

N61165.AR.003451  
CNC CHARLESTON  
5090.3a

RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORK  
PLAN ADDENDUM ZONE H CNC CHARLESTON SC  
6/27/2001  
CH2M HILL

# RCRA Facility Investigation Work Plan Addendum – Zone H



***Charleston Naval Complex  
North Charleston, South Carolina***

SUBMITTED TO  
***U.S. Navy Southern Division  
Naval Facilities Engineering Command***

PREPARED BY  
***CH2M-Jones***

*June 2001*  
158814.ZH.PR.00

Revision 1  
Contract N62467-99-C-0960



**CH2MHILL**

**CH2M HILL**

115 Perimeter Center Place NE

Suite 700

Atlanta, GA

30346-1278

Tel 770.604.9095

Fax 770.604.9183

June 27, 2001

Mr. David Scaturo  
Division of Hazardous and Infectious Wastes  
South Carolina Department of Health and  
Environmental Control  
Bureau of Land and Waste Management  
2600 Bull Street  
Columbia, SC 29201

Re: RCRA Facility Investigation Work Plan Addendum(Revision 1), Zone H, Charleston  
Naval Complex

Dear Mr. Scaturo:

Enclosed please find four copies of the updated text and cover pages to the RCRA Facility Investigation Work Plan Addendum(Revision 0), Zone H of the Charleston Naval Complex (CNC), originally issued during January 2001. These updates to the Revision 0 document reflect agreements made during the Zone H RFI comment resolution and scoping meeting held between South Carolina Department of Health and Environmental Control (SCDHEC) and CH2M-Jones on January 12, 2001, and will update the Revision 0 document to a Revision 1 document.

Please replace the text and cover pages in the Revision 0 document with the revised text and cover pages attached, and include the minutes of the scoping meeting, and responses to comments on the Zone H RFI Work Plan Addendum, Revision 0.

This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

Please contact me if you have any questions or comments at (770)-604-9182 ext. 255.

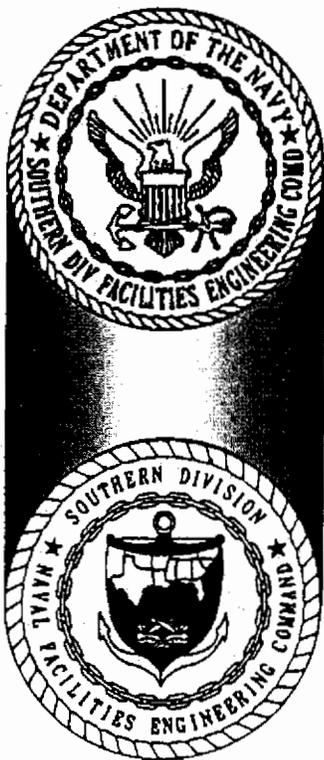
Sincerely,

CH2M HILL

Sam Naik

cc: Rob Harrell/Navy, w/att  
Dann Spariosu, USEPA w/att  
Gary Foster/CH2M HILL, w/att

# RCRA Facility Investigation Work Plan Addendum – Zone H



*Charleston Naval Complex  
North Charleston, South Carolina*

SUBMITTED TO  
*U.S. Navy Southern Division  
Naval Facilities Engineering Command*

PREPARED BY  
**CH2M-Jones**

A072000001ATU/Cover 6

*June 2001  
158814.ZH.PR.00*

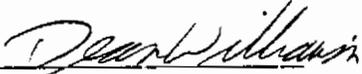
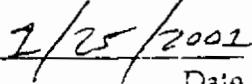
*Revision 1  
Contract N62467-99-C-0960*

1 **Certification Page for RFI Work Plan Addendum**  
2 **Zone H Charleston Naval Complex**

3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26

I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina  
Temporary Permit No. T2000342

  
\_\_\_\_\_  
Dean Williamson, P.E.  
  
\_\_\_\_\_  
Date



# 1 Contents

---

2	Section	Page
3	Acronyms and Abbreviations.....	iv
4		
5	1.0 Introduction.....	1-1
6		
7	2.0 Scope of Work.....	2-1
8	2.1 Introduction .....	2-1
9	2.2 SWMU 136/AOC 663 .....	2-3
10	2.2.1 Previous Site Investigations.....	2-3
11	2.2.2 Soil Data Gaps .....	2-5
12	2.2.3 Groundwater Data Gaps.....	2-5
13	2.2.4 Closeout Issues .....	2-5
14	2.2.5 Sampling and Analysis Plan to Close Data Gaps.....	2-8
15	2.3 AOC 666.....	2-11
16	2.3.1 Previous Site Investigations.....	2-11
17	2.3.2 Soil and Groundwater Data Gaps.....	2-12
18	2.3.3 Closeout Issues .....	2-13
19	2.3.4 Sampling and Analysis Plan to Close Data Gaps.....	2-16
20	2.4 SWMU 138/AOC 667 .....	2-19
21	2.4.1 Previous Site Investigations.....	2-19
22	2.4.2 Soil and Groundwater Data Gaps.....	2-21
23	2.4.3 Closeout Issues .....	2-21
24	2.4.4 Sampling and Analysis Plan to Close Data Gaps.....	2-24
25	2.5 SWMU 17.....	2-26
26	2.5.1 Previous Site Investigations.....	2-27
27	2.5.2 Soil Data Gaps and Sampling Plan to Close Data Gaps .....	2-29
28	2.5.3 Groundwater Data Gaps and Sampling Plan to Close Data Gaps...	2-29
29	2.5.4 Closeout Issues .....	2-29
30	2.6 SWMU 159.....	2-35
31	2.6.1 Previous Site Investigations.....	2-35
32	2.6.2 Closeout Issues .....	2-37

# 1 Contents, Continued

---

2	2.6.3	Data Gaps and Sampling Plan to Close Data Gaps.....	2-38
3	2.7	AOC 653.....	2-41
4	2.7.1	Previous Site Investigations.....	2-41
5	2.7.2	Data Gaps .....	2-43
6	2.7.3	Closeout Issues .....	2-43
7	Figure 2-1	Site Features and RFI Sampling Locations – SWMU 136/AOC 663	
8	Figure 2-2	SWMU 136/AOC 663 Sampling Locations and Sewer System Locations	
9	Figure 2-3	Site Features and RFI Sampling Locations –AOC 666	
10	Figure 2-4	AOC 666 Sampling Locations and Sewer System Locations	
11	Figure 2-5	SWMU 138/AOC 667 Sampling Locations and Sewer System Locations	
12	Figure 2-6	SWMU 17 Site Features	
13	Figure 2-7	SWMU 17 Sampling Locations and Sewer System Locations	
14	Figure 2-8	SWMU 159 Site Features and Sampling Locations	
15	Figure 2-9	AOC 653 Site Features and Sampling Locations	
16			
17	<b>3.0</b>	<b>Sampling Protocol and Analysis.....</b>	<b>3-1</b>
18	Table 3-1	Proposed Sampling and Analysis Plan	
19			
20	<b>4.0</b>	<b>Investigation-Derived Waste .....</b>	<b>4-1</b>
21			
22	<b>5.0</b>	<b>References.....</b>	<b>5-1</b>
23			
24	<b>Appendix A</b>		
25		Response to SCDHEC and USEPA Comments on Zone H RCRA Facility Investigation	
26		Report Addendum for SWMU 136/AOC 663, AOC 666, SWMU 138/AOC 667, SWMU 197	
27		and SWMU 17; Draft Corrective Measures Study Report SWMU 159 and AOC 653.	
28			
29			

# 1 Acronyms and Abbreviations

---

2	AOC	area of concern
3	AST	aboveground storage tank
4	BCT	BRAC Cleanup Team
5	BEHP	bis(2-Ethylhexyl)phthalate
6	BEQ	benzo(a)pyrene equivalent
7	BRAC	Base Realignment and Closure
8	BTEX	benzene, toluene, ethylbenzene, and xylene
9	CA	corrective action
10	CMS	corrective measures study
11	CNC	Charleston Naval Complex
12	COC	chemical of concern
13	COPC	chemical of potential concern
14	CSAP	Comprehensive Sampling and Analysis Plan
15	1,2-DCA	1,2-dichloroethane
16	1,1-DCE	1,1-dichloroethene
17	DET	U.S. Naval Detachment
18	DMP	Data Management Plan
19	DPT	Direct-Push Technology
20	DQO	data quality objective
21	EnSafe	EnSafe, Inc.
22	EPA	U.S. Environmental Protection Agency

# 1 Acronyms and Abbreviations, Continued

---

2	ESDLOPQCM	U.S. Environmental Protection Agency Environmental Services
3		Division <i>Laboratory Operations and Quality Control Manual</i>
4	ESDSOPQAM	U.S. Environmental Protection Agency Environmental Services
5		Division <i>Standard Operating Procedures and Quality Assurance Manual</i>
6	ft bgs	feet below ground surface
7	IDW	investigation-derived waste
8	ISM	interim stabilization measure
9	µg/L	micrograms per liter
10	MCL	maximum concentration limit
11	mg/L	milligrams per liter
12	MTBE	methyl tert-butyl ether
13	MNA	monitored natural attenuation
14	NFA	no further action
15	OWS	oil-water separator
16	PAH	polynuclear aromatic hydrocarbon
17	PCB	polychlorinated biphenyl
18	QAP	Quality Assurance Plan
19	RBC	Risk-Based Concentration
20	RBSL	Risk-Based Screening Level
21	RCRA	Resource Conservation and Recovery Act
22	RFI	RCRA Facility Investigation
23	SAA	satellite accumulation area

# 1 Acronyms and Abbreviations, Continued

---

2	SCDHEC	South Carolina Department of Health and Environmental Control
3	SSL	soil screening level
4	SSV	sediment screening values
5	SVOC	semivolatile organic compound
6	SWMU	Solid Waste Management Unit
7	TCE	trichloroethene
8	TPH	total petroleum hydrocarbon
9	UTL	upper tolerance limit
10	UST	underground storage tank
11	VOC	volatile organic compound

SECTION 1.0

# Introduction

---

# 1.0 Introduction

---

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan Addendum has been prepared for Zone H at the Charleston Naval Complex (CNC). After the initial RFI, Solid Waste Management Unit (SWMU) 136/Area of Concern (AOC) 663, AOC 666, SWMU 138/AOC 667, SWMU 196 and SWMU 17 were identified as sites in Zone H requiring additional investigation. Based on an evaluation of the nature and extent of contamination at AOC 653 and SWMU 159, minimal additional investigation is warranted at SWMU 159. The RFI Work Plan Addendum addresses the sampling and analysis requirements necessary in Zone H to complete the RFI. This document will be used in conjunction with the *Final Comprehensive RFI Work Plan* and the *Final Zone H RFI Work Plan* prepared for CNC by EnSafe, Inc. (EnSafe).

Additionally, the Work Plan Addendum addresses site closeout issues pertaining to linkages of SWMUs and AOCs with site features, such as storm and sanitary sewer lines, oil-water separators (OWSs) and surface water bodies. An examination of these issues is required to satisfy agreements made by the Base Realignment and Closure (BRAC) Cleanup Team (BCT). The Zone L RFI (EnSafe, 1998) and Zone J RFI (EnSafe, 2000) were used in conjunction with the Zone H RFI to evaluate closeout issues.

This document presents the proposed locations and the analyses required to delineate the extent of soil and/or groundwater contamination at the sites listed above. The Work Plan outlines the scope of work for the following sites as described below:

- SWMU 136/AOC 663: a) Presents the proposed soil and groundwater sample locations and the analyses required to investigate the nature of arsenic contamination in surface and subsurface soils, and b) presents the analyses to verify the absence of benzene and naphthalene in groundwater.
- AOC 666: a) Presents the analyses to characterize the contents of the OWS, and b) presents the proposed additional groundwater monitoring well installation, sampling and analyses to investigate the presence of contamination in groundwater east of the site.

- SWMU 138/AOC 667: a) Presents the analyses to characterize the contents of the OWS, and b) presents the proposed additional groundwater monitoring well installation, sampling and analyses to investigate the presence of contaminants east of the site.
- SWMU 17: Discusses additional soil and groundwater sampling at select locations to confirm the absence of site contaminants in soil and groundwater
- SWMU 159: Discusses additional soil and groundwater sampling at select locations to confirm the absence of site contaminants in soil and groundwater
- AOC 653: Addresses closeout issues to support a No Further Action (NFA) decision for this site

The Work Plan Addendum also provides the strategy for additional sample collection should the contaminants detected in soil samples exceed the contaminant-specific upper tolerance limit (UTL) and the contaminants in groundwater exceed the contaminant-specific maximum contaminant levels (MCLs) or tap water risk-based concentrations (RBCs).

The remaining chemicals of potential concern (COPCs) have been identified, and the nature and extent of contamination has been subsequently delineated, as outlined in the *Zone H RFI Report Addendum* (EnSafe, 2000).

Site-specific information for the sites listed above, including site history, geology, hydrogeology, soil and groundwater sampling, and risk assessment evaluation, are provided in the *Zone H RCRA Facility Investigation Report* (EnSafe, 1996) and the *Zone H RFI Report Addendum* (EnSafe, May 2000). Analytical results from samples collected at these sites as part of previous investigations were used to determine the locations for the additional soil and groundwater sampling required to complete the delineation of site-specific COPCs. The proposed scope of work presented in this Work Plan Addendum was discussed during the November 2000 CNC Partnering Meetings and in the subsequent task team meeting held on January 12, 2000, at the offices of the South Carolina Department of Health and Environmental Control (SCDHEC) in Columbia, SC. A task team consisting of members from SCDHEC and CH2M-Jones was assembled to evaluate the scope of work required to further investigate any identifiable data gaps and to evaluate the need for additional characterization at each of the above sites in Zone H.

Proposed soil and groundwater sample collection locations were selected on the basis of existing soil and groundwater data and subsurface locations, such as utilities and building foundations.

This Work Plan Addendum consists of the following six sections:

**1.0 Introduction** — Presents the purpose of the report and background information relating to the Work Plan Addendum.

**2.0 Scope of Work** — Provides a description of the scope of work for investigation of selected soil and groundwater locations, as well as OWSs.

**3.0 Sampling Protocol and Analysis** — Describes the procedures to be implemented for soil and groundwater sampling.

**4.0 Investigative-Derived Waste** — Describes collection and analysis of investigative-derived waste.

**5.0 References** — Lists the references used in this document.

**Appendix A** — Presents the response to SCDHEC comments on the *Zone H RFI Addendum* (EnSafe, May 2000).

All tables and figures are included in their respective sections.

SECTION 2.0

## **Scope of Work**

---

## 2.0 Scope of Work

---

### 2.1 Introduction

This section outlines the scope of work for the following sites as described below:

- SWMU 136/AOC 663: a) Presents the proposed soil and groundwater sample locations and the analyses required to investigate the nature of arsenic contamination in surface and subsurface soils, and b) presents the analyses to verify the absence of benzene and naphthalene in groundwater.
- AOC 666: a) Presents the analyses to characterize the contents of the OWS, and b) presents the proposed additional groundwater monitoring well installation, sampling and analyses to investigate the presence of contamination in groundwater east of the site.
- SWMU 138/AOC 667: a) Presents the analyses to characterize the contents of the OWS, and b) presents the proposed additional groundwater monitoring well installation, sampling and analyses to investigate the presence of contaminants east of the site.
- SWMU 17: Discusses additional soil and groundwater sampling at select locations to confirm the absence of site contaminants in soil and groundwater
- SWMU 159: Discusses additional soil and groundwater sampling at select locations to confirm the absence of site contaminants in soil and groundwater
- AOC 653: Addresses closeout issues to support a No Further Action (NFA) decision for this site

The BCT agreed that the issues listed below should be addressed prior to changing the status of any site to NFA in the CNC RCRA Corrective Action (CA) permit. Although this document is not intended to provide the rationale for changing the status of the sites being discussed to NFA, the following closeout strategies will be discussed in order to evaluate their relevance to data gaps in the determination of the nature and extent of contamination at the sites:

- Presence of metals (inorganics) in groundwater

- Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)
- Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)
- Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)
- Potential migration pathways to surface water bodies (Zone J)
- Potential contamination associated with OWSs

Discussions of the relevance or need for land-use controls at the sites are beyond the scope of this document. The Corrective Measures Study (CMS) Work Plan, which will present the rationale for NFA for the individual sites, will address land-use controls.

#### **2.1.1.1 RFI Report update**

The Zone H RFI Addendum Report will be updated with additional tables, text, figures and errata pages to incorporate information resulting from additional field investigations and responses to comments from SCDHEC on the existing Zone H RFI Report. These updates are indicated in the Response to SCDHEC Comments included in Appendix A.

#### **Groundwater Monitoring Well Installation**

CH2M-Jones will submit a request for a well installation permit to SCDHEC 2 weeks prior to well installation activities.

## 2.2 SWMU 136/AOC 663

This section provides a brief background of site conditions and outlines the proposed sample locations and analyses required to further investigate the presence of arsenic contamination in surface and subsurface soils and to verify the levels of benzene and naphthalene in groundwater at SWMU 136/AOC 663.

SWMU 136 is the former Satellite Accumulation Area (SAA) No. 19 which received hazardous waste from nearby Building NS-53. Waste materials, including empty paint and motor oil cans, were stored at the SAA and were removed before July 1996 when the RFI was completed.

AOC 663 is a former fuel dispenser island that was identified as facility NS-851. Two underground storage tanks (USTs)—UST 851A, a 500-gallon gasoline tank, and UST 851B, a 500-gallon diesel fuel tank—supplied fuel to the dispenser island. The USTs and associated fuel lines were removed by the Navy in June 1996.

SWMU 136 and AOC 663 were combined for investigation during the RFI since they are adjacent to one another. Figure 2-1 shows the site features.

### 2.2.1 Previous Site Investigations

Soil and groundwater contamination was investigated during the Zone H RFI field activities as presented in the Zone H RCRA Facility Investigation Report (EnSafe, 1996) and the Zone H RCRA Facility Investigation Report Addendum (EnSafe, 2000).

During the initial RFI effort, soil samples were collected from 12 locations and groundwater samples were collected from 3 monitoring wells. These sample locations are shown in Figure 2-1. The RFI identified three inorganic elements (aluminum, arsenic, and vanadium) and three organic compounds (4,4-DDE, Aroclor-1254, and benzo(a)pyrene equivalents (BEQs)) as chemicals of concern (COCs) in soil. Additionally, total petroleum hydrocarbon (TPH) was identified as a COC in surface soil only. Benzene and 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) equivalents were identified as COCs in groundwater.

During the risk assessment, arsenic in surface soil and benzene in groundwater were identified as the COCs contributing the largest risk to human health. Arsenic in surface soil exceeded its background reference concentration (15.6 mg/kg) and residential RBC at two sample locations: 23.9 mg/kg at 136SB004 and 16.2 mg/kg at 663SB007. Benzene exceeded

the MCL (5 µg/L) in well 663002 at 160 µg/L. No ecological risk was anticipated for the sites due to the lack of a suitable habitat and ecological receptors at the site. The initial RFI recommended a CMS due to the cumulative site risk exceeding 1E-06 and hazard quotient exceeding 1.

During the review of the initial RFI in 1997, a project team subcommittee reached consensus to include SWMU 136/AOC 663 in the CMS and identified benzene and Bis(2-ethylhexyl)phthalate (BEHP) in groundwater and arsenic in soil as the compounds of primary interest.

