

N61165.AR.003187
CNC CHARLESTON
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FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION
ZONE C WORK PLAN PAGE CHANGES CNC CHARLESTON SC
4/10/1996
ENSAFE

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL BASE CHARLESTON
CHARLESTON, SOUTH CAROLINA
CTO-029**



**FINAL ZONE C WORK PLAN
PAGE CHANGES, REVISION NO: 01**

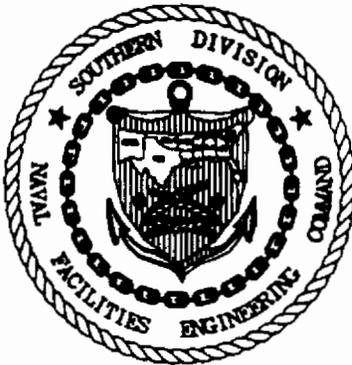
Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA**

**SOUTHDIV CONTRACT NUMBER:
N62467-89-D-0318**

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April 10, 1996

Release of this document requires the prior notification of the Commanding Officer of the Naval Base Charleston, Charleston, South Carolina.

**RESPONSE TO
SOUTH CAROLINA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL CONTROL
COMMENTS FOR THE
RCRA FACILITY INVESTIGATION (RFI) ZONE C & I WORK PLAN
CHANGES (DATED 1/24/96)
March 7, 1996**

AOC 522: Former Grease and Wash Building

Comment 1:

The location of AOC 522 has to be defined on Figure 1-1, " General AOC/SWMU location map," on the already approved RFI workplan for zone C.

Response 1:

AOC 522 has been included on Figure 1-1.

Comment 2:

Figure 2-1 in the currently approved RFI workplan for zone C has to be updated by including the proposed sampling locations for AOC 522.

Response 2:

Figure 2-1 has been updated to include the proposed sampling locations for AOC 522.

Comment 3:

On page 2-59 of the proposed RFI workplan for AOC 522, the word "site" can be fitted in the previous line of that paragraph, in the interest of a good presentation.

Response 3:

On Page 2-59 the word "site" has been added to the previous line in the interest of a good presentation.

AOC 700: Golf Course Maintenance Building

Comment 4:

Same as (1), for AOC 700.

Response 4:

AOC 700 has been included on Figure 1-1.

Comment 5:

Same as (2), for AOC 700.

Response 5:

Figure 2-1 has been updated to include the proposed sampling locations for AOC 700.

Comment 6:

Since this section makes reference to runoff patterns, drainage ditches and runoff accumulation areas as possible contaminant routes to Noisette Creek, the compromised area with its topographical relief should be included on figure 2-14.

Response 6:

Figure 2-14 has been updated to indicate topographical relief.

Comment 7:

Same as (3) on section 4.8A.

Response 7:

The word "site" has been added to the previous line in the interest of a good presentation.

SWMU #177: RTC-4 Oil Spill

Comment 8:

Take precautions to include the location of SWMU #177 on the appropriate map. An updated map with the locations of AOCs and SWMUs should be submitted.

Response 8:

Figure 1-1 has been updated to indicate the location of SWMU 177.

Comment 9:

The text on page 2-84 makes reference to figure 2.12 for the soil borings sampling locations. This mentioned figure has not been included for review nor is listed on the Table of Contents (List of Figures section). The workplan should be revised accordingly.

Response 9:

Figure 2.12 has been included in this submission.

Comment 10:

Section 2.12 of the Table of Contents has not been listed in detail as all the other similar sections. Subsections of section 2.12 should be listed, following the same scheme, in the Table of Contents.

Response 10:

The Table of Contents has been updated to include consistent subsection numbering details.

Comment 11:

On the Health and Safety Plan section of the Table of Contents, the addition of SWMU #177 as subsection 4.14A shows the intention to maintain order in the numbering of the document pages, and serve the intrinsic purpose of a "Table of Contents." If such is the purpose, the same should be done with the page numbering of this added subsection. It is recommended to change the page numbering starting at subsection 4.14A to the end of section 4. It should be noted that

if the page numbering changes, as recommended, tables 4.21A and 4.21B should be re-enumerated accordingly and appropriate changes to the List of Tables should be made as well.

Response 11:

As recommended, all subsequent page, subsection, and table numbering to the added section for SWMU 177 has been changed. In addition, all references to these "changed" sections and tables has been changed.

Comment 12:

Section 4.14A on page 4.50a, in the Site Activities Section, refers back to section 2.12A. There is no such section in the workplan. On the same page, next to the previously mentioned paragraph, is made reference to table 4-22B. This should be table 4.21B instead.

Response 12:

The referenced section and table number has been corrected.

Comment 13:

Table 4-21B, "Exposure Guidelines for Expected Site," does not refer to SWMU #177. Instead it refers to the guidelines for SWMUs 672 & 673, or else this header is mistaken. The same mistake is repeated in the Table of Contents. The proposed workplan for SWMU #177 should be revised accordingly.

Response 13:

The table header has been corrected to read "SWMU 177" instead of SWMUs 672 and 673.

Record of Changes to the Final Zone C RFI Work Plan Naval Base Charleston		
Page(s)	Change/Revision	Reason for Change
i to vi	Table of Contents: Resubmit entire TOC.	Table of Contents had to be revised to incorporate the addition of Sections 2.7, 2.8, 4.9, and 4.10.
1-3	Modified Figure 1-1.	Include AOCs 522 and 700 on the Zone C SWMU/AOC Location Map.
2-3	Modified Figure 2-1.	Modified drawing to include proposed sampling locations for AOCs 522 and 700.
2-10, 2-19, 2-26, 2-32, 2- 38 & 2-45	Under the matrix column of the table " was changed to ' .	Change made to indicate feet.
2-59	Modified last sentence of the first paragraph.	Change made for presentation purposes.
2-59 to 2-70	Addition for two site descriptions and investigative approaches: Sections 2.7 and 2.8.	Include two sites requiring either a CSI or RFI in the investigation.
2-61	Modified last sentence of first paragraph.	Clarified that sanitary and storm sewer utilities are to be investigated in Zone L.
2-61	Modified last sentence of this page.	Clarified that the number of samples and sample locations proposed are for AOC 522.
2-63	Modified Figure 2-13.	Changed drawing to include proposed sampling locations for AOC 522.
2-68	Modified the third line of the first paragraph.	Clarified that the number of samples and sample locations proposed are for AOC 700.
2-69	Modified Figure 2-14.	Changed drawing to include proposed sampling locations and topographical relief for AOC 700.
4-1 to 4-56	Resubmit entire Section 4.	Reflect corrections to page and section references due to AOCs 522 and 700 section additions.
4-19	Modified last sentence of the first paragraph.	Change made for presentation purposes.
4-19 to 4-24	Addition for two Site Specific Health and Safety Plans: Sections 4.9 and 4.10.	Include two sites requiring either a CSI or RFI in the investigation.

FILING INSTRUCTIONS

The following is a list of pages in the *Final Zone C Work Plan, dated February 24, 1995*, that have been revised. The obsolete pages presently in your binders are listed in the column headed "Remove." New and replacement pages are listed in the column headed "Replace." Please file this instruction cover sheet preceding the Table of Content of *Final Zone C Work Plan*.

If you have any questions, please call 803-884-0029.

List of Changes/Revisions	<u>Remove</u> <u>Pages</u>	<u>Replace</u> <u>Pages</u>
Table of Contents - updated.	i - vi	i - vi
Section 2.0 - Text change as are highlighted.	2-9 to 10, 2-19 to 20, 2-25 to 26, 2-31 to 32, 2-37 to 38, & 2-45 to 46	Same as Removed
Section 2.0 - Added Sections 2.7 and 2.8	—	2-59 - 2-70
Section 4.0 - Updated Section 4.0. Text changes are highlighted.	4-1 - 4-52	4-1 - 4-56
Section 4.0 - Added Sections 4.9 and 4.10	—	4-19 - 4-24

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2.1.5 Objectives

Based on the data gaps presented, the objective of the proposed field investigation is to collect the data necessary to confirm whether contaminants are present. If COPCs are detected, the horizontal and vertical extent, as well as the rate of any soil, soil-gas, groundwater, surface water or sediment contamination, will be delineated concurrently. Data collection efforts will also support the technical evaluation of identified remedial options.

2.1.6 Screening Alternatives

Only limited sampling has been conducted to determine COPCs, therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. While collecting all soil boring samples and installing all monitoring wells, samples will be screened for volatile organic compounds (VOCs) using a photoionization detector (PID). All screening results will be recorded in field notebooks and boring logs.

2.1.7 Sampling and Analysis Plan

To fulfill the RFI objectives, site-specific sampling and analysis requirements have been proposed. Table 2-3 summarizes the types of samples and analytical parameters. Several surface water runoff samples taken in previous investigations were used to select the following biased sampling locations.

Table 2-3 SWMU 44 Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1' bgs)	8	Metals and Cyanide
Soil (3'-5' bgs)	8	
Groundwater (shallow wells)	8	Grain size and total organic carbon (sediment).
Sediment	14	
Surface Water	14	General water quality standards (surface water).
<p>Engineering Parameters:</p> <p>Slug tests will be performed on two of the shallow wells. While installing the wells, Shelby tubes will be collected when lithology changes significantly. Samples will be tested for permeability, grain size, porosity, total organic carbon (TOC) and cation exchange capacity (CEC). Analysis for any of the remaining design parameters listed in Appendix C will be performed at selected locations when a better understanding of the contamination distribution (if contamination is present) is developed.</p>		
<p>Notes:</p> <p>Groundwater monitoring wells will be sampled quarterly for one year.</p> <p>A leachability test will be conducted on a sample from the coal pile.</p> <p>The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives.</p> <p>All analysis to be performed per SW-846 except where other methods are specified. Data Quality Objective (DQO) Level III analysis as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at the locations where contaminants are most likely to be present. The sample quantities presented do not include Quality Assurance/Quality Control (QA/QC).</p>		

The soil boring and groundwater monitoring well locations are proposed for the inner and outer perimeters of the anticipated migration pathways. Four soil borings to be completed as groundwater monitoring wells will be located on each side, directly adjacent to the coal pile. These sampling locations will be used to confirm if COPCs derived directly from the coal pile are present. Four additional soil borings completed as groundwater monitoring wells will be oriented on the west and northwest side of the coal pile adjacent to the surface water runoff ditches, which are also the site boundaries. These borings and wells will confirm the presence of COPCs deposited and/or having the possibility of migrating offsite.

Table 2-5 AOC 516 (Including SWMU 47) Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1½ bgs)	17	VOA, SVOA w/ Tentatively Identified Compounds (TICs), Metals, Cyanide, Pesticides, TPH and Polychlorinated biphenyls (PCBs).
Soil (3-5½ bgs)	17	
Groundwater (shallow wells)	15	
<p>Engineering Parameters:</p> <p>Slug tests will be performed on 25% of the shallow wells. While installing the wells, Shelby tubes will be collected when significant changes in lithology occur. Samples will be tested for permeability, grain size, porosity, TOC, and CEC. Analysis for any of the remaining design parameters listed in Appendix C will be performed at selected locations when a better understanding of the contamination distribution (if contamination is present) is developed.</p>		
<p>Notes:</p> <p>Groundwater monitoring wells will be sampled quarterly for one year.</p> <p>The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives.</p> <p>All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis, as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at the locations where contaminants are most likely to be present. The sample quantities presented do not include QA/QC samples.</p>		

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2.3.5 Objectives

The goal of the CSI is to classify the site as requiring No Further Investigation (NFI) or an RFI by using DQO Level III or IV data to determine whether contaminants are present. If an RFI is required, the objective of field investigations shall be to fill the identified data gaps by delineating the horizontal and vertical extent of any soil and groundwater contamination as well as the rate of contaminant migration at the sites. Data collection efforts shall support the technical evaluation of identified remedial options.

2.3.6 Screening Alternatives

No sampling has been conducted to determine COPCs, therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. While collecting all soil boring samples, soil samples will be screened for VOCs with a PID. All screening results will be recorded in field notebooks and boring logs.

2.3.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Two soil borings will be placed inside the suspected boundaries of the former building locations and one on each of the sides, 25 feet away. This sampling scheme will confirm whether COPCs are present relating to the former buildings. The length of time since operation and the shallow depth to groundwater enables the use of soil borings only to determine whether COPCs are present. Because soil gas has been identified as a migration pathway, a PID will be used to screen all borings and soil samples. Table 2-7 summarizes the types of samples to be collected and analytical parameters to be used. Proposed sampling locations for AOCs 508 and 511 are illustrated in Figure 2-4. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan*.

Table 2-7 AOC 508 (Including AOC 511) Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1½ bgs)	12	VOA, SVOA w/ TICs, Metals, Cyanide, Pesticides, TPH and PCBs
Soil (3½-5½ bgs)	12	
Engineering Parameters: Selected soil samples will be tested for permeability, grain size, porosity, TOC, and CEC.		
Notes: The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives. All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at the locations where contaminants are most likely to be present. The sample quantities presented do not include QA/QC samples.		

investigations shall be to fill the identified data gaps by delineating the horizontal and vertical extent of any soil and/or groundwater contamination as well as the rate of contaminant migration at the sites. Data collection efforts will also support the technical evaluation of identified remedial options.

2.4.6 Screening Alternatives

No sampling has been conducted to determine COPCs, therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. However, while collecting all soil boring samples, soil samples will be screened for VOCs with a PID. All screening results will be recorded in field notebooks and boring logs.

2.4.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Two soil borings will be placed inside the suspected boundaries of the former buildings and one on each of the sides, 25 feet away. This sampling scheme will determine whether COPCs are present relating to the former buildings. The length of time since operation and shallow depth to groundwater enables the use of soil borings only to determine whether COPCs are present. Because soil gas is identified as a potential migration pathway, a PID will be used to screen all borings and soil samples. Table 2-9 summarizes the types of samples to be collected and analytical parameters to be used. Proposed sampling locations for AOCs 515 and 519 are illustrated in Figure 2-5. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan*.

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Table 2-9 AOC 515 (Including AOC 519) Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1½ bgs)	12	VOA, SVOA w/ TICs, Metals, Cyanide, Pesticides, TPH, and PCBs
Soil (3½-5½ bgs)	12	
Engineering Parameters: Selected soil samples will be tested for permeability, grain size, porosity, TOC, and CEC.		
Notes: The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives. All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at the locations where contaminants are most likely to be found. The sample quantities presented do not include QA/QC samples.		

at the sites. The remaining objective will be to establish the presence/absence, number of, and location of USTs. Data collection efforts shall also support the technical evaluation of identified remedial treatment options.

2.5.6 Screening Alternatives

No sampling has been conducted to determine COPCs, therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. While collecting all soil boring samples and installing all monitoring wells, samples will be screened for VOCs using a PID. All screening results will be recorded in field notebooks and boring logs.

2.5.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Two soil borings, which will be completed as groundwater monitoring wells, will be located just outside the south and east perimeters of Building 198. The placement of the first well, south of the building, was chosen because it is the closest feasible location to the site and it is upgradient of the anticipated easterly flow of groundwater. The remaining well will be placed downgradient, east of Building 198, to define whether COPCs are present relating to AOC 523.

The soil borings will occur directly on the area with suspected COPCs. Investigative measures to determine the presence/absence of USTs will be conducted by a location specialist under the direction of E/A&H personnel. Because soil gas is identified as a potential migration pathway, a PID will be used to screen all borings and soil samples. Table 2-11 summarizes the types of samples to be collected and analytical parameters to be used. Proposed sampling locations for AOC 523 are illustrated in Figure 2-6. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan*.

Table 2-11 AOC 623 (Including SWMU 49) Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1' bgs)	4	VOA & SVOA w/ TICs, Metals, Cyanide, Pesticides, TPH, and PCBs.
Soil (3'-5' bgs)	4	
Groundwater	2	
Engineering Parameters: Slug tests will be performed on 25% of the shallow wells. While installing the wells, Shelby tubes will be collected when lithology changes significantly. Samples will be tested for permeability, grain size, porosity, TOC, and CEC.		
Notes: Groundwater monitoring wells will be sampled quarterly for a year. The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives. All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at the location where contaminants are most likely to be found. The sample quantities presented do not include QA/QC samples.		

Table 2-13 Other Sites Designated CSI Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1 $\frac{1}{2}$ bgs)	28	VOA & SVOA w/ TICs, Metals, Cyanide, Pesticides and PCBs.
Soil (3 $\frac{1}{2}$ -5 $\frac{1}{2}$ bgs)	28	
Groundwater wells (shallow)	2	
<p>Engineering Parameters:</p> <p>Slug tests will be performed on one of the shallow wells. While installing the wells, Shelby tubes will be collected when lithology changes significantly. Samples will be tested for permeability, grain size, porosity, TOC and CEC.</p>		
<p>Notes:</p> <p>Groundwater monitoring wells will be sampled quarterly for one year.</p> <p>The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives.</p> <p>Samples will be taken of the residue in the pit, if present, at AOC 510.</p> <p>Floor and roof wipe samples will be taken at the former indoor range, AOC 517.</p> <p>All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis, as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at locations where contaminants are most likely to be found. The sample quantities presented do not include QA/QC samples.</p>		

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2.7 AOC 522, Former Grease and Wash Building

AOC 522 is the site of former Building 1252, a grease and wash building, located at the southeast corner of Building 198, near the loading docks. This site has been designated for a CSI. Table 2-14 describes the site.

Table 2-14 AOC 522 Site Information and Description			
Number	Description	Materials Generated or Stored	Potential Pathways
AOC 522 FORMER BUILDING 1252	Former building 1252 was a small garage-type structure used for vehicle maintenance in the early 1950s. It was located adjacent to the present Building 198 shipping and receiving warehouse. No visible evidence of the building remains today, and the area is now mainly covered by asphalt. ^a	Lead Paint Solvent Anti-freeze Battery acid Degreasing solvents Petroleum hydrocarbons (VOA, SVOA, and Metals)	Air Soil Soil Gas Groundwater Surface Water
Notes: ^a Described in the <i>Final RCRA Facility Assessment</i> , Vol. II, June 1995 Pathways scheduled for sampling are bold.			

2.7.1 Previous Investigations

This site has not been investigated previously.

2.7.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.7.3 Data Gaps

Currently no environmental media data have been collected to characterize this site or to support detailed evaluation of treatment alternatives, if necessary. To ensure data collection efforts are sufficient to meet the stated investigative objectives, the following data gaps have been identified and will be resolved:

- There are currently no data to establish whether COPCs are present for any of the potential migration pathways; and,
- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.7.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support following closure. Data will be generated during the investigation to determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population, who may be exposed through invasive or non-invasive activities. Sampling will characterize the potential pathways bolded in Table 2-14.

Land around this site consists of paved parking areas. Potential receptors are site workers or other land users involved with invasive and non-invasive activities bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

The underground utility systems in this area could act as a conduit for moving any product released at this facility, and thus could expose those working on any of these underground

systems. ~~The sanitary and storm sewer systems, as well as the railroad system, will be investigated in the Zone L Work Plan.~~

2.7.5 Objectives

The goal of the CSI is to classify the site as NFI or RFI by using DQO Level III or IV data to determine whether COPCs are present. If an RFI is required, the objective of field investigations shall be to fill the identified data gaps by delineating the horizontal and vertical extent of any soil and/or groundwater contamination as well as the rate of contaminant migration at the sites. Data collection efforts shall also support the technical evaluation of identified remedial options.

2.7.6 Screening Alternatives

No sampling has been conducted to determine the existence of COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be re-evaluated. While collecting all soil boring samples and installing all monitoring wells, samples will be screened for VOCs using a PID. All screening results will be recorded in field notebooks and boring logs.

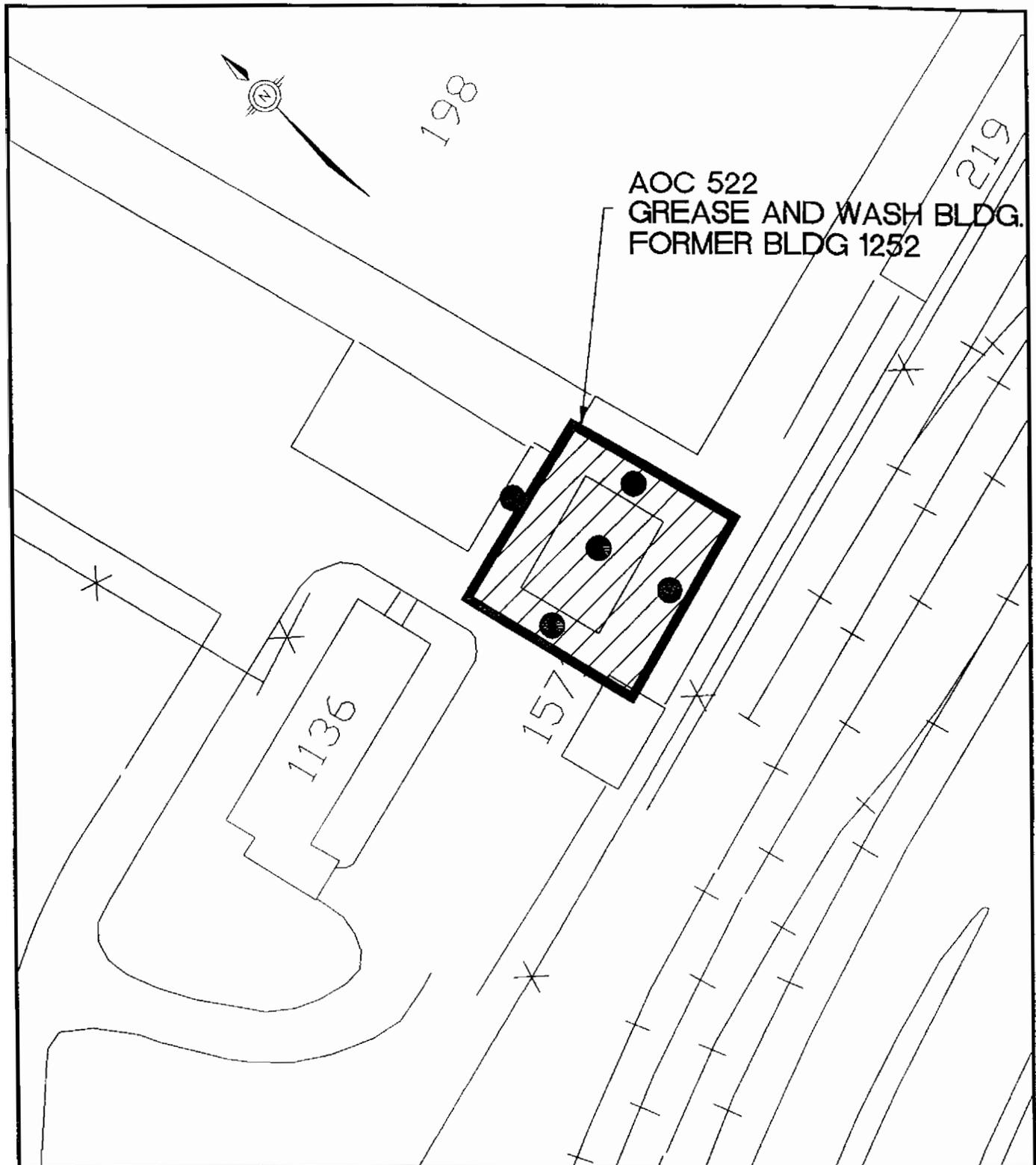
2.7.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Table 2-15 summarizes the types of samples to be collected and analytical parameters to be used. Proposed sampling locations for AOC 522 are illustrated in Figure 2-13.

