inhalation and contact with hazardous decomposition products.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Cells may rupture when exposed to excessive heat.

6 - Health Hazard Data

THRESHOLD LIMIT VALUE:
See Section 3, Hazardous Ingredients. Zinc Chloride is an experimental mutagen, teratogen, and tumor producer.

EFFECTS OF OVEREXPOSURE:
In a fire situation, cells may release hazardous substances.
ACUTE OVEREXPOSURE:
INHALATION - May cause irritation or metal fume fever in a fire situation.
INGESTION - Ingredients are poisonous.
CONTACT - Materials may cause eye and skin irritation by vapor or direct contact.
CHRONIC OVEREXPOSURE:

VARIOUS MANUFACTURERS FOR NAVMINEWARENGACT
MSDS for BATTERY, DRY, CARBON-ZINC, UNDISCHARGED

8 - Spill or Leak Procedures (continued)

non-conductive insulating material.
AVOID HEAT AND WATER.
Use rubber gloves for cleaning up spills or handling internal parts of cells. Use adequate ventilation and avoid contact of cell internal components with skin or eyes.

STE DISPOSAL METHOD:
Discard in accordance with local, state, and federal regulations. Disposal by landfill may be illegal in some areas.

9 - Special Protection Information

RESPIRATORY PROTECTION (SPECIFY TYPE):
None needed under normal use
TILATION:
None needed under normal use
OTECTIVE GLOVES:
None required under normal use
PROTECTION:
None required under normal use
ER PROTECTIVE EQUIPMENT:
None required under normal use

10 - Special Precautions DISPOSE IAW ALL REGULATIONS

CAUTIONS TO BE TAKEN IN HANDLING AND STORING:
Do not store unpackaged cells together so contacts can touch. This situation will result in cell shorting and heat build-up.

R PRECAUTIONS:
Do not charge, overheat (greater than 160 F), or open cells. Avoid contact with water.

6 - Health Hazard Data (continued)

Not likely under normal use.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
Respiratory infections and diseases, Skin diseases.

EMERGENCY AND FIRST AID PROCEDURES:
INHALATION:
Remove to fresh air, use artificial respiration if needed. Seek medical attention.
EYE CONTACT:
Flush at least 15 minutes with fresh running water, occasionally lifting upper and lower eyelid. Seek medical attention.
SKIN CONTACT:
Thoroughly wash affected area until no trace of material remains.
INGESTION:
Not likely under normal use. If ingestion should occur, get immediate medical attention. Drink large quantities of water.
EXPOSURE IN A FIRE:
Remove victim from fire hazard area to fresh air. Seek medical attention.

7 - Reactivity Data

STABILITY:
Stable

CONDITIONS TO AVOID:
Excessive heat and fire (heating above 150 F), Charging

INCOMPATIBILITY (MATERIALS TO AVOID):
Keep away from water

HAZARDOUS DECONPOSITION PRODUCTS:
In a fire situation, mercury vapor, ammonium chlorides, nitrous oxides, chlorine, and zinc chloride fumes may be emitted.

HAZARDOUS POLYMERIZATION:
No

CONDITIONS TO AVOID:
None known

8 - Spill or Leak Procedures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Batteries are a dry solid and can be handled easily with shovels or similar equipment. When accumulating large quantities on undischarged batteries for disposal pack in