Benzene concentrations decreased significantly from a high of 160 µg/L in March 1995 (2<sup>nd</sup> event) to 13 µg/L in September 1995 (3<sup>rd</sup> event) and 3 µg/L in March 1996 (4<sup>th</sup> event). The project team decided to conduct two more sampling rounds and evaluate the data before proceeding to a CMS. These two rounds of sampling were conducted in March 1998 (5<sup>th</sup> event) and in April 1999 (6<sup>th</sup> event) and showed non-detects for benzene. During June 1996, the U.S. Naval Detachment (DET) removed USTs 851A and 851B associated with Building 851 as an Interim Stabilization Measure (ISM). Soil samples from the excavations were analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX) and polynuclear aromatic hydrocarbons (PAHs). Two soil samples collected 2 feet below ground surface (ft bgs) under the location of the feedpipes from the USTs showed low-level detections of some PAH compounds. However, subsurface soil samples collected (during the 1999 Rapid Assessment effort by Tetra Tech NUS performed subsequent to the UST removals) from a soil boring adjacent to these locations did not show detections for petroleum compounds. Direct-push technology (DPT) groundwater sampling conducted during the Rapid Assessment at well CNC11-M01 adjacent to these locations did not show detections for the PAH compounds. Eight shallow monitoring wells were also installed as part of this effort and samples were collected and analyzed for BTEX, methyl tributyl ethylene (MTBE), naphthalene and PAHs.

One of the shallow monitoring wells installed during the Rapid Assessment (CNC11-M04), along with well 663001 installed during the RFI effort, showed levels of naphthalene at 114 µg/L and 29 µg/L, respectively, exceeding the Region III Tap Water RBC level of 0.36 µg/L and the MCL of 5 µg/L.

Based on the project team recommendations, additional soil sampling for arsenic was conducted to fill in the data gaps remaining after the initial RFI effort by EnSafe. A detailed description of this effort is found in the Zone H RCRA Facility Investigation Report

Addendum (EnSafe, 2000). Surface and subsurface soils were collected at eight locations surrounding the site. All eight surface soil samples collected during the RFI Addendum effort showed arsenic levels below the Zone H surface soil background level of 15.6 mg/kg. Two subsurface soil samples showed arsenic levels of 24.8 mg/kg (from soil boring 136SB010) and 23 mg/kg (from soil boring 136SB012), slightly above the 22.5 mg/kg arsenic Zone H subsurface soil background level.

Groundwater was monitored for two more rounds from three existing site wells and two wells from nearby SWMU 178 to evaluate long-term trends in groundwater. SCDHEC requested that bis(2-ethyl-hexyl)phthalate (BEHP) be added to the groundwater suite of analyses due to its historical detection at nearby SWMU 178. From an examination of blank data from several rounds of sampling, the RFI Addendum Report concluded that BEHP was a laboratory artifact and not a COC at this site.

## **2.2.2 Soil Data Gaps**

SCDHEC recommended additional delineation of arsenic in subsurface soils because of the two exceedances above the Zone H subsurface background level and the fact that the two soil boring locations were outlying on the southern side of the site.

## **2.2.3 Groundwater Data Gaps**

During the additional groundwater investigations conducted as part of the RFI Addendum work, benzene concentrations were not detected in the last two sampling rounds. SCDHEC recommended one additional round of groundwater sampling to confirm the absence of benzene.

## **2.2.4 Closeout Issues**

### **2.2.4.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater do not warrant further investigation at this site.

#### **2.2.4.1.1 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Report* (EnSafe, 1998). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

#### **2.2.4.2 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There are two sanitary sewer lines near the site -- one approximately 100 feet due east and the other approximately 130 ft south of the site. Figure 2-2 shows the locations of the sanitary sewers and the SWMU 37 sampling locations.

##### **Soil Samples**

There were three SWMU 37 (Zone L) DPT soil samples collected in the vicinity of the sanitary sewer lines near the site, identified as LH037SP016, LH037SP022 and LH037SP023 in Figure 2-2. These soil samples were analyzed for VOCs, metals, and cyanide.

No VOCs were detected above RBCs or soil screening levels (SSLs) in the DPT samples. Arsenic and iron were detected above the RBCs but well below their surface soil UTLs and subsurface soil SSL (no soil-to-groundwater SSL calculated for iron). There were no exceedances of cyanide above the residential RBCs or soil-to-groundwater SSLs.

There were no Zone L soil borings installed in the vicinity of the site.

##### **Groundwater Samples**

There are three SWMU 37 (Zone L) DPT groundwater sampling locations in the vicinity of the site. The DPT locations selected for consideration for this site are LH037GP026, LH037GP027 and LH037GP035 shown in Figure 2-2. DPT groundwater samples were

analyzed for VOCs, metals and cyanide. There were no SWMU 37 permanent monitoring wells installed in the vicinity of the site.

None of the DPT groundwater samples collected from the three DPT locations showed exceedances above the tap water RBC or MCL values for VOCs or cyanide.

Inorganic analytical results from Zone L DPT groundwater samples were not compared to RBCs or MCLs during the RFI. However, a comparison of DPT groundwater results with the RBCs and MCLs showed some exceedances of either the tap water RBCs or MCLs for drinking water. The Zone L RFI did not compare the concentrations of metals in the DPT groundwater samples against the RBCs or MCLs due to the presence of high turbidity in these samples. A comparison performed during the Zone L RFI between DPT samples and permanent monitoring well samples showed significant differences in both the turbidity and concentrations of inorganics between the monitoring well samples and the DPT samples. In the absence of Zone L permanent monitoring wells near the DPT sample locations, concentrations detected in the permanent monitoring wells installed at SWMU 136/AOC 663 were considered to evaluate site-specific sources of contaminants. The Zone H RFI Addendum effort did not identify contaminants in the site wells that needed further evaluation or that were migrating away from the site. SCDHEC required an additional round of sampling in well 663002 to confirm the absence of benzene in the permanent monitoring wells at the site. Well 663002 will be sampled during February 2001. Additionally, the Zone L DPT groundwater samples did not detect any VOCs.

Based on these observations, no linkage has been established between SWMU 136/AOC 663 past site uses and detected contaminants in Zone L DPT samples.

#### **2.2.4.3 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

The sections of the stormwater sewer system in the vicinity of the site were not investigated as part of the AOC 699 investigations. There is no evidence of past site uses or the presence of contamination near the stormwater sewer system near the site that could have potentially impacted the stormwater sewer system. There are two stormdrain inlets approximately 50 – 80 feet to the northwest of the site and a third stormdrain inlet approximately 50 feet to the northeast of the site as shown in Figure 2-2. No contamination in the soils or groundwater has been detected at the site that could potentially reach these stormdrain inlets or infiltrate the stormwater sewer lines. The pattern of arsenic concentrations in surface and subsurface soil detected during the RFI efforts and the absence of COCs in groundwater at the site

indicate there is no linkage between the site and the stormwater sewers in this area. Therefore, no further evaluation of this linkage is necessary.

#### **2.2.4.4 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

#### **2.2.4.5 Potential migration pathways to surface water bodies (Zone J investigation)**

The nearest water body is the Cooper River, which is approximately 750 ft to the north of the site. There is a heavily developed, paved area between the site and the river. No surface or subsurface contaminant migration pathway to the Cooper River as a result of site activities has been established.

#### **2.2.4.6 Potential contamination associated with Oil-Water Separators (OWSs)**

There are no OWSs associated with the site. Therefore no linkage is established.

### **2.2.5 Sampling and Analysis Plan to Close Data Gaps**

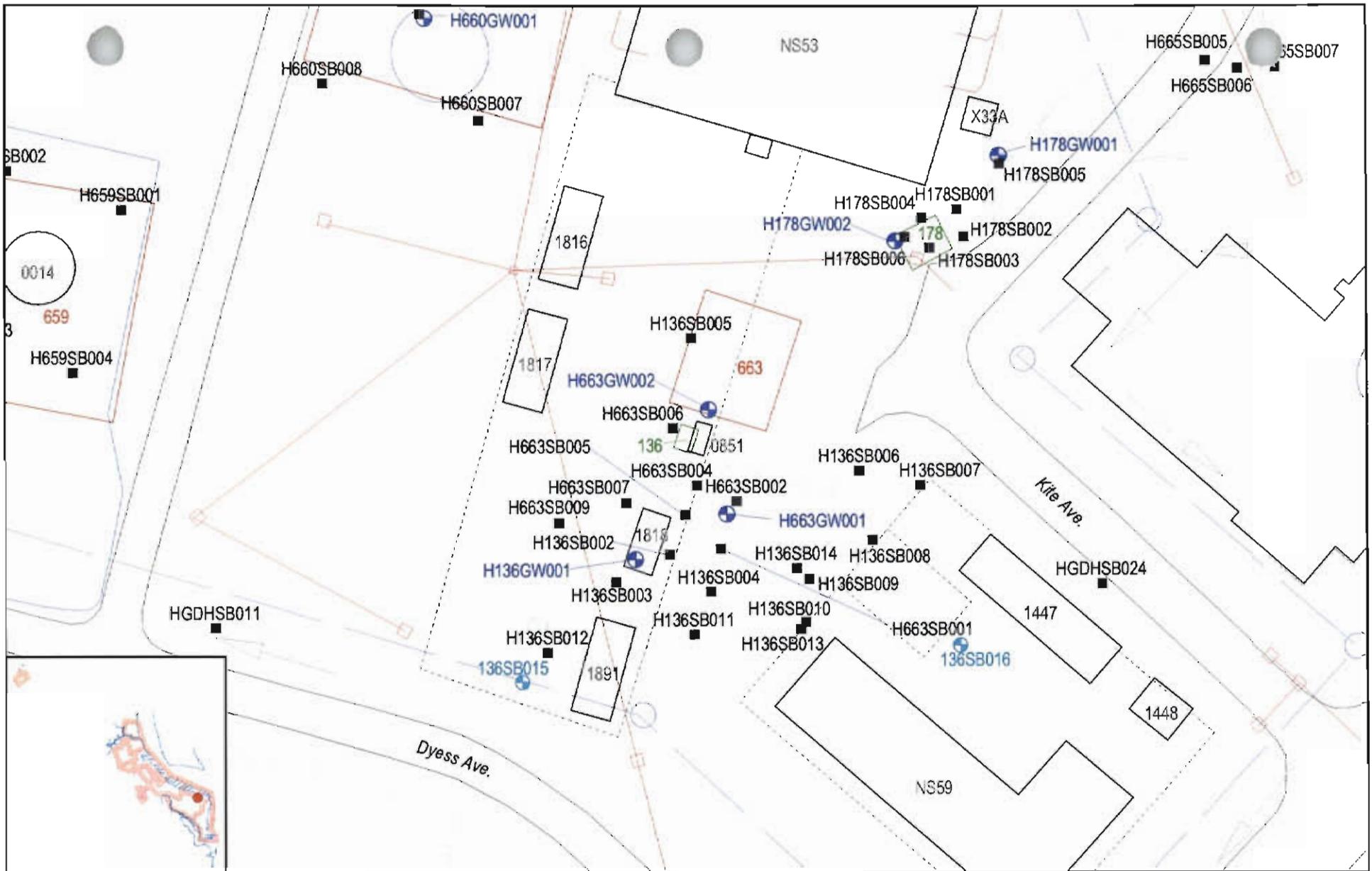
#### **2.2.5.1 Soil Sampling and Analysis**

Two soil borings will be introduced to collect surface and subsurface soil samples south of previous soil boring locations 136SB010 and 136SB012 to delineate the extent of arsenic contamination in soil. Proposed locations of these soil borings are shown in Figure 2-1. The samples will be analyzed for total arsenic by USEPA Method 6010.

#### **2.2.5.2 Groundwater Sampling and Analysis**

One additional round of groundwater sampling will be conducted for monitoring well 663002. Groundwater samples will be analyzed for BTEX and naphthalene.

Sampling Protocol and Analyses are described in Section 3. The underground utilities in the areas surrounding the areas of investigation will be identified and properly labeled in the field prior to field investigation.



- Surface Soil
- ⊕ Groundwater Well
- ⊕ Proposed Soil Boring Locations
- ⚡ Railroads
- ⚡ Roads
- ⚡ Bridges
- ⚡ Surrounding Area
- ⚡ Shoreline
- ⚡ Fence
- ⚡ AOC Boundary
- ⚡ SWMU Boundary
- ⚡ Zone Boundary
- Buildings



0 50 100 Feet

**Figure 2-1**  
 Site Features and Sampling Locations  
 SWMU 136 and AOC 663, Zone H  
 Charleston Naval Complex





## 2.3 AOC 666

This section provides a brief background of site conditions and outlines the proposed sample locations and analyses required to further investigate the presence of arsenic contamination in surface and subsurface soil and to verify the levels of naphthalene in groundwater at AOC 666.

### 2.3.1 Previous Site Investigations

AOC 666 is the area in Zone H where two USTs were located adjacent to the boiler house (Building NS-44) that supplied steam to ships and to some areas of CNC prior to the base closure. The 550-gallon UST NS-44A was a gravity-fed waste oil collection for an OWS which was present at the site at the time of the RFI. The 25,000-gallon UST NS-45 supplied No. 2 fuel oil for Building NS-44. Figure 2-3 shows the site features.

The initial RFI conducted by EnSafe included investigation of surface and subsurface soil and groundwater.

The RFI identified two inorganics (arsenic and vanadium), two organics (BEQs, N-nitrosodi-n-propylamine) and Aroclor-1260 as COPCs in soil. Chloromethane and vinyl chloride were identified as the COPCs in groundwater.

Arsenic in surface soil and vinyl chloride and chloromethane in groundwater were identified as the COCs contributing the largest risk to human health. Arsenic was found at concentrations of 16.5 mg/kg at 666SB002 and 30.5 mg/kg at 666SB004, both exceeding the surface soil UTL of 15.6 mg/kg. Vinyl chloride exceeded the MCL of 2 µg/L and tap water RBC of 0.19 µg/L in well 666001. Chloromethane exceeded the tap water RBC of 1.5 µg/L in the same well. Well 666001 was sampled four times during the initial RFI. During August 1996, DET removed the two USTs at the site. Analysis of the soil samples from the UST excavations for BTEX and PAHs identified contaminant concentrations below the residential RBC for the parameters using a target hazard quotient of 0.1. Arsenic concentrations were detected below the subsurface soil UTL of 22.5 mg/kg.

No fate and transport concerns were identified for AOC 666.

The project team decided that a supplemental RFI effort would be necessary to further investigate the extent of arsenic in soil and vinyl chloride and chloromethane in the groundwater.

Supplemental soil sampling was conducted in seven additional locations outside the footprint of the UST excavations (locations 666SB008 through 666SB014). Additionally, four soil samples from the SWMU 37 investigation were also considered (locations 037SB015 through 037SB018). Arsenic was below surface and subsurface UTLs in all supplemental RFI and SWMU 37 soil samples. Figure 2-3 shows the locations of the OWS and the sampling locations from the initial RFI and the supplemental RFI Addendum sampling efforts. Details of DET's ISM are found in the Zone H RFI Addendum Report (EnSafe, 2000).

An additional round of groundwater sampling during the supplemental RFI effort of November 1999 (5<sup>th</sup> event) detected no vinyl chloride or chloromethane.

The RFI Addendum Report (EnSafe, 2000) concluded that the risks due to arsenic in surface soil at AOC 666 are no higher than that of background levels of arsenic in surface soils for Zone H. Additionally, supplemental soil samples collected around 666SB004, which showed a value of 30.5 mg/kg during the initial RFI, was encircled by additional sampling locations during the Supplemental RFI. The supplemental soil samples did not show exceedances of the Zone H surface soil background level for arsenic of 15.6 mg/kg. The RFI Addendum concluded that the only detections of chloromethane and vinyl chloride were in one of the two wells at the site during the first round of sampling (during 1994) and no detections were reported in either well during subsequent monitoring. Additionally, the UST removal done at the site as part of DET's ISM removed a possible source of these compounds.

The RFI Addendum recommended NFA status for AOC 666.

### **2.3.2 Soil and Groundwater Data Gaps**

After review of the RFI Addendum, SCDHEC recommended that the contents of the OWS currently present at the site be sampled to evaluate the OWS's potential as a source of groundwater and soil contamination.

In an effort to better evaluate possible downgradient migration of contaminants, SCDHEC also required the installation of one additional well east of AOC 666 and west of the stormwater sewer line, at the proposed location shown in Figure 2-3. This well will be

sampled by USEPA methods for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

### **2.3.3 Closeout Issues**

#### **2.3.3.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater do not warrant further investigation at this site.

#### **2.3.3.2 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Report* (EnSafe, 1998). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

#### **2.3.3.3 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There are two sanitary sewer lines near the site – one approximately 70 ft northeast of the site and the other approximately 10 ft south of the site. Figure 2-4 shows the locations of the sanitary sewers and the SWMU 37 sampling locations.

#### **DPT Soil Samples**

There were three SWMU 37 DPT soil samples collected in the vicinity of the sanitary sewer lines near the site, identified as LH037SP019, LH037SP020 and LH037SP021. These soil samples were analyzed for VOCs, metals, and cyanide.

There were no detections of VOCs above RBCs or SSLs in these DPT samples. Arsenic and iron were detected at these three DPT locations above the RBCs but well below their surface soil UTLs and subsurface soil SSL (no soil-to-groundwater SSL calculated for iron). No cyanide was detected at these three DPT locations.

#### Soil Boring Samples

There were four SWMU 37 soil borings installed at the site. These are shown in Figure 2-3 and are identified as 037SB015, 037SB016, 037SB017 and 037SB018. Soil samples were analyzed for VOCs, SVOCs, metals, cyanide, pesticides, and polychlorinated biphenyls (PCBs).

There were no VOCs detected in these samples. No SVOCs, pesticides, PCBs or cyanide were detected above residential RBCs or soil-to-groundwater SSLs in the samples collected from the site.

Arsenic and iron were detected above their RBCs but well below the surface and subsurface soil UTLs.

#### DPT Groundwater Samples

There were three SWMU 37 DPT groundwater sampling locations in the vicinity of the site. The DPT locations selected for consideration are LH037GP030, LH037GP031 and LH037GP032 as shown in Figure 2-4. DPT groundwater samples were analyzed for VOCs, metals, and cyanide. There were no SWMU 37 permanent monitoring wells installed near the site.

None of the DPT groundwater samples collected from the three DPT locations showed exceedances above the tap water RBC or MCL values for VOCs or cyanide. Inorganic analytical results from Zone L DPT groundwater samples were not compared to RBCs or MCLs. However, a comparison of DPT groundwater results with the RBCs and MCLs showed some exceedances of either the tap water RBCs or MCLs for drinking water. The Zone L RFI did not compare the concentrations of metals in the DPT groundwater samples against the RBCs or MCLs due to the presence of high turbidity in these samples. A comparison performed during the Zone L RFI between DPT samples and permanent monitoring well samples showed significant differences in both the turbidity and concentrations of inorganics between the monitoring well samples and the DPT samples.

In the absence of Zone L permanent monitoring wells near the DPT sample locations, the concentrations found in samples from the permanent monitoring wells installed at AOC 666 are being considered to evaluate site-specific sources of contaminants. The Zone H RFI Addendum effort did not identify contaminants in the permanent monitoring well samples at AOC 666 that needed further evaluation. SCDHEC has required the installation of an additional monitoring well to verify the presence of site contaminants near the storm sewer line east of the site. This well will be installed at the proposed location shown in Figure 2-3.