Due to the general lack of information regarding this site, proposed sample locations, as illustrated, represent the areas most likely to have been impacted if a release has occurred. The number of samples and sample locations for ~~AOC 522~~ are based on what is reasonably expected

to provide adequate information to identify the presence of COPCs. All sampling will adhere to NAVBASE *Final Comprehensive RFI Work Plan*.

Table 2-15 AOC 522 Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1' bgs)	5	VOA & SVOA w/ TICs, Metals, Cyanide, Pesticides and PCBs.
Soil (3'-5' bgs)	5	
<p>Notes:</p> <p>The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives.</p> <p>All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis, as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at locations where contaminants are most likely to be found. The sample quantities presented do not include QA/QC samples.</p>		



AOC 522
 GREASE AND WASH BLDG.
 FORMER BLDG 1252

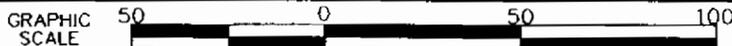
LEGEND

- - ZONE C SOIL BORINGS
- ⊙ - ZONE C DEEP MONITORING WELLS
- ▲ - ZONE C SHALLOW MONITORING WELLS



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FIGURE 2-13
 AOC 522
 FORMER GREASE & WASH BUILDING
 PROPOSED SAMPLING LOCATIONS



DWG DATE: 4/04/96 | DWG NAME: 29AOC522

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2.8 AOC 700, Golf Course Maintenance Building

AOC 700 is the site of a golf course maintenance building, Building 1646, located west of Avenue "D" and north of Hunt Street. This site has been designated for an RFI. Table 2-16 describes the sites.

Table 2-16 AOC 700 Site Information and Description			
Number	Description	Materials Generated or Stored	Potential Pathways
AOC 700 GOLF COURSE MAINTENANCE BUILDING	This structure was built in 1975. It has been used for lawnmower storage and repair and pesticide storage and mixing. The building is no longer being used and all chemicals and equipment have been removed. ^a	Acids Solvents Herbicides Pesticides Petroleum Hydrocarbons (VOA, SVOA, Pesticides, Herbicides and Metals)	Air Soil Soil Gas Groundwater Surface Water
Notes: ^a Described in the <i>Final RCRA Facility Assessment</i> , Vol. V, June 1995 Pathways scheduled for sampling are bold.			

2.8.1 Previous Investigations

This site has not been investigated previously. However, several areas of dark soil were observed on the west and northwest sides of the building. Stressed and dead vegetation was also observed on the west, north and northwest sides of the building.

2.8.2 Treatment Alternatives

As outlined in the overall sampling strategy in the *Final Comprehensive RFI Work Plan*, treatment alternatives are being identified for each site likely to require remediation. Data collection efforts will support evaluating these alternatives. Table C-4 (Appendix C) lists treatment alternatives for groundwater; Table C-5 lists treatment alternatives for soil; Table C-6

lists treatment alternatives for the presence of soil gas. Alternatives presented here are for preliminary evaluation only.

2.8.3 Data Gaps

Currently no environmental media data have been collected to characterize this site or to support detailed evaluation of treatment alternatives, if necessary. To ensure data collection efforts are sufficient to meet the stated investigative objectives, the following data gaps have been identified and will be resolved:

- The nature and extent of impact to environmental media (soil, soil-gas and groundwater) from the suspected releases has not been defined.
- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.8.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support following closure. Data will be generated during the investigation to determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population, who may be exposed through invasive or non-invasive activities. Sampling will characterize the potential pathways bolded in Table 2-16.

Land around this site ranges from grassy to asphalt areas. Potential receptors are site workers or other land users involved with invasive and non-invasive activities bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

Runoff patterns, drainage ditches and runoff accumulation areas provide a possible contaminant route to Noisette Creek, approximately 600 feet away. These avenues may result in the exposure to biological receptors other than humans.

The utility system in this area could act as a conduit for moving any product released at this facility, and thus could expose those working on any of these underground systems. The underground utility system will be investigated in the Zone L work plan.

2.8.5 Objectives

The objective of field investigations is to fill the identified data gaps by establishing whether contaminants are present in the identified migration pathways. If COPCs are detected, the horizontal and vertical extent and rate of any soil contamination will be delineated concurrently. Data collection efforts shall also support the technical evaluation of identified remedial options.

2.8.6 Screening Alternatives

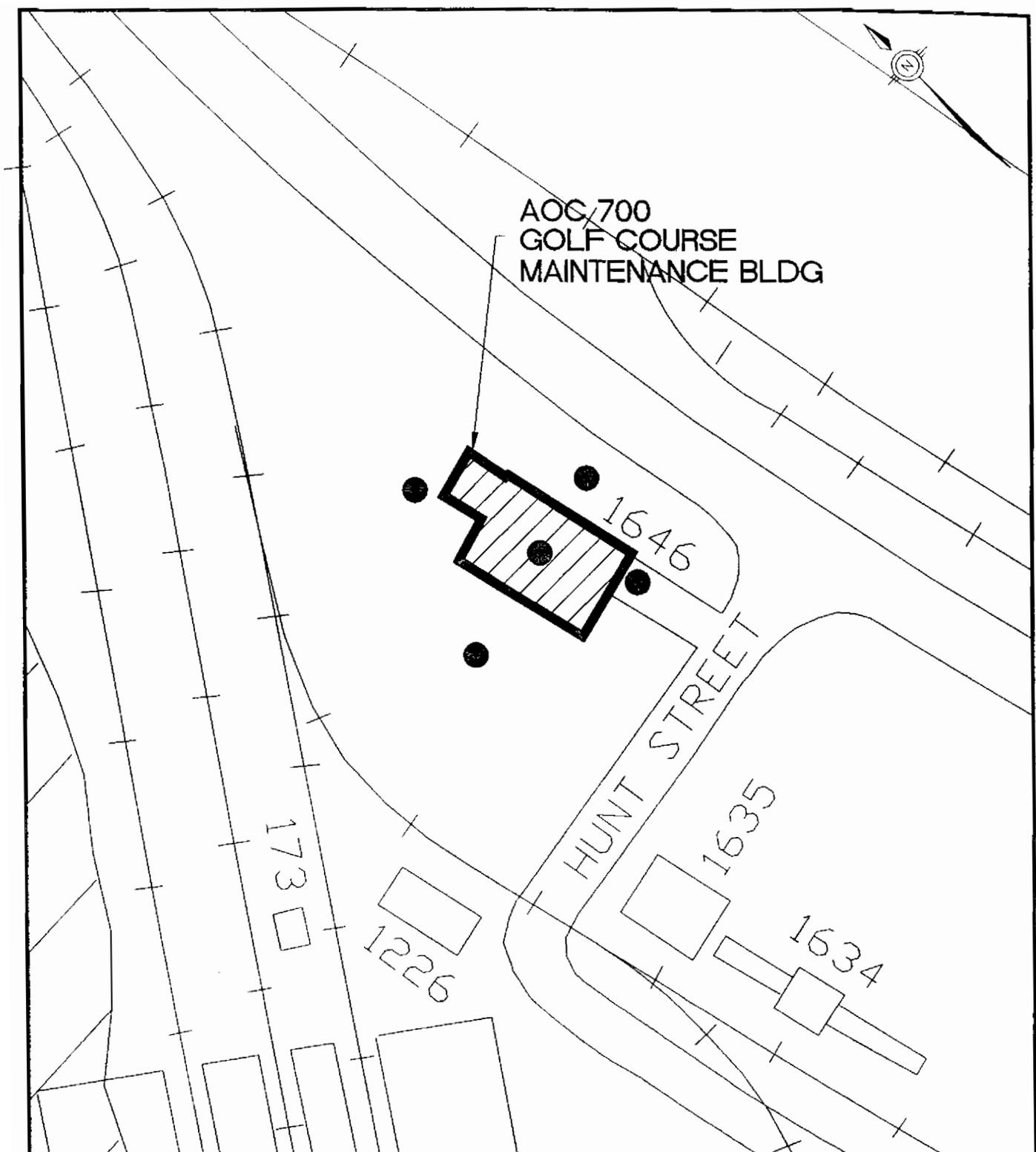
No sampling has been conducted to determine the existence of COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the extent of contamination (if present), the feasibility of employing screening methods will be re-evaluated. While collecting all soil boring samples and installing all monitoring wells, samples will be screened for VOCs using a PID. All screening results will be recorded in field notebooks and boring logs.

2.8.7 Sampling and Analysis Plan

To fulfill the objectives, the following site-specific sampling and analysis requirements have been proposed. Table 2-17 summarizes the types of samples to be collected and analytical parameters to be used. Proposed sampling locations for AOCs 700 are illustrated in Figure 2-14.

Due to the general lack of information regarding this site, proposed sample locations, as illustrated, represent the areas most likely to have been impacted if a release has occurred. The number of samples and sample locations for AOC 700 are based on what is reasonably expected to provide adequate information to identify the presence of COPCs. All sampling will adhere to NAVBASE Final Comprehensive RFI Work Plan.

Table 2-17 AOC 700 Sampling Plan		
Matrix	Quantity	Analysis
Soil (0-1' bgs)	5	VOA & SVOA w/ TICs, Metals, Cyanide, Pesticides, Herbicides and PCBs.
Soil (3'-5' bgs)	5	
<p>Notes:</p> <p>The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion of the investigation may be necessary to meet the stated objectives.</p> <p>All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analysis, as specified in the sampling plan will be used, with a minimum of 10% duplicates analyzed for all Appendix IX constituents at DQO Level IV. Duplicates will be collected at locations where contaminants are most likely to be found. The sample quantities presented do not include QA/QC samples.</p>		



AOC 700
 GOLF COURSE
 MAINTENANCE BLDG

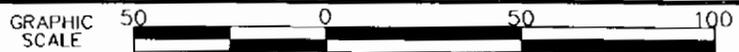
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- - ZONE C SOIL BORINGS
- ⊙ - ZONE C DEEP MONITORING WELLS
- ⊕ - ZONE C SHALLOW MONITORING WELLS



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FIGURE 2-14
 AOC 700
 GOLF COURSE MAINTENANCE BLDG.
 PROPOSED SAMPLING LOCATIONS



DWG DATE: 4/04/96 | DWG NAME: 29AOC700

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4.0 HEALTH AND SAFETY PLAN

EnSafe/Allen and Hoshall is conducting an environmental monitoring program at various specified locations (sites) within NAVBASE. The purpose of the monitoring program is to assess the nature and extent of contamination at these sites and to determine if additional action is required to maintain compliance with environmental regulations.

The base closure team has divided the NAVBASE sites into SWMUs and AOCs which have been grouped into zones for investigative purposes. These SWMUs and AOCs have been grouped into zones for investigative purposes. This Zone-Specific Health and Safety Plan (ZCHASP) has been developed for SWMUs and AOCs located in Zone C.

This ZCHASP was written to complement the E/A&H NAVBASE *Final Comprehensive Health and Safety Plan* (CHASP) by providing site specific details which are absent in the CHASP. Site specific details presented in this ZCHASP include: potential site contaminants, proposed site activities, action levels and initial level of personal protective equipment. Copies of both this plan and the CHASP should be onsite during all field operations.

This Work Plan and ZCHASP use both the term COPC "chemical of potential concern" and contaminate of concern. Not all COPCs are necessarily of interest from a human health perspective. COPCs refers to compounds of analytical interest. The analytical interest may be because of public health, regulatory, ecological or other concerns. The term contaminant of concern is used to identify (potential) site contaminants that may be present in sufficient concentrations to cause concern about potential occupational exposures to onsite personnel.

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4.1 Applicability

The provisions of this plan are mandatory for E/A&H personnel. E/A&H personnel shall read this plan and sign the plan acceptance form (Appendix D) before starting site activities. In addition, personnel will operate in accordance with the most current requirements of 29 Code of Federal Regulations (CFR) 1910.120, Standards for Hazardous Waste Workers and Emergency Responders (HAZWOPER). These regulations include the following provisions for employees involved in cleanup operations covered by Resource Conservation and Recovery Act (RCRA): training 1910.120(e), medical surveillance 1910.120(f), and personal protective equipment (PPE) 1910.120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this ZCHASP and the corresponding CHASP or shall have their own safety plan which, at minimum, meets the requirements of the E/A&H CHASP and ZCHASP.

This ZCHASP applies to standard field procedures and tasks such as drilling; installing and developing monitoring wells; surveying; and collecting soil, groundwater, surface water, and sediment samples. Non-routine procedures and tasks involving non-routine risks are not covered by this plan, examples of procedures that are not covered in this plan are:

- Trenching
- Confined space Entry
- Locating and/or recovering unexploded ordnance
- Sampling, handling, or removing unidentified drums

Should it be necessary to conduct these or other "high risk" tasks specific Health and Safety procedures must be developed, approved, and implemented before these tasks may proceed.

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4.2 Zone Characterization

Sites included in this ZCHASP consist of SWMUs and AOCs as identified in the RFI plan for NAVBASE as prepared by E/A&H (Appendix A). Figure 2-1 on page 2-3 shows the location of each SWMU and AOC and the associated sampling locations.

Physical hazards that are inherent in environmental investigations, or present throughout the zone are discussed in Section 4.11. Subsections 4.3 through 4.10 contain site specific health safety information for each site in Zone C. Included in these subsections is a discussion of Site Descriptions, planned Site Activities, Chemical Hazards, and PPE requirements. Also any Operational/Physical Hazards that are specific to a site will be discussed in that site's subsection.

Under the heading "Chemical Hazard", chemical hazards are discussed in terms of COPCs. COPCs are selected to represent the range of acute and chronic health (toxicological) hazards that are, or foreseeably may be present at the site. That is, not every chemical known or suspected of being present is listed as a COPC. Rather, one or two of the most toxic or most prevalent contaminants within a class of chemicals are listed. It is in this light that cadmium and chromium have been listed in the health and safety plan as COPCs. To illustrate this principle, listed below are classes of chemicals or chemical categories in one column, and examples of chemicals that may be listed as a COPC in the second column.

Class of Chemical/Product	Potential Contaminant of Concern
• Chlorinated solvents/ Degreasers	perchloroethylene, chloroform, methylene chloride, trichloroethylene, and 1,1,1-trichloroethane
• Non-chlorinated solvents	benzene, toluene, xylene, ethylbenzene, 2-butanone and hexane
• Metals/Heavy metals	lead, cadmium, chromium (especially hexavalent chrome), mercury, silver, and copper
• Fuels - gasoline, fuel, oils, diesel, lubricants	benzene, toluene, tetraethyl lead, kerosene, xylene, hexane

- Paints see - Solvents and Metals above, plus tributyl tin
- Pesticides - chlorinated DDT, DDE, chlordane, dieldrin and endrin

Material Safety Data Sheets (MSDSs) for COPCs are provided in a field MSDS book.

4.2.1 Work Zones

Section 2.1 of the CHASP, describes the function and interrelatedness of the three work zones which, in combination, comprise the work area. The three work zones are:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ)
- Support Zone (SZ)

These work zones will be established and utilized during field work covered under this ZCHASP.

4.2.2 Work Area Access

Authorized personnel will be allowed access to work areas as long as they follow the requirements of this ZCHASP and the CHASP. See also Work Area Access, Section 2.2 of the CHASP.

Authorized Personnel — In order for E/A&H personnel to be authorized to enter an E/A&H controlled work area, they must have a current HAZWOPER training certificate on file onsite. Individuals whose certification is not on file, or those who have a more recent certificate (have attended a refresher course), will provide the onsite Supervisor with a copy of their certificate before being allowed to enter a work area.

Subcontractors, DOD oversight personnel, and other site visitors shall demonstrate compliance with HAZWOPER training requirements before entering a work area.

4.3 SWMU 44, Coal Storage Area

SWMU 44 is an active coal pile, in the northern portion of Zone C with drainage ditches to the west and Noisette Creek and wetlands to the north. Table 4-1 describes SWMU 44.

Table 4-1 SWMU 44 Site Information and Description		
Number	Description	Materials Generated or Stored
SWMU 44 Coal Pile	The coal storage yard began operations in the 1940s and is used for unloading coal railcars and for the intermediate storage of coal before use at the steam-generation plant (Building 32). The coal pile is currently 80' x 400'. ¹	Coal Coal Derivatives
Note: ¹ Described in the Draft Final RCRA Facility Assessment, (Volume I, November 1994).		

Previous investigations conducted at SWMU 44 have focused on sampling surface water and surface water runoff. Previous sampling events detected the presence of metals and TSS in the surface water and surface water runoff. Table 2-2 lists the previous investigations and analytical results for SWMU 44. A map identifying previous sampling locations can be found in Appendix B, Location Maps from Previous Investigations.

Site Activities

Initial site activities include soil borings, soil sampling, sediment sampling, and installing monitoring wells. Subsequent activities include well development, purging, and sampling. Field work for this site is described in Section 2.1 of this Work Plan.

Chemical Hazards and PPE Requirements

The stored coal itself is not hazardous, but rainwater percolating through the coal produces runoff water which has been very acidic (pH average as low as 2.5) causing metals to precipitate

and elevate TSS above background. If additional chemicals of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZCHASP.

The initial level of PPE for invasive field activities performed at SWMU 44 is modified Level D. The Action Level (AL) for this site is a continuous photoionization detector (PID) reading of 5 parts per million (ppm) or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

4.4 AOC 516, Wash Area (Includes SWMU 47)

AOC 516, a former wash area in Building 233, is currently used as a lead-acid battery charging area. SWMU 47, a former burning dump, is to the southeast. Currently this area contains Buildings NSC-66, NSC-64 and NSC-67, where petroleum product spills have been reported in recent years. These sites have been designated for an RFI. Because of the proximity of SWMU 47 to AOC 516, these sites will be investigated as a single unit. These sites have not been investigated previously. Table 4-2 describes the sites.

Table 4-2 AOC 516 and Associated Site Information and Description		
Number	Description	Materials Generated or Stored
AOC 516 Wash Area/ Battery Charging	Building 233 was used for spray washing vehicles and equipment from 1972 until the 1980s. Currently it is used as a lead-acid battery charging facility. ¹	Lead Metals Solvents Battery Acids Petroleum Products
SWMU 47 Burning Dump	This site was a burning dump during the 1920s. Currently, it is an asphalt and grassy area on which Buildings NSC-64, NSC-66 and NSC-67 are located. Petroleum product spills have been reported at these buildings in recent years. ²	Petroleum Products Products of incomplete combustion Medical waste
Notes: ¹ Described in the Draft Final RCRA Facility Assessment, (Volume II, November 1994). ² Described in the Draft Final RCRA Facility Assessment, (Volume I, November 1994).		

Site Activities

Initial site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities include well development, purging, and sampling. Field work for this site is described in Section 2.2 of this Work Plan.

Chemical Hazards and PPE Requirements

The contaminants of concern at this site are petroleum products, heavy metals, solvents, and battery acids. Table 4-3 lists exposure guidelines for these compounds.

If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

Table 4-3 Exposure Guidelines for Expected Site Chemical Hazards — AOC 516						
Contaminant of Concern	Odor ^a Threshold	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^d	Ionization Potential (eV) ^e	Flammable Range (% by Volume)
Benzene	4.68 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	9.25	1.3 to 7.1
Cadmium	NA	0.6 mg/m ³ Ceiling	0.05 mg/m ³	Potential Occupational Carcinogen	NA	NA
Chromium	NA	1 mg/m ³	0.5 mg/m ³	NA	NA	NA
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Kerosene	1 ppm	NA	NA	100 mg/m ³	6.8	0.7 to 5.0
Lead	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA	NA
Sulfuric Acid	NA	1 mg/m ³	1 mg/m ³	1 mg/m ³	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 STEL	8.8	1.3 to 7.1
Xylene	1 ppm ^a	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990*.
- ^e = Odor Thresholds for Chemicals, *Chemical Hazards in the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fichman, M.D., M.P.H.

NA = Substance information not available, or substance unlisted.

The initial PPE level for invasive field activities performed at AOCs 516 and SWMU 47 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

4.5 AOC 508, Former Incinerator (Includes AOC 511, Former Oil Storage House)

AOC 508 is the site of a former incinerator, between Avenue H and the west NAVBASE property boundary. Southwest of this site is AOC 511, a former oil storehouse. These sites have been designated as a CSI. These sites will be investigated as a single unit because of their proximity. Table 4-3A describes the sites.

Table 4-3A AOC 508 and AOC 511 Information and Description		
Number	Description	Materials Generated or Stored
AOC 508 INCINERATOR	Former Incinerator 19 operated from 1922 until 1929. Its exact dimensions and operating practices are unknown. Currently the site is a grassy area west of Avenue H and north of AOC 511.*	Metals Petroleum Hydrocarbons Products of Incomplete Combustion (VOA, SVOA, Metals, and TPH)
AOC 511 OIL STORAGE	Former Building 16 was used for oil storage from 1922 until approximately 1955. The design features and operating practices of this facility are unknown. Currently the site is a grassy area west of Avenue H and north of Building 762.*	Petroleum Hydrocarbons (VOA, SVOA, and TPH)
Notes: * Described in the Draft Final RCRA Facility Assessment, Vol. II, November 1994		

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.3 of this Work Plan.

Chemical Hazards and PPE Requirements

The COCPs at this site are petroleum products, heavy metals, and polynuclear aromatic hydrocarbons. Table 4-4 lists exposure guidelines for representative contaminants of concern. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

The initial PPE level for invasive field activities performed at AOCs 508 and 511 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

Table 4-4 Exposure Guidelines for Expected Site Chemical Hazards — AOC 508						
Contaminant of Concern	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Ionization Potential (eV) ^(e)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Benzo(a) pyrene	NA	0.2 mg/m ³	Suspected Human Carcinogen	NA	NA	NA
Cadmium	NA	0.6 mg/m ³ Ceiling	0.05 mg/m ³	Potential Occupational Carcinogen	NA	NA
Chromium	NA	1 mg/m ³	0.5 mg/m ³	NA	NA	NA
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Kerosene	1 ppm	NA	NA	100 mg/m ³	6.8	0.7 to 5.0
Lead	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA	NA
Mercury	NA	0.05 mg/m ³ Skin	0.05 mg/m ³ Skin	0.05 mg/m ³	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 STEL	8.8	1.3 to 7.1
Xylene	1 ppm ^(e)	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993-1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards*, June 1990.
- ^e = Odor Thresholds for Chemicals, *Chemical Hazards in the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fichman, M.D., M.P.H.

NA = Substance information not available, or substance unlisted.

4.6 AOC 515, Former Incinerator and Paint Shop (Includes AOC 519, Former Boiler House)

AOC 515, a former incinerator and paint shop, and AOC 519, a former boiler house, are both south of Turnbull Avenue and east of NH-55. These sites are both designated for a CSI. Because of the close proximity of these sites they will be discussed as a unit. Table 4-5 describes these sites.

Table 4-5 AOC 515 and Associated Site Information and Description		
Number	Description	Material Released or Stored
AOC 515 Incinerator	An incinerator operated at this site in the 1920s and a paint shop replaced it in the 1930s. Currently, it is a gravel parking area east of AOC 519. ¹	Oils Paints Solvents Products of Incomplete Combustion Petroleum Products
AOC 519 Boiler House	A boiler house for the Navy Brig operated at this site from 1922 until 1929. Currently this site is a gravel parking area east of Building NH-55. ¹	Coal Petroleum Products
Note: ¹ Described in the Draft Final RCRA Facility Assessment, (Volume II, November 1994).		

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.4 of this Work Plan.

Chemical Hazards and PPE Requirements

The COPCs at this site include oils, metal-based paints, solvents, petroleum hydrocarbons, and polynuclear aromatic hydrocarbons. This site has not been investigated previously. Table 4-6 lists exposure guidelines for contaminants of concern. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZCHASP.

Table 4-6 Exposure Guidelines for Expected Site Chemical Hazards — AOC 515						
Contaminant of Concern	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Benzo(a) pyrene	NA	0.2 mg/m ³	Suspected Human Carcinogen	NA	NA	NA
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Lead	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	8.8	1.3 to 7.1
Trichloroethylene	0.5 to 176	50 ppm 200 ppm STEL	50 ppm 200 ppm STEL	25 ppm	9.45	11 to 41
Xylene	1 ppm ^(e)	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993-1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- ^e = Odor Thresholds for Chemicals, *Chemical Hazards in the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fichman, M.D., M.P.H.
- NA = Substance information not available, or substance unlisted.

The initial PPE level for invasive field activities performed at AOCs 515 and 519 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

4.7 AOC 523, Former Gas Station (Includes SWMU 49, Lead-Acid Battery Charging Area)

AOC 523 is the site of a former gas station located where Building 198 now stands. This site has been designated as a CSI. These sites will be investigated as a unit because of their proximity. Table 4-7 describes the sites.

Table 4-7 AOC 523 Site Information and Description		
Number	Description	Materials Generated or Stored
AOC 523 Gas Station	Former Gas Station (M-1234) operated from 1958 until 1962. Currently the site is covered by the southeastern portion of Building 198. It is unknown if USTs are present. ¹	Lead Petroleum Products
Note: ¹ Described in the Draft Final RCRA Facility Assessment (Volume I, November 1994).		

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.5 of this Work Plan.

Chemical Hazards and PPE Requirements

The COPCs at these sites include acids, solvents, heavy metals, and petroleum products. Table 4-8 lists exposure guidelines for contaminants of concern. This site has not been investigated previously. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

The initial PPE level for invasive field activities performed at AOC 523 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

Table 4-8 Exposure Guidelines for Expected Site Chemical Hazards — AOC 523						
Contaminant of Concern	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Ionization Potential (eV) ^(e)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Cadmium	NA	0.6 mg/m ³ Ceiling	0.05 mg/m ³	Potential Human Carcinogen	NA	NA
Chromium	NA	1 mg/m ³	0.5 mg/m ³	NA	NA	NA
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Lead	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	8.8	1.3 to 7.1
Xylene	1 ppm ^(a)	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993-1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards*, June 1990.
- ^e = Odor Thresholds for Chemicals, *Chemical Hazards in the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fichman, M.D., M.P.H.
- NA = Substance information not available, or substance unlisted.

4.8 All other CSI Sites (Includes AOC 510, Geotechnical Laboratory; AOC 512, Former Incinerator; AOC 513, Former Morgue; AOC 517, Indoor Firing Range; AOC 518, Former Coal Bins; AOC 520, Former Garbage House)

Site Activities

Site activities will include soil borings, soil sampling, wide sampling, residue sampling and installing a monitoring well. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.6 of this Work Plan.

Chemical Hazards and PPE Requirements

The risk assessment performed by E/A&H indicated that numerous chemicals were stored and used at these locations. The major constituents of concern are solvents, heavy metals, petroleum products, coal, and formaldehyde. Table 4-9 lists exposure guidelines for COPCs. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

The initial PPE level for invasive field activities performed at these AOCs will be modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

Table 4-9 Exposure Guidelines for Expected Site Chemical Hazards — Other Sites Designated CSI						
Contaminant of Concern	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Ionization Potential (eV) ^(e)	Flammable Range (% by Volume)
Acetone	100	750 ppm 1,000 ppm STEL	750 ppm 1,000 ppm STEL	250 ppm	9.69	2.6 to 12.8
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Benzo(a) pyrene	NA	0.2 mg/m ³	Suspected Human Carcinogen	NA	NA	NA

Table 4-9 Exposure Guidelines for Expected Site Chemical Hazards -- Other Sites Designated CSI						
Contaminant of Concern	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Ionization Potential (eV) ^(e)	Flammable Range (% by Volume)
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Formaldehyde		0.75 ppm 2 ppm STEL	Suspected Human Carcinogen	0.016 ppm 0.1 ppm STEL	10.88	
Lead	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA	NA
Methyl Ethyl Ketone		200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	9.54	
Methylene Chloride	214	500 ppm 1,000 ppm Ceiling	50 ppm Suspected Human Carcinogen	Potential Occupational Carcinogen	11.32	12 to 19
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	8.8	1.3 to 7.1
Trichloroethylene	0.5 to 176	50 ppm 200 ppm STEL	50 ppm 200 ppm STEL	25 ppm	9.45	11 to 41
Xylene	1 ppm ^(a)	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 -1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards*, June 1990.
- ^e = Odor Thresholds for Chemicals, *Chemical Hazards in the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fichman, M.D., M.P.H.

NA = Substance information not available, or substance unlisted.

4.9 AOC 522, Former Grease and Wash Building

AOC 522 is the site of former Building 1252, a grease and wash building, located at the southeast corner of Building 198, near the loading docks. This site has been designated for a CSI. Table 4-10 describes the site.

Table 4-10 AOC 522 Site Information and Description		
Number	Description	Materials Generated or Stored
AOC 522 FORMER BUILDING 1252	Former building 1252 was a small garage-type structure used for vehicle maintenance in the early 1950s. It was located adjacent to the present Building 198 shipping and receiving warehouse. No visible evidence of the building remains today, and the area is now mainly covered by asphalt. ¹	Lead Paint Solvents Ethylene Glycol Sulfuric Acid Degreasing Solvents Petroleum Hydrocarbons
Notes: ¹ Described in the <i>Final RCRA Facility Assessment</i> , Vol. II, June 1995		

Site Activities

Site activities will include coring, soil borings, and soil sampling. Field work for this site is described in Section 2.7 of this Work Plan.

Chemical Hazards and PPE Requirements

The COPCs at these sites include ethylene glycol, lead, paints, solvents, sulfuric acid, and petroleum hydrocarbons. Table 4-11 lists exposure guidelines for contaminants of concern. This site has not been investigated previously. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

The initial PPE level for invasive field activities performed at this AOC will be modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

Table 4-11 Exposure Guidelines For Expected Site Chemical Hazards - AOC 522						
Chemical Name	Odor ^(d) Threshold	OSHA PEL ^(e)	ACGIH TLV ^(f)	NIOSH REL ^(g)	Autoignition Temp. (°F)	Flammable range (% by volume)
Acetone	100	750 ppm 1000 ppm STEL	750 ppm 1000 ppm STEL	250 ppm	869	2.6 to 12.8%
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1097	1.3 to 7.1%
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	N.A.	860	1.0 to 6.7%
Ethylene Glycol	N.A.	50 ppm Ceiling	50 ppm Ceiling	N.A.	751.8	3.2 to 15.3%
Kerosene	1	N.A.	N.A.	100 mg/m ³	444	0.7 to 5%
Lead	N.A.	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	N.A.	N.A.
Methylene Chloride	214	500 ppm 1000 ppm Ceiling	50 ppm Suspected Human Carcinogen	Potential Occupational Carcinogen	1184	12 to 19%
Methyl Ethyl Ketone	10	200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	960	1.8 TO 11.5%
Sulfuric Acid	N.A.	1 mg/m ³	1 mg/m ³ 3 mg/m ³ STEL	1 mg/m ³	N.A.	N.A.
Tetraethyl Lead	N.A.	0.075 mg/m ³ Skin	0.1 mg/m ³ Skin	<0.1 mg/m ³	229.8	1.8 to 7%
Trichloroethylene	0.5 to 176	50 ppm 200 ppm STEL	50 ppm 200 ppm STEL	25 ppm	770	11 to 41%

Table 4-11 Exposure Guidelines For Expected Site Chemical Hazards - AOC 522						
Chemical Name	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Autoignition Temp. (°F)	Flammable range (% by volume)
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	996.5	1.3 to 7.1%
Xylene	N.A.	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	N.A.	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 -1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- NA = Substance information not available, or substance unlisted.

4.10 AOC 700, Golf Course Maintenance Building

AOC 700 is the site of a golf course maintenance building, Building 1646, located west of Avenue "D" and north of Hunt Street. This site has been designated for an RFI. Table 4-12 describes the sites.

Table 4-12 AOC 700 Site Information and Description		
Number	Description	Materials Generated or Stored
AOC 700 GOLF COURSE MAINTENANCE BUILDING	This structure was built in 1975. It has been used for lawnmower storage and repair and pesticide storage and mixing. The building is no longer being used and all chemicals and equipment have been removed. ¹	Sulfuric Acids Solvents Herbicides Pesticides Petroleum Hydrocarbons
Notes: ¹ Described in the <i>Final RCRA Facility Assessment</i> , Vol. V, June 1995.		

Site Activities

Site activities will include coring, soil borings, and soil sampling. Field work for this site is described in Section 2.8 of this Work Plan.

Chemical Hazards and PPE Requirements

The COPCs at these sites include sulfuric acids solvents, pesticides, herbicides, and petroleum hydrocarbons. Table 4-13 lists exposure guidelines for contaminants of concern. This site has not been investigated previously. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into this ZCHASP.

Table 4-13 Exposure Guidelines For Expected Site Chemical Hazards - AOC 700						
Chemical Name	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Autoignition Temp. (°F)	Flammable range (% by volume)
Acetone	100	750 ppm 1000 ppm STEL	750 ppm 1000 ppm STEL	250 ppm	869	2.6 to 12.8%
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1097	1.3 to 7.1%
Chlordane	N.A.	0.5 mg/m ³ Skin	0.5 mg/m ³ Skin	Potential Occupation Carcinogen	N.A.	N.A.
DDT	N.A.	1 mg/m ³ Skin	1 mg/m ³	0.5 mg/m ³	N.A.	N.A.
DDE	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Dieldrin	0.041	0.25 mg/m ³ Skin	0.25 mg/m ³ Skin	Potential Occupational Carcinogen	N.A.	N.A.
Endrin	N.A.	0.1 mg/m ³ Skin	0.1 mg/m ³ Skin	N.A.	N.A.	N.A.
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	N.A.	860	1.0 to 6.7%
Ethylene Glycol	N.A.	50 ppm Ceiling	50 ppm Ceiling	N.A.	751.8	3.2 to 15.3%
Kerosene	1	N.A.	N.A.	100 mg/m ³	444	0.7 to 5%
Lead	N.A.	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	N.A.	N.A.
Malathion	N.A.	10 mg/m ³	10 mg/m ³ Skin	15 mg/m ³	N.A.	N.A.
Methylene Chloride	214	500 ppm 1000 ppm Ceiling	50 ppm Suspected Human Carcinogen	Potential Occupational Carcinogen	1184	12 to 19%
Methyl Ethyl Ketone	10	200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	200 ppm 300 ppm STEL	960	1.8 TO 11.5%
Parathion	N.A.	0.1 mg/m ³ Skin	0.1 mg/m ³ Skin	0.05 mg/m ³	N.A.	N.A.

Table 4-13 Exposure Guidelines For Expected Site Chemical Hazards - AOC 700						
Chemical Name	Odor ^(a) Threshold	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Autoignition Temp. (°F)	Flammable range (% by volume)
Sulfuric Acid	N.A.	1 mg/m ³	1 mg/m ³ 3 mg/m ³ STEL	1 mg/m ³	N.A.	N.A.
Tetraethyl Lead	N.A.	0.075 mg/m ³ Skin	0.1 mg/m ³ Skin	<0.1 mg/m ³	229.8	1.8 to ?%
Trichloroethylene	0.5 to 176	50 ppm 200 ppm STEL	50 ppm 200 ppm STEL	25 ppm	770	11 to 41%
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	996.5	1.3 to 7.1%
Xylene	N.A.	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	N.A.	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 -1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- NA = Substance information not available, or substance unlisted.

The initial PPE level for invasive field activities performed at this AOC will be modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

4.11 Zone Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations. These hazards include heat related illnesses, severe weather, aboveground utilities, working with and around drill rigs and heavy equipment, uneven terrain, slippery surfaces, lifting, and the presence of poisonous flora and fauna such as poison ivy, and snakes.

4.11.1 Radiological Site Screening

Radioactive materials/hazards are potentially present within Zone C as a result of past operational activities at the Charleston Naval Shipyard (CNSY).

As part of the CNSY and the Charleston Naval Base closure process, the Navy is required to conduct radiological surveys to verify that all Naval material has been removed.

Prior to EnSafe/Allen & Hoshall and contractors performing any of the below actions, the CNSY General Survey Project Superintendent of Zone C shall be contacted by E/A&H employees and contractors to determine if the CNSY verification surveys have been completed in Zone C. Once completion of the surveys has been verified, work may be performed in the verified areas with no radiological precautions required. This applies to all E/A&H employees and their contractors while conducting field work in Zone C, including but not limited to walkover investigations, drilling, well development, soil sampling, water sampling, and trenching.

4.11.2 Underground Utilities

A major safety concern in environmental investigations is drilling into underground utilities, particularly electrical and natural gas lines. Prior to drilling or conducting an intrusive activity

with the potential to penetrate a utility line, at a minimum, the following steps must be taken at each location, for each well or penetration:

- Conduct a surficial resistivity and magnetic survey to locate underground utilities.
- Offset drilling location from located utility allowing a minimum of 5 feet.
- Core asphalt and concrete then post hole dig to 5 feet below ground surface (bgs).
- During the act of drilling, post hole digging, and hand augering in areas where underground utilities may be present the individual(s) actually doing the invasive work shall wear boots and gloves that provide electrical insulation.

4.11.3 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

The Site Supervisor and the Site Health and Safety Officer (SHSO) shall be aware of the potential for heat stress and other environmental illnesses. When necessary, work regimens shall be implemented that minimize the potential for employee illness. At these times field staff need to be reminded to regularly look at their co-workers for signs or symptoms of hot or cold induced illness. For a discussion of the more common heat and cold related illnesses and their associated symptoms (see CHASP Section 6.5.1).

Monitoring of heat stress conditions (area and/or personal) will be employed during hot weather conditions and/or when elevated levels of PPE are utilized. When the oral temperature of field staff reaches or exceeds 100°F they shall rest until their temperature drops below 99°F. The oral temperature of field staff should not exceed 100.4°F as specified by the ACGIH (TLVs and BIs for 1994-5, Cincinnati, OH, ACGIH 1994, pp 84-90).

Note: Rather than measuring oral temperatures which can be influenced by external factors such as breathing through one's mouth, temperature measurements using infrared measurements of the tympanic membrane will be used as oral temperature equivalents.

4.11.4 Severe Weather Conditions

Field work shall not be conducted when lightning can be seen from the work area. When lightning is observed, cease work, perform emergency personal and equipment decontamination (see Section 4.18) as needed, then seek shelter.

During extreme weather conditions the Site Supervisor shall use his/her best judgement and has the authority to stop field work or dismiss workers for the day. Examples of conditions that may warrant work stoppage include: high winds, hail, flooding, and ice storms. In the event of severe weather (e.g. lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.11.5 Working Around Drill Rigs and Heavy Equipment

Heavy equipment and drill rig operations will be performed in accordance with the procedures outlined in the CHASP.

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4.12 Employee Protection

Employee protection for this project is addressed in several ways including the use of: work limitations (Section 4.12.1), specified personal protective equipment (Section 4.12.2), air monitoring (Section 4.12.3), establishment of action levels (Section 4.12.3), decontamination procedures (Section 4.13), standard safe work practices (Section 4.14), and general rules of conduct (Section 4.15).

4.12.1 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER Site Supervisor training. All personnel must complete an eight-hour refresher training course annually to continue working at the site.

4.12.2 Selection of Personal Protective Equipment

It is important that specified PPE protects against known and suspected site hazards. Selection of protective equipment is based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, and a greater emphasis is placed on past experiences and sound safety practices.

PPE requirements are subject to change as site information is updated or changes. A decision to deviate from specified levels of PPE as contained in this ZCHASP must be made or reviewed by the Project Health and Safety Officer (PHSO).

Initial Level of Personal Protective Equipment

Based on the best available information, the appropriate level of PPE for initial site entry is modified Level D. Modified Level D shall be the initial PPE for work activities that disturb the soil or could result in personnel coming into contact with contaminated soil, sediment, groundwater or surface water. This level of protection was selected because the concentrations of contaminants detected in the previous studies were low and free product was not detected. Modified Level D protection consists of a hard hat, chemical-resistant coveralls and gloves (vinyl or nitrile), eye protection, and steel-toed and shank boots.

Examples of activities to be initiated in Modified Level D include: soil boring, well installation and construction, soil sampling and well development. Collecting groundwater samples and determining water levels are two field activities than can be conducted in Level D, provided that field personnel supplement their Level D attire with nitrile gloves (outer gloves, not the 4 mil nitrile inner glove liners).

4.12.3 Air Monitoring

Air monitoring using a PID and/or other appropriate sampling equipment will be conducted prior to beginning field activities at a new EZ and during ground-disturbing activities. The PID will be field calibrated to measure volatile organic compounds (VOCs) relative to a 100 ppm isobutylene standard. If VOCs are detected down-hole, colorimetric detector tubes and/or other sampling media may be used to determine the identity and approximate the concentration of these compounds.

The PHSO reserves the right to require personal exposure monitoring or other types of air sample collection and analysis. These samples may be required for a variety of reasons such as: to identify a chemical odor, PID readings exceed or approach the action level, or to determine if personal exposures are below OSHA PELs.

A combustible gas indicator (CGI) will be used during all soil borings and well installations. The CGI will be field calibrated to measure flammable gases relative to a methane standard. Downhole CGI readings will be collected periodically during soil disturbing operations. Field activities will immediately cease if downhole readings exceed 20 percent of the lower explosive limit (LEL). If CGI readings do not subside, the area will be immediately evacuated and the situation re-evaluated to determine how to proceed. An investigation of the area will be made; operations may not proceed until downhole readings are below 20 percent LEL.