Based on these observations, no linkage has been established between AOC 666 site uses and the sanitary sewer system investigated under Zone L.

#### **2.3.3.4 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

The sections of the stormwater sewer system in the vicinity of the site were not investigated as part of the Zone L RFI effort. There is no evidence of past site uses or the presence of contamination near the stormwater sewer system in the vicinity of the site that could have potentially impacted the stormwater sewer system. There is one stormdrain inlet approximately 50 ft southeast of the site and two stormsewer lines approximately 50 ft on the eastern and southern sides of the site. No contamination in the soil or groundwater has been detected that could reach these stormdrain inlets or infiltrate the stormwater sewer lines. The pattern of arsenic concentrations in surface and subsurface soil detected during the RFI efforts and the absence of COCs in groundwater at the site indicate there is no linkage between the site and the stormwater sewers in this area. Therefore, no further evaluation of this linkage is necessary.

#### **2.3.3.5 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

#### **2.3.3.6 Potential migration pathways to surface water bodies (Zone J)**

The nearest water body is the Cooper River, which is approximately 750 ft to the north of the site. There is a heavily developed, paved area between the site and the river. No surface or subsurface contaminant migration pathway to the Cooper River as a result of site activities has been established.

### **2.3.3.7 Potential contamination associated with Oil-Water Separators (OWSs)**

There is an OWS associated with Building NS-44 (shown in Figure 2-3). The OWS was connected to a 550-gallon UST which was fed by the OWS through gravity flow. SCDHEC requested sampling of the contents of the OWS to determine if the OWS was a source of contamination.

## **2.3.4 Sampling and Analysis Plan to Close Data Gaps**

### **2.3.4.1 Oil-Water Separator Sampling and Analysis**

One sample will be taken from each sample medium of the contents (if any) of the OWS and analyzed by USEPA methods for VOCs, SVOCs, total metals, pesticides, and PCBs to characterize the contents.

### **2.3.4.2 Groundwater Sampling and Analysis**

In an effort to better evaluate possible downgradient migration of contaminants, one additional well will be installed east of AOC 666 but west of the stormwater sewer line, at the proposed location shown in Figure 2-3. This well will be sampled by USEPA methods for VOCs, SVOCs, and metals analysis. Should additional monitoring wells be deemed necessary based on the analytical results of sampling from this shallow well, their locations and sampling parameters will be discussed with SCDHEC and these wells installed.

Sampling Protocol and Analyses are described in Section 3. The underground utilities in the areas surrounding the areas of investigation will be identified and properly labeled in the field prior to field investigations.

### **2.3.3.7 Potential contamination associated with Oil-Water Separators (OWSs)**

There is an OWS associated with Building NS-44 (shown in Figure 2-3). The OWS was connected to a 550-gallon UST which was fed by the OWS through gravity flow. SCDHEC requested sampling of the contents of the OWS to determine if the OWS was a source of contamination.

## **2.3.4 Sampling and Analysis Plan to Close Data Gaps**

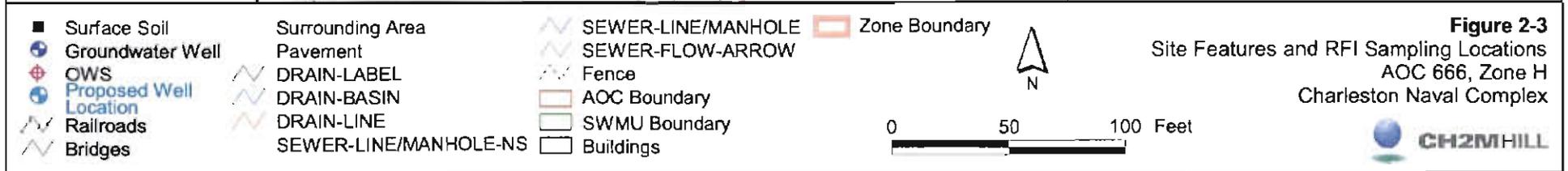
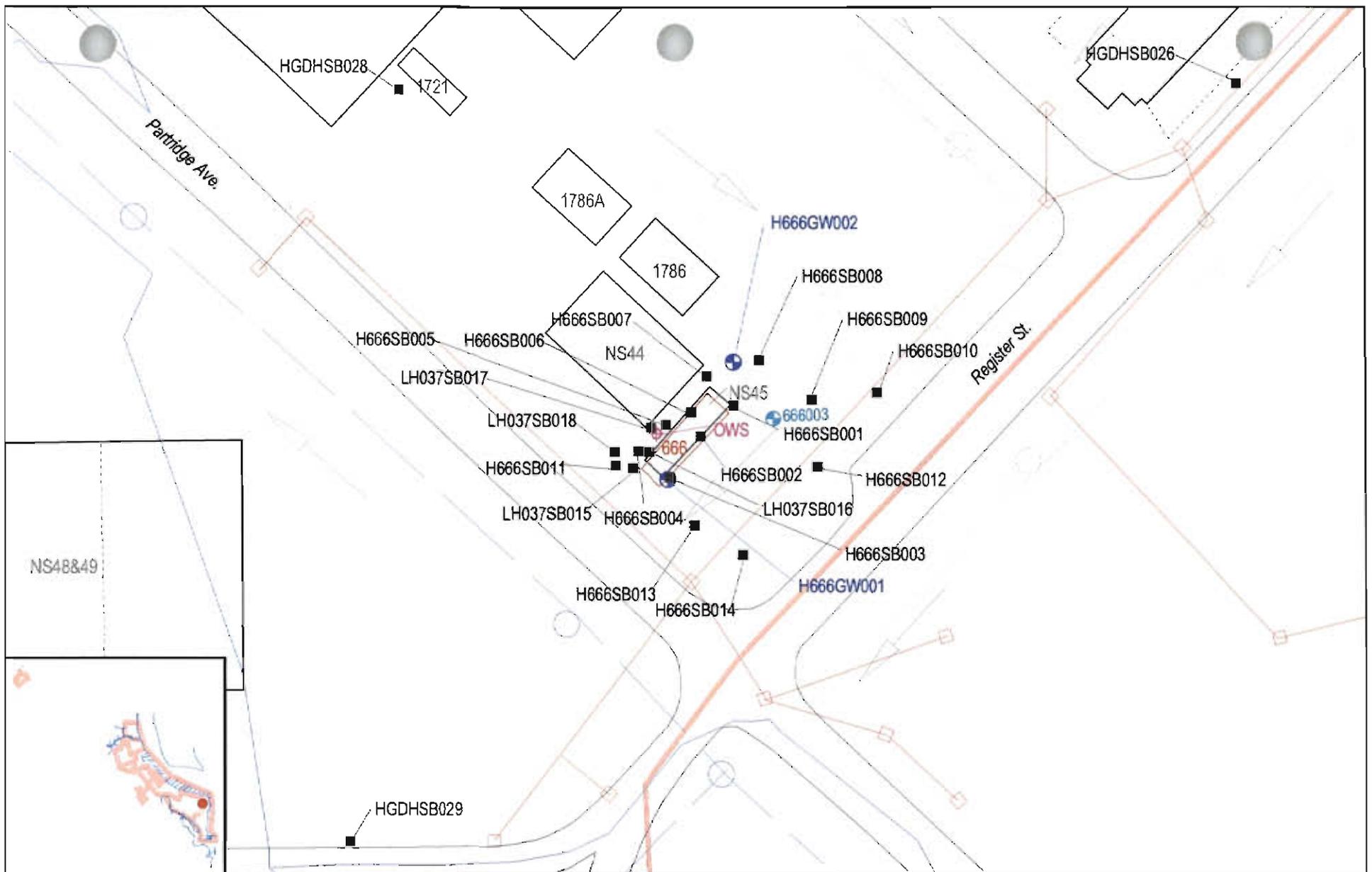
### **2.3.4.1 Oil-Water Separator Sampling and Analysis**

A sample will be taken from the contents (if any) of the OWS and analyzed by USEPA methods for VOCs, SVOCs, total metals, pesticides, and PCBs to characterize the contents.

### **2.3.4.2 Groundwater Sampling and Analysis**

In an effort to better evaluate possible downgradient migration of contaminants, one additional well will be installed east of AOC 666 but west of the stormwater sewer line, at the proposed location shown in Figure 2-3. This well will be sampled by USEPA methods for VOCs, SVOCs, and metals analysis.

Sampling Protocol and Analyses are described in Section 3. The underground utilities in the areas surrounding the areas of investigation will be identified and properly labeled in the field prior to field investigations.



**Figure 2-3**  
 Site Features and RFI Sampling Locations  
 AOC 666, Zone H  
 Charleston Naval Complex





## 2.4 SWMU 138/AOC 667

This section provides a brief background of the site conditions and outlines the proposed sample locations and analyses required to further investigate the presence of arsenic contamination in surface and subsurface soil and to verify the levels of naphthalene in groundwater at SWMU138/AOC 667.

SWMU 138 was an SAA for Building 1776 where 55-gallon drums were stored until they were transferred to a permitted hazardous waste facility.

AOC 667 was an area used for routine vehicle maintenance of automobiles and heavy equipment. A 550-gallon portable waste oil storage tank was located approximately 80 yards east of the site.

A grease rack/OWS is located east of Building 1776. This OWS was primarily used as a catch basin to collect oil and grease from vehicle washing. It is not currently being used, according to the occupants of the facility. It is covered by a ¼-inch steel plate and the inlet to the catch basin is not physically connected to the adjacent buildings. An assessment of maps/drawings from the Navy during the initial RFI indicated that the structure had a PVC pipe entering the tank from the side and inverted to direct only water to the storm sewer system during periods of high rainfall.

Because of their proximity, SWMU 138 and AOC 667 were investigated together. Figure 2-5 shows the site features.

### 2.4.1 Previous Site Investigations

During the initial RFI, soil and groundwater were sampled to determine if releases had occurred at the site, such as releases associated with petroleum product storage and dispensing at the storage tank.

The only soil contaminants identified as exceeding the RBCs in the initial RFI were benzo(a)pyrene and beryllium. Additionally, TPH was detected at 200 – 1,800 mg/kg.

Two rounds of groundwater sampling were performed during the initial RFI. Groundwater COCs identified during these rounds were chloroethane and 1,1-Dichloroethane. An additional sampling was considered necessary by the project team based on analytical results from initial rounds of sampling and from Zone I shallow grid wells installed

downgradient of SWMU 138/AOC 667, which showed detections of similar VOC compounds.

Additional groundwater sampling was conducted in June 1997 as part of a supplemental RFI effort. Groundwater analysis data collected at this time from nearby wells as part of the Zone L RFI (sanitary sewer system) were also examined. Eight DPT samples were collected from locations around the site. Of the VOCs detected in the four rounds of groundwater sampling at SWMU 138/AOC 667, only carbon disulfide was detected in the DPT samples, and concentrations were below the tap water RBC. No other VOCs were detected.

Groundwater was originally not included in the CMS process because no COPCs were identified in the screening process. However, a reduction in chloroethane's tap water RBC warranted further evaluation and the project team decided to evaluate chloroethane before performing a CMS.

During the supplemental RFI Addendum effort (EnSafe, 2000), no additional soil sampling was deemed necessary since no soil COCs were identified for further consideration by the risk assessments done during the initial RFI.

Groundwater sampling conducted as part of the RFI Addendum effort detected chloroethane in monitoring well 667002. Analytical results from adjacent wells indicated that chloroethane was localized to the well 667002 area.

The RFI Addendum considered previous detections of chlorinated organic compounds 1,1-Dichloroethene (1,1-DCE), 1,1-Dichloroethane (1,1-DCA) and 1,2-Dichloroethane (1,2-DCA) to be subject to natural degradation in the groundwater through hydrolysis with chloroethane at the end of the degradation pathway. The RFI Addendum concluded that the next step in the pathway is mineralization to inorganic salts, carbon dioxide and water, with the degradation process being rapid.

The RFI Addendum also concluded that the chloroethane detection was not related to any known previous site activities and is likely due to the degradation of the other chlorinated compounds detected at the site during previous rounds of sampling.

Based on these observations, the RFI Addendum recommended NFA status for this site.

## **2.4.2 Soil and Groundwater Data Gaps**

### **2.4.2.1 Soil Data Gaps**

No data gaps have been identified for the determination of nature and extent of contamination in soil at this site.

### **2.4.2.2 Groundwater Data Gaps**

Based on a review of the RFI Addendum Report, SCDHEC indicated that an additional groundwater well may be needed to better characterize the groundwater downgradient and on the northeast side of the sewer line. SCDHEC and USEPA also required a more detailed explanation of the stated natural degradation process of the chlorinated organic compounds in groundwater.

## **2.4.3 Closeout Issues**

### **2.4.3.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater does not warrant further investigation at this site.

### **2.4.3.2 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Work Plan* (EnSafe, 1995). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

### **2.4.3.3 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There is one sanitary sewer line associated with Building 1776 at the site. Figure 2-5 shows the locations of the sanitary sewers and the SWMU 37 sampling locations.

#### **DPT Soil Samples**

There were no SWMU 37 DPT soil samples collected near the site.

#### **Soil Boring Samples**

There were no SWMU 37 soil borings installed at the site. The only soil borings installed at the site were those installed during the RFI. No COCs were identified during the initial RFI or supplemental RFI sampling efforts as requiring further investigation. No linkage is established between site soil contaminant levels and the sanitary sewer line near the site. No further investigation of soil at the site is warranted.

#### **DPT Groundwater Samples**

There was one SWMU 37 DPT groundwater sample identified as 037GP033 collected near the sanitary sewer line at the site. The DPT groundwater samples were analyzed for VOCs, metals, and cyanide. There were no SWMU 37 permanent monitoring wells installed near the site.

None of the DPT groundwater samples collected from the three DPT locations showed exceedances above the tap water RBC or MCL values for VOCs or cyanide. Inorganic analytical results from Zone L DPT groundwater samples were not compared to RBCs or MCLs. However, a comparison of DPT groundwater results with the RBCs and MCLs showed some exceedances of either the tap water RBCs or MCLs for drinking water. The Zone L RFI did not compare the concentrations of metals in the DPT groundwater samples against the RBCs or MCLs due to the presence of high turbidity in these samples. A comparison performed during the Zone L RFI between DPT samples and permanent monitoring well samples showed significant differences in both the turbidity and concentrations of inorganics between the monitoring well samples and the DPT samples.

In the absence of Zone L permanent monitoring wells near the DPT sample locations, the concentrations found in samples from the permanent monitoring wells installed at SWMU 138/AOC 667 are being considered to evaluate site-specific sources of contaminants. The

Zone H RFI Addendum effort did not identify contaminants in the permanent monitoring well samples installed at the site that needed further evaluation.

SCDHEC has required the installation of an additional monitoring well to verify the presence of contaminants near the storm sewer line east of the site. This well will be installed at the proposed location shown in Figure 2-5. Based on the analytical results from sampling this new well, any potential linkage to the sanitary sewer system from contaminants at this well location will be verified. There has been no other linkage established between the site soils and the sanitary sewer system at the present time.

#### **2.4.3.4 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

The sections of the stormwater sewer system in the vicinity of the site were not investigated as part of the Zone L RFI effort. There is no evidence of past site uses or the presence of contamination near the stormwater sewer system in the vicinity of the site that could have potentially impacted the stormwater sewer system. There is one stormdrain inlet approximately 300 ft southeast of the site and one stormsewer line running through the site. No contamination in the soil or groundwater has been detected that could reach any of these stormdrain inlets or infiltrate the stormwater sewer lines. The concentrations of contaminants in surface and subsurface soil detected during the RFI efforts and the absence of COCs in groundwater at the site indicate there is no linkage between the site and the stormwater sewers in this area. Therefore, no further evaluation of this linkage is necessary.

#### **2.4.3.5 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

#### **2.4.3.6 Potential migration pathways to surface water bodies (Zone J)**

The nearest water body is the Cooper River, which is approximately 1,200 ft to the north of the site. There is a heavily developed, paved area between the site and the river. No surface or subsurface contaminant migration pathway to the Cooper River as a result of site activities has been established in the Zone J RFI.

#### **2.4.3.7 Potential contamination associated with Oil-Water Separators (OWSs)**

There is an OWS associated with the grease rack as shown in Figure 2-5. The Zone H RFI Addendum reported that the OWS was not connected physically to any of the buildings but was used as a catch basin. This basin was pumped dry and steam-cleaned after use. It is

now covered by a steel plate. Soil and groundwater sampling conducted around the location of the OWS found no contaminants present and no need for further investigation of contaminants. No contamination is attributable to the OWSs.

#### **2.4.4 Sampling and Analysis Plan to Close Data Gaps**

One additional groundwater monitoring well downgradient and on the northeast side of the sewer line will be installed and sampled for VOCs, SVOCs and metals.

Additional discussion of the site-specific natural degradation will also be provided as an addendum to the discussion presented in the RFI Addendum Report (EnSafe, 2000).

Sampling Protocol and Analyses are described in Section 3. The underground utilities in the areas surrounding the areas of investigation will be identified and properly labeled in the field prior to field investigations.



## 2.5 SWMU 17

SWMU 17 is the site of a boiler fuel oil leak which occurred in June 1987 at Building FBM 61. Figure 2-6 shows the site features.

FBM 61 was the Fleet Ballistic Missile Training Center which began service in 1962. The training facility used equipment from ballistic missile submarines to simulate real-time operations during training. Several additions to the building were constructed until work on the training center was completed in 1980. The Navy's use of FBM 61 as a training facility ended in June 1996, after which it was acquired by the U.S. Border Patrol for use as a law enforcement training facility.

Room 111 of FBM 61 contains two #5 diesel oil-fired boilers. Fuel for the boilers was supplied by a 30,000 gallon aboveground storage tank (AST) listed as facility NS-600. Piping for the boiler fuel runs underground and beneath the Storage Building/ Pressurization Lab (Storage) addition on the north side of the building. The storage addition was built in the early 1960's after installation of the fuel pipeline. A leak in the boiler fuel oil line occurred beneath the storage addition on June 8, 1987, involving approximately 14,355 gallons of #5 diesel fuel oil. Soil samples were collected and test pits were excavated to assess the impact of the spilled oil. The test pits were also used to recover spilled boiler fuel oil.

Approximately 7,300 gallons of fuel oil were recovered during the June 1987 efforts by the Navy to clean up the spill. Three sumps were built along the outside wall of the storage addition to collect residual spilled oil. The three collection sumps consisted of two to three 55-gallon drums welded end to end and installed underground. PCBs were detected in soil samples of oil-contaminated soil analyzed during the 1987 spill cleanup.

An emergency electrical generator was also located in the boiler room of FBM 61. The #2 diesel fuel for this generator was stored in a 250-gallon steel UST (UST FBM 61-1), installed in 1961 in the paved courtyard next to the transformer vault (TV1). This UST was removed in September 1997 because it had developed pinholes and diesel fuel had leaked into the surrounding soil. The excavation was backfilled with the same soil.

An OWS was installed in the paved courtyard below grade in a concrete containment structure to treat water from FBM 61 boiler room bilges and sumps. Oil recovered from OWS was collected in UST FBM 61-2 adjacent to the OWS. UST FBM 61-2 was removed in September 1997, and no contamination was detected in excavated soils. The tank removal

excavation was backfilled with the same soil. The OWS was taken out of service at this time and is no longer connected to FBM 61 boiler room bilges.