Action Level and Ceiling Concentration

Each site at NAVBASE has a designated action level and ceiling concentration. For this project the AL is defined as the PID reading in the breathing zone above which respiratory protection must be upgraded; chemical protective clothing may also be upgraded. The AL is determined on a site-by-site basis. To exceed the AL, PID readings should be sustainable. Readings should remain above the AL for at least one or two minutes at a time. Readings that are elevated for only a couple of seconds every 15 or 20 minutes do not exceed the AL and do not require workers to upgrade their level of PPE.

The general AL for this zone, as determined on a properly calibrated PID, is 5 PID units above background. This action level was selected after reviewing available site-specific information and previous sampling data for each site in Zone C. If additional information becomes available, the AL for this zone or specific sites may be revised. PPE shall be upgraded to Level C (assuming that cartridge respirators are appropriate, otherwise Level B) if airborne VOC concentrations in the breathing zone exceed the AL, or if the concentration of any contaminant exceeds 50 percent of the OSHA PEL.

If breathing zone levels exceed the AL, or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact the Project Manager and/or the PHSO.

The PHSO will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. See Table 4-14 for specific criteria for each protection level.

If PID readings exceed 10 units the SHSO shall contact the PHSO and discuss the need to identify and quantify airborne contaminants. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone readings will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

The ceiling concentration is defined as the maximum allowable PID reading in the breathing zone regardless of PPE. A ceiling concentration of 50 PID units has been established. Should VOC levels exceed 50 ppm in the breathing zone, field workers should secure their equipment and back off the site. Work shall not resume until the Site Supervisor understands why VOC levels became elevated, knows the major constituents of the VOCs being generated, and the VOCs in the breathing zone are less than 5 ppm or workers have upgraded to Level C or B. The proper PPE upgrade shall be determined by the PHSO based on site-specific chemical information (i.e. is there enough information to determine that air purifying respirators will provide sufficient protection).

Field monitoring values will be recorded in a field logbook and copies must be posted for field personnel review.

Equipment Maintenance

Before being used on a daily basis, PIDs, CGIs, and other monitoring equipment shall be calibrated or their proper function verified. Throughout the day this equipment shall be periodically checked to ensure it is working properly. A final calibration shall be conducted at

Table 4-14 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides). 	<ul style="list-style-type: none"> Positive-pressure full-face piece self-contained breathing apparatus or positive pressure supplied air respirator with escape self-contained breathing apparatus (SCBA).
	<ul style="list-style-type: none"> When known atmospheres or potential situations exist that could affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes or mucous membranes. 	<ul style="list-style-type: none"> Fully-encapsulating chemical protective suit.
	<ul style="list-style-type: none"> Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. 	<ul style="list-style-type: none"> Chemical-resistant inner and outer gloves.
	<ul style="list-style-type: none"> Where atmospheres are oxygen deficient. 	<ul style="list-style-type: none"> Steel toe and steel shank chemical resistant boots.
	<ul style="list-style-type: none"> When the type(s) and or potential concentration of toxic substances are not known. 	<ul style="list-style-type: none"> Hard hat under suit.
Level B	<ul style="list-style-type: none"> When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are: 	<ul style="list-style-type: none"> Chemical resistant clothes, coveralls.
	<ul style="list-style-type: none"> When work area may contain less than 19.5 percent oxygen, 	<ul style="list-style-type: none"> Positive-pressure full-face, SCBA or supplied airline system (SAR) with escape bottle.
	<ul style="list-style-type: none"> When expected contaminants do not have appropriate warning properties e.g. vinyl chloride, or 	<ul style="list-style-type: none"> Hard hat.
	<ul style="list-style-type: none"> When cartridges are not available to protect against all COPCs. 	<ul style="list-style-type: none"> Chemical resistant outer and inner gloves.
	<ul style="list-style-type: none"> Hazards associated with limited dermal exposure are not significant. 	<ul style="list-style-type: none"> Steel toe and steel shank boots.
		<ul style="list-style-type: none"> Chemical resistant outer boots.
Level C	<ul style="list-style-type: none"> When respiratory protection is warranted and cartridge respirators are appropriate. 	<ul style="list-style-type: none"> Chemical resistant coveralls.
	<ul style="list-style-type: none"> When PID readings exceed the Action Level. 	<ul style="list-style-type: none"> Full-face, air purifying respirator equipped with cartridges suitable for the hazard.

Table 4-14 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level C	<ul style="list-style-type: none"> When air monitoring indicates airborne concentration of a chemical is 50 percent or more of the PEL or TLV 	<ul style="list-style-type: none"> Hard hat.
	<ul style="list-style-type: none"> And the work area contains at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Chemical resistant outer and inner gloves.
Modified Level D	<ul style="list-style-type: none"> When chemical contamination is known or expected to be present, yet inhalation risk is 	<ul style="list-style-type: none"> Chemical resistant coveralls.
	<ul style="list-style-type: none"> Low and respiratory protection is not required. 	<ul style="list-style-type: none"> Chemical resistant outer gloves; inner gloves or glove liners, optional.
	<ul style="list-style-type: none"> Site contaminants may be absorbed through the skin. 	<ul style="list-style-type: none"> Steel toe and steel shank boots.
	<ul style="list-style-type: none"> The "default level" of PPE required when the ZCHASP does not specify another level of PPE. 	<ul style="list-style-type: none"> Hard hat.
	<ul style="list-style-type: none"> And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Safety glasses with side shields or safety goggles.
Level D	<ul style="list-style-type: none"> When minimal or no chemical contamination is expected. 	<ul style="list-style-type: none"> Inner gloves or chemical-resistant gloves needed to handle soil or water samples.
	<ul style="list-style-type: none"> When ZCHASP specifies Level D protection is adequate. 	<ul style="list-style-type: none"> Steel toe and steel shank boots.
	<ul style="list-style-type: none"> And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Hard hat.
		<ul style="list-style-type: none"> Safety glasses with side shields or safety goggles.
		<ul style="list-style-type: none"> Optional: coveralls and disposable outer boots.
		<ul style="list-style-type: none"> Work clothes.

the end of the work day, at which time each instrument will be checked to ensure that it is free from surface contamination. Air monitoring equipment shall detect the calibration standard within a range of plus or minus 10 percent; otherwise the instrument shall be considered to be malfunctioning. Field staff shall note in their field notebooks that they conducted these calibrations and checks and note whether the equipment was or was not functioning properly. When equipment is not functioning properly it should be brought to the attention of the Site Supervisor or SHSO who will arrange for repairs and/or replacement of that equipment as needed.

4.13 Personnel and Equipment Decontamination

As needed, a CRZ will be established adjacent to EZs established for invasive activities, and will include stations for decontaminating personnel, PPE, and hand tools. Typically, a portion of the CRZ will be covered with sheets of 6 mil polyethylene (generally, an area 20-feet by 20-feet is sufficient) with specific stations to accommodate the removal and disposal of the protective clothing, boot covers, gloves and respiratory protection.

Heavy equipment and field equipment that cannot adequately be decontaminated in the CRZ may be decontaminated on a more centrally located decontamination pad. Table 4-15 lists equipment that may be convenient to have onsite to decontaminate heavy equipment and vehicles; this table also explains how this equipment may be utilized.

Table 4-15 Equipment Recommended for Decontaminating Heavy Equipment and Vehicles	
<ul style="list-style-type: none">• Storage tanks or drums to be used for storing collected wash and rinse solutions; alternatively, equipment for the treatment of collected wash and rinse solutions may be substituted.• Pumps and filters as needed for the collection of wash and rinsate solutions.• Pressurized steam sprayers for steam cleaning equipment.• Long handled brushes for general cleaning of exterior surfaces. Also shovels and other equipment may be used to dislodge caked on contaminated mud that may be present on the undercarriage or in the tires.• Wash solutions, selected for their ability to remove (dissolve, etc.) contaminants• Rinse solutions, selected for their ability to remove contaminants and wash solutions.• Pressurized sprayers for washing and rinsing particularly hard to reach areas.• Clean buckets that can contain cleaning and rinsing solutions.• Brooms and brushes that can be used to clean the interior operator areas of vehicles and equipment.	

Figure 4-1 shows one method of laying out an acceptable decontamination area for Level B PPE. There are numerous ways to lay out decontamination areas. Decontamination areas for Level C and Modified D PPE should be based on this concept of decontamination, but can be scaled back in accordance with the decontamination needs of the specific site and level of PPE. As a general rule, persons working in the CRZ and assisting in the decontamination of workers leaving the EZ, shall be outfitted in PPE that is one protection level below what the exiting workers are using. For example, if workers leave the EZ in Level C, personnel in the CRZ should be in Modified D.

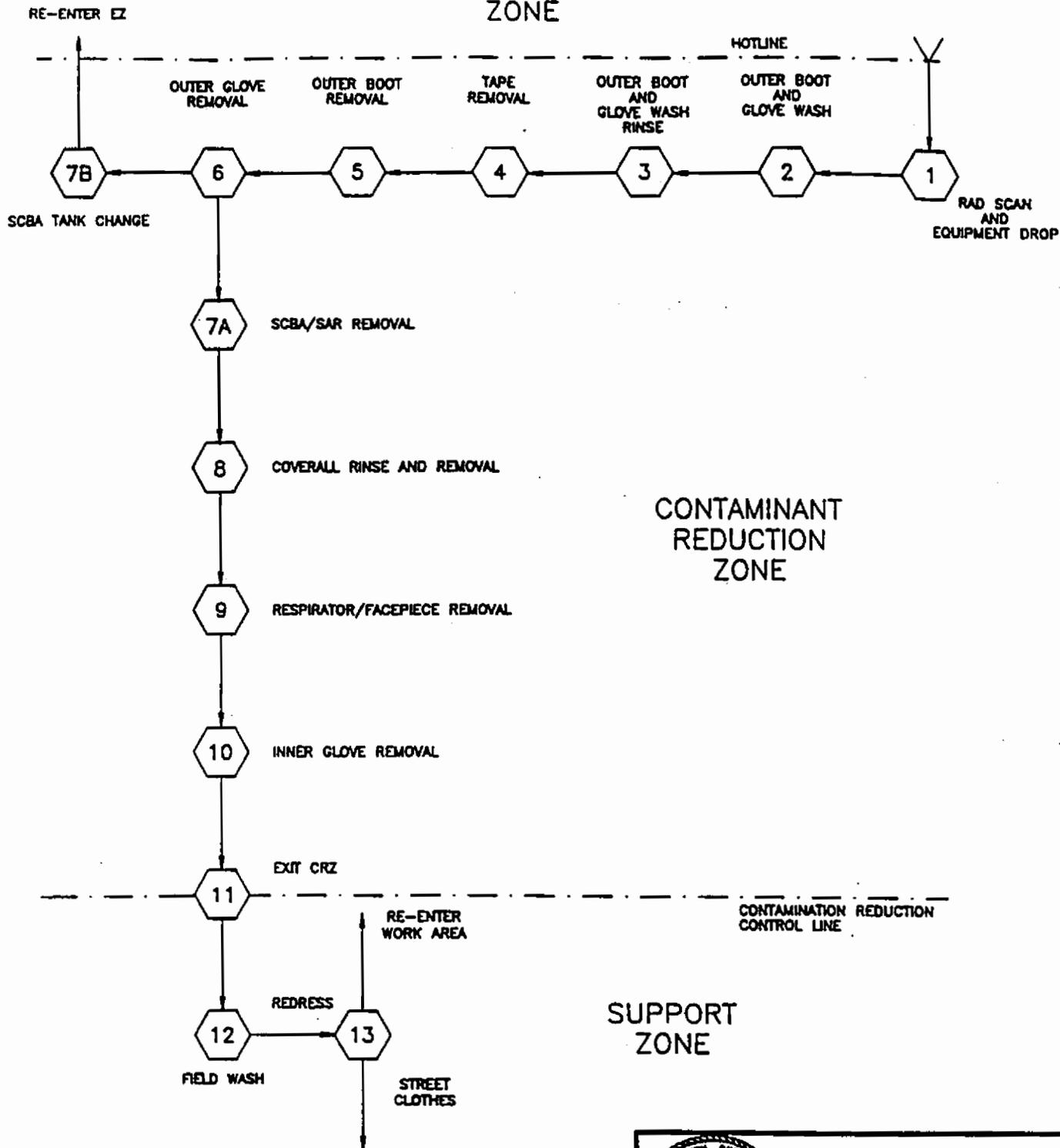
Often equipment may be adequately decontaminated using a soapy wash solution and following specified rinsing procedures. Normally equipment decontamination will be completed in Level D with gloves or Modified D PPE. Respirators not only need to be decontaminated and cleaned between uses, but also need to be sanitized. Alcohol swabs are generally sufficient.

In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.13.1 Full Decontamination Procedures

Workers shall utilize the following cleaning and decontamination procedures when exiting the EZ. These procedures should be followed when workers are leaving the area for lunch, at the end of their shift or when work is completed for an EZ. Procedures for rest breaks and changing SCBA tanks and cartridges are described in **Section 4.13.2**. Not all steps apply to every situation; follow applicable procedures. Decontamination procedures shall start at the EZ/CRZ interface and continue away from the EZ towards the SZ.

EXCLUSION ZONE




ZONE C HASP
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-1
FULL DECONTAMINATION LAYOUT
LEVEL B PROTECTION
 DWG DATE: 10/19/84 | DWG NAME: 29FDLLP

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Full Decontamination

1. **Equipment drop.** Deposit equipment used onto plastic drop cloths or into a plastic lined tub. All gross contamination should be removed here; fine cleaning and decontamination of equipment may be completed here or elsewhere. Equipment that is still contaminated must be wrapped and taped prior to being moved.
2. **Outer boot and glove wash.** Wash/remove gross contamination from outer boots, outer gloves, SCBA and/or airline equipment.
3. **Tape removal.** Remove tape from ankles and wrists and dispose of in plastic lined drum.
4. **Outer boot removal.** Remove outer boots; disposable outer boots may be disposed of in the same waste container used in Step 3. Non-disposable boots need a thorough cleaning before they can be removed from the site. (If non-disposable boots are used, it is preferable to have them dedicated to the project.)
5. **Outer glove removal.** Remove and dispose of outer gloves. Gloves may be disposed of in the same waste container as used in Step 3.
6. **SCBA and SAR removal.** For Level B*.
SCBA — With buddy or other site worker, remove backpack, remove face-piece and shut off air flow.

Airline — With buddy or other site worker, remove harness and escape bottle, remove face-piece, shut off air flow.

- * If coveralls are significantly contaminated, leave the respirator face-piece on, disconnect the air hose just downstream of the regulator, turn off the flow of air, remove the backpack or equipment harness, and leave the face-piece in place. Remove the face-piece in Step 9.

7. **Coverall removal.** Rinse coveralls if needed. Remove coveralls and dispose of them. The same drum may be used as in Step 3. Non-disposable coveralls shall be double-bagged with the outer bag clearly labeled "contaminated".
8. **Respirator removal.** Remove respirator (or face-piece of Level B equipment, if it is still being worn). Dispose of spent cartridges. Clean, disinfect, dry and properly store respirator or face-piece.
9. **Inner glove removal.** Remove and dispose inner gloves.
10. **Exit area.** Exit the CRZ via the SZ.
11. **Field Wash.** Wash and rinse hands and face.
12. **Redress.** Redress into appropriate PPE for re-entry or change into street clothes.

Notes:

- All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel; final disposal will be by the Navy.
- Hard hats and eye protection should be washed at the end of each work day with a soap and water solution.

4.13.2 Partial Decontamination Procedures

To change a respirator cartridge or SCBA tank:

1. **Outer boot and glove wash.** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or airline equipment.

2. ***Tape removal.*** Remove tape from ankles and wrists and dispose of it in a plastic lined drum.
3. ***Face-piece removal.*** Disconnect face-piece and air hose just downstream of regulator. The face-piece may remain in place, or may be removed and cleaned. Remove the spent tank from the backpack and replace it with a full tank. Connect air hose and turn on air.
4. ***Respirator removal.*** Remove respirator, remove used cartridges, clean and disinfect respirator, install new cartridges and don respirator.
5. ***Respirator check.*** Check to make sure that respirator still seals properly to your face.
6. ***Don clean PPE.*** Put on clean outer gloves, tape wrists (as applicable), and re-enter EZ.

When taking a rest break:

1. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or airline equipment.
2. ***Tape removal.*** Remove tape from ankles and wrists and dispose of it in a plastic lined drum.
3. ***Respirator removal.*** Remove SCBA unit, airline harness or respirator, and place in a clean area, plastic sheeting may be needed.
4. ***Coverall removal.*** Remove outer wear if it is ripped or significantly contaminated. In hot weather, at least unzip and pull down upper half of coveralls.

5. **Inner glove removal.** Remove and dispose of inner gloves.
6. **Wash.** Wash and rinse hands and face at the field wash station.
7. **Rest break.** Take rest break. Remember to drink plenty of water, Gatorade or other similar beverage
8. **Don inner gloves.** Put on inner gloves.
9. **Don PPE.** Don coveralls, outer boots, and outer gloves. Tape wrists and ankles (as needed) and re-enter the EZ.

Decontamination procedures, based on Level D protection:

- Brush heavily soiled boots and rinse outer gloves and boots with soap and water.
- Remove gloves and deposit them in a trash container.
- Dispose gloves and other disposable PPE in a trash container.
- Wash hands and face, and preferably shower as soon as practical.

4.13.3 Closure of the Decontamination Station

All disposable clothing and plastic sheeting used during site activities at sites with Level D through Level C will be double-bagged and disposed of in a refuse container. Decontamination and rinse solutions and disposable PPE from Level B site will be placed in a labeled 55-gallon drum (separate solids and liquids) for later analysis and disposal. All washtubs, pails, buckets, etc. will be washed and rinsed at the end of each workday.

4.14 Standard Safe Work Practices:

- Eating, drinking, chewing gum or tobacco, smoking, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.
- Hands and face must be thoroughly washed upon leaving the work area.
- No contact lenses will be worn in work areas while invasive activities are conducted.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces, or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.
- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.

- NAVBASE Public Works and local utility representatives shall be contacted and requested to identify all underground utility lines. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either side of a utility line, should be maintained during all subsurface investigations.
- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.15 General Rules of Conduct:

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.
- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized altering of any government records is forbidden.
- Securing government tools in a personal or contractor's tool box is forbidden.
- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc. is forbidden.
- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long distance telephone calls is forbidden.
- Compliance with posted signs and notices is required.

- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communicative expression which tends to disrupt the work or morale of others is forbidden.

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, pants or slacks, or coverall-type garments will be worn at all times on government property.

- All persons operating motor vehicles will obey all NAVBASE traffic regulations.

4.16 Medical Monitoring Program

See CHASP Section 7.0.

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4.18 Emergency Information

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside emergency, immediately call the appropriate contact from the following list:

Contact	Agency or Organization	Telephone
Joe Camp	Caretaker Site Officer Site Contact	(803) 743-9985
Matthew A. Hunt	SOUTHDIV	(803) 820-5525
Brian Stockmaster	Engineers-in-Charge	(803) 820-7481
Law Enforcement	NAVBASE Security	(803) 743-5555
Fire Department	NAVBASE Fire Department	(803) 743-5333
Ambulance Service	NAVBASE Ambulance	(803) 743-5444
Hospital	Charleston Naval Hospital Roper Hospital North*	(803) 743-7000 (803) 744-2110
Southern Poison Control Center	—	(800) 922-1117
Todd Haverkost	EnSafe/Allen & Hoshall, Task Order Manager/Project Manager	(803) 884-0629
Ginny Gray	EnSafe/Allen & Hoshall, Task Order Manager	(513) 248-8449
David Isenberg	EnSafe/Allen & Hoshall, PHSO	(615) 399-8800

- * Use Charleston Naval Hospital for (potentially) life-threatening situations. For medical needs that are less urgent, the Naval Hospital will not provide service to civilians; Roper Hospital North is the next closest appropriate medical facility.

Should an emergency occur or should a potential emergency arise, the following persons shall be fully appraised of the situation as soon as practical: Joe Camp, Caretaker; Matthew Hunt and Brian Stockmaster, SOUTHDIV Engineer-in-Charge; Todd Haverkost, E/A&H Manager Charleston Operations; Ginny Gray, Project Manager; and David Isenberg, E/A&H PHSO. As appropriate, other persons may also need to be contacted.

4.18.1 Site Resources

A cellular telephone will be available in the SZ for routine and emergency communication/coordination with NAVBASE, SOUTHDIV, and the E/A&H field office. First aid and eye wash equipment will be available at the work area and in each field vehicle.

4.18.2 Emergency Procedures

Examples of an emergency include:

- A fire, explosion, or similar event at or near the site whether related to this project or not.
- A member of the field crew sustains a significant injury, or experiences symptoms of a chemical exposure.
- The discovery of a condition which suggests that site conditions are imminently more dangerous or hazardous than anticipated.

In the event of an emergency, the following emergency procedures should be followed:

- If it is necessary to evacuate the area, immediately proceed to a rally point and remain there until instructed otherwise.
- Utilize planned escape routes.

- If a member of the field team experiences effects or symptoms of exposure while on the scene, the field crew will immediately halt work and act according to the instructions provided by the Site Supervisor or, in his absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously indicate downwind, preferred escape routes, from upwind routes.
- Investigate condition(s) suggesting that site conditions may be more hazardous than anticipated. The condition observed and the decisions made shall be recorded in the safety logbook, or in the field logbook if there is not a safety logbook being maintained. If there are doubts about how to proceed, suspend work and leave the work area until the PHSO has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Supervisor is to complete an Accident Report Form (Appendix D) for submittal to the managing Principal-in-Charge of the project.
- If a member of the field crew suffers a personal injury, the SHSO will call **NAVBASE Fire Department 743-5333, or 743-5444** if an ambulance is needed. Next, alert appropriate emergency response agencies as the situation dictates. Complete an Accident Report Form for any such incident.
- If a member of the field crew suffers chemical exposure, flush the affected areas immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. (See Appendix E for directions to the emergency medical facility.) An Accident Report Form will be completed for any such incident.

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Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix E of this ZCHASP.

4.19 Forms

The following forms will be used in implementing this Health and Safety Plan:

- Plan Acceptance Form
- Plan Feedback Form
- Exposure History Form
- Accident Report Form

A ZCHASP Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the SHSO and any other on-site employee who wishes to fill one out. The Exposure History Form will be completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix D of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

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**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL BASE CHARLESTON
CHARLESTON, SOUTH CAROLINA
CTO-029**

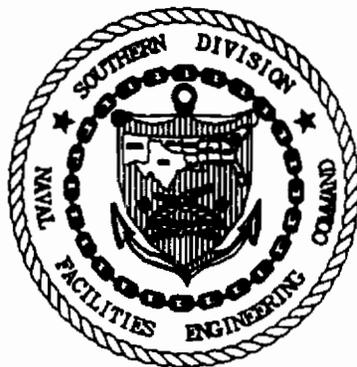


**FINAL ZONE I WORK PLAN
PAGE CHANGES, REVISION NO: 01**

Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA**

**SOUTHDIV CONTRACT NUMBER:
N62467-89-D-0318**



Prepared by:

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April 10, 1996

Release of this document requires the prior notification of the Commanding Officer of the Naval Base Charleston, Charleston, South Carolina.

Record of Changes to the Final Zone I RFI Work Plan Naval Base Charleston		
Page(s)	Change/Revision	Reason for Change
i-vi	Table of Contents: Entire TOC.	Table of Contents had to be revised to incorporate the addition of Sections 2.12 and 4.15.
vii-viii	Replace the Acronym List.	The acronym NOAA was added.
1-3	Figure 1-1.	Included location of SWMU 177 on the SWMU/AOC Site Location Map.
2-81 to 2-86	Addition of site specific, Sampling and Analysis Plan for SWMU 177	Incorporate an additional site requiring a CSI into the investigation. Includes Figure 2-12 which indicates the proposed soil sample locations.
4-1 to 4-92	Resubmit entire Section 4.0.	Reflect corrections to page and section references due to SWMU 177 section addition.
4-49 to 4-52	Addition of site specific, Sampling and Health and Safety Plan for SWMU 177, Section 4.15.	Incorporate an additional site requiring a CSI into the investigation.
4-52	Corrected the header for Table 4-23.	Changed header to indicate SWMU 177.

FILING INSTRUCTIONS

The following is a list of pages in the *Final Zone I Work Plan*, dated February 24, 1995, that have been revised. The obsolete pages presently in your binders are listed in the column headed "Remove". New and replacement pages are listed in the column headed "Replace". Please file this instruction cover sheet preceding the Table of Contents of the *Final Zone I Work Plan*.

If you have any questions, please call 803-884-0029.

List of Changes/Revisions	<u>Remove Pages</u>	<u>Replace Pages</u>
Table of Contents and Acronym List - updated.	i-vi	i-viii
Section 1.0 - Revised Figure 1-1.	1-2	1-2
Section 2.0 - Added Section 2.12	—	2-81 - 2-86
Section 4.0 - Updated Section 4. Text changes are highlighted.	4-1 - 4-90	4-1 - 4-92
Section 4.0 - Added Section 4-15.	—	4-49 - 4-52

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ACRONYM LIST

ACGIH	American Conference for Governmental Industrial Hygienists
AL	Action Level
AOC	Areas of Concern
bgs	Below Ground Surface
CAMP	Corrective Action Management Plan
CEC	Cation Exchange Capacity
CFR	Code of Federal Register
CHASP	Comprehensive Health and Safety Plan
CLEAN	Comprehensive Long Term Environmental Action Navy
CMS	Corrective Measures Study
COPC	Constituent of Potential Concern
CRZ	Contaminant Reduction Zone
CSI	Confirmatory Sampling Investigation
CWP	Comprehensive Work Plan
DANC	Decontaminating Agent Non-Corrosive
DMDA	Dredged Materials Disposal Area
DNAPL	Dense Non-Aqueous Phase Liquid
DOD	Department of Defense
DQO	Data Quality Objective
E/A&H	EnSafe/Allen & Hoshall
EM	Electro Magnetic
EPA	Environmental Protection Agency
EZ	Exclusion Zone
HAZWOPER	Hazardous Waste Workers and Emergency Responders
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
MWR	Morale, Welfare, and Recreation Department
NAVBASE	Naval Base Charleston
NE	North East
NFI	No Further Investigation
NIOSH	National Institute of Occupational Safety and Health Administration
NOAA	National Oceanographic and Atmospheric Administration
OSHA	Occupational Safety and Health Act
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PPE	Person Protective Equipment
PRG	Preliminary Remedial Goal
PWC	Public Works Center

ACRONYM LIST CONTINUED

QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAA	Satellite Accumulation Area
SCBA	Self-Contained Breathing Apparatus
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division
STEL	Short-Term Exposure Limit
SWMU	Solid Waste Management Unit
SZ	Support Zone
TIC	Tentatively Identified Compounds
TLV	Threshold Limit Value
TOC	Total Organic Carbon
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
ZIHASP	Zone I Health and Safety Plan

2.12 SWMU #177, RTC-4 Oil Spill

SWMU #177 consists of two adjacent buildings both of which have been designated as Building RTC-4. The original RTC-4 was a 24 foot x 60 foot metal structure used to house heavy equipment including backhoes and trackhoes. Recently, however, the designation RTC-4 has been given to a newer facility built adjacent to the former RTC-4. The new RTC-4 is used to store lawn mowers and other lawn maintenance equipment. This unit was designated as a SWMU because of oil spillage associated with operations at these two buildings. These buildings are included in a lease agreement reached between the Navy and the National Oceanographic and Atmospheric Administration (NOAA) in the spring 1995. SWMU 177 has been designated for a CSI and is described in Table 2.23.

Table 2.23 SWMU 177 Site Description			
Number	Description	Materials of Concern	Potential Pathways
SWMU 177 RTC-4 Oil Spill	Petroleum spill on the order of several gallons observed within the original Building RTC-4. Spill most likely waste motor oil based on usage of Building RTC-4 as shelter for heavy equipment. Stains in parking area suspected to be hydraulic fluid leaks from facility fork lift. ^a	VOCs Petroleum Hydrocarbons Lubricating oil Anti-freeze Motor oil	Soil Soil Gas Sediment Surface Water Groundwater Air
Notes: ^a Described in the <i>Final RCRA Facility Assessment</i> , June 6, 1995. Pathways scheduled for confirmatory sampling are in bold.			

2.12.1 Previous Investigations

SWMU 177 has not been investigated previously.

2.12.2 Treatment Alternatives

As outlined in the overall sampling strategy in the *Final Comprehensive RFI Work Plan* (August 30, 1994), treatment alternatives are being identified for each of the sites likely requiring some type of remedial action. Data collection efforts will support evaluating these alternatives. Tables B-1 through B-7 (Appendix B) list the treatment alternatives for groundwater, soil, sediment, and surface water runoff for SWMU 177. Alternatives presented here are for preliminary evaluation only. If contaminants are present at concentrations requiring remediation, a CMS will be undertaken to identify feasible treatment alternatives.

2.12.3 Data Gaps

Currently no environmental media data have been collected at SWMU 177 to characterize the site or to support a detailed evaluation of treatment alternatives. As a result, the following data gaps have been identified to ensure that data collection efforts are sufficient to fill these gaps and to meet the stated investigation objectives:

- Soil data to define the nature and extent of contamination from releases which have occurred at SWMU 177.

2.12.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support following closure. Due to the nature of the wastes stored at this unit and its proximity to the Cooper River, the potential exists for exposure to ecological receptors in the Cooper River. Data will be generated during the investigation to determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population, who may be exposed through invasive or non-invasive activities. Sampling will characterize the potential pathways highlighted in Table 2.23.

Land near SWMU 177 is used for vehicle parking and vehicular and pedestrian traffic. Potential receptors are site workers involved in invasive activity bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

Risk posed to terrestrial ecological receptors will be evaluated as part of this site investigation. The nature and extent determinations also indicate migration of site contaminants which creates a potential for exposure to ecological receptors in the Cooper River. Sufficient data will be collected to perform a preliminary risk characterization. A complete risk characterization with respect to aquatic receptors will be assessed in the Zone J RFI.

2.12.5 Objective

The objective of the proposed field investigation is to confirm the presence/absence of contamination in environmental media. If present, the investigation will delineate the horizontal and vertical extent of any soil contamination. While sediment, soil gas, surface water, groundwater, and underground utility conduits are potential contaminant pathways, initial sampling of these matrices is not required to determine the presence of contaminants. If soil contamination is identified, then the site will be designated for a complete RFI to delineate the nature and extent of contamination. Data collection will support technical evaluation of identified treatment alternatives.

2.12.6 Screening Alternatives

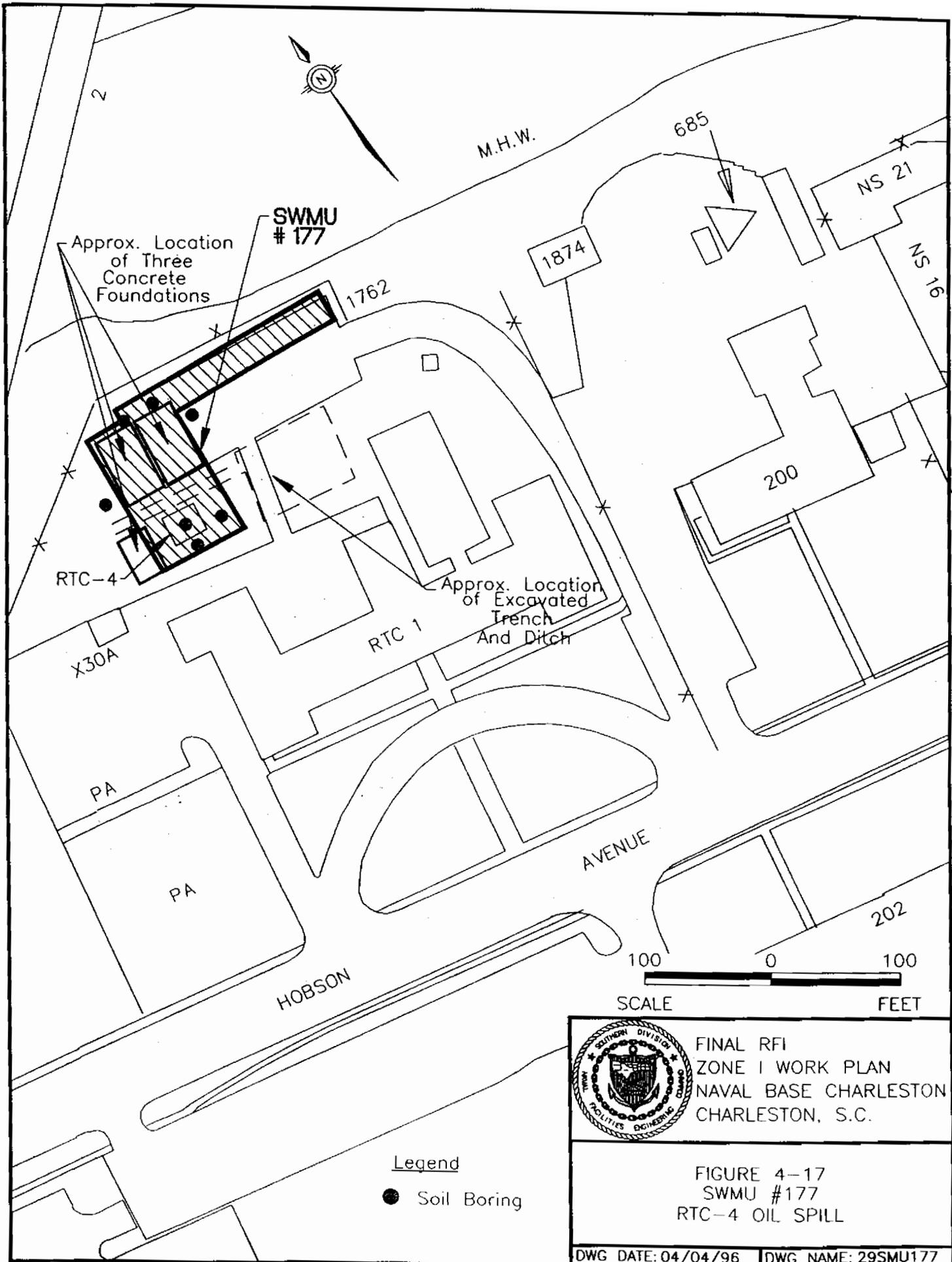
No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of the high-quality samples is inadequate to define the real extent of contamination (if present), the feasibility of employing screening methods will be re-evaluated.

A PID will be used to qualitatively screen for volatile compounds in all soil samples from every soil boring location. Results will be recorded in the field notebooks and boring logs.

2.12.7 Sampling and Analysis Plan

Seven shallow soil borings are proposed for SWMU 177. Six locations will encircle Building RTC-4 with three of the six situated between the building and the Cooper River to investigate the potential for contaminant migration from the point source of Building RTC-4 to the river. One location will be advanced mechanically through the asphalt and/or concrete floor of Building RTC-4 where the major spill at SWMU 177 is known to have occurred. The locations in Figure 2-12 are expected to closely represent the actual sample locations in number and placement. All the borings will be advanced to a depth of 5 feet bgs wherever possible. Table 2.24 summarizes the sampling plan for SWMU 177. Any deviations that occur in the field will be documented and reported in the RFI report.

Table 2.24 SWMU 177 Sampling Plan		
Matrix	Quantity	Analysis
Soil (0'-1') bgs	7	VOCs, SVOCs, TPH, PCBs, dioxin (fill dirt present), Metals
Soil (3'-5') bgs	7	
Notes: All analysis to be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed, as specified in sampling plan, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.		



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4.0 HEALTH AND SAFETY PLAN

EnSafe/Allen and Hoshall (E/A&H) is conducting an environmental monitoring program at various specified locations (sites) within NAVBASE to assess the nature and extent of contamination at these sites and to determine if additional action is required to maintain compliance with the HSWA permit and environmental regulations. The Navy project contract number with E/A&H is *N62467-89-D-0318*.

The base closure team has divided the NAVBASE sites into SWMUs and AOCs which have been grouped into zones for investigative purposes. This Zone I Specific Health and Safety Plan (ZIHASP) has been developed for SWMUs and AOCs there.

This ZIHASP was written to complement the E/A&H NAVBASE *Final Comprehensive Health and Safety Plan (CHASP)* by providing site-specific details absent in the CHASP. Site-specific details presented in this ZIHASP include: potential site contaminants, proposed site activities, action levels, and initial level of personal protective equipment (PPE). Copies of both this plan and the CHASP should be onsite during all field operations.

This ZIHASP uses the term *contaminants of concern* and *constituents of concern*. Not all constituents of concern are contaminants of concern. Constituents of concern are compounds of analytical interest. The analytical interest may be because of public health, regulatory, ecological, or other concerns. Contaminant of concern identifies site contaminants that may be present in sufficient concentrations to cause concern about potential occupational exposures to onsite personnel.

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4.1 Applicability

The provisions of this plan are mandatory for E/A&H personnel. E/A&H personnel shall read this plan and sign the plan acceptance form (Appendix D) before starting site activities. In addition, personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders (HAZWOPER). These regulations include the following provisions for employees involved in cleanup operations covered by RCRA: training 1910.120(e), medical surveillance 1910.120(f), and PPE 1910.120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this ZIHASP and the corresponding CHASP or shall have their own safety plan which, at minimum, meets the requirements of the E/A&H CHASP and ZIHASP.

This ZIHASP applies to standard field procedures and tasks such as drilling; installing and developing monitoring wells; surveying; and collecting soil, groundwater, surface water, and sediment samples. Non-routine procedures and tasks involving non-routine risks are not covered by this plan, examples of procedures that are not covered in this plan are:

- Trenching
- Confined space entry
- Locating and/or recovering unexploded ordnance
- Sampling, handling, or removing unidentified drums

Should it be necessary to conduct these or other *high risk* tasks, specific Health and Safety procedures must be developed, approved, and implemented before proceeding.

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4.2 Zone Characterization

Sites included in this ZIHASP consist of SWMUs and AOCs as identified in the RFI plan for NAVBASE as prepared by E/A&H. These subsections will include Site Descriptions, Chemical Hazards, and Operational/Physical Hazards for each site. Each site within Zone I is discussed in the following subsections of this document.

Physical hazards that are inherent in environmental investigations, or present throughout the zone are discussed in Section 4.16. Subsections 4.3 through 4.15 contain site specific health safety information for each site in Zone I. Included in these subsections is a discussion of Site Descriptions, planned Site Activities, Chemical Hazards, and PPE requirements. Also any Operational/Physical Hazards that are specific to a site will be discussed in that site's subsection.

Under the heading "Chemical Hazard", chemical hazards are discussed in terms of potential chemicals of concern (PCOCs). PCOCs are selected to represent the range of acute and chronic health (toxicological) hazards that are, or foreseeably may be present at the site. That is, not every chemical known or suspected of being present is listed as a PCOC. Rather, one or two of the most toxic or most prevalent contaminants within a class of chemicals is listed. It is in this light that cadmium and chromium have been listed in the health and safety plan as PCOCs. To illustrate this principle, listed below are classes of chemicals or chemical categories in one column, and examples of chemicals that may be listed as a PCOC in the second column.

Class of Chemical/Product	Potential Contaminant of Concern
— Chlorinated solvents/ Degreasers	perchloroethylene, chloroform, methylene chloride, trichloroethylene, and 1,1,1-trichloroethane

Class of Chemical/Product	Potential Contaminant of Concern
— Non-chlorinated solvents	benzene, toluene, xylene, ethylbenzene, 2-butanone (MEK) and hexane
— Metals/Heavy metals	lead, cadmium, chromium (especially hexavalent chromium compounds), mercury, silver, and copper
— Fuels - gasoline, fuel, oils, diesel, lubricants,	benzene, toluene, tetraethyl lead, kerosene, xylene, hexane
— Paints	see - Solvents and Metals above, plus tributyl tin
— Pesticides - chlorinated organophosphate	DDT, DDE, chlordane, dieldrin and endrin

4.2.1 Work Zones

Section 2.1 of the CHASP, describes the function and interrelationship of the three work zones which, in combination, compose the work area. The three work zones are:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

These work zones will be established and used during field work covered under this ZIHASP.

4.2.2 Work Area Access

Authorized personnel will be allowed access to work areas as long as they follow the requirements of this ZIHASP and the CHASP. See also Work Area Access, Section 2.2 of the CHASP.

Authorized Personnel — In order for E/A&H personnel to be authorized to enter an E/A&H controlled work area, they must have a current HAZWOPER training certificate on file onsite. Individuals whose certification is not on file, or those who have a more recent certificate (have attended a refresher course), will provide the onsite Supervisor with a copy of their certificates before being allowed to enter a work area.

Subcontractors, Department Of Defense (DoD) oversight personnel, and other site visitors shall demonstrate compliance with HAZWOPER training requirements before entering a work area.

4.2.3 Zone Investigation

Figure 1-1 (Section 1.0) contains a map of Zone I showing each SWMU and AOC. In addition, included in the sampling and analysis section of the Work Plan is a map of each site. The EZ, CRZ, and SZ for each site will be established in the field. The location of these zones is dependent on the work task, layout of the site, meteorological conditions and logistical factors.

Sites covered by this ZIHASP consist of SWMUs and AOCs (Appendix A). Sections 4.3 through 4.15 of this ZIHASP describe sites, chemical hazards, and operations/physical hazards for each SWMU or AOC.

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4.3 AOC 671, Metering House, Former Building 3905G and Surrounding Aviation Gasoline Compound

AOC 671 includes the former Metering House, Building 3905G, and the associated Aviation Gasoline compound east of Hobson Avenue, just south of Pier Q (Facility 329). The site is bounded to the northeast by the Cooper River. The facilities are in and adjacent to a parking lot for ship's personnel. The outlines of the two underground 25,000-gallon concrete tanks can be seen in the asphalt parking lot. This site has been designated for a CSI. Table 4.1 describes the AOC.

Table 4.1 AOC 671 Site Description			
Number	Description	Materials Generated or Stored	Potential Pathways
AOC 671	Aviation Gasoline compound operating from the 1940s until the 1960s. Two 25,000 gallon concrete tanks, and the possible foundation of the truck load stand still exist. There is no evidence of the metering house, or any other ancillary structures at this time. ^a	Aviation gasoline	Soil Sediment Soil Gas Surface Water Groundwater Underground utility conduits
Notes: ^a Described in the RCRA Facility Assessment, November 1994.			

Site Activities

Initial site activities include soil borings, soil sampling, and installing monitoring wells. Subsequent activities include well development, purging, and sampling. Field work for this site is described in Section 2.1 of this Work Plan.

Chemical Hazards and PPE Requirements

The major constituents of concern are volatile organic compounds contained in gasoline, aviation gasoline (AVGAS), and lead. Table 4.2 lists exposure guidelines for expected site contaminants of concern. Material Safety Data Sheets (MSDS) will only be placed in field copies of the

ZIHASP. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS files onsite.