Two transformer vaults are located on the north side of FBM 61. TV1 is located in the paved courtyard area and a second transformer vault (TV2) in the grassy courtyard west of the storage addition. Samples collected in 1982 from oily soil beneath drains from transformers at TV1 analyzed positive for PCBs. Recommendations to remove the oil-soaked soil were made by the Commanding Officer, Naval Regional Medical Center. It is not known if the PCB-contaminated soil at TV1 was removed. No information is available for the TV2 transformers. The PCB-filled transformers at FBM 61 were reportedly removed in the early 1990s. A line-pole capacitor rupture in 1984 spilled PCB oils onto the underlying asphalt pavement at the north end of the paved courtyard. The PCB oils were cleaned up by Navy Shop 07.

### **2.5.1 Previous Site Investigations**

RFI Investigations included soil and groundwater sampling. RFI activities began in 1994 with soil and groundwater sampling around FBM 61. Results of the SWMU 17 RFI were presented in the Final Zone H RFI Report (EnSafe 1996). Soil samples were collected from 34 locations around the site. Shallow wells, 017001 through 017004, were installed and groundwater samples were collected beginning in late 1994 as part of the original RFI.

Wells 017005 and 006 were subsequently installed to delineate the extent of groundwater contamination north of the paved courtyard area and well 017002. Groundwater samples from these initial site wells indicated the presence of nonaqueous phase liquids at 017001 and 017002.

Zone L RFI activities in June 1997 included advancing of six soil borings in the paved courtyard area to investigate the OWS at SWMU 17.

The oil collection sumps built in 1987 were used as part of a 1998 effort by DET to recover residual nonaqueous phase liquids (NAPLs) at FBM 61.

Shallow wells 017007 through 017010 were installed in June 1998 to further delineate the extent of groundwater contamination at the site. Deep well 01702D was also installed at this time to delineate the full stratigraphic section at SWMU 17 and sampled to verify groundwater quality at the base of the surficial aquifer.

Monitored Natural Attenuation (MNA) groundwater samples were collected in September 1998 to determine MNA applicability at SWMU 17. Figure 2-7 shows soil and groundwater sampling locations from the initial RFI at SWMU 17.

RFI addendum activities were implemented in November 1999 and completed in January 2000 to address SWMU 17 data gaps in the Zone H RFI Report. Twenty-eight DPT soil borings were advanced during this activity and 27 new temporary wells were subsequently installed. Soil samples were collected for chemical analysis at six surface soil locations to delineate the extent of Aroclor-1260 in surface soil. Soil samples based on field observations were also collected at several well borings to qualitatively characterize contributions of fuel oil contamination in soil to groundwater contamination. Before and after sampling, synoptic water-level and immiscible phase measurements were taken to determine local groundwater flow and the extent of measurable NAPLs. RFI Addendum sampling locations are shown in Figure 2-7.

The RFI Addendum identified the following contaminants above the RBC and/or other screening levels:

#### Soil

*VOCs:* No VOCs identified in surface soils during the initial RFI and were not investigated as part of the RFI Addendum. Subsurface soil showed VOCs benzene, chlorobenzene, 1,2-dichlorobenzene, DCE, ethylbenzene, styrene, 1,1,2,2-TCA, PCE, Toluene and Xylene. Additionally, methylene chloride and trichloroethene (TCE) were detected in saturated soil samples.

*SVOCs:* BEQs; dibenzofuran, 1,2-DCB, 1,3-DCB, 2,4-dichlorophenol, 2,6-DNT, hexachlorobenzene, 2-methylnaphthalene, naphthalene, 1,2,4-TCB

*Pesticides/PCBs:* Dieldrin, endrin aldehyde; Aroclor-1260.

*Inorganics:* Low-levels of cadmium in one location.

#### Groundwater:

*VOCs:* Acetone, chlorobenzene; benzene, 1,2-DCE, methylene chloride.

*SVOCs:* benzidine, BEHP, 4-chloro-3methylphenol, 2-chlorophenol; dibenzofuran; 1,2-DCB, 1,3-DCB, 1,4-DCB, 2,4-dichlorophenol, 2-methylnaphthalene, naphthalene, 1,2,4-TCB

*Pesticides/PCBs:* Aroclor-1016, Aroclor-1260; 4,4-DDT, dieldrin and heptachlor epoxide.

*Inorganics*: manganese, arsenic, chromium.

The risk assessment in the RFI Addendum identified surface soil risk from BEQs and Aroclor-1260 for future resident scenario, and groundwater risk from Aroclor-1260, heptachlor, dieldrin, heptachlor epoxide, 4,4-DDT, acetone, methylene chloride, benzene, chlorobenzene, 1,2-DCE, 1,2-DCB, 1,3-DCB, 1,4-DCB, 1,2,4-TCB, 4,4-DDT and 2,4-dichlorophenol.

The RFI Addendum recommended a CMS for surface soil and shallow groundwater.

## **2.5.2 Soil Data Gaps and Sampling Plan to Close Data Gaps**

Two RFI Addendum soil boring locations, 017SWB02 and 017SWT02 (as shown in Figure 2-7), where visual observations were relied upon present a data gap. These locations will be resampled for VOCs, SVOCs, and PCBs by USEPA Methods.

## **2.5.3 Groundwater Data Gaps and Sampling Plan to Close Data Gaps**

Well 017004 will be resampled for VOCs and SVOCs to confirm the absence of methylene chloride and benzidine in groundwater at the site. Well 017009 will be resampled for VOCs to confirm the absence of methylene chloride in groundwater.

The following figures in the RFI Addendum Report will be updated to close open-ended contours as appropriate: Figures 2.5.33, 2.5.35, 2.5.38, 2.5.39, 2.5.45, 2.5.49, 2.5.51, 2.5.55, 2.5.56 and 2.5.61.

## **2.5.4 Closeout Issues**

### **2.5.4.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater do not warrant further investigation at this site.

### **2.5.4.2 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Work Plan* (EnSafe, 1995). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

#### **2.5.4.3 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There is a sanitary sewer line approximately 250 ft west of the site. There were soil and groundwater samples collected as part of the SWMU 37 investigations near SWMU 17.

##### **Soil Samples**

Two DPT soil (LH037SP009 and LH037SP010) were collected from two nearby locations along the sanitary sewer system as shown in Figure 2-7. These DPT soil samples were analyzed for VOCs, metals and cyanide. There were no detections of cyanide or VOCs in the SWMU 37 samples collected at this site. Arsenic and iron were detected above RBCs but well below the site background levels.

Additionally, six soil borings (037SB009 through 037SB014) were introduced adjacent to Building FBM 61 at SWMU 17 as part of the SWMU 37 investigations. These were sampled for VOCs, SVOCs, metals, cyanide, PCBs, and chlorinated pesticides. There were no detections of cyanide or VOCs in these SWMU 37 samples.

No pesticides were detected above the RBCs or soil-to-groundwater SSLs in the soil samples. One PCB congener Aroclor-1260 was detected in upper and lower interval soil samples above the RBCs. Aroclor-1260 is the only COC identified for surface soil in the RFI Addendum.

Semivolatile organic compounds benzo(a)pyrene and benzo(b)fluoranthene were detected above the RBCs in soil boring 037SB010. Based on an evaluation of the frequency of detections in subsurface soils from SWMU 17 soil borings, Aroclor-1260, benzene,

chlorobenzene, 1,3-DCB, 1,4,DCB and 1,2,4-TCB have been identified as COCs in subsurface soil needing further evaluation as part of the CMS for SWMU 17.

Arsenic, beryllium and iron exceeded the RBC in these soil samples but were well below the site surface and subsurface soil background levels.

SWMU 37 investigations did not identify a linkage between these site soil contaminants and the sanitary sewer system downgradient from the site.

#### Groundwater Samples

Two DPT groundwater samples (LH037GP017 and LH037GP018) were introduced along the sanitary sewer system as shown in Figure 2-7. These DPT samples were analyzed for VOCs, metals and cyanide. There were no detections of cyanide in these samples. No VOCs exceeded the tap water RBCs in these samples.

There were some detections of arsenic, barium, total chromium, lead, and vanadium above RBCs/MCLs in these DPT samples. The Zone L RFI did not compare the concentrations of metals in the DPT groundwater samples against the RBCs or MCLs due to the presence of high turbidity in these samples. A comparison performed during the Zone L RFI between DPT samples and permanent monitoring well samples showed significantly low concentrations of inorganics and turbidity in the monitoring well samples when compared to DPT samples which showed relatively high turbidity and inorganics.

The Zone H RFI indicates that the contaminants in groundwater are localized in the storage addition area of SWMU 17. The sanitary sewer system runs in the west and northwest directions away from the site. The soil borings and monitoring wells introduced in the westerly and northwesterly directions away from the most contaminated area did not detect site contaminants, thus indicating that site contaminants are not migrating along the sewer system downgradient from SWMU 17.

#### **2.5.4.4 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

There were no stormwater sewers investigated in the vicinity of SWMU 17 as part of AOC 699 investigations. There are two stormwater sewer lines in the vicinity of the site as shown in Figure 2-7.

The stormwater sewer system heads west and northwest from the most contaminated area of SWMU 17. The SWMU 17 soil borings and monitoring wells in those directions did not

detect site contaminants, thereby indicating that site contaminants are not migrating along the stormwater sewer system downgradient from SWMU 17. Therefore, no linkage is established between site contaminants and the stormwater sewer system.

#### **2.5.4.5 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

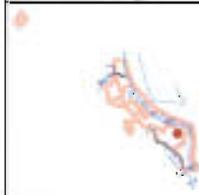
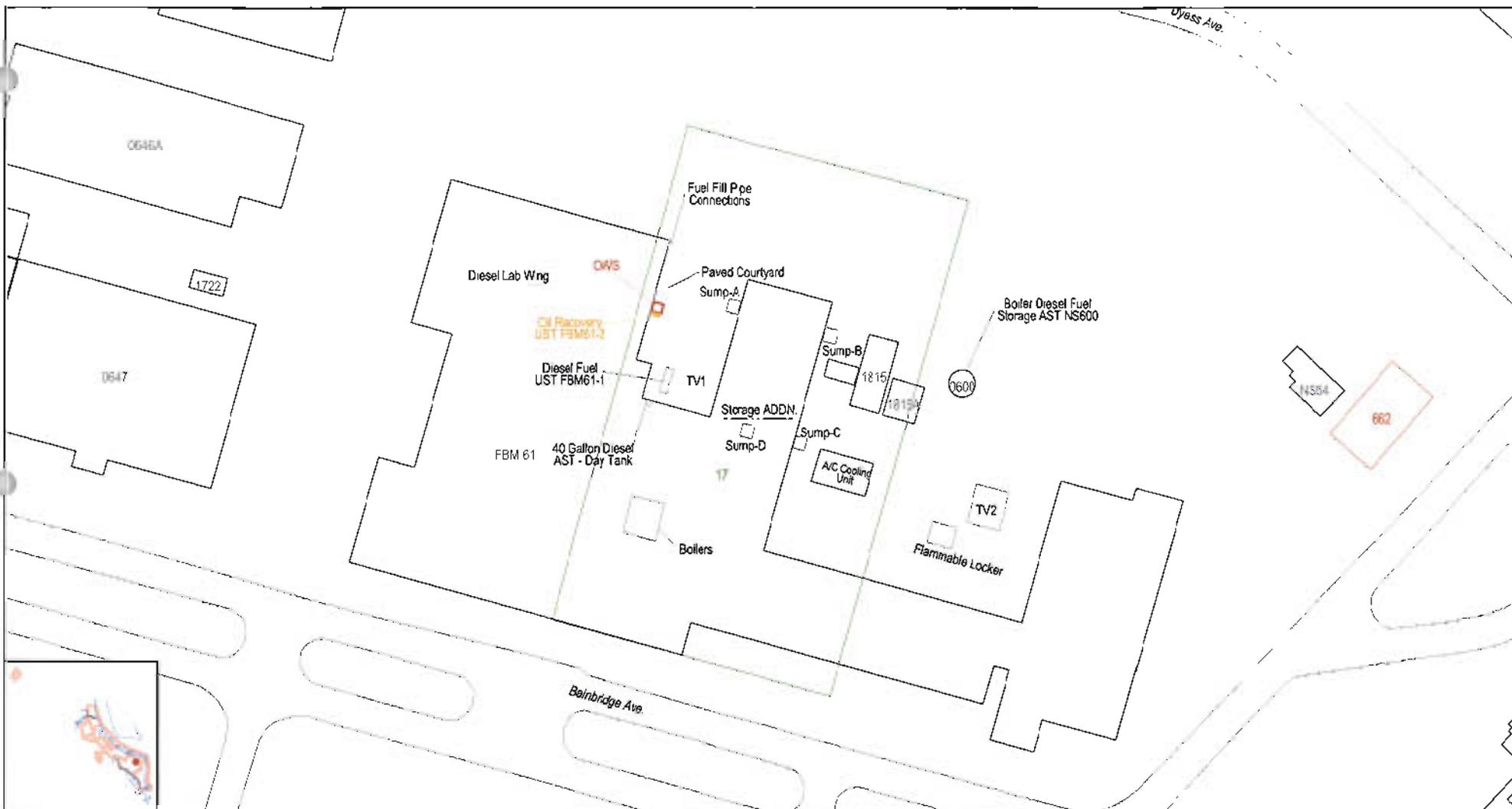
#### **2.5.4.6 Potential migration pathways to surface water bodies (Zone J)**

The nearest water body is the Cooper River, which is approximately 1,200 ft north and approximately 2,000 ft east of the site. The majority of the land parcels surrounding SWMU 17 are paved. There are no other surface water bodies in the vicinity of the site. The Zone H RFI did not establish the migration of SWMU 17 contaminants beyond the investigated boundaries of this site. Therefore, no linkage is established between the site-specific contaminants at SWMU 17 and surface water bodies or sediments associated with surface water bodies.

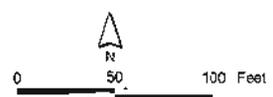
#### **2.5.4.7 Potential contamination associated with Oil-Water Separators (OWSs)**

There is an OWS at this site connected to the boiler room of Building FBM 61. To treat water from boiler room bilges and sumps, the OWS was installed in the paved courtyard below grade in a concrete containment structure.. Oil recovered from the OWS was collected in UST FBM 61-2 adjacent to the OWS. The RFI Addendum indicated that UST FBM 61-2 was removed in September 1997 and no contamination was detected in excavated soils. The OWS was taken out of service at this time and is no longer connected to the FBM 61 boiler room. Contamination in areas adjacent to the OWS have been attributed to the leaks in the diesel supply UST and associated fuel lines and a PCB leak from the transformer in the paved courtyard on the north side of the building. No linkage has been established between the OWS and site contamination.

Sampling Protocol and Analyses are described in detail in Section 3. The underground utilities in the areas surrounding the areas of investigation will be identified and properly labeled in the field prior to field investigations.



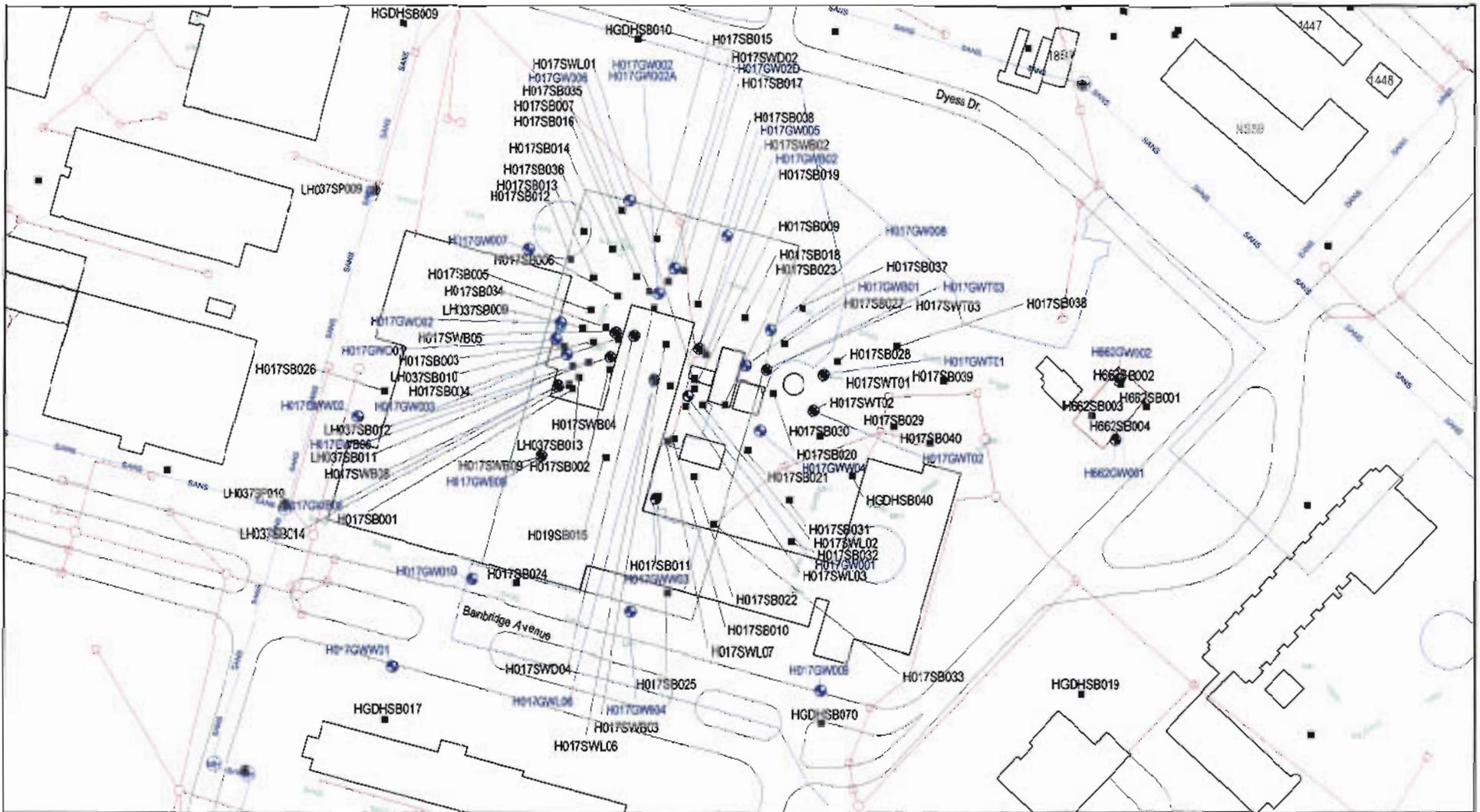
- Fence
- Railroads
- Roads - Lines
- Bridges
- Surrounding Area
- Pavement
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary
- Oil Water Separator



**Figure 2-6**  
 Site Features  
 SWMU 17, Zone H  
 Charleston Naval Complex



File Path: c:\1189\kennedycaps\_1-29-01.apr, Date: 23 Jan 2011 12:10, User: ESADK



**Figure 2-7**  
**SWMU 17 RFI and Sampling Stations**  
 SWMU 17, Zone H  
 Charleston Naval Complex  
 Charleston, SC



The Firm's responsibility for the accuracy of the information is limited to the data provided to it. It is not responsible for the accuracy of the information provided to it by others. Date: 15 Jan 2001 14:05, User: RINACK

## 2.6 SWMU 159

SWMU 159 is a former SAA near the southwest corner of Building 665, the former base package store. The SAA was established in March 1994, and was used approximately one year to temporarily store and accumulate hazardous materials, such as batteries, aerosol cans, and paint waste. It consisted of an 8 ft by 6ft by 6 ft metal structure lined with plastic. The area surrounding the SAA was used for recycling. A diesel fuel AST, a hydraulic can crusher, and two small debris piles were also in place at the site.