The initial level of PPE for invasive field activities performed at AOC 671 is modified Level D. The Action Level (AL) for this site is a continuous photoionization detector (PID) reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.2 Exposure Guidelines For Expected Site Chemical Hazards — AOC 671						
Chemical Name	Odor SM Threshold	Ionization Potential (eV) SM	OSHA PEL SM	ACGIH TLV SM	NIOSH REL SM	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1.3 to 7.1%
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Lead	NA	NA	0.05 mg/m ³	0.15 mg/m ³	0.15 mg/m ³	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%

Table 4.2 Exposure Guidelines For Expected Site Chemical Hazards -- AOC 671						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^d	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^e	Flammable range (% by volume)
Xylene	1 ppm ^a	8.56	100 150 STEL	100 150 STEL	100 150 STEL	1.0 to 7.0%
Notes: ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000. ^c = Threshold Limit Values, and Short-Term Exposure Limits (TLVs and STELs) recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH) and published annually. For this ZIHASP site, 1993 - 1994 <i>Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. NIOSH Pocket Guide to Chemical Hazards, June 1990. ^e = Odor Threshold for Chemicals, <i>Chemical Hazards of the Workplace</i> , by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H. NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.4 AOC 672, Building 126 Substation (includes AOC 673, Building 169 Paint and Oil Storage)

AOC 672 is an electrical substation (Building 126), built in 1947 and modified in 1950. It houses transformers and switch gear. Present equipment is non-PCB, but previous equipment (transformers and switches) would have contained PCB dielectric fluid or PCB-contaminated dielectric fluid. Building 126 is northeast of Hobson Avenue just south of the approach to Pier Q. It is adjacent to Building 169, which has been designated AOC 673. Building 169 was built in 1949 and has been used to store paints, oils, solvents and other materials associated with painting. This AOC has been designated for a CSI. Table 4.3 describes AOCs 672 and 673.

Table 4.3 AOC 672 and AOC 673 Site Description			
Number	Description	Materials Generated or Stored	Potential Pathways
AOC 672	Substation containing transformer and switch gear to support electrical grid. Facility dates from WWII era with a modification in 1950. Transformer reported to have had a moderate leak in 1981. Tests completed in 1987 showed transformer was PCB contaminated (73 ppm). Present equipment all non-PCB.*	Dielectric fluids	Soil Sediment Surface Water Groundwater Underground utility conduits
AOC 673	Building used to store paint, oils, solvents and other materials supporting painting activities.*	Paints, oils, solvents and other associated materials.	Soil Sediment Surface Water Groundwater Underground utility conduits

Notes:
 * Described in RCRA Facility Assessment, November 1994

Site Activities

Initial site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities include well development, purging, and sampling. Section 2.2 of this Work Plan describes the field work for this site.

Chemical Hazards and PPE Requirements

The contaminants of concern at this site are PCBs, paints, solvents, petroleum products, metals and volatile organic compounds (VOCs). Table 4.4 lists exposure guidelines for the contaminants of concern. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

The initial PPE level for invasive field activities performed at AOC 672 and 673 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.4 Exposure Guidelines For Expected Site Chemical Hazards — AOC 672 and AOC 673						
Chemical Name	Odor TM Threshold	Ionization Potential (eV) ^d	OSHA PEL TM	ACGIH TLV TM	NIOSH REL TM	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 STEL Potential Occupational Carcinogen	1.3 to 7.1%
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Human Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Chromium VI	NA	NA	0.1 mg/m ³	0.05 mg/m ³ Suspected Human Carcinogen.	1 µg/m ³ Potential Human Carcinogen	NA
Copper	NA	NA	0.1 mg/m ³ - Fume 1 mg/m ³ - Dust	0.2 mg/m ³ - Fume 1 mg/m ³ - Dust	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Lead	NA	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA
Mercury	NA	NA	0.05 mg/m ³ Skin	0.025 mg/m ³ Skin	0.05 mg/m ³ Skin	NA

Table 4.4 Exposure Guidelines For Expected Site Chemical Hazards -- AOC 672 and AOC 673						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^d	Flammable range (% by volume)
Polychlorinated Biphenyls (PCB)	NA	NA	1 mg/m ³	0.5 - 1 mg/m ³	0.001 mg/m ³	NA
Silver	NA	NA	0.01 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1 %
Xylene	1 ppm ^e	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0 %

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- ^e = Odor Threshold for Chemicals, *Chemical Hazards of the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H.
- NA = Substance information not available, or substance unlisted.

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.5 AOC 675, Fuel Oil Storage Tank NS-4; AOC 676, Former Incinerator; and AOC 677, Grounds of Building NS-2

The area designated AOC 675, 676, and 677 includes the following structures: Building NS-2, Tank NS-4, Building NS-3, abandoned USTs near NS-3, an oil/water separator, a storm water drain, and a sewage lift station. These AOCs are described in Table 4.5.

Table 4.5 AOC 675, AOC 676, and AOC 677 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 675	A 25,000-gallon residual oil UST supporting the boiler in Building NS-2 used from 1952 until conversion to diesel fuel in 1991. There are additional USTs are near NS-3 to the west. ^a	Residual fuel Diesel fuel Aviation gasoline	Soil Soil Gas Surface Water Groundwater Underground utility conduits
AOC 676	An incinerator which operated in the area prior to the construction of NS-2. There is no information regarding the type of structure which existed, the type of incinerator, or the materials incinerated at this facility. ^a	Ash (metals) Petroleum products	Soil Surface Water Groundwater
AOC 677	The grounds around Building NS-2 have been the site of a number of petroleum spills associated with the operation of the boilers in NS-2. Spill reports indicate a number of releases since 1977. This is also near the location of seaplane refueling operations conducted during the 1940s. ^a	Residual fuel Diesel fuel Aviation gasoline Lead	Soil Surface Water Groundwater Underground utility conduits
Notes: ^a Described in <i>RCRA Facility Assessment, November 1994.</i>			

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required.

Chemical Hazards and PPE Requirements

The exact nature of the contaminants of concern in AOC 675, 676, and 677 are likely to be associated with residual petroleum hydrocarbons from the storage of fuels at the site and ash contaminated with heavy metals.

Table 4.6 lists the primary chemicals of concern as well as regulatory and recommended exposure guidelines for this site. The primary chemicals of concern were determined based on an informal evaluation of potential site contaminants, looking at such factors as: site history and the toxicity of known and suspected contaminants.

The initial PPE level for invasive field activities at AOCs 675, 676, and 677 in modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.6 Exposure Guidelines For Expected Site Chemical Hazards --- AOC 675, AOC 676, and AOC 677						
Chemical Name	Odor ^{1a} Threshold	Ionization Potential (eV) ⁴	OSHA PEL ^{2a}	ACGIH TLV ^{2b}	NIOSH REL ^{2c}	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 STEL Potential Occupational Carcinogen	1.3 to 7.1%
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Human Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Chromium VI	NA	NA	0.1 mg/m ³ Ceiling	0.05 mg/m ³ Suspected Human Carcinogen	1 µg/m ³ Suspected Human Carcinogen	NA
Copper	NA	NA	0.1 mg/m ³ - Fume 1 mg/m ³ - Dust	0.2 mg/m ³ - Fume 1 mg/m ³ - Dust	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Lead	NA	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA

Table 4.6 Exposure Guidelines For Expected Site Chemical Hazards — AOC 675, AOC 676, and AOC 677						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^d	Flammable range (% by volume)
Mercury	NA	NA	0.05 mg/m ³ Skin	0.025 mg/m ³ Skin	0.05 mg/m ³ Skin	NA
Polychlorinated Biphenyls (PCB)	NA	NA	1 mg/m ³	0.5 - 1 mg/m ³	0.001 mg/m ³	NA
Silver	NA	NA	0.01 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%
Xylene	1 ppm ^e	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- ^e = Odor Threshold for Chemicals, *Chemical Hazards of the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H.

NA = Substance information not available, or substance unlisted.

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.6 AOC 678, Firefighter School, Former Building 2-V and AOC 679, Former Wash Rack

AOC 678 is the former site of Building 2-V, the Firefighter School, which was behind Building NS-1 in the northeastern portion of the southern peninsula. The firefighting school was reportedly constructed in 1947 and demolished circa 1955. No other details regarding the design features or operating practices were available but controlled fires may have been ignited and extinguished onsite for firefighter training. Petroleum contaminants may therefore be present.

Nearby is AOC 679, the former location of a wash rack. Details regarding the design features, years of operation, and operating practices of this rack are also unknown but likely involved petroleum-based materials. The *RCRA Facility Assessment, November 1994*, lists paint as a characteristic waste. Upon further review of current information, paint contaminants were associated with lead-based paint suspected in adjacent Building NS-1, not the former wash rack. Like AOC 678, the wash rack has been designated for a CSI and both sites will be investigated concurrently. Table 4.7 describes these AOCs.

Table 4.7 AOC 678 and AOC 679 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 678	Former firefighter school and potential site of controlled burning of ignitable materials. ^a	Petroleum	Soil Groundwater Surface Water Underground utility conduits
AOC 679	Former location of wash rack. ^a	Petroleum	Soil Groundwater Surface Water Underground utility conduits
Notes: ^a Described in the <i>RCRA Facility Assessment, November 1994</i> .			

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.4 of this Work Plan.

Chemical Hazards and PPE Requirements

Table 4.8 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

The initial PPE level for invasive field activities performed at AOC 678 and 679 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.8 Exposure Guidelines For Expected Site Chemical Hazards — AOC 678 and AOC 679						
Chemical Name	Odor SM Threshold	Ionization Potential (eV) SM	OSHA PEL SM	ACGIH TLV SM	NIOSH REL SM	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1.3 to 7.1%
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Lead	NA	NA	0.05 mg/m ³	0.15 mg/m ³	0.15 mg/m ³	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%

Table 4.8 Exposure Guidelines For Expected Site Chemical Hazards -- AOC 67B and AOC 67D						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^e	Flammable range (% by volume)
Xylene	1 ppm *	8.56	100 150 STEL	100 150 STEL	100 150 STEL	1.0 to 7.0%
Notes: * = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000. c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 <i>Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. <i>NIOSH Pocket Guide to Chemical Hazards, June 1990</i> . e = Odor Threshold for Chemicals, <i>Chemical Hazards of the Workplace</i> , by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H. NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.7 AOC 680, NS-26 Grinding Room/Brake Repair Area

AOC 680 is the former grinding room in Building NS-26, reportedly used for repairing brake components containing asbestos. Building plans from 1969 show the grinding room on the southern side of Building NS-26, not the northeast side as described in the *RCRA Facility Assessment, November 1994*. Recent interviews with NS-26 personnel also indicate that brakes have not been repaired at NS-26 since 1970. The area once occupied by the grinding room was remodeled in 1985 and is now the southern entrance with a short hallway. Since details regarding both past activities and period of operation are uncertain, AOC 680 has been designated for a CSI to determine if asbestos dust is present.

Site Activities

The CSI for this AOC will consist of sampling accumulated dust from building structural component surfaces.

Chemical Hazards and PPE Requirements

The chemical hazard of concern for this site is asbestos-containing dust on building components. Sampling activities require modified Level D PPE. The OSHA PEL for asbestos is 0.2 fibers/cubic centimeter (f/cc) with a prescribed action level of 0.1 f/cc.

In the worst circumstances rather than starting work in Level C, E/A&H would collect aggressive air samples to determine if airborne asbestos is present in the facility. For E/A&H to work in PPE less than Level C, air samples must confirm that airborne asbestos concentrations do not exceed 0.05 f/cc.

Site-specific Operational and Physical Hazards

Access to the building's structural components may require using ladders and working at potentially hazardous heights.

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4.8 AOC 681, Building 681 Blast Booth

AOC 681 is the abrasive blast booth on the west side of Building 681 used for stripping miscellaneous ship and boiler components. The blasting agent (aluminum oxide) is recycled through a cyclone separator and the wastes generated, primarily paint dust, are directed into an outdoor hopper and then into 55-gallon drums for disposal. AOC 681 has been designated for an RFI to determine if the blast booth has impacted either the building's interior or the soil surrounding the exterior hopper. Table 4.9 describes this AOC.

Table 4.9 AOC 681 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 681	Blast Booth in Building 681 used to strip miscellaneous components. ^a	Lead-based paint Aluminum oxide	Soil Groundwater Air
Notes: ^a Described in the RCRA Facility Assessment, November 1994.			

Site Activities

Seven wipe samples are proposed for surfaces near the blast booth. Three soil borings will be installed around the outdoor hopper.

Chemical Hazards and PPE Requirements

The major constituents of concern are lead-based paint, aluminum oxide, cadmium and chromium. Table 4.10 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite. The initial PPE level for invasive field activities performed at AOC 681 is modified Level D.

Table 4.10 Exposure Guidelines For Expected Site Chemical Hazards — AOC 681						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^d	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^e	Flammable range (% by volume)
Aluminum Oxide	NA	NA	10.0 mg/m ³	10.0 mg/m ³	10.0 mg/m ³	NA
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Occupational Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Chromium VI	NA	NA	0.1 mg/m ³ Ceiling	0.05 mg/m ³ Suspected Human Carcinogen	1 µg/m ³ Suspected Human Carcinogen	NA
Copper	NA	NA	0.1 mg/m ³ - Fume 1 mg/m ³ - Dust	0.2 mg/m ³ - Fume 1 mg/m ³ - Dust	NA	NA
Lead	NA	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA
Mercury	NA	NA	0.05 mg/m ³ Skin	0.025 mg/m ³ Skin	0.05 mg/m ³ Skin	NA
Silver	NA	NA	0.01 mg/m ³	0.1 mg/m ³	NA	NA
Notes: ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000. ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 <i>Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. <i>NIOSH Pocket Guide to Chemical Hazards, June 1990.</i> NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

4.9 AOC 685, Former Smoke Drum

AOC 685, the former site of a smoke drum which reportedly operated from 1941 until 1953, was on the west side of Juneau Avenue, south of Partridge Avenue. Currently, this area is a grassy field with no visible evidence of the former smoke drum. The smoke drum's design features, dimensions, and operating practices are unknown; thus this AOC is designated as a CSI site. Table 4.11 describes this AOC.

Table 4.11 AOC 685 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 685	Former Smoke Drum; usage unknown. ^a	Unknown	Air (past) Soil Sediment Groundwater
Notes: ^a Described in the <i>RCRA Facility Assessment, November 1994.</i>			

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.7 of this Work Plan.

PPE Requirements

The initial PPE level for invasive field activities performed at AOC 685 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.10 AOC 687, Building X-55 — Ammunition Storage Bunker (Includes SWMU 16, Paint Storage Bunker)

AOC 687 is an earth-covered ammunition storage bunker constructed in 1942 between Juneau Avenue and the current southern spoils area. The facility continues to store high explosives and small arms ammunition. Prior to starting any invasive activities the bunkers will be checked again to make sure that ammunition is not present when field work is being conducted. The bunker reportedly was also once used for unauthorized paint storage. This AOC is designated for a CSI.

The earth-covered roof of X-55 was reportedly used for the unauthorized open storage of small quantities of paint, paint thinner, and other hazardous materials and has been designated as SWMU 16. The investigations for both X-55 sites will be performed concurrently. A description of the AOC and SWMU is provided in Table 4.12.

Table 4.12 AOC 687 and SWMU 16 Site Descriptions			
Number	Description	Materials of Concern	Potential Pathways
AOC 687	Ammunition Storage Bunker X-55 used to store explosives and paint. ^a	Explosives Paint waste	Soil Sediment Surface Water Groundwater
SWMU 16	Roof of Storage Bunker X-55 used for unauthorized open storage of small quantities of paint and other materials with a spill history. ^b	Paint wastes	Soil Sediment Surface Water Groundwater

Notes:
^a Described in the *RCRA Facility Assessment, November 1994.*
^b Described in the *RCRA Facility Assessment, August, 1987.*

Site Activities

Site activities will include sediment sampling, soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.8 of this Work Plan.

Chemical Hazards and PPE Requirements

Table 4.13 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

The initial PPE level for invasive field activities performed at AOC 687 and SWMU 16 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.13 Exposure Guidelines For Expected Site Chemical Hazards --- AOC 687 and SWMU 16						
Chemical Name	Odor ^(M) Threshold	Ionization Potential (eV) ^(S)	OSHA PEL ^(M)	ACGIH TLV ^(M)	NIOSH REL ^(M)	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 STEL Potential Occupational Carcinogen	1.3 to 7.1 %
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Human Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Chromium VI	NA	NA	0.1 mg/m ³ Ceiling	0.05 mg/m ³ Suspected Human Carcinogen	1 µg/m ³ Suspected Human Carcinogen	NA

Table 4.13 Exposure Guidelines For Expected Site Chemical Hazards — AOC 687 and SWMU 18						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^d	Flammable range (% by volume)
Copper	NA	NA	0.1 mg/m ³ - Fume 1 mg/m ³ - Dust	0.2 mg/m ³ - Fume 1 mg/m ³ - Dust	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	Not Listed	NA	NA	100 mg/m ³	0.7 to 5.0%
Mercury	NA	NA	0.05 mg/m ³ Skin	0.025 mg/m ³ Skin	0.05 mg/m ³	NA
Polychlorinated Biphenyls (PCB)	NA	NA	1 mg/m ³	0.5 - 1 mg/m ³	0.001 mg/m ³	NA
Silver	NA	NA	0.01 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%
Xylene	1 ppm *	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines
- * = Odor Threshold for Chemicals, *Chemical Hazards of the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H.

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.11 AOC 688, Building X-56 — Ammunition Storage Bunker

AOC 688 is an earth-covered ammunition storage bunker constructed in 1942 between Juneau Avenue and the current southern spoils area. The facility still stores high explosives and ammunition. The bunker reportedly was once used for the unauthorized storage of 3,420 gallons of paint in 1987. This AOC, designated for a CSI, is described in Table 4.14.

Table 4.14 AOC 688 Site Descriptions			
Number	Description	Materials of Concern	Potential Pathways
AOC 688	Ammunition Storage Bunker X-56 used to store explosives and paint. ^a	Explosives Paint waste	Soil Sediment Surface Water
Notes: ^a Described in the RCRA Facility Assessment, June 13, 1994			

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.9 of this Work Plan.

Chemical Hazards and PPE Requirements

The contaminants of concern for this AOC include petroleum hydrocarbons, solvents, and paints. Table 4.15 list exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

The initial PPE level for invasive field activities performed at AOC 688 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.15 Exposure Guidelines For Expected Site Chemical Hazards --- AOC 688						
Chemical Name	Odor TM Threshold	Ionization Potential (eV) ²	OSHA PEL TM	ACGIH TLV TM	NIOSH REL TM	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 STEL Potential Occupational Carcinogen	1.3 to 7.1%
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Human Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Chromium VI	NA	NA	0.1 mg/m ³ Ceiling	0.05 mg/m ³ Suspected Human Carcinogen	1 µg/m ³ Suspected Human Carcinogen	NA
Copper	NA	NA	0.1 mg/m ³ Fume 1 mg/m ³ Dust	0.2 mg/m ³ Fume 1 mg/m ³ Dust	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	Not Listed	NA	NA	100 mg/m ³	0.7 to 5.0%
Mercury	NA	NA	0.05 mg/m ³ Skin	0.025 mg/m ³ Skin	0.05 mg/m ³	NA
Polychlorinated Biphenyls (PCB)	NA	NA	1 mg/m ³	0.5 - 1 mg/m ³	0.001 mg/m ³	NA
Silver	NA	NA	0.01 mg/m ³	0.1 mg/m ³	NA	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%

Table 4.15 Exposure Guidelines For Expected Site Chemical Hazards — AOC 858						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^e	Flammable range (% by volume)
Xylene	1 ppm ^a	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%
Notes: ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000. ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, <i>1993 -1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. <i>NIOSH Pocket Guide to Chemical Hazards, June 1990.</i> ^e = Odor Threshold for Chemicals, <i>Chemical Hazards of the Workplace</i> , by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H. NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.12 AOC 689, Dredged Materials Disposal Area at Southern Tip of Base

AOC 689 is a 67.95-acre dredged materials disposal area at the southern end of NAVBASE. The confined area has received materials from dredging operations in both the Cooper River and Shipyard Creek since the 1940s and has undergone several dike relocation projects sponsored by the U.S. Army Corps of Engineers. Two spillways in the southern portion of the diked area deposited sediments to de-water. The southernmost spillway ultimately discharges to the Cooper River and the western spillway discharges directly to Shipyard Creek. AOC 689 is bounded to the southwest by West Road and Shipyard Creek, and to the east by Juneau Avenue and the Cooper River. This AOC has been designated for an RFI. AOC 689 is described in Table 4.16.

Table 4.16 AOC 689 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 689	Confined Land Dredge Disposal Area used since the 1940s. The spoil area received dredged material from both the Cooper River and Shipyard Creek.*	Petroleum Dioxins Tricyclic Aromatic Tributyltin	Soil Sediment Soil Gas Surface Water Groundwater
Notes: * Described in the RCRA Facility Assessment, November 1994.			

Site Activities

To fulfill the RFI objectives, site-specific sampling and analysis requirements have been proposed. Eight proposed sediment samples within the dike will be collected on a grid-based sampling scheme. Two additional sediment samples will be collected in the drainage ditch which conveys effluent from the spoils area to the Cooper River. Four grid-based soil samples will be collected outside the dike. Five surface water samples from standing water in the diked area are also proposed.

Site conditions within the diked area may be non-conducive to standard sampling protocol as outlined in the NAVBASE Charleston *Final Comprehensive RFI Work Plan*. Access to several of the pre-determined sampling locations will require techniques designed for moving personnel and equipment within a marsh habitat with scrub-shrub vegetation and extremely soft, fine-grained, calcareous sediments. Modifying gear, primarily to its portability and effectiveness in such conditions, may be required. Site activities will include soil borings and soil sampling.

Chemical Hazards and PPE Requirements

Table 4.17 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

Due to the potential presence of low concentration dioxins and tributyl tins in the dredge spoils, the initial PPE level for invasive field activities at AOC 689 is modified Level D, augmented with *Saranex*-treated protective coveralls and full-length nitrile gloves. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.17 Exposure Guidelines For Expected Site Chemical Hazards — AOC 689						
Chemical Name	Odor TM Threshold	Ionization Potential (eV) ^c	OSHA PEL TM	ACGIH TLV TM	NIOSH REL TM	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1.3 to 7.1%

Table 4.17 Exposure Guidelines For Expected Site Chemical Hazards — AOC 889						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^e	Flammable range (% by volume)
Dioxin 2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA
Dioxin 2,3,7,8-TCDF	NA	NA	NA	NA	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Tributyl tin	NA	NA	0.1 mg/m ³	0.1 mg/m ³	0.1 mg/m ³	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%
Xylene	1 ppm ^a	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- ^e = Odor Threshold for Chemicals, *Chemical Hazards of the Workplace*, by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H.

NA = Substance information not available, or substance unlisted.

Site-specific Operational and Physical Hazards

Site conditions within the diked area require techniques designed for moving personnel and equipment within a marsh habitat with scrub-shrub vegetation and extremely soft, fine-grained calcareous sediments. Due to the extremely soft sediments, access to sample collection points will be gained using a shallow draft swamp boat and pole. All personnel will be secured via

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lifeline to the boat and the boat secured via cable to a vehicle on the spoil area road. All personnel will wear U.S. Coast Guard approved personal floatation devices (PFD). This is a prime habitat for poisonous reptiles and insects.

4.13 SWMU 12, Old Firefighter Training Area

SWMU 12 is the former location of the firefighter training area in the southwestern portion of the southern peninsula. This unit was a 30-foot to 50-foot diameter pit used for training between 1966 and 1971. A gravel road and clearing in this area, currently used as a construction *lay-down* yard, is believed to be near the former location of the training area. SWMU 12 has been designated for an RFI. Table 4.18 describes this SWMU.

Table 4.18 SWMU 12 Site Description			
Number	Description	Materials of Concern	Potential Pathways
SWMU 12	Old firefighter training area consisting of a shallow pit into which ignitable liquids were pumped and set on fire and then extinguished. ^a	Petroleum	Soil Sediment Groundwater Surface Water
Notes: ^a Described in the <i>RCRA Facility Assessment, August 1987</i>			

Site Activities

Site activities will include soil borings and soil sampling. Field work for this site is described in Section 2.11 of this Work Plan.

Chemical Hazards and PPE Requirements

The major constituent of concern at SWMU 12 is petroleum hydrocarbon. Table 4.19 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

The initial PPE level for invasive field activities performed at SWMU 12 is modified Level D PPE. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.19 Exposure Guidelines For Expected Site Chemical Hazards -- SWMU 12						
Chemical Name	Odor ^a Threshold	Ionization Potential (eV) ^b	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^e	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	1.3 to 7.1%
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%
Xylene	1 ppm ^a	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%

Notes:

- ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
- ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
- ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
- ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
- ^e = Odor Threshold for Chemicals, *Chemical Hazards of the Workplace*, by Nick H. Proctor, James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H. Ph.D.,
- NA = Substance information not available, or substance unlisted.

Site-specific Operational and Physical Hazards

See **Section 4.16.**

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4.14 AOC 690, Dredged Materials Area Roads

AOC 690 is the network of roadways on the southern tip of the naval base, including West Road, Lunsford Loop, and a portion of Juneau Avenue. The roadside areas along these dirt roads, totaling about 4,500 feet, are reported locations of historic, unauthorized chemical dumping by ship personnel; and have therefore been designated for a CSI. A description of this AOC is provided in Table 4.20.

Table 4.20 AOC 690 Site Description			
Number	Description	Materials of Concern	Potential Pathways
AOC 690	Spoils Area Roads are reported sites for unauthorized disposal of chemicals and other hazardous wastes by ship personnel.*	Unknown	Soil Sediment Surface Water Groundwater Air
Notes: * Described in the RCRA Facility Assessment, November 1994.			

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Field work for this site is described in Section 2.10 of this Work Plan.

Chemical Hazards and PPE Requirements

Table 4.21 lists exposure guidelines for expected site chemicals. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the MSDS file onsite.

Due to the unknown type or quantities of pesticides potentially present in the soil, all field work that will disturb soil or require contact with groundwater should be performed in Level C PPE

until analytical data can be evaluated for possible consideration of a downgrade to Level D PPE. The AL for this site is a continuous PID reading of 10 ppm or greater. If this occurs, work activities shall be discontinued until arrangements can be made to resume work in Level B.

Table 4.21 Exposure Guidelines For Expected Site Chemical Hazards — AOC 690						
Chemical Name	Odor ^(a) Threshold	Ionization Potential (eV) ^(d)	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(e)	Flammable range (% by volume)
Arsenic	NA	NA	0.01 mg/m ³	0.2 mg/m ³	0.002 mg/m ³ potential occupational carcinogen	NA
Chlordane	NA	NA	0.5 mg/m ³	0.5 mg/m ³ 2.0 mg/m ³ STEL	potential occupational carcinogen	NA
DDT	NA	NA	1 mg/m ³	1 mg/m ³	0.5 mg/m ³	NA
Dieldrin	0.041 ppm	NA	0.25 mg/m ³	0.25 mg/m ³	potential occupational carcinogen	NA
Malathion	NA	NA	10 mg/m ³	10 mg/m ³	15 mg/m ³	NA
Toxaphene	NA	NA	0.5 mg/m ³ 1.0 mg/m ³ STEL	0.5 mg/m ³ 1.0 mg/m ³ STEL	potential occupational carcinogen	NA
Notes: ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. ^b = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000. ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, 1993 - 1994 <i>Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. <i>NIOSH Pocket Guide to Chemical Hazards, June 1990.</i> NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

4.15 SWMU #177, RTC-4 Oil Spill

SWMU #177 consists of two adjacent buildings both of which have been designated as Building RTC-4. The original RTC-4 was a 24' x 60' metal structure used to house heavy equipment including backhoes and trackhoes. Recently, however, the designation RTC-4 has been given to a newer facility built adjacent to the former RTC-4. The new RTC-4 is used to store lawn mowers and other lawn maintenance equipment. This unit was designated as a SWMU because of oil spillage associated with operations at these two buildings. SWMU 177 is described in Table 4.22.

Table 4.22 SWMU 177 Site Description			
Number	Description	Materials of Concern	Potential Pathways
SWMU 177 RTC-4 Oil Spill	Petroleum spill on the order of several gallons observed within the original Building RTC-4. Spill most likely waste motor oil based on usage of Building RTC-4 as shelter for heavy equipment. Stains in parking area suspected to be hydraulic fluid leaks from facility fork lift. ^a	VOCs Petroleum Hydrocarbons Lubricating oil Anti-freeze Motor oil	Soil Soil Gas Sediment Surface Water Groundwater Air
Notes: ^a Described in the <i>Final RCRA Facility Assessment</i> , June 6, 1995. Pathways scheduled for confirmatory sampling are in bold.			

Site Activities

Site activities will include soil borings and soil sampling. Field work for this site is described in Section 2.12 of this Work Plan.

Chemical Hazards and PPE Requirements

The major constituents of concern at SWMU 177 are related to used motor oil, in particular, petroleum hydrocarbons and heavy metals may be present at this site. Table 4.23 lists exposure guidelines for expected site chemicals.

The initial PPE level for invasive field activities performed at SWMU 177 is modified Level D PPE. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for a substantial time (greater than 2-3 minutes), the required PPE level shall be upgraded to Level C.

Table 4.23 Exposure Guidelines For Expected Site Chemical Hazards — SWMU 177						
Chemical Name	Odor ^(a) Threshold	Ionization Potential (eV)	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Flammable range (% by volume)
Benzene	4.68 ppm	9.24	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 STEL Potential Occupational Carcinogen	1.3 to 7.1%
Cadmium	NA	NA	0.6 mg/m ³	0.05 mg/m ³	Potential Human Carcinogen	NA
Chromium	NA	NA	1 mg/m ³	0.5 mg/m ³	NA	NA
Ethylbenzene	140 ppm	8.76	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	1.0 to 6.7%
Kerosene	1 ppm	6.8	NA	NA	100 mg/m ³	0.7 to 5.0%
Lead	NA	NA	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	NA
Toluene	40 ppm	8.82	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	1.3 to 7.1%
Xylene	1 ppm ^e	8.56	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	1.0 to 7.0%

Table 4.23 Exposure Guidelines For Expected Site Chemical Hazards — SWMU 177						
Chemical Name	Odor ^(a) Threshold	Ionization Potential (eV)	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Flammable range (% by volume)
Notes: ^a = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989. ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000. ^c = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, <i>1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices</i> was used. ^d = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute for Occupational Safety and Health (NIOSH) to support OSHA. <i>NIOSH Pocket Guide to Chemical Hazards, June 1990.</i> ^e = Odor Threshold for Chemicals, <i>Chemical Hazards of the Workplace</i> , by Nick H. Proctor, Ph.D., James P. Hughes, M.D., F.A.C.P., and Michael L. Fischman, M.D., M.P.H. NA = Substance information not available, or substance unlisted.						

Site-specific Operational and Physical Hazards

See Section 4.16.

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4.16 General Operational and Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations. These hazards may include movement over slippery and/or uneven terrain. Personnel may be required to carry equipment over this type of terrain. These types of surfaces present a significant slip, trip and fall hazard. When conducting any field operations personnel will walk.

Heat stress and other environmental illnesses are a major concern when performing site activities during summer months. When deemed necessary the Site Supervisor and the Site Health and Safety Officer shall implement work regiments that will minimize the potential for employee illness.

4.16.1 Radiological Site Screening

Radioactive materials/hazards are potentially present within Zone I as a result of past operational activities at the Charleston Naval Shipyard (CNSY).

As part of the CNSY and the Charleston Naval Base closure process, the Navy is required to conduct radiological surveys to verify that all Naval material has been removed.

Prior to EnSafe/Allen & Hoshall and contractors performing any of the below actions, the CNSY General Survey Project Superintendent of Zone I shall be contacted by E/A&H employees and contractors to determine if the CNSY verification surveys have been completed in Zone I. Once completion of the surveys has been verified, work may be performed in the verified areas with no radiological precautions required. This applies to all E/A&H employees and their contractors while conducting field work in Zone I, including but not limited to walkover investigations, drilling, well development, soil sampling, water sampling, and trenching.

4.16.2 Underground Utilities

A major safety concern in environmental investigations is drilling into underground utilities, particularly electrical and natural gas lines. Prior to drilling or conducting an intrusive activity with the potential to penetrate a utility line, at a minimum, the following steps must be taken at each location, for each well or penetration:

- Conduct a surficial resistivity and magnetic survey to locate underground utilities.
- Offset drilling location from located utility allowing a minimum of 5 feet.
- Core asphalt and concrete then post hole dig to 5 feet below ground surface (bgs).
- During the act of drilling, post hole digging, and hand augering in areas where underground utilities may be present the individual(s) actually doing the invasive work shall wear boots and gloves that provide electrical insulation.

4.16.3 Severe Weather Conditions

Field work shall not be conducted when lightning can be seen from the work area. When lightning is observed, cease work, perform emergency personal and equipment decontamination (see **Section 4.18**) as needed, then seek shelter.

During extreme weather conditions the Site Supervisor shall use his/her best judgement and has the authority to stop field work or dismiss workers for the day. Examples of conditions that may warrant work stoppage include: high winds, hail, flooding, and ice storms. In the event of severe weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.16.4 Working Around Drill Rigs and Heavy Equipment

Heavy equipment and drill rig operations will be performed in accordance with the procedures outlined in the CHASP.

4.17 Employee Protection

Employee protection for this project is addressed in several ways including the use of: work limitations, specified PPE, air monitoring, decontamination procedures, standard safe work practices, general rules of conduct, procedures for extreme weather conditions and medical surveillance.

4.17.1 Work Limitations

All site activities will be conducted during daylight only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER Site Supervisor training. All personnel must complete an eight-hour refresher training course annually to continue working onsite.

4.17.2 Selecting Proper PPE

It is important that specified PPE protects against known and suspected site hazards. Selection of protective equipment is based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, and a greater emphasis is placed on past experiences and sound safety practices.

PPE requirements are subject to change as site information is updated or changes. **A decision to deviate from specified levels of PPE as contained in this ZIHASP must be made or reviewed by the Project Health and Safety Officer (PHSO).**

Initial Level of PPE

Based on the best available information, the appropriate level of PPE for initial site entry is modified Level D. Modified Level D shall be the initial PPE for work activities that disturb the soil or could result in personnel coming into contact with contaminated soil, sediment, groundwater, or surface water. This level of protection was selected because the concentrations of contaminants detected in the previous studies were low and free product was not detected. Modified Level D protection consists of a hard hat, chemical-resistant coveralls and gloves (vinyl or nitrile), eye protection, and steel-toed and shank boots.

Examples of activities to be initiated in Modified Level D include: soil boring, well installation and construction, soil sampling, and well development. Collecting groundwater samples and determining water levels are two field activities that can be conducted in Level D, provided that field personnel supplement their Level D attire with nitrile gloves (outer gloves, not the 4-mil nitrile inner glove liners). The history and nature of potential contaminants at specific site locations may indicate a higher or lower level of initial PPE. In these cases the PPE requirements are defined in the subsection *Chemical Hazards and PPE Requirements*.

4.17.3 Air Monitoring

Air monitoring using a PID and/or other appropriate sampling equipment will be conducted before beginning field activities at a new EZ and during ground-disturbing activities. The PID will be field calibrated to measure VOCs relative to a 100 ppm isobutylene standard. If VOCs are detected downhole, colorimetric detector tubes and/or other sampling media may be used to identify and approximate the concentrations of these compounds.

The PHSO reserves the right to require personal exposure monitoring or other types of air sample collection and analysis. These samples may be required for a variety of reasons such as: to identify a chemical odor, PID readings exceed or approach the action level, or to determine if personal exposures are below OSHA PELs.

A combustible gas indicator (CGI) will be used during all soil borings and well installations. The CGI will be field calibrated to measure flammable gases relative to a methane standard. Downhole CGI readings will be collected periodically during soil-disturbing operations. Field activities will immediately cease if downhole readings exceed 20 percent of the lower explosive limit (LEL). If CGI readings do not subside, the area will be immediately evacuated and the situation re-evaluated to determine how to proceed. An investigation of the area will be made; operations may not proceed until downhole readings are below 20 percent LEL.

Action Level and Ceiling Concentration

Each site at NAVBASE has a designated AL and ceiling concentration. For this project the AL is defined as the PID reading in the breathing zone above which respiratory protection must be upgraded; chemical-protective clothing may also be upgraded. The AL is determined on a site-by-site basis. To exceed the AL, PID readings should be sustainable. Readings should remain above the AL for at least one or two minutes at a time. Readings that are elevated for only a few seconds every 15 or 20 minutes do not exceed the AL and do not require workers to upgrade their level of PPE.

The general AL for this zone, as determined on a properly calibrated PID, is 5 PID units above background. PPE shall be upgraded to Level C (assuming that cartridge respirators are appropriate, otherwise Level B) if airborne VOC concentrations in the breathing zone exceed the AL, or if the concentration of any contaminant exceeds 50 percent of the OSHA PEL. This baseline AL and PPE requirement may be superseded by more stringent site-specific levels, as identified in each Site Chemical Hazard and PPE requirements section.

If breathing zone concentrations exceed the AL, or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact the Project Manager and/or the PHSO. The PHSO will be responsible for reassessing the hazards and prescribing revised health

and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. See Table 4.24 for specific criteria for each protection level.

If PID readings exceed 10 units, the SHSO shall contact the PHSO and discuss the need to identify and quantify airborne contaminants. Work shall not proceed until breathing zone concentrations return to background levels and it is reasonably anticipated that breathing zone readings will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

Table 4.24 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> • When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations exist that could affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen deficient. • When the type(s) and or potential concentration of toxic substances are not known. 	<ul style="list-style-type: none"> • Positive-pressure full-face piece self-contained breathing apparatus or positive-pressure supplied air respirator with escape SCBA. • Fully-encapsulating chemical protective suit. • Chemical-resistant inner and outer gloves. • Steel toe and steel shank chemical resistant boots. • Hard hat under suit. • Two-way radios worn inside suit. • Optional: coveralls, long cotton underwear, disposable protective suit, gloves and boots, over fully encapsulating suit.

Table 4.24 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level B	<ul style="list-style-type: none"> When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are: <ul style="list-style-type: none"> when work area may contain less than 19.5 percent oxygen, when expected contaminants do not have appropriate warning properties e.g. vinyl chloride, or when cartridges are not available to protect against all contaminants of concern. Hazards associated with limited dermal exposure are not significant. 	<ul style="list-style-type: none"> Chemical resistant clothes, coveralls. Positive-pressure full-face, self-contained breathing apparatus (SCBA) or supplied airline system (SAR) with escape bottle. Hard hat. Chemical resistant outer and inner gloves. Steel toe and steel shank boots. Chemical resistant outer boots.
Level C	<ul style="list-style-type: none"> When respiratory protection is warranted and cartridge respirators are appropriate. When PID readings exceed the Action Level. When air monitoring indicates airborne concentration of a chemical is 50 percent or more of the PEL or TLV And the work area contains at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Chemical resistant coveralls. Full-face, air purifying respirator equipped with cartridges suitable for the hazard. Hard hat. Chemical resistant outer and inner gloves. Steel toe and steel shank boots. Disposable outer boots.
Modified Level D	<ul style="list-style-type: none"> When chemical contamination is known or expected to be present, yet inhalation risk is low and respiratory protection is not required. Site contaminants may be absorbed through the skin. The "default level" of PPE required when the ZIHASP does not specify another level of PPE. And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Chemical resistant coveralls. Chemical resistant outer gloves; inner gloves or glove liners, optional. Steel toe and steel shank boots. Hard hat. Safety glasses with side shields or safety goggles. Optional: chemical resistant outer boots.
Level D	<ul style="list-style-type: none"> When minimal or no chemical contamination is expected. When ZIHASP specifies Level D protection is adequate. And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> Inner gloves or chemical-resistant gloves needed to handle soil or water samples. Steel toe and steel shank boots. Hard hat. Safety glasses with side shields or safety goggles. Optional: coveralls and disposable outer boots. Work clothes.

The ceiling concentration is defined as the maximum allowable PID reading in the breathing zone regardless of PPE. A ceiling concentration of 50 PID units has been established. Should VOC concentrations exceed 50 ppm in the breathing zone, field workers should secure their equipment and back off the site. Work shall not resume until the Site Supervisor understands

why VOC concentrations became elevated, knows the major constituents of the VOCs being generated, and the VOCs in the breathing zone are less than 5 ppm or workers have upgraded to Level C or B. The proper PPE upgrade shall be determined by the PHSO based on site-specific chemical information (i.e., is there enough information to determine that air purifying respirators will provide sufficient protection).

Field monitoring values will be recorded in a field logbook and copies must be posted for field personnel review.

Equipment Maintenance

Before being used on a daily basis, PIDs, CGIs, and other monitoring equipment shall be calibrated or their proper function verified. Throughout the day this equipment shall be periodically checked to ensure it is working properly. A final calibration shall be conducted at the end of the work day, at which time each instrument will be checked to ensure that it is free from surface contamination. Air monitoring equipment shall detect the calibration standard within a range of plus or minus 10 percent; otherwise the instrument shall be considered to be malfunctioning. Field staff shall note in their field notebooks that they conducted these calibrations and checks and note whether the equipment was functioning properly.

When equipment is not functioning properly it should be brought to the attention of the Site Supervisor or SHSO, who will arrange for repairs and/or replacement of that equipment as needed.

4.18 Personnel and Equipment Decontamination

As needed, a CRZ will be next to EZs established for invasive activities and will include stations for decontaminating personnel, PPE, and hand tools. Typically, a portion of the CRZ will be covered with sheets of 6-mil polyethylene (generally, an area 20 feet by 20 feet is sufficient) with specific stations to accommodate the removal and disposal of the protective clothing, boot covers, gloves, and respiratory protection.

Heavy equipment and field equipment that cannot adequately be decontaminated in the CRZ may be decontaminated on a more centrally located decontamination pad. Table 4.25 lists equipment that may be convenient to have onsite to decontaminate heavy equipment and vehicles; this table also explains how this equipment may be utilized.

Table 4.25 Equipment Recommended for Decontaminating Heavy Equipment and Vehicles	
<ul style="list-style-type: none">• Storage tanks or drums to be used for storing collected wash and rinse solutions, alternatively, equipment for the treatment of collected wash and rinse solutions may be substituted.• Pumps and filters as needed for the collection of wash and rinsate solutions.• Pressurized steam sprayers for steam cleaning equipment.• Long-handled brushes for general cleaning of exterior surfaces. Also shovels and other equipment may be used to dislodge caked on contaminated mud that may be present on the undercarriage or in the tires.• Wash solutions, selected for their ability to remove (dissolve, etc.) contaminants• Rinse solutions, selected for their ability to remove contaminants and wash solutions.• Pressurized sprayers for washing and rinsing, particularly hard to reach areas.• Clean buckets that can contain cleaning and rinsing solutions.• Brooms and brushes that can be used to clean the interior operator areas of vehicles and equipment.	

Figure 4-1 shows one method of laying out an acceptable decontamination area for Level B PPE. There are numerous ways to lay out decontamination areas. Decontamination areas for Level C and Modified D PPE should be based on this concept of decontamination, but can be scaled back in accordance with the decontamination needs of the specific site and level of PPE. As a general rule, persons working in the CRZ and assisting in the decontamination of workers leaving the EZ, shall be outfitted in PPE that is one protection level below what the exiting workers are

using. For example, if workers leave the EZ in Level C, personnel in the CRZ should be in Modified D.