Building 665 is currently being used by Omni-Cube, which is a laundry facility that uses strictly detergents and wash water only and no solvents. Figure 2-8 shows site features and sampling locations.

### 2.6.1 Previous Site Investigations

The initial RFI conducted by EnSafe included investigation of surface soil, subsurface soil, sediment, surface water and groundwater. Sampling was conducted to encompass all areas at the site that potentially could have been impacted by past activities at the site. Samples were targeted in the SAA and AST areas, the debris pile areas, the surface water runoff ditch near the can crusher, and the areas near the outfall of the drainage ditch and a stormwater outfall pipe. Figure 2-9 shows historic sampling locations for soil, sediment and groundwater.

Benzo(a)pyrene was detected in one soil sample point (159SB011) at 100 µg/kg, which exceeded the RBSL of 88 µg/kg. Indeterminate lubricating oil was detected in all soil samples at concentrations ranging from 29,000 µg/kg to 179,000 µg/kg. In sediments, pyrene, benzo(a)anthracene, benzo(a)pyrene, and phenanthrene were detected at concentrations above the Region IV sediment screening values (SSV). Additionally, inorganics were detected in sediments above their Region IV SSVs. There were no detections above the USEPA chronic marine quality criteria in surface water for any parameters analyzed. The criteria were used as surface water screening criteria during the RFI.

The risk assessment conducted as part of the RFI identified BEQs and aluminum in soil as COPCs. The RFI recommended a CMS for soil at SWMU 159 because the residential risk exceeded 1E-06 and TPH concentrations exceeded 100 mg/kg. Approximately 96 percent of site risk was the direct result of BEQs in one soil sample from soil boring 159SB011. Soils

contributing to this concentration were later removed as part of an Interim Measure performed by the Navy and described below.

DET conducted an ISM during September 1996 in an effort to eliminate sources of contamination and limit the spread of contaminants. The presence of indeterminate lubricating oils in the soil samples collected during the RFI also prompted the ISM, which included soil excavation and offsite disposal. As part of the ISM, an estimated 16 cubic yards of soil and sediments were removed from three areas in which contaminants showed exceedance of the SCDHEC petroleum cleanup criteria and USEPA Region III RBCs. The excavations were conducted in the SAA, a sediment area associated with the stormwater outfall and the drainage ditch near the can crusher. Twenty-four confirmation samples were collected from the floor and sidewalls of the excavation to ensure compliance with the cleanup criteria and analyzed for BTEX, naphthalene and PAHs. There were no detections of these compounds above the RBCs.

The RFI identified one site sample at boring location 159SB011 (where BEQs were detected) as contributing to a surface soil point risk greater than  $1E-06$ . All other RFI sample points showed risk values below  $1E-06$ . The soil surrounding and including the soil boring location 159SB011 were excavated and disposed offsite. The excavation backfilled with clean soil during the ISM, thereby removing the source of the risk.

This site was designated for a CMS by the project team, which was concerned about the potential for TCE to migrate from soil into groundwater, to investigate the presence of contaminants in groundwater at the site. TCE was detected in surface and subsurface soil samples at levels well below RBCs.

During the CMS process, two monitoring wells 159001 and 159002 were installed at locations where TCE was most likely to be present (hydrogeologically downgradient from potential TCE sources). Three rounds of groundwater monitoring were conducted. No TCE was detected in either CMS well during any of the three sampling rounds. The only compounds detected in the groundwater were acetone and methylene chloride which were evaluated during the CMS and determined to be laboratory artifacts.

The CMS effort included derivation of site-specific soil screening levels for TCE to investigate the threat to groundwater from the possible presence of TCE in the soil. The CMS effort concluded that based on site-specific soil and hydrogeologic characteristics, TCE migration from soil to groundwater at SWMU 159 was unlikely.

## **2.6.2 Closeout Issues**

### **2.6.2.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater do not warrant further investigation at this site.

### **2.6.2.2 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Work Plan* (EnSafe, 1995). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

### **2.6.2.3 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There are no sanitary sewer lines in the vicinity of SWMU 159. No SWMU 37 investigations were conducted near SWMU 159.

### **2.6.2.4 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

There are two stormwater sewer lines east of SWMU 159 at approximately 75 ft and 150 ft from the site (as shown in Figure 2-8). A small run of the stormwater sewer line has been shown in the Zone H RFI Reports. Surface water flow at the site is in the southeasterly direction away from the storm drains on the eastern side of the site. There was no AOC 699 investigation conducted in the vicinity of SWMU 159. Surface and subsurface soil, sediment and groundwater investigations conducted during the RFI and CMS sampling efforts did not identify contamination that could impact the stormwater sewer lines near the site.

Additionally, the soil removal and disposal conducted as part of DETs' ISM after the initial RFI further reduced the possibility of site contaminants impacting the sewer lines. No linkage has been established from site constituents and the stormwater sewer lines at this site.

#### **2.6.2.5 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

#### **2.6.2.6 Potential migration pathways to surface water bodies (Zone J)**

The nearest water body to SWMU 159 is Shipyard Creek. Low detections of BEHP, heptachlor, and heptachlor epoxide in sediments from two sediment samples were evaluated during the Zone J RFI (EnSafe, 2000). However, the Zone H RFI or the EnSafe CMS Report for SWMU 159 showed risks from sediments due to these constituents below 1E-06 (Table 3.8 of the SWMU 159 Corrective Measures Study Report, EnSafe, May 23, 2000). Additionally, sediments and soil from the locations of these two sediment samples were excavated and disposed offsite during DET's ISM after the initial RFI. Therefore, the potential sources of the contaminants have been removed from the site.

The Zone J RFI indicated that no constituents were found in surface water samples above saltwater chronic Ambient Water Quality Criteria (AWQC) and suggested that surface soil concentrations are protective of the surface water environment. No migration pathways have been established from the present levels of constituents in the SWMU 159 soil or sediments to Shipyard Creek.

### **2.6.3 Data Gaps and Sampling Plan to Close Data Gaps**

A soil and groundwater data gap in the delineation of TCE on the southern side was identified during review and comment resolution of the SWMU 159 investigation effort. Two additional soil borings will be introduced at locations identified as 159SB017 and 159SB019 to collect surface and subsurface soil samples to cover the southern side of the site (at locations shown in Figure 2-8) to investigate the presence of TCE contamination in soil. Should groundwater be encountered in the subsurface interval, only surface soil samples will be collected. Should analytical results of sampling conducted at the proposed new soil boring locations indicate exceedance of TCE RBCs, additional soil boring locations will be decided upon to delineate the extent of TCE contamination. All soil samples will be analyzed for VOCs by USEPA Method 8260B. An additional groundwater monitoring well

159003 (as shown in Figure 2-8) will be installed at the site, and soil samples will be collected in the upper and lower intervals during well installation and analyzed for VOCs.

Additional text describing site-specific fate and transport potential for TCEs at SWMU 159 will be appended to the CMS Report.



## 2.7 AOC 653

AOC 653 is a former leaking underground hydraulic fluid storage tank (40 gallons) at the west end of Building 1508, one of the four buildings that made up the automotive hobby shop complex in the northern portion Zone H. According to the RCRA Facility Assessment (RFA) and Environmental Baseline Survey (EBS), (EnSafe 1995 and 1996 respectively), typical hobby shop activities included minor automotive maintenance, repair, painting, and washing. Based on these activities, various paints, solvents, thinners, and petroleum products have likely been used and stored onsite. Other structures in the complex include Buildings 636, 1347, 1493, and 1508. The site is mostly covered by barrier materials, such as buildings and asphalt, with grass and gravel in some areas.

In 1972, the approximately 1,500-square-foot automobile hobby shop was constructed on fill material (dredge spoils) covered by soil or some other unconsolidated material. Based on a 1939 aerial photograph, before being filled in, the area was a marsh. In 1974, the surface area was paved and auto lifts were added to the west end of Building 1508. The use of the underground hydraulic fluid storage tank was initially discontinued due to suspected leakage, as reported during the EBS. Approximately 100 gallons of hydraulic fluid are reported to have leaked from this steel tank during its 22 years. DET removed the tank from the site during 1996 ISM, as described in Section 3. Numerous stains and petroleum odors were noted near the hobby shop during the EBS. Two other 40-gallon aboveground hydraulic fluid storage tanks were located on the site as well. However, neither is known to have released any product.

### 2.7.1 Previous Site Investigations

The RFI included investigation of soil and groundwater. Based on identified site uses, sampling locations were targeted at the areas that would have had the most impact from spills, etc. Soil samples were also collected from an expanded area along the site perimeter to provide adequate spatial coverage. Two groundwater monitoring wells were installed at the site in an area likely to have been impacted by site activities.

Benzo(a)anthracene at 150 µg/kg and benzo(b)fluoranthene at 140 µg/kg were detected in two soil samples above their RBC of 88 µg/kg. Aroclor-1248 at 88 µg/kg slightly exceeded the RBSL of 83 µg/kg in one sample. Lead was detected in one sample location at 638 µg/kg

above the UTL. TPH was detected at 400 to 42,000 mg/kg. Arsenic was detected in groundwater above the UTL.

The RFI recommended a CMS for soil due to TPH concentrations above 100 mg/kg and shallow groundwater risk from arsenic.

SCDHEC comments on the initial RFI (EnSafe, 1997) required that the extent of TPH contamination be determined more exactly.

In an effort to eliminate the TPH source of contamination, DET removed the hydraulic lift and associated appurtenances, along with approximately 700 cubic yards of soil from areas contaminated with petroleum compounds. Additionally, 4,500 SF of asphalt and 1000 SF of concrete from a pad were removed and disposed. All excavated soil was characterized and disposed at an offsite disposal facility.

Sixteen confirmatory soil samples were collected from the excavated area and analyzed for BTEX, PAHs, RCRA metals and TPH. There was one detection of Benzo(a)pyrene at 285 µg/kg and arsenic at 38.2 mg/kg above the screening levels. Arsenic was not exceeded in any surrounding samples. Site risk prior to the ISM was below 1E-06.

Subsequent to this effort, the project team expressed concerns about arsenic in groundwater. Therefore, supplemental sampling was conducted during 1999. An additional groundwater monitoring well NBCH653003 was installed and sampled for two rounds. Additionally, two grid well pairs (NBCHGRD003/03D, NBCHGRD006/06D) were sampled and the arsenic results compared. Results from all five wells showed arsenic concentrations below the MCL. Low levels of acetone were also detected in groundwater.

The risk assessment identified arsenic and iron as the two COPCs based on hypothetical consumption of groundwater pathway. No further action for groundwater was recommended due to the presence of low levels of arsenic and due to a lack of arsenic source at the site.

One sample location (653SB001) which contributed to the soil risk during the RFI stage due to the presence of BEQs and Aroclors-1248 and -1260 was excavated and the soils removed and disposed offsite. The CMS recommended NFA status for AOC 653.

## **2.7.2 Data Gaps**

There are no data gaps identified in the RFI for this site. During a comment resolution meeting held during January 2001, a project task team comprising of SCDHEC and CH2M-Jones team members, AOC 653 was recommended for NFA after site closeout issues were considered. These issues are discussed in the following sections of this document.

## **2.7.3 Closeout Issues**

### **2.7.3.1 Presence of inorganics in groundwater**

The levels of inorganics in groundwater detected at this site were determined to be protective of human health and the environment based on the risk assessment conducted during the RFI. Therefore, inorganics in groundwater do not warrant further investigation at this site.

### **2.7.3.2 Potential linkage to surrounding site features**

With respect to linkage of individual sites to sanitary sewers, stormwater sewers, and railroad lines, reference is made to the *Final Zone L RFI Work Plan* (EnSafe, 1995). The investigated segments of Zone L encompass the following:

- Specific sections of the sanitary sewer system that may have been exposed to hazardous materials (SWMU 37)
- Specific sections of the stormwater collection system likely exposed to hazardous materials (AOC 699)
- Sections of the railroad line system where known or suspected releases of solid or hazardous waste contaminants have occurred (AOC 504)

The *Zone J Draft RCRA Facility Investigation Report* (EnSafe, 2000) is also referenced in this RFI Addendum Work Plan. Zone J encompasses investigated surface water bodies on CNC.

### **2.7.3.3 Potential linkage of SWMU/AOC to SWMU 37 (investigated sanitary sewers)**

There is a sanitary sewer line approximately 120 ft north and east of the site. There were soil and groundwater samples collected as part of the SWMU 37 investigations near AOC 653.

### Soil Samples

Two DPT soil (LH037SP001 and LH037SP003) were collected from two nearby locations along the sanitary sewer system as shown in Figure 2-9. These DPT soil samples were analyzed for VOCs, metals, and cyanide. There were no detections of cyanide or VOCs in the SWMU 37 samples collected at this site. Arsenic was detected above RBCs but well below the site background levels. Iron was detected above RBCs (there is no SSL for iron established for the site). Chromium was detected at 22.2 mg/kg above the SSL of 19 mg/kg for the site, but this level was below the RBC of 39 mg/kg.

No soil borings were introduced at AOC 653 as part of SWMU 37 investigations.

### Groundwater Samples

Four DPT groundwater samples (LH037GP004, LH037GP006, LH037GP006A and LH037GP010) were introduced along the sanitary sewer system as shown in Figure 2-9. These DPT samples were analyzed for VOCs, metals, and cyanide. There were no detections of cyanide in these samples. No VOCs exceeded the tap water RBCs in these samples.

There were some detections of aluminum, arsenic, total chromium, copper, iron, lead, selenium, and vanadium above RBCs/MCLs in these DPT samples. The Zone L RFI did not compare the concentrations of metals in the DPT groundwater samples against the RBCs or MCLs due to the presence of high turbidity in these samples. A comparison performed during the Zone L RFI between DPT samples and permanent monitoring well samples showed significantly lower concentrations of inorganics and turbidity in the monitoring well samples than in DPT samples, which showed relatively high turbidity and inorganics.

#### **2.7.3.4 Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)**

There were no stormwater sewers investigated in the vicinity of AOC 653 as part of AOC 699.

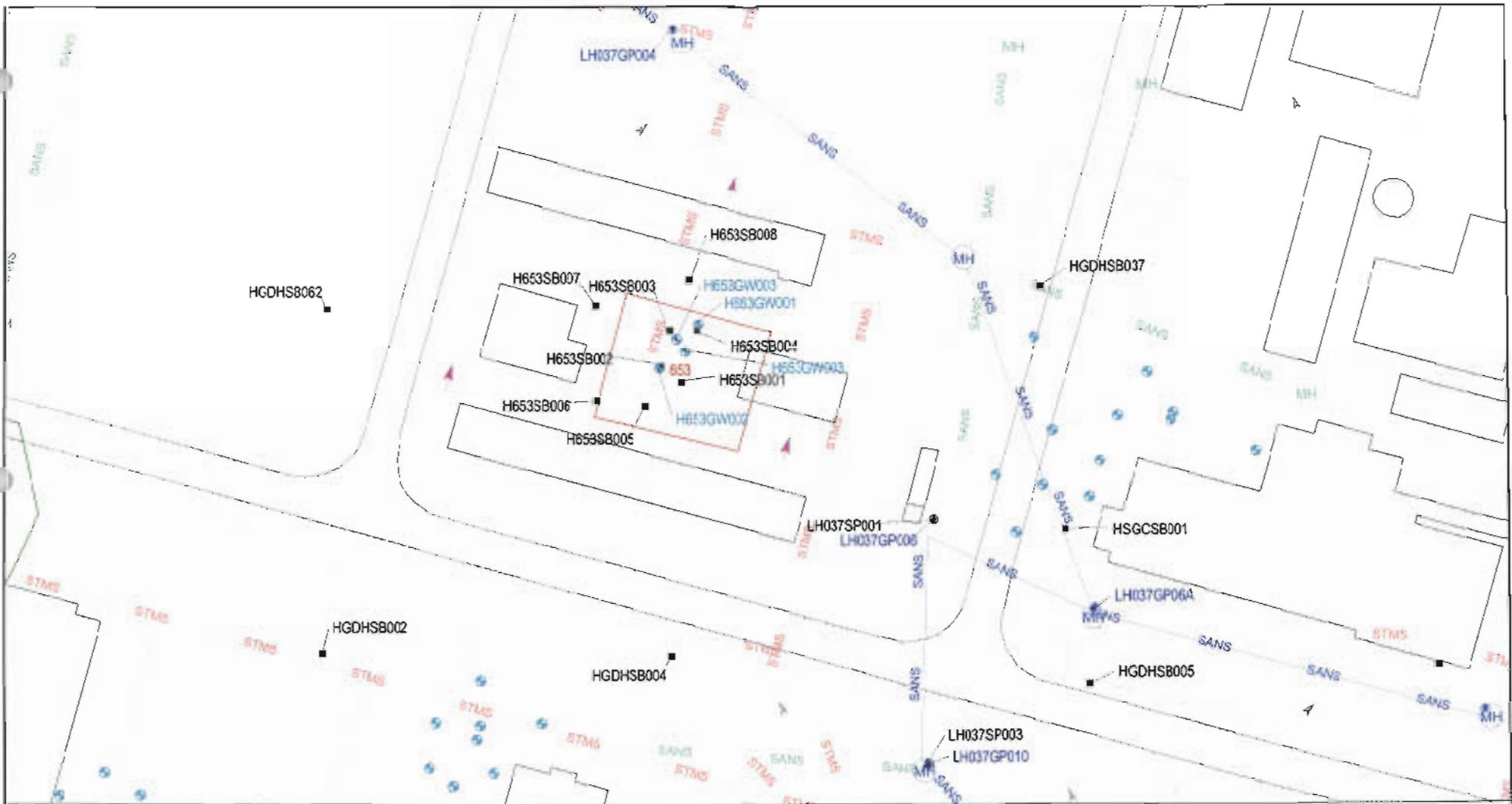
There are two stormwater sewer lines 50 ft to the east and approximately 100 ft to the south of the site. The Zone H RFI (EnSafe, 1997) and the subsequent AOC 653 Corrective Measures Study Report (EnSafe, 2000) did not identify contaminants in soil or groundwater that could potentially impact the stormwater sewer lines in the vicinity of this site. Therefore no linkage is established between the site constituents at AOC 653 and the stormwater sewer system.

**2.7.3.5 Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)**

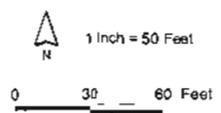
There are no railroad lines present in the vicinity of the site. Therefore no linkage is possible.

**2.7.3.6 Potential migration pathways to surface water bodies (Zone J)**

The nearest water body is the Cooper River, which is approximately 650 ft north of the site. The majority of the land parcels surrounding AOC 653 are paved. There are no other surface water bodies in the vicinity of the site. The Zone H RFI did not establish the migration of AOC 653 contaminants beyond the investigated boundaries of this site. Therefore, no linkage is established between the site-specific contaminants at SWMU 17 and surface water bodies or sediments associated with surface water bodies.