Often equipment may be adequately decontaminated using a soapy wash solution and following specified rinsing procedures. Normally equipment decontamination will be completed in Level D with gloves or Modified D PPE. Respirators not only need to be decontaminated and cleaned between uses, but also need to be sanitized. Alcohol swabs are generally sufficient.

Field work shall not be conducted when lightning can be seen from the work area. When lightning is observed, cease work, perform emergency personal and equipment decontamination if need be, then seek shelter.

In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.18.1 Full Decontamination Procedures

Workers shall use the following cleaning and decontamination procedures when exiting the EZ. These procedures should be followed when workers are leaving the area for lunch, at the end of their shifts, or when work is completed for an EZ. Procedures for rest breaks and changing SCBA tanks and cartridges are described in **Section 4.18.2**. Not all steps apply to every situation; follow applicable procedures. Decontamination procedures shall start at the EZ/CRZ interface and continue away from the EZ toward the SZ.

Full Decontamination Level B

1. **Equipment drop.** Deposit equipment used onto plastic drop cloths or into a plastic-lined tub. All gross contamination should be removed here; equipment may be fine-cleaned and decontaminated here or elsewhere. Equipment that is still contaminated must be wrapped and taped before being moved.
2. **Outer boot and glove wash.** Wash/remove gross contamination from outer boots, outer gloves, SCBA and/or airline equipment.
3. **Tape removal.** Remove tape from ankles and wrists and dispose of in plastic lined drum.
4. **Outer boot removal.** Remove outer boots, disposable outer boots may be disposed of in the same waste container used in **Step 3**. Non-disposable boots need a thorough cleaning before they can be removed from the site. (If non-disposable boots are used, it is preferable to have them dedicated to the project.)
5. **Outer glove removal.** Remove and dispose outer gloves. Gloves may be disposed of in the same waste container as used in **Step 3**.
6. **SCBA and SAR removal.** For Level B*.
SCBA — With buddy or other site worker, remove backpack, remove face-piece and shut off air flow.
Airline — With buddy or other site worker, remove harness and escape bottle, remove face-piece, shut off air flow.

* If coveralls are significantly contaminated, leave the respirator face-piece on, disconnect the air hose just downstream of the regulator, turn off the flow of air, remove

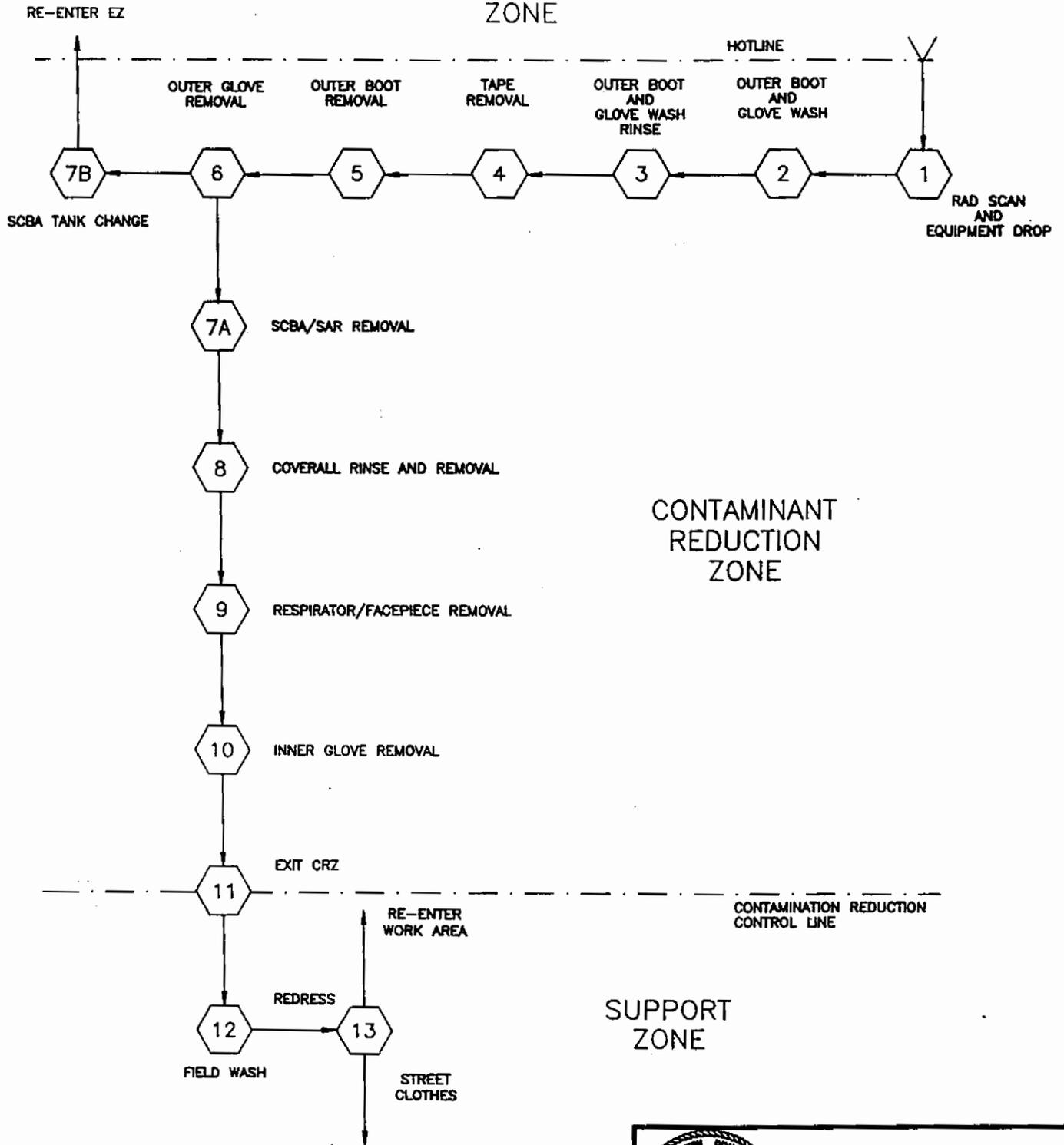
the backpack or equipment harness, and leave the face-piece in place. Remove the face-piece in Step 9.

7. **Coverall removal.** Rinse coveralls if needed. Remove coveralls and dispose of them. The same drum may be used as in Step 3. Non-disposable coveralls shall be double-bagged with the outer bag clearly labeled "contaminated".
8. **Respirator removal.** Remove respirator (or face-piece of Level B equipment, if it is still being worn). Dispose of spent cartridges. Clean, disinfect, dry, and properly store respirator or face-piece.
9. **Inner glove removal.** Remove and discard inner gloves.
10. **Exit area.** Exit the CRZ via the SZ.
11. **Field Wash.** Wash and rinse hands and face.
12. **Redress.** Redress into appropriate PPE for re-entry or change into street clothes.

Notes:

- All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel; final disposal will be by the Navy.
- Hard hats and eye protection should be washed at the end of each workday with a soap and water solution.

EXCLUSION ZONE



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FIGURE 4-1
 FULL DECONTAMINATION LAYOUT
 LEVEL B PROTECTION

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Full Decontamination Level C

1. **Equipment drop.** Deposit equipment used onto plastic drop cloths or into a plastic-lined tub. All gross contamination should be removed here; equipment may be fine-cleaned and decontaminated here or elsewhere. Equipment that is still contaminated must be wrapped and taped before being moved.
2. **Outer boot and glove wash.** Wash/remove gross contamination from outer boots, outer gloves.
3. **Tape removal.** Remove tape from ankles and wrists and dispose of in plastic lined drum.
4. **Outer boot removal.** Remove outer boots, disposable outer boots may be disposed of in the same waste container used in **Step 3**. Non-disposable boots need a thorough cleaning before they can be removed from the site. (If non-disposable boots are used it is preferable to have them dedicated to the project.)
5. **Outer glove removal.** Remove and dispose outer gloves. Gloves may be disposed of in the same waste container as used in **Step 3**.
6. **Coverall removal.** Rinse coveralls, if needed. Remove coveralls and dispose of them. The same drum may be used as in **Step 3**. Non-disposable coveralls shall be double-bagged with the outer bag clearly labeled *contaminated*.
7. **Respirator removal.** Remove respirator and dispose of spent cartridges. Clean, disinfect, dry, and properly store respirator.
8. **Inner glove removal.** Remove and discard inner gloves.

9. ***Exit area.*** Exit the CRZ via the SZ.

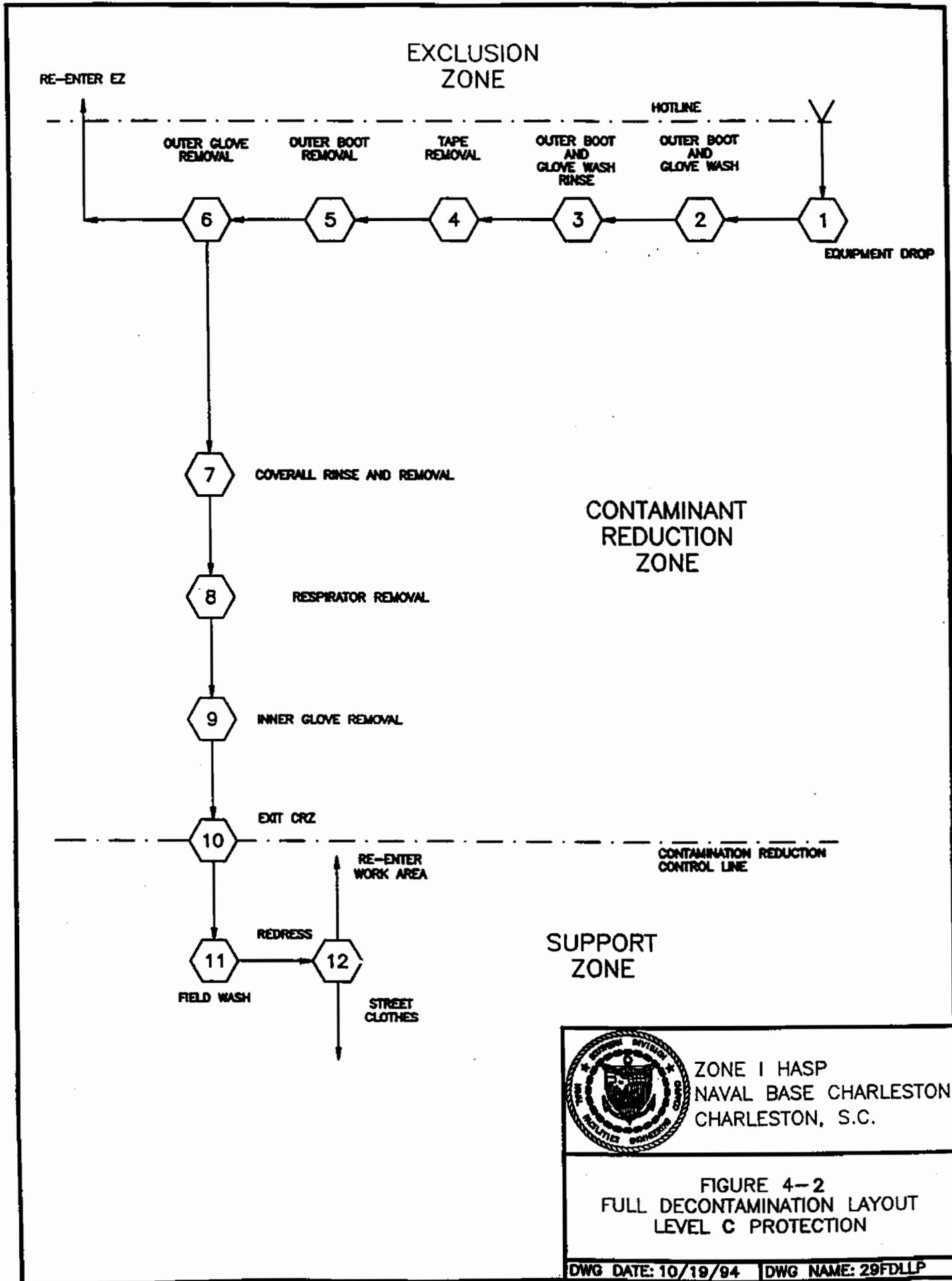
10. ***Field Wash.*** Wash and rinse hands and face.

11. ***Redress.*** Redress into appropriate PPE for re-entry or change into street clothes.

Notes:

- All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel; final disposal will be by the Navy.

- Hard hats and eye protection should be washed at the end of each workday with a soap and water solution.



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FIGURE 4-2
 FULL DECONTAMINATION LAYOUT
 LEVEL C PROTECTION

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4.18.2 Partial Decontamination Procedures

To change a respirator cartridge or SCBA tank:

1. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or airline equipment.
2. ***Tape removal.*** Remove tape from ankles and wrists and discard of it in a plastic-lined drum.
3. ***Face-piece removal.*** Disconnect face-piece and air hose just downstream of regulator. The face-piece may remain in place, or may be removed and cleaned. Remove the spent tank from the backpack and replace it with a full tank. Connect air hose and turn on air.
4. ***Respirator removal.*** Remove respirator, remove used cartridges, clean and disinfect respirator, install new cartridges, and don respirator.
5. ***Respirator check.*** Check to make sure that respirator still seals properly to your face.
6. ***Don clean PPE.*** Put on clean outer gloves, tape wrists (as applicable), and re-enter EZ.

When taking a rest break:

1. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or airline equipment.
2. ***Tape removal.*** Remove tape from ankles and wrists and dispose of it in a plastic lined drum.

3. **Respirator removal.** Remove SCBA unit, airline harness, or respirator and place in a clean area, plastic sheeting may be needed.
4. **Coverall removal.** Remove outer wear if it is ripped or significantly contaminated. In hot weather, at least unzip and pull down upper half of coveralls.
5. **Inner glove removal.** Remove and dispose of inner gloves.
6. **Wash.** Wash and rinse hands and face at the field wash station.
7. **Rest break.** Take rest break: Remember to drink plenty of water, Gatorade or other similar beverage.
8. **Don inner gloves.** Put on inner gloves.
9. **Don PPE.** Don coveralls, outer boots, and outer gloves. Tape wrists and ankles (as needed), and re-enter the EZ.

Decontamination procedures, based on Level D protection:

- Brush heavily soiled boots and rinse outer gloves and boots with soap and water.
- Remove gloves and deposit them in a trash container.
- Dispose gloves and other disposable PPE in a trash container.
- Wash hands and face, and preferably shower as soon as practical.

4.18.3 Closure of the Decontamination Station

All disposable clothing and plastic sheeting used during site activities at sites with Level D through Level C will be double-bagged and disposed of in a refuse container. Decontamination and rinse solutions and disposable PPE from Level B site will be placed in a labeled 55-gallon drum (separate solids and liquids) for later analysis and disposal. All washtubs, pails, buckets, etc. will be washed and rinsed at the end of each workday.

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■ Procedures Hot or Cold Weather Conditions

For signs and symptoms of heat and cold related illnesses see CHASP Section 6.5.1. Monitoring of heat stress conditions (area and personal) will be employed during hot weather conditions and/or when elevated levels of PPE are utilized. When the oral temperature of field staff reaches or exceeds 100°F they shall rest until their temperature drops below 99°F. The oral temperature of field staff should not exceed 100.4°F as specified by the ACGIH (TLVs and BIs for 1994-5, Cincinnati, OH, ACGIH 1994, pp 84-90). Oral temperature equivalents shall be obtained by the infrared measurement of the tympanic membrane.

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4.20 Standard Safe Work Practices

- Eating, drinking, chewing gum or tobacco, smoking, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.
- Hands and face must be thoroughly washed upon leaving the work area.
- No contact lenses will be worn in work areas while invasive activities are conducted.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces, or lean, sit, or place equipment on drums, containers, or soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.
- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.

- NAVBASE Public Works and local utility representatives shall be contacted and requested to identify all underground utility lines. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either side of a utility line, should be maintained during all subsurface investigations.
- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.21 General Rules of Conduct:

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.
- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized altering of any government records is forbidden.
- Securing government tools in a personal or contractors' tool box is forbidden.
- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc., is forbidden.
- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long-distance telephone calls is forbidden.
- Compliance with posted signs and notices is required.

- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communicative expression which tends to disrupt the work or morale of others is forbidden.

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, pants or slacks, or coverall-type garments will be worn at all times on government property.

- All persons operating motor vehicles will obey all NAVBASE traffic regulations.

4.22 Medical Monitoring Program

See CHASP Section 7.0.

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4.24 Emergency Information

All hazardous waste site activities present a risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

Examples of an emergency include:

- A fire, explosion, or similar event at or near the site whether related to this project or not.
- A member of the field crew sustains a significant injury, or experiences symptoms of a chemical exposure.
- The discovery of a condition which suggests that site conditions are imminently more dangerous or hazardous than anticipated.

4.24.1 Site Resources

A cellular telephone will be available in the SZ for routine and emergency communication/coordination with NAVBASE, SOUTHDIV, and the E/A&H field office. First aid and eye wash equipment will be available at the work area and in each field vehicle.

In the event that a situation occurs such that it is necessary to evacuate the work site because of an emergency, all E/A&H personnel shall seek a safe place of refuge (Safe Haven). The primary place of Safe Haven shall be the E/A&H Trailer located in Zone H. Employees shall remain at their selected Safe Haven until they receive further instructions from either the Site Supervisor or PHSO, or the Safe Haven is no longer safe. It is imperative that persons remain

at the Safe Haven so that E/A&H can account for all personnel that were onsite at the time of the incident.

EnSafe's Charleston office will be used as the Command Center. Cellular phones will be used to contact the office and appraise them of the situation; to locate E/A&H personnel needed for assistance; and to coordinate other appropriate actions.

Emergency Actions

In the event of an emergency E/A&H personnel are not to take/effect emergency response actions unless they have received specific training in emergency response actions and their training is current. For example, several E/A&H employees presently hold EMT (Emergency Medical Training) certification by the American Red Cross.

In that E/A&H personnel do not operate heavy equipment as part of their employment, and E/A&H does not have heavy equipment of its own onsite, E/A&H personnel shall not operate heavy equipment in an emergency response situation. There are no functions or services provided by E/A&H that are critical to the operation of NAVBASE Charleston during an emergency.

All emergency response operations and actions that may be necessary at NAVBASE Charleston shall be directed by the Navy and shall utilize Naval personnel and **properly trained civilians**. However, if the Navy requests assistance and that assistance can be provided without personal risk, personnel should cooperate as much as possible. If possible let others (E/A&H) know you are safe first, than assist.

Additional procedures that should be followed include:

- If a member of the field team experiences effects or symptoms of exposure while on the scene, the field crew will immediately halt work and act according to the instructions provided by the Site Supervisor or, in his absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously indicate downwind, preferred escape routes, from upwind routes.
- Investigate condition(s) suggesting that site conditions may be more hazardous than anticipated. The condition observed and the decisions made shall be recorded in the safety logbook, or in the field logbook if there is not a safety logbook being maintained. If there are doubts about how to proceed, suspend work and leave the work area until the PHSO has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Supervisor is to complete an Accident Report Form (Appendix D) for submittal to the managing Principal-in-Charge of the project.
- If a member of the field crew suffers a personal injury, the SHSO will call **NAVBASE Fire Department 743-5333, or 743-5444** if an ambulance is needed. Next, alert appropriate emergency response agencies as the situation dictates. Complete an Accident Report Form for any such incident.
- If a member of the field crew suffers chemical exposure, flush the affected areas immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt

treatment. (See Appendix E for directions to the emergency medical facility.) An Accident Report Form will be completed for any such incident.

Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix E of this ZIHASP.

Emergency Contacts

If any situation or unplanned occurrence requires outside emergency, immediately call the appropriate contact from the following list:

Contact	Agency or Organization	Telephone
Joe Camp	Caretaker Site Office, Site Contact	(803) 743-9985
Matthew A. Hunt	SOUTHDIV	(803) 820-5525
Brian Stockmaster	Engineers-in-Charge	(803) 820-7481
Law Enforcement	NAVBASE Security	(803) 743-5555
Fire Department	NAVBASE Fire Department	(803) 743-5333
Ambulance Service	NAVBASE Ambulance	(803) 743-5444
Hospital	Charleston Naval Hospital* Roper Hospital North *	(803) 743-7000 (803) 744-2110
Southern Poison Control Center	_____	(800) 922-1117
Todd Haverkost	EnSafe/Allen & Hoshall Task Order Manager	(803) 884-0029
John Borowski	EnSafe/Allen & Hoshall PHSO	(901) 372-7962
Ginny Gray	EnSafe/Allen & Hoshall Project Manager	(513) 248-8449

- * Use Charleston Naval hospital for (potentially) life-threatening situations. For medical needs that are less urgent, the Naval Hospital will not provide service to civilians. ~~Roper Hospital North~~ is the next closest appropriate medical facility.

As soon as practical, the following shall be fully apprised of the situation: ~~Joe Camp, Caretaker~~; Matthew Hunt and ~~Brian Stockmaster~~, SOUTHDIV Engineer-in-Charge; Ginny Gray, E/A&H Project Manager; and John Borowski, E/A&H PHSO. Other persons, as appropriate, may also need to be contacted.

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4.25 Forms

The following forms will be used in implementing this Health and Safety Plan:

- Plan Acceptance Form
- Plan Feedback Form
- Exposure History Form
- Accident Report Form

A ZIHASP Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the SHSO and any other on-site employee who wishes to fill one out. The Exposure History Form will be completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in **Appendix D** of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

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