- Groundwater Well
- ⊕ Groundwater Probe
- Surface Soil
- Groundwater Flow
- Direction of Stormwater Runoff
- STVS Storm Sewer Line
- SANS Sanitary Sewer Line
- STMS Storm Sewer Line
- Roads
- Pavement
- Shoreline
- SWMU / ACC**
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary



**Figure 2-9 - AOC 653**  
**Site Features and Sampling Locations, Zone H**  
 Charleston Naval Complex  
 Charleston, SC



SECTION 3.0

## Sampling Protocol and Analysis

## 3.0 Sampling Protocol and Analysis

---

The soil and groundwater samples will be collected and analyzed according to the procedures outlined in the approved Comprehensive Sampling and Analysis Plan (CSAP) portion of the RFI Work Plan (EnSafe, 1994). The CSAP, Quality Assurance Plan (QAP), and Data Management Plan (DMP) outline the monitoring procedures to be performed for contaminant investigation and delineation to verify that all the information and data are valid and properly documented. Unless otherwise noted, the sampling strategy and procedures will be performed in accordance with the EPA Environmental Services Division *Standard Operating Procedures and Quality Assurance Manual* (ESDSOPQAM, 1996). A copy of the ESDSOPQAM will be kept onsite during all field operations to supplement the CSAP. Sample analyses will be conducted in accordance with the guidance in EPA *Test Methods for Evaluating Solid Waste, SW-846, 3rd ed.*, Office of Solid Waste and Emergency Response (SW-846) and the EPA Environmental Services Division *Laboratory Operations and Quality Control Manual* (ESDLOPQCM, 1996). Sample analysis and data collection efforts will satisfy EPA data quality objective (DQO) Level III protocol. A minimum of 5 percent of the samples will be analyzed at EPA DQO Level IV for confirmation purposes.

Table 3-1 summarizes the proposed sampling and analysis plan for the sites described in Section 2.0.

<b>TABLE 3-1</b>					
Proposed Sampling and Analysis Plan—Zone H					
<i>Charleston Naval Complex, North Charleston, South Carolina</i>					
<b>Site</b>	<b>Proposed Sample Collection Location(s)</b>	<b>Matrix/Interval</b>	<b>Quantity</b>	<b>Analysis</b>	<b>Rationale</b>
SWMU 136/AOC 663	New soil borings 136SB015-136SB016	Surface soil/0 to 1 ft bgs and subsurface soil 2-5 ft bgs	Two locations	Total arsenic	Investigate presence of arsenic in soils outside of present exceedances of site background levels of arsenic
SWMU 136/AOC 663	Contingency samples	Surface soil/0 to 1 ft bgs and subsurface soil 2-5 ft bgs	To be determined	Total arsenic	Contingency samples downgradient of arsenic exceedances of site background levels.
SWMU 136/AOC 663	Shallow monitoring well 663002	Groundwater/shallow aquifer	One	BTEX and naphthalene	Confirm the absence of benzene and verify levels of naphthalene in groundwater
AOC 666	Oil/water separator at Bldg NS-44	To be field determined	One per matrix	VOCs, SVOCs, PCBs, Pesticides and metals	Investigate nature of contents of OWS as a potential source of contamination.
AOC 666	New shallow monitoring well 666003	Groundwater/shallow aquifer	One	VOCs, SVOCs and metals	Investigate presence of site contaminants in shallow groundwater downgradient of site.
AOC 666	Contingency deep monitoring well	Groundwater/deep aquifer	One	VOCs, SVOCs and metals	Investigate presence of site contaminants in deep groundwater downgradient of site.

<b>TABLE 3-1</b>					
Proposed Sampling and Analysis Plan—Zone H					
<i>Charleston Naval Complex, North Charleston, South Carolina</i>					
<b>Site</b>	<b>Proposed Sample Collection Location(s)</b>	<b>Matrix/Interval</b>	<b>Quantity</b>	<b>Analysis</b>	<b>Rationale</b>
SWMU 138/AOC 667	667003	Groundwater/shallow aquifer	One	VOCs/SVOCs/metals	Investigate presence of VOC contamination in groundwater downgradient of site and upgradient of sewer lines.
SWMU 17	New soil borings at previous locations 017SWB02 and 017SWT02	Surface soil/0 to 1 ft bgs and subsurface soil 2-5 ft bgs	Total of four	VOCs, SVOCs and PCBs	Verify the presence of VOCs and SVOCs in surface and subsurface soils.
SWMU 17	Existing groundwater monitoring wells 017005 and 017009	Groundwater/ shallow interval	One each	VOCs and SVOCs for 017005; VOCs for 017009	Verify the absence of methylene chloride and benzidine in groundwater.
SWMU 159	New soil borings 159SB017, 159SB018 (samples from well 159003 boring) and 159SB019	Surface Soil/0 to 1 ft bgs and subsurface soil 2-5 ft bgs	Six	VOCs	Investigate presence of TCE in surface and subsurface soils on southern side of site.
SWMU 159	New shallow monitoring well 159GW003	Groundwater/ shallow interval	One	VOCs	Investigate presence of TCE in shallow groundwater on southern side of site.

SECTION 4.0

## Investigation-Derived Waste

## 1 4.0 Investigation-Derived Waste

---

2 Investigation-derived waste (IDW) that is generated during this effort will include purge  
3 water from the groundwater sampling activities and possibly soil cuttings from well drilling  
4 activities. Soil removed from hand-auger soil borings will be returned to the boring loca-  
5 tions after samples have been collected. IDW will be collected in 55-gallon drums or port-  
6 able tanks for proper handling. These containers will be properly labeled and the contents  
7 will be sampled for waste characterization parameters based on identified site contam-  
8 inants. While waste characterization is being performed, the containers will be kept in the  
9 temporary storage facility located at Building 1824. Once waste characterization is complete,  
10 the wastes will be transported and disposed according to regulations at a licensed offsite  
11 disposal facility.

SECTION 5.0

## References

---

## 1 5.0 References

---

- 2 EnSafe, Inc. *Zone H RCRA Facility Investigation Report, NAVBASE Charleston*. July 1996 with  
3 updates of June 24, 1997 and June 18, 1998.
- 4 EnSafe, Inc. *Zone H RCRA Facility Investigation Report, RFI Addendum, NAVBASE Charleston*.  
5 May 5, 2000.
- 6 EnSafe, Inc. *Zone L RCRA Facility Investigation Work Plan, NAVBASE Charleston*. October 18,  
7 1995.
- 8 EnSafe, Inc. *Zone L RCRA Facility Investigation Report, NAVBASE Charleston*. December 18,  
9 1998.
- 10 EnSafe, Inc. *Zone J RCRA Facility Investigation Report, NAVBASE Charleston*. April 24, 2000.
- 11 EnSafe, Inc. *Zone H AOC 653 and SWMU 159 Corrective Measures Study Report, NAVBASE*  
12 *Charleston. Revision 0*. May 23, 2000.
- 13 U. S. Environmental Protection Agency, Region IV, Environmental Services Division.  
14 *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*.  
15 1996.
- 16
- 17

APPENDIX A

**Response to SCDHEC and USEPA Comments**

CHARLESTON NAVAL COMPLEX

RESPONSES TO SCDHEC COMMENTS ON ZONE H RFI

FOR SWMU 136/AOC 663; AOC 666; SWMU 138/AOC 667; SWMU 196 & SWMU 17

## General Comments

### Comment:

1. Site Close-out strategies to support NFA recommendation.

At the May, 2000 meeting, the team discussed the need to include/evaluate Oil Water Separators, Zone J, Zone L, inorganics in groundwater, and indoor air quality issues when closing out a SWMU (recommending an NFA). As currently written, the Navy does not evaluate these issues to support their NFA recommendation. The Department will not concur with an NFA recommendation until these issues are addressed.

### Response:

*Oil/water separators (OWSs) and inorganics in groundwater are being addressed at this time. The locations of the OWSs have been incorporated into the GIS. The relationship of inorganics in groundwater to the various sites and their overall distribution and occurrence are being addressed at the site-specific level as well as on a base-wide level.*

*The relationship of Zone L to the Zone H sites will be evaluated. Zone J evaluation is currently being addressed by EnSafe/Allen & Hoshall, and any connections to the Zone H sites will be evaluated. The relationship and impact of Zone J and Zone L studies to the sites in Zone H will be discussed in the CMS Report for the Zone H sites.*

### Comment:

2. DET reports

The Navy has used the completion of Interim Stabilization Measure (ISM) reports to support their RFI addendum recommendations. The Navy must

- a. Provide a copy of the ISM report to the Department
- b. Incorporate, as deemed appropriate, the necessary information from the ISM report to support the RFI addendum recommendations.

The Department is unable to concur with any recommendations until the Navy provides this information.

### Response:

*The ISM reports will be provided to SCDHEC under separate cover.*

*Information from the ISM reports will be incorporated into the RFI reports as deemed appropriate.*

### Comment:

3. Changes in SWMUs/ AOCs due to an ISM

The Navy has included figures in this RFI addendum report that do not represent the current conditions they claim to represent. An example of this is the area of surface soil at AOC 666 where arsenic exceeds the background calculations. The Charleston DET conducted an ISM following the initial RFI. The figure in the report however represents the conditions prior to the ISM. The referenced report should illustrate pre- and post-ISM conditions of the SWMU/AOC to support the proposed recommendation.

**Response:**

*Comment noted. Figure 2.2.5 presents the excavation area and sample locations within and outside of the excavated area. Figure 2.2.6 shows the surface soil concentrations of arsenic retained for evaluation at AOC 666 from soil borings 666SB008 through 666SB014 remaining in place subsequent to the UST removal (ISM) activities.*

## Specific Comments, per SWMU/AOC

### SWMU 136/AOC 663

#### Navy recommends an NFA

Based on the information provided in the report, the Department is unable to concur with the Navy's recommendation. The following comment(s) support this decision:

#### Comment:

4. Close-out strategies

The Navy has not addressed the close-out strategies (see General comments).

#### Response:

*Please see responses to Comments 1 and 2.*

#### Comment:

5. Implied excavation of fuel lines

As per page 2-1-8, the Navy claims that the Charleston DET removed Building 851's 500-gallon gasoline UST, 500-gallon diesel UST, and associated piping from the site in June 1996. This claim is also graphically depicted by Figure 2.1.6. During the August 7, 2000 field visit, the Department saw no evidence that supported this claim. This leads the Department to question whether a source of contamination remains in place. Please revise the figures to show pre- and post-ISM conditions for the site. Please evaluate the confirmatory sampling results to determine whether the remaining contamination (if any) requires further characterization. Please also address General Comment #3.

#### Response:

*The Rapid Assessment Report for Site 11, Structure 851, Zone H, Charleston Naval Complex prepared by Tetra Tech NUS (dated November 1999) outlines the UST removal activities conducted by the Charleston DET at this site. According to this report, the Charleston DET removed the 500-gallon USTs 851A and 851B and associated piping lines at this site between May 29 and June 5, 1996. The report indicates that the condition of both the USTs was sound, with no evidence of corrosion, pitting or visible holes. Light surface corrosion on the associated piping was also noticed. No petroleum odors were detected during excavation activities.*

*The report indicates that groundwater was encountered in the UST excavation at about 4 ft bgs, but it did not exhibit a sheen to indicate the presence of petroleum hydrocarbons. Soil and groundwater samples were collected from the open excavation and analyzed for BTEX and PAHs.*

*Two soil samples – one under each of the feed pipes for diesel and gasoline — showed levels of PAH compounds slightly above the RBSLs in the confirmatory soil sampling performed by the Navy DET after the UST removals. However, because these soils were not a direct exposure concern, PAHs were also compared with the SSLs and found to be below these values.*

*There were no PAH concentrations above detection limits in the 1998 and 1999 rounds of groundwater sampling conducted subsequent to the Navy DET's ISM. Although the detection limits (5 µg/L) for benzene for the sampling rounds were above the tapwater RBC (0.36 µg/L), they are not above the MCL (5 µg/L) for benzene.*

*The Rapid Assessment detected low levels of naphthalene in the groundwater. Based on a review of the data, naphthalene is the only concern and it appears to be UST-related. Therefore, AOC 663 is considered a candidate for closure under the SC UST program.*

**Comment:**

6. RFI addendum objective

Navy has not met the objective of the RFI addendum. With regard to soil, the objective of the RFI addendum was to further evaluate arsenic, the primary contributors to the human health risk and hazard identified in the RFI.

From the previous RFI, Arsenic levels in subsurface soil did not exceed the subsurface background concentration of 22.5 mg/kg. However, two subsurface soil results from the RFI addendum activities did exceed the subsurface background concentration and the site-specific SSL value. The Navy is required to delineate the extent of arsenic exceedances in subsurface soil. As the Navy has not done this, they have not met the objective of the RFI addendum.

**Response:**

*In an effort to better characterize the levels of arsenic contamination at this site, hand-auger soil samples from the subsurface interval will be collected from two locations southeast of boring locations 136SB012 and 136SB010 and analyzed for arsenic. If the first two samples indicate sufficiently high levels of arsenic, two additional soil samples will be collected from farther south of the first two samples and then analyzed.*

**Comment:**

7. The Navy's argument regarding samples 136SB010 and 136SB012

The Navy, as per the text on page 2.1.28, believes "because (samples 136SB010 and 136SB012) are separated by approximately 130 feet and arsenic is absent in soil boring 136SB011, these two exceedances do not appear related." The Department does not refute that these could be two separate areas of contamination. The Navy is required to delineate the extent of arsenic exceedances in subsurface soil. This may involve sampling west of 136SB012 and in the area of 136SB004 and 136SB010.

**Response:**

*Please see response to Comment 6.*

**Comment:**

8. Possible connection between 136SB004 and 136SB010

Upon review of Figures 2.1.7 and 2.1.8, there appears to be a close proximity between 136SB004 and 136SB010. Thus the Department believes a connection may exist between 136SB004, a surface soil sample that contained arsenic (23.9 mg/kg) greater than the background concentration and 136SB010, the subsurface soil sample that contained arsenic (24.8 mg/kg) greater the background concentration and site-specific SSL. Please address this concern with respect to hot-spot area contamination and the possible connection stated above.

**Response:**

*The exceedances of arsenic cited in the comment (slightly above the UTL of 22.5 mg/kg) are within the range of background values exhibited in Zone H. Please see response to Comment 6.*

**Comment:**

9. Content of the argument supporting the NFA recommendation

The Department understands that collecting additional samples enabled the Navy to compute an Exposure Point Concentration that resulted in revised risk values. The Department believes these revised risk values support the recommendation of NFA, but believe there are other reasons (some are listed in previous sections, some should be included as close-out strategies) to substantiate the NFA recommendation. The Department recommends expanding on the section used to support the NFA recommendation to include additional information. Please consider this comment as it may be applicable to additional SWMUs/AOCs in these documents.

**Response:**

*Comment noted. Please see responses to Comments 1 and 2.*

**AOC 666**

**Navy recommends an NFA**

**Based on the information provided in the report, the Department is unable to concur with the Navy's recommendation. The following comment(s) support this decision:**

**Comment:**

10. Close-out strategies

The Navy has not addressed the close-out strategies (see General comments).

**Response:**

*Please see responses to Comments 1 and 2.*

**Comment:**

11. Objective of the RFI addendum

Navy has not met the objective of the RFI addendum. With regard to soil, the objective of the RFI addendum was to further evaluate arsenic (see Figure 2.2.6), one of the primary contributors to the human health risk and hazard identified in the RFI. However, the Charleston DET conducted an ISM prior to the RFI addendum activities. Thus the DET disturbed area of surface soil where arsenic exceeded background values. Please provide additional information or a proposal to address this concern.

**Response:**

*Samples collected prior to the ISM represent levels of arsenic contamination within the footprint of the excavation performed during the ISM.*

**Comment:**

12. Oil/Water separator

An O/W separator is located adjacent to the footprint of the AOC. The Department requests that the Navy evaluate this O/W separator as part of AOC 666. Please propose the strategies to evaluate the potential release of contamination, evaluate the source of contamination via sampling the contents, and characterize the media that a potential source may have impacted.

**Response:**

*Several soil borings exist around this OWS at AOC 666: 037SB016, 037SB017, (sampled during August 1997 as part of SWMU 37), 666SB004, and 666SB005 (sampled during August 1994). There is no evidence to indicate releases from the OWS.*

*In an effort to evaluate possible downgradient migration of contaminants, one additional well will be installed east of AOC 666 but west of the stormwater sewer line and sampled.*

**Comment:**

13. Incorrect Figures

The Navy should explain the relevance of Figure 2.2.6 with respect to the ISM. The Department believes the figure to represent the area following the initial RFI, prior to the ISM. Please provide figures that show the pre- and post-ISM condition of the site. Please provide a figure that shows the location and results of the confirmatory sampling. Please evaluate whether residual contamination exists that would require further characterization.

**Response:**

*A review of the UST Assessment Report for UST NS45A prepared by the Navy DET following the UST removal activities at AOC 666 indicates that Figure 2.2.6 represents post-ISM conditions. Additionally, this report indicates that post-excavation confirmatory soil samples were collected and analyzed for BTEX and PAHs.*

*Site Map 4 from the UST Assessment Report for UST NS45A shows the locations of soil and groundwater samples collected from the UST excavation.*

## **SWMU 138/AOC 667**

### **Navy Recommends an NFA**

**Based on the information provided in the report, the Department is unable to concur with the Navy's recommendation. The following comment(s) support this decision:**

**Comment:**

14. Close-out strategies

The Navy has not addressed the close-out strategies (see General comments).

**Response:**

*Please see responses to Comments 1 and 2.*

**Comment:**

15. Clarification of risk values, Table 2.3.6

Please provide an explanation as to how the Navy calculated the risk values for 1,1-Dichloroethene and Chloroethane.

**Response:**

*The risk assessment was conducted using the default exposure assumptions for groundwater, which were detailed in the 1996 RFI Report. Table 2.3.5 indicates that 1,1-dichloroethene and chloroethane exceeded RBC-based (no MCLs) criteria and therefore were selected as COPCs. The default exposure assumptions for intake (dose) estimates include for example, an estimate for a child with a body weight of 15 kg consuming about 1 l/day of this water for 6 years of his/her life as a child.*

*Intake = Concentration in water (mg/L) x Ingestion rate (1L/day)/body weight (Kg)*

*Cancer risk = Intake x Cancer slope factor (CSF)*

*Hazard Index = Intake/Reference Dose (RfD)*

*The RfDs and CSFs are provided by EPA. These methods were described in the previous reports (e.g., 1996 RFI). An appendix including these risk calculations will be added to the revised report, as appropriate.*

## **SWMU 17**

### **Navy Recommends a CMS for Surface Soil and Shallow Groundwater**

The Department concurs with this recommendation, but offers the following comment(s):

**Comment:**

16. Close-out strategies

Although the Navy has not requested an NFA for SWMU 17, the Navy should address the close-out strategies as listed in General Comment #3.

**Response:**

*Please see responses to Comments 1 and 2.*

**Comment:**

17. RFI addendum objective

Page 2-5-26 lists the objectives of the RFI addendum report. The Navy does not list subsurface soil contamination as a concern. However, the Navy was thorough in providing figures that show the delineation of contamination for 9 VOCs, 13 SVOCs, and 1 PCB. Please revise page 2-5-26 to include subsurface soil contamination.

**Response:**

*Please refer to the text and tables under Section 2.5.5, page 2-5-85 which clarifies that subsurface soil contamination was investigated.*

## **SWMU 196**

### **Navy recommends a CMS**

The Department concurs with this recommendation, but offers the following comment(s):

#### **Comment:**

##### **18. Summary figures**

The Navy has provided a single figure for each constituent (for example inorganics) that had hits that exceeded background values, SSLs, and/or other applicable screening criteria. The figures show inferred iso-contour lines depicting the general area that exceeded the criteria. The Department requests a single summary figure that shows these inferred iso-contour lines per media. This will draw attention to certain areas, for example sample 196SB004 for antimony, that seem to have consistently exceeded the screening criteria. Please provide similar summary figures for VOCs, SVOCs, pesticides.

#### **Response:**

*Figures will be revised to adequately present information as appropriate. Comment to be further discussed with SCDHEC in future Zone H scoping meetings.*

#### **Comment:**

##### **19. Use of diffusion sampling results**

The text states on p. 2-4-173 that "diffusion samples were used to sample the four temporary wells for VOCs to determine if the diffusion sampler technique would be feasible for future sampling." Please state Navy's determination regarding this technique. (Section 2.4.2.6 does not clarify this).

#### **Response:**

*Comment noted. The diffuser sampling is considered a screening tool, not a substitute for conventional methods of sampling. The diffusion sampling method will be further evaluated and the text in the RFI will be updated.*

#### **Comment:**

##### **20. Use of conventional sampling results over the diffusion sampling results**

Please justify the decision to use the results from the conventional sampling technique as opposed to the results from the diffusion sampling technique. The justification should include information other than the fact that the two methods produced different results, which would be expected. The Navy does not provide an evaluation of the inaccuracy of the technique to support its decision. The diffusion sampling method showed higher results for chlorobenzene and carbon disulfide than did the conventional sampling technique. From the information provided, the Department can only determine that the Navy did not want to evaluate risk values based on the higher results. The Navy should recalculate the risk using the results from the diffusion sampling technique.

#### **Response:**

*The diffuser sampling is considered a screening tool, not a substitute for conventional methods of sampling, and is not used as a definitive sampling method of sufficient data quality as a basis for RFI characterization and risk assessment use.*

**Comment:**

21. Pathway validity, p. 2-4-333

Please explain the reasoning/criteria that makes a constituent's pathway valid or invalid, with respect to Table 2.4.40.

**Response:**

*A pathway is considered valid or invalid, based on the detection of a constituent above MCL. In the absence of an MCL, the detection is compared to an RBC. When multiple sampling events are available, and the later events no longer detect a chemical that was initially detected, then the pathway is considered invalid. This is explained in the bulleted list on pages 2-4-333 through 2-4-338. Further clarification will be added as a footnote to the tables in the revised report.*

**Comment:**

22. Lack of soil sample information east of the site

Along the eastern portion of the site, the Navy (p. 2-4-136) has not determined the extent of inorganics in surface soil that exceed the screening criteria. For example, the Navy has determined a boundary along the north, west, and south of SWMU 196 for the antimony that exceeded the screening criteria. The text states "because Shipyard Creek is to the east, no soil borings could be taken to define surface soil contamination." The Department does not agree with this argument for the following reasons: 1) the Navy was successful in installing 4 temporary wells in the marsh. The Navy could have collected soil samples while installing the wells. Those results could have been used to determine the extent of surface soil that exceeded the screening criteria. 2) The site visit showed a vertical slope between the eastern portion of the site and the marsh, but the Department did not believe the conditions would prevent collecting hand-augered surface soil samples.

The Navy should collect these soil/sediment samples to 1) meet the objective of the RFI which is to delineate the nature and extent of contamination (which at this stage are those constituents that exceed the screening criteria) and 2) support the ecological risk assessment requirements.

**Response:**

*Figure 2.4.27 indicates that 4 of the 17 soil borings installed at SWMU 196 were located east of Building 1838. Table 2.4.17 (pages 2-4-72 and 2-4-73) indicate that soil samples were collected from both the upper interval (surface soil) and lower interval (subsurface soil) for these four locations.*

*Additionally, five sediment samples were collected in the marsh area adjacent to Shipyard Creek during 1994 as part of the SWMU 9 investigation; three more samples were collected in the SWMU 196 area during 1999.*

**Comment:**

23. Lack of sediment information east of the site

Please review the above comment as it may also apply to other media, such as sediment and subsurface soil.

**Response:**

*Please see response to Comment 22.*

**Comment:**

**24. Concrete Pads**

Figure 2.4.7 shows that concrete pads are located across Shipyard Creek between SWMU 196 and SWMU 121p. The Department believes that past operations conducted on these pads may have contributed to area contamination. The Department requests that the Navy evaluate and provide information about the concrete pads, in addition to proposing a path forward for the concrete pads with respect to the Zone H RFI report.

**Response:**

*The concrete pads will be further evaluated. If this evaluation indicates a need for investigation, the scope of the investigation will be discussed with SCDHEC.*

*Locations of chlorobenzene detections in groundwater at SWMU 121 are hydraulically upgradient from the concrete pads and hydraulically unrelated to SWMU 196. Therefore, there is no relationship of groundwater between those two SWMUs.*

## General Comments

### Comment:

1. The quality of information provided on maps and figures is a huge improvement.

### Response:

*Comment noted.*

### Comment:

2. The Zone H document, as submitted for SWMU136/AOC 663, and AOC 666, does not include the recommendation/conclusion information from the rapid assessments completed for the UST sites. This information is crucial where tanks are an issue. The additional data would have been a tremendous help for the Department in making decisions and should have been included in this document.

### Response:

*The Rapid Assessment Reports for UST sites in Zone H will be submitted to SCDHEC under separate cover to facilitate review. Information from the Rapid Assessment Reports will be incorporated into the RFI where appropriate.*

### Comment:

3. This document references a South Carolina Risk Based Screening Level for Groundwater in several sections. The Department does not recognize any tables for groundwater except the MCL and Tap Water RBC for cleanup at CNC in RCRA. The Navy has yet to incorporate the correct terminology into all of the reports, rapid assessments, and other documents that discuss groundwater issues. It should be noted that the values noted in the SCRBSL are different from the values found in the MCLs and RBCs. Because of this fact the Department considers this document to be incomplete and cannot make decisions based on the information provided. Please revise all pertinent sections.

### Response:

*References to SCDHEC Risk-Based Screening Levels (SCRBSLs) were provided in the text describing the Rapid Assessment Report for UST 851 in the AOC 663/SWMU 136 Area. The Rapid Assessment conducted by Tetra Tech NUS as part of the SCDHEC's Rapid Assessment Plan compared the SCRBSLs during the soil and groundwater screening effort.*

*A review of the RFI Report Addendum did not indicate instances in which SCRBSLs were used to screen groundwater contaminant concentrations or to make risk assessment decisions for the RFI. The Navy will continue to use MCLs and Tap Water risk-based concentrations (RBCs) in the RCRA program, as they have done in the past. The RFI updates will include verification that the RBCs or MCLs were met by the confirmation results of the Rapid Assessment effort.*

### Comment:

4. This document does not evaluate the sites as they pertain to Zone L issues associated with SWMU 136/AOC 663, AOC 666, SWMU 138/AOC 667. Therefore this document is incomplete.

### Response:

*The relationship of Zone L studies to Zone H sites will be evaluated once an evaluation approach is accepted by SCDHEC. At this time there appears to be no relationship between these sites and AOC 504. The RFI Work Plan Addendum will include a discussion of the relationship, if any.*

**Comment:**

5. This document does not evaluate the sites as they pertain to Zone J issues associated with SWMU 136/AOC 663, AOC 666, SWMU 138/AOC 667. Therefore, this document is incomplete.

**Response:**

*EnSafe/Allen & Hoshall is currently evaluating Zone J. Those findings will be incorporated into the updates to the RFI. The potential migration of contaminated groundwater and sediment to surface water is being evaluated to address the potential impact to Zone J. The RFI Work Plan Addendum will include a discussion of this relationship, if any.*

**Comment:**

6. If this document is to be a stand-alone-document it is missing the site geology and hydrogeology sections. Without this information the Department cannot determine the K value, porosity, infiltration rate, and other geologic/hydrogeologic information needed to make proper site decisions. See comments 10 and 11.

**Response:**

*Appropriate site geology and background information will be incorporated into the text of the updated RFI.*

**Comment:**

7. This document does not define the nature and extent of contamination for indoor air in occupied buildings, the status of OWS, and inorganics in groundwater.

**Response:**

*Comment noted.*

*The issue of oil/water separators (OWSs) is being addressed. The locations of the OWSs have been incorporated into the GIS.*

*If volatile organic compounds (VOCs) are found in the subsurface soil or groundwater, potential volatilization into buildings along the contaminant migration path will be addressed. Inorganic chemicals in groundwater will be addressed. The Johnson-Ettinger air migration model will be applied, and where the model shows a potential risk, ambient air samples will be collected for analysis. Inorganics in groundwater will be addressed further if they are detected above screening criteria.*

**Comment:**

8. This document compares risk-based levels versus risk-based levels for sites that the Navy is recommending a NFA decision. The Department cannot grant a NFA for these areas. The Department also requires the comparison of concentration levels to make risk management decisions. Please revise to include all pertinent data.

**Response:**

*To be discussed further at a future scoping meeting. The RBCs are protective of human health under conservative exposure conditions. If site concentrations are lower than the RBCs, NFA is requested because site does not pose human health impacts.*

**Comment:**

9. The section on SWMU 17 provides adequate map production for the CNC project to date for the Navy. The geologic figures and maps are of high quality. The text is also well written in that it lists and explains the reasons for certain data interpretation and analytical results.

**Response:**

*Comment noted.*

**Specific Comments**

**Comment:**

10. **Page 4, Executive Summary, lines 11-14, 15-19,**

The text uses such terms as “nominally, essentially equal, slightly exceeded”, to levels. Please provide the actual levels when making such references.

**Response:**

*Agreed.*

**Comment:**

11. **Page 1-6, Table 1.1, Zone H AOC and SWMU Summary**

This table shows that SWMU 196, 136/AOC 663, 138/AOC667, and AOC 666 have not previously been investigated. The text indicates otherwise. Please revise the document to clear up this discrepancy

**Response:**

*The text in Table 1.1 will be updated.*

**Comment:**

12. **Page 2-1, Section 2.0, Site Specific Evaluations, lines 6-13**

This sections states that discussions for the supplemental RFI sites include detailed summaries containing: site history and previous investigations, supplemental RFI sampling, revised risk evaluations, and conclusions and recommendations. This is contradictory to Table 1.1, which shows areas that have not been investigated.

Furthermore the section describing previous investigations is sufficiently lacking of needed information from the previous work. See comment 6.

**Response:**

*Appropriate information on site geology and background will be incorporated into this section.*

**Comment:**

Lines 14-17

This paragraph references figure 2.1 which is supposed to show the AOCs and SWMUs that were investigated in the RFI Addendum. The copy of the document that the Hydrogeology Department received did not contain this figure. Please provide this figure in question.

**Response:**

*A copy of Figure 2.1 from this document will be provided to the Hydrogeology Department of SCDHEC.*

**SMWU 136**

**Comment:**

**13. Page 2-1-2, Section 2.1.2, Previous Investigations**

This section contradicts the Table 1.1 found in Section 1 of this document. Please revise Table 1.1.

**Response:**

*Agreed. Please see response to Comment 11.*

**Comment:**

**14. Page 2-1-25, UST Rapid Assessment –Structure 851, second paragraph**

The text states that naphthalene was the only groundwater COC to exceed the SCDHEC risk based screening level (RBSL). All groundwater in SC is classified as “GB” which is suitable for drinking. The Navy must show that the MCL has not been exceeded for any groundwater sample. If no MCL exists then the Tap Water RBC level should be used. See comment # 3. Of note, the MCL is not listed for naphthalene, and the April 1999 table Tap Water RBC is 6.5 ug/L.

The rapid assessment found the naphthalene in well NBCH663-001 at 29.9ug/L from the March 17, 1999 sampling event. This suggests that the Navy should add this site to the groundwater monitoring plan for the base. The team must decide to continue with this site or, since contamination was found from the Rapid Assessment, be transferred to the UST program.

**Response:**

*Please see response to Comment 3.*

*Based on a review of the data, naphthalene is the only concern, and it appears to be UST- related. Therefore, AOC 663 is considered a candidate for closure under the SC UST program.*

**Comment:**

**15. Page 2-1-27, Table 2.1.6, Soil Data for Arsenic at SWMU 136/AOC 663**

This table shows that two surface soil and several sub-surface soil samples were not taken. Please explain the reason why these soil samples were not taken.

**Response:**

*Section 4.17.3 of the Final RFI Report for Zone H, Rev. 0, dated July 5, 1996, indicates that several subsurface soil samples could not be collected due to the presence of shallow groundwater and underlying concrete. This information will be added to the revised report.*

**Comment:**

**16. Page 2-1-28, Section 2.1.3.1, Soil Sampling, lines 18-23**

This text states that certain assumptions were made for risk management decisions, but is not clear if this was a decision the entire team made. Please clarify.

**Response:**

*Comment needs further clarification, as there was no mention of a risk management decision in the text referenced in the comment.*

**Comment:**

**17. Page 2-1-33, Section 2.1.3.2, Groundwater Sampling, lines 9-10**

The text states that the Navy has had two rounds of sampling showing ND for benzene. The Department will not decide for no further action at this well unless a third ND is found.

**Response:**

*Agreed. Well NBCH663002 will be re-sampled during the proposed groundwater monitoring for wells at this site to verify benzene concentrations (see response to Comment 14).*

**Comment:**

**18. Page 2-1-33, Section 2.1.3.2, Groundwater Sampling, Benzene in Groundwater, lines 15-17**

The text states that benzene was not detected in the soil. However in the Underground Storage Tank section there is no mention of soil samples taken from the soil that was used for backfill. Please revise.

**Response:**

*According to the Rapid Assessment Report, Site 1, Structure 851, prepared by Tetra Tech NUS, dated November 1999, the Charleston DET conducted removals of USTs 851A and 851B during May and June 1996.*

*There is no indication in the Rapid Assessment Report that samples were collected from the soils returned to the excavation as backfill.*

*According to the UST Assessment Report prepared by the Charleston DET, eight soil samples were collected within the footprint of the excavated area subsequent to the UST removals and analyzed during June 1996 for BTEX and PAHs. Thirty-three soil borings were completed as part of the Rapid Assessment effort and samples were collected from the soil and soil vapor for BTEX and diesel-range organics. Some of these soil borings were located in the area of the UST excavation. A review of the analytical results for these samples included in the Rapid Assessment Report indicate that Benzene was not present in these soil samples above the RBCs.*

**Comment:**

**19. Page 2-1-33, Section 2.1.3.2, BEHP in Groundwater**

This section states that some wells adjacent to SWMU 136/AOC 663 have been found to contain BEHP. The text also states that wells associated with SWMU 136/AOC 663 have been found to show BEHP hits above MCL. The Navy must address the issue of contaminants in groundwater above MCL.

**Response:**

*The presence of certain chemicals in the analytical data indicates a need for data quality evaluation that compares the laboratory results with the appropriate QA/QC parameters. As noted in pages 5-16 and 5-17 of RAGS Part A of EPA Guidance (see Attachment 1), phthalate esters (e.g., BEHP) are common laboratory contaminants that are considered to be contaminants in the site sample only when their concentrations are ten times higher than the maximum amount detected in any blank.*

*Table 2.1.12 presented the BEHP data for samples from the site and different blank samples. BEHP was detected in blanks during every sampling event, ranging in concentration between 0.8 µg/L to 130 µg/L, indicating that in this example, only detections above 1,300 µg/L (second sampling event in 1995) should be considered true contamination. The maximum detected blank contamination was 91 µg/L for the third sampling event; therefore, unless the site samples exceed 910 µg/L, it is not considered present in site samples (i.e., not site related), as per EPA Guidance. The maximum detected BEHP was at 530 µg/L from the third sampling event; thus, there is no BEHP at the site.*

**Comment:**

**20. Page 2-1-43, Section 2.1.5, COC Refinement, BEHP in Zone H Primary and Blank Samples**

This section explains the purpose of table 2.1.12, which is an attempt to explain the BEHP "hits" for the Zone H wells. The table does offer good information about BEHP found at other sites besides SWMU 136/AOC 663.

**Response:**

*Please refer to response to Comment 19. This explanation will be used to update the revised report.*

**Comment:**

**21. Page 2-1-62, Event 3, lines 1-3**

The text states that well 178GW00103 had a detection of 290ug/L of BEHP and well 663GW00203 was validated to non-detect due to the 130ug/L of BEHP found in blank 009DW00703. However, in table 2.1.12, blank 009DW00703 for the third round, is shown to have only a 22ug/L hit of BEHP. Please explain and revise to clear up this discrepancy.

**Response:**

*Please refer to response to Comment 19. This explanation will be used to update the report.*

**Comment:**

**22.. Page 2-1-63, Recommendations/Conclusions**

The recommendation for a NFA does not concur with the Rapid Assessment's conclusion. The Department does not agree with the recommendation of NFA for this site. The Navy needs to address all instances where the MCL/Tap Water RBC has been exceeded.

In addition the Navy must install additional wells downgradient to complete site characterization of groundwater. The present wells are up and side gradient.

**Response:**

*Please see response to Comment 14.*

## **AOC 666**

### **Comment:**

- 23. Page 2-2-2, Section 2.2.2, Previous Investigative Activities**  
See comment # 12.

### **Response:**

*Agreed. Appropriate information on site geology and background will be incorporated into the report.*

### **Comment:**

- 24. Page 2-2-23, Section 2.2.3.2, VOCs in Groundwater**  
This paragraph states that the source of the vinyl chloride and chloromethane is not known. The project team has speculated that the source may have been a leaky joint on the drain from the OWS. The Navy must sample the contents of the OWS to help to determine the source of vinyl chloride and chloromethane.

The Department requests the Navy to provide mechanical drawings of the current piping system of the OWS still in place.

### **Response:**

*The relationship of OWS to AOC/SWMUs is currently being evaluated by the project team. Six copies of the mechanical drawings of the OWS were provided to SCDHEC during the BCT Meeting held in December 2000.*

### **Comment:**

- 25. Page 2-2-35, Conclusions/Recommendations**  
The Department does not agree with the recommendation of NFA. The Navy must address the OWS, and other site close out issues before this site can move forward. In addition, the Navy may need to install additional wells NE of well 666001 to ensure that no contaminants have migrated into the sewer ditch line. The present wells at AOC 666 do not properly characterize groundwater conditions southeast of the former UST NS45.

### **Response:**

*An additional monitoring well is likely to be installed downgradient of the site to evaluate groundwater contamination downgradient of AOC 666. This issue will be further discussed during future Zone H scoping meetings.*

## **SWMU 138/AOC 667**

### **Comment:**

- 26. Page 2-3-1, Section 2.3.1 Site description and Conceptual Model, lines 20-23**  
The text states that the soil and groundwater were sampled to determine if releases associated with petroleum product storage and dispensing at the storage tank. The text is not clear if there were any samples conducted on the contents of the OWS or the surrounding areas to determine if there had been any releases associated with the OWS. Please explain/clarify.

### **Response:**

*There is no indication that the contents of the OWS were sampled. Four soil borings (667SB001 through 667SB004) surrounding the OWS were completed during the initial RFI stage. One*

groundwater monitoring well, 667002, is located adjacent to the OWS. A DPT groundwater sample (location 037GP033) collected from SWMU 37 (Zone L) investigation effort is also located northeast of the OWS.

**Comment:**

**27. Page 2-3-9, Section 2.3.2, SWMU 138/AOC 667 Site History, lines 7-12**

The text states that a pathway for groundwater was not included in the human health risk assessment because no COPCs were identified in the screening process. There were constituents found above the Tap Water RBC so the risk evaluation should have been formally conducted. Future risk management decisions can be made for carrying the COPCs into the CMS. Please revise where needed.

**Response:**

*As explained in subsequent paragraphs on pages 2-3-9 and 2-3-10, chloroethane was detected above the RBC. Also, based on this comment and EPA comments on risk assessment for these sites, a natural attenuation justification will be provided, which will address potential risks from groundwater use at these sites at the present time and in the future.*

**Comment:**

**28. Page 2-3-23, Section 2.3.5, COC Refinement**

This section briefly mentions the process of hydrolysis and references a generalized flowchart of organic degradation. The Department requires more detailed data to support the site-specific hydrolysis process to determine the path forward.

**Response:**

*Additional information will be provided as part of the natural attenuation data interpretation for groundwater using site-specific data for AOC 667/ SWMU 138.*

**Comment:**

**29. Page 2-3-23, Section 2.3.6, Conclusions**

The Department does not agree with the recommendation of NFA for this site. The Navy must provide more detailed information on the stated natural degradation process.

The Navy may also need to install additional wells to better characterize the groundwater downgradient and on the northeast side of the sewer line.

**Response:**

*An additional monitoring well will be installed downgradient. To be discussed further in future Zone H scoping meetings.*

## **SWMU 196**

### **Comment:**

**30. Page 2-4-2, Section 2.4, Site history, lines 18-20.**

The text states that chlorobenzene, methylene chloride, and 1,2-dichlorobenzene were detected above screening values in groundwater. The Department uses the MCL or Tap Water RBC table when referencing groundwater contamination. Please clarify which screening values were used for this comparison.

### **Response:**

*The SWMU 196 RFI report indicates that RBCs and MCLs were used in the evaluation of contaminants of concern. Please see Section 2.4.4, pages 2-4-44 and 2-4-55 to 2-4-57.*

### **Comment:**

**31. Page 2-4-32, Section 2.4.1, Physical Setting and Geology, lines 18-19**

The text states that Shipyard Creek (surface water body) is the discharge point for groundwater. The Navy must act immediately to gain control of groundwater flow and/or initiate remediation at this site.

### **Response:**

*Comment noted. Efforts are under way to address the groundwater discharge from SWMU 196 to Shipyard Creek.*

### **Comment:**

**32. Section 2.4, Physical Setting and Geology**

This section does not include any geological cross sections to help describe the site specific geology/hydrogeology. Please revise section to include all pertinent maps and figures.

### **Response:**

*Section 2.4 will be expanded to include additional information on site-specific geology and hydrogeology. Additionally, Appendix A of the SWMU 196 Interim Measure Work Plan submitted to SCDHEC during November 2000 describes the stratigraphy and site geological profile.*

### **Comment:**

**33. Page 2-4-36, Section 2.4.2.5, Temporary Monitoring Well Installation, lines 22-23**

The text states that 4 wells were installed. However a search of well approvals did not turn up an approval letter issued from the department. If the Navy did receive such approval, please provide a copy of the letter.

### **Response:**

*SCDHEC issued a permit (No. HW-99-033) for these wells.*

### **Comment:**

**34. Page 2-4-37, Section 2.4.2.5, Temporary Monitoring Well Installation, lines 9-10**

The text states that when the wells are abandoned, the boreholes will be filled with bentonite. This is a direct violation of the SC well Regulations. See SC Well Regulation 61-71.10.B.(5), which states that boreholes must be filled with bentonite grout. The Department would like to discuss this issue for further necessary action.

**Response:**

*The temporary wells were abandoned by pulling the casing and grouting the borehole from the bottom of the borehole to the ground surface using a bentonite slurry.*

**Comment:**

**35. Page 2-4-168, Section 2.4.9 Groundwater Sampling and Analysis, lines 11-12**

The text states that after sampling, the temporary well was abandoned and the borehole was filled with bentonite. See comment # 34.

**Response:**

*The temporary wells were abandoned by pulling the casing and grouting the borehole from the bottom of the borehole to the ground surface using a bentonite slurry.*

**Comment:**

**36. Page 2-4-173, Section 2.4.9 Groundwater Sampling and Analysis, lines 5-8**

The text states that in May 1999, the four temporary wells were installed in the marsh adjacent to the to Shipyard Creek and sampled. Wells 196DF01, 02, 03, 04 are identified in Table 2.4.22 as being temporary wells sampled in June 1999. Please provide the well ID numbers to verify their locations on a site-specific map.

**Response:**

*Please refer to Figure 2.4.9 Site Sample Locations for locations of these temporary monitoring wells.*

**Comment:**

**Lines 8-11**

This portion of the text states that a comparison of sampling techniques was made but does not provide the conclusion of that experiment. The reference made to Section 2.4.2.6 does not provide that explanation. Please provide the results and conclusions of the conventional and diffusion sampling techniques and determine if which method (or both) is recommended for future sampling.

**Response:**

*The conclusions and observations will be expanded appropriately. Additional comparison of the diffuser sampling and conventional sampling results are provided in Table 2.4.23, page 2-4-177 and page 2-4-178.*

**Comment:**

**37. All figures, Section 2.4.10**

The figures showing groundwater contours and contaminants provided in this section are an example of excellent work for interpretation of groundwater nature and extent. However, some figures for soil and groundwater do show large areas of data gaps. The Navy should make plans to initiate further delineation of contaminants to facilitate quick groundwater control and remediation.

**Response:**

*Comment noted.*

**Comment:**

**38. Page 2-4-177, Section 2.4.10, Nature and Extent of Contamination in Groundwater, lines 17-19**

The text states that the results from the conventional method of diffusion sampling will be used for nature and extent evaluation, fate and transport assessment, human health risk assessment, and ecological risk assessment. Please explain why all diffusion sample results were not used for the nature and extent evaluation, fate and transport assessment, human health risk assessment, and ecological risk assessment.

**Response:**

*The diffuser sampling is used only as a screening tool and not as a definitive basis for RFI work. The diffuser sampling is not being considered as a substitute for conventional methods of sampling. It is a relatively new technique that was implemented at this site (for the first time) to cross-check the results between it and conventional sampling methods. A similar explanation will be added to the report.*

**Comment:**

**39. Page 2-4-194, Section 2.4.10, Nature and Extent of Contamination in Groundwater, lines 3-4**

The text states that acetone was the only VOC found in deep groundwater and did not exceed the tap water RBCs. While this fact may be true, acetone is not naturally occurring in this area. The Navy should offer some explanation as to how/why acetone was found in the deep groundwater.

**Response:**

*The data validation report for the data set on SWMU 196 groundwater indicated that acetone did not meet the validation qualifier criteria, therefore most of the non-detects were rejected. The detects at 6 µg/L and 7 µg/L reported in two samples are near the detection limit of 5 µg/L. Similar to BEHP (see response to Comment 19), acetone is a common lab contaminant. Any detection in blanks above detection limits will likely remove acetone as site-related. Therefore, because it is not related to the site, and reported detections were very low, acetone was not further considered. A similar explanation will be provided in the report.*

**Comment:**

**40. Page 2-4-336, Section 2.4.15.2 Groundwater Migration and Groundwater-to-Surface Water Cross-Media Transport, Deep Groundwater, lines 1-5**

The text states that the groundwater pathway has merit because of the close proximity of site wells GEL015, 009020, and 009021 to Shipyard Creek and groundwater flows toward the Creek. Because the wells are down gradient from well 009022, any upgrade exceedances that are not also exceedances in the three downgradient wells are not considered significant. The Department reminds the Navy that any exceedance over MCL or Tap Water RBC and would warrant appropriate attention to properly address regardless of the location of the well.

**Response:**

*Agree with the comment that any groundwater detections during site characterization will be compared to MCLs and RBCs. For the site management decisions, since SWMU 196 is located immediately adjacent to Shipyard Creek, release to the creek is the likely migration/exposure pathway. Therefore, criteria appropriate to protect against such releases will be evaluated. Since Shipyard Creek*

*is a brackish/saline water source, criteria appropriate to protect aquatic organisms in salt water should be considered for such management considerations.*

**Comment:**

**41. Page Section 2.4.18, Conclusions and Recommendations**

This section recommends a CMS for surface soil and shallow groundwater. The Department conditionally agrees with this recommendation, but also reminds the Navy that the RFI Report for SWMU 196 is not complete. The Navy must complete the nature and extent and site characterization before the RFI can be considered as complete. Please revise current RFI information to include all pertinent information.

Previous investigations have found chlorobenzene at SWMU 9 and SWMU 121. The Navy may want to look at this area in the bigger picture to help with source characterization.

**Response:**

*Comment noted. The RFI provided adequate information on the nature of contamination in soil and sediments adjoining SWMU 196. An Interim Measure Work Plan has been prepared to conduct additional delineation of contaminants in the groundwater. The findings of this Interim Measure will be incorporated into the RFI. This SWMU 196 Interim Measure Work Plan (Rev. 1) document has been submitted to SCDHEC and USEPA for review during November 2000.*

**SWMU 17**

**Comment:**

**42. Page 2-5-7, Section 2.5.1 Site History/Conceptual Model, lines 5-6**

This text states that it is not known if PCB contaminated soils have been removed. If this statement is still true then the nature and extent for the present time is not complete. The sampling to date should be an indication as to whether the contamination is still in place or not. Please revise to reflect the present conditions.

**Response:**

*This sentence will be removed in the revised report, as it relates to a summary of historical reports and does not speak for data available for the site. Several samples (n=17) were collected and analyzed for PCBs (e.g., see Table 2.5.12 and 2.5.13) from 1994 to 2000 in this area. Several soil borings were introduced as part of investigations under SWMU 37 (Zone L) and SWMU 17 in the vicinity of the transformer vault TV1.*

*A review of the Draft Zone L RFI Report, Section 10.8.1.3, page 10.8.18, lines 21-24 indicate that soil borings completed as part of SWMU 37 investigations detected concentrations of Aroclor-1260 in surface soils at borings 037SB010, -12, -13, -14 and -17 exceeding the RBC (December 1998).*

*A review of Figure 2.5.31 of the Zone H RFI Addendum Report, Vol. II, indicates that four subsurface soil sample locations from the SWMU 37 investigation effort (037SB011, -12, -13 and -14) indicate Aroclor-1260 concentrations greater than the RBC and Soil Screening Level (SSL).*

*A risk assessment was conducted to determine the potential human health impacts from future exposures to PCBs (Section 2.5.7).*

*An evaluation is currently being made to decide whether additional soil borings are needed to better delineate site contaminants, and these decisions will be incorporated into the CMS Work Plan for SWMU 17.*

**Comment:**

**43. Page 2-5-92, Section 2.5.5.1 Subsurface soil, lines 22-23**

The text states that some locations were not sampled due to the fact that there were no obvious sign of contamination such as odor or staining. The Department does not recognize this as acceptable and points out that a data gap may exist at these locations where visual acuity deselected samples for analysis. Please provide a list of all sample locations that were not completed because of visual observations.

**Response:**

*A review of the RFI showed that there were only two locations where soil was not sampled based on visual observations. These were soil boring locations 017SWB02 and 017SWT02. Consideration will be made in the CMS Work Plan to install additional soil borings at these locations to perform sampling.*

**Comment:**

**44. Page 2-5-105, lines 12-24**

The statement is made that no "obvious signs of contamination" were found, and the sample was not analyzed for VOCs. See comment above (43)

**Response:**

*Please see response to comment 43.*

**Comment:**

**45. Page 2-5-106, lines 10-11, 19-20**

See comment 43.

**Response:**

*Please see response to comment 43.*

**Comment:**

**46. Page 2-5-115, lines 1-5, 13-14, 23-24**

See comment 43.

**Response:**

*Please see response to comment 43.*

**Comment:**

**47. Page 2-5-116, lines 11-12**

See comment 43.

**Response:**

*Please see response to comment 43.*

**Comment:**

**48. Page 2-5-128, lines 17-18**

See comment 43.

**Response:**

*Please see response to comment 43.*

**Comment:**

**49. Page 2-5-226, Section 2.5.5.2 Volatile Organic Compounds in Groundwater, lines 18-21**

The text states that benzene contamination has been delineated in all directions by no-detects. However, Figure 2.5.33 shows open-ended contours for benzene west of 017003. Please propose a plan to correct this data gap.

**Response:**

*The open-ended contours resulted from the lack of data on the southwest side of the inferred area above the RBC. This was due to the absence of wells 017O01, 017O02, 017B06, 017B08, and 017B09 during the July 1998 sampling event. These wells were installed later and sampled during the July 1999 sampling event. Figure 2.5.36 shows that the inferred area contour was closed due to the availability of data from the additional wells installed in 1999 and sampled during the December 1999 - January 2000 event.*

**Comment:**

**50. Page 2-5-242, Volatile Organic Compounds in Groundwater, lines 1-7**

The text states that chlorobenzene plume was delineated in all directions by non-detects at 017W02 and 107W01. However the figure 2.5.35 shows open-ended contour lines.

This suggests data gaps exist. Please revise the figure or propose a plan to correct this data gap.

**Response:**

*The open-ended contours resulted from the lack of data on the southwest side of the inferred area above the RBC. This was due to the absence of wells 017O01, 017O02, 017B08, and 017B09 during the July 1998 sampling event. These wells were installed later and sampled during the July 1999 sampling event. Figure 2.5.36 shows that the inferred area contour was closed due to the availability of data from the additional wells installed in 1999 and sampled during the December 1999 - January 2000 event.*

**Comment:**

**51. Figure 2.5.38**

The figure shows methylene chloride above MCLs and RBCs with open-ended contour lines. Please propose a plan to correct data gap and/or address this exceedance.

**Response:**

*Methylene chloride has been detected in three wells at SWMU 17 – 017002, 017004 and 017009.*

*017002: During the September 1995 event, methylene chloride was detected in well 017002 at 240 µg/l and this concentration was qualified with a J value. Earlier detections of methylene chloride at this well during October 1994 and March 1995 both showed non-detects (U qualifiers) at 250 µg/l and 500 µg/l respectively. Three later rounds of groundwater sampling showed non-detects at this well. Five out of six sampling rounds have showed non-detects for methylene chloride at this well. The single occurrence of methylene chloride during the September 1995 round is considered an anomaly.*

017004: During the September 1995 event, methylene chloride was detected in well 017004 at 16 µg/l and this concentration was qualified with a J value. Earlier detections of methylene chloride at this well during October 1994 and March 1995 both showed non-detects (U qualifiers) at 250 µg/l and 500 µg/l respectively. Three later rounds of groundwater sampling showed non-detects at this well. Five out of six sampling rounds have showed non-detects for methylene chloride at this well. The single occurrence of methylene chloride during the September 1995 round is considered an anomaly.

017009: During the August 1998 event, methylene chloride was detected at 26 µg/l and this concentration was qualified with a J value. There was a non-detect during the next event in January 2000.

All other wells at SWMU 17 sampled between 1994 and January 2000 have shown non-detects for methylene chloride, and it is not considered a contaminant of concern at SWMU 17.

**Comment:**

**52. Figure 2.5.39**

See comment # 50.

**Response:**

Please see response to comment 51.

**Comment:**

**53. Page 2-5-253, Section 2.5.5.2, Semivolatile Organic Compounds in Groundwater, lines 5-11**

The text states that it is believed that the occurrence of benzidine is a one time anomalous detection. This detection is 5 orders of magnitude above the RBC and will not be ignored as anomalous hit. The Navy must properly address this issue. Please propose a plan to address this exceedance and correct the data gap shown in figure 2.5.40.

**Response:**

Three subsequent rounds of sampling have shown non-detects for benzidine at 017005. A review of detection limits for benzidine in 299 samples on a basewide basis showed that the average value qualified as non-detect (with a U qualifier) was 57 µg/l. The single detection of benzidine at 56 µg/l is considered a laboratory anomaly. The analytical data validation reports is being checked to verify this consideration. Should this verification be inconclusive, an additional sample will be collected from this well and sampled for SVOCs.

**Comment:**

**54. Page 2-5-254, Semivolatile Organic Compounds in Groundwater, lines 17-21**

The text states that dibenzofuran remains undefined to the northwest and southwest, and is shown on figure 2.5.45. See comment #50.

**Response:**

Figure 2.5.45 will be corrected to close the contour.

**Comment:**

**55. Figure 2.5.49**

See comment #50.

**Response:**

*Figure 2.5.49 will be corrected to close the contour.*

**Comment:**

**56. Page 2-5-282, Section 2.5.5.2, Semivolatile Organic Compounds in Groundwater, lines 10-26**

The text states that 1,2,4-trichlorobenzene was found to exceed the MCLs and RBCs in all pre-1999 samples, and if 017002 had been sampled in 1999 an expected MCL exceedance would have made it possible to close the contaminant contour lines. This text and the figure 2.5.5.1 indicate a data gap exists. Please propose a plan to correct data gap.

**Response:**

*Well 017002 will be sampled and the contours for Figure 2.5.57 will be redrawn.*

**Comment:**

**57. Figure 2.5.51**

See comment #50.

**Response:**

*Figure 2.5.51 will be corrected to close the contour.*

**Comment:**

**58. Figure 2.5.55**

This figure indicates open-ended contour lines for naphthalene west of 017B08. This suggests a data gap in this area. Please propose a plan to correct data gap.

**Response:**

*Figure 2.5.55 will be corrected to close the contour.*

**Comment:**

**59. Figure 2.5.55**

This figure indicates open-ended contour lines for naphthalene west of 017B08. This suggests a data gap in this area. Please propose a plan to correct data gap.

**Response:**

*Please see response to comment 58.*

**Comment:**

**60. Figure 2.5.61**

See comment #50.

**Response:**

*Figure 2.5.61 will be corrected to close the contours.*

**Comment:**

**61. Page 2-5-413, Section 2.5.8, Groundwater, lines 11-15**

The text states that benzidine should not be considered as a COC for SWMU 17. The detection of benzidine was so substantial that it should be addressed in some fashion.

**Response:**

*Agreed. Three rounds of sampling following the reported detection of benzidine at well 017005 have shown non-detects for benzidine. A review of detection limits for benzidine in 299 samples on a basewide basis showed that the average value qualified as non-detect (with a U qualifier) was 57 µg/l. The single detection of benzidine at 56 µg/l is considered a laboratory anomaly. The analytical data validation reports is being checked to verify this consideration. Should this verification be inconclusive, an additional sample will be collected from this well and sampled for SVOCs.*

**Comment:**

**62. Page 2-5-415, Section 2.5.9, Conclusions and recommendations, lines 21-23**

The text refers to RBCs without mention of MCLs. See comment # 60.

**Response:**

*Groundwater contamination levels were compared to both RBCs and MCLs during the 1999 RFI Addendum investigations. Please see Section 2.5.4 of the RFI Addendum Report. The report will be revised to incorporate the comments.*

**Comment:**

**63. Page 2-5-421, Section 2.5.9, Conclusions and recommendations, lines 18-21**

The Navy recommends that a CMS be done for surface soil and shallow groundwater at SWMU 17. The Department agrees with this recommendation, but reminds the Navy to apply all previous comments to future investigations to close data gaps and not leave out any important contaminants. This may include additional contaminants being added to the CR list and closing contour lines to make risk management decisions easier for the Team to make.

**Response:**

*Comment noted.*

**CHARLESTON NAVAL COMPLEX**

**RESPONSES TO SCDHEC COMMENTS ON ZONE H RFI**

**FOR SWMU 136/AOC 663; AOC 666; SWMU 138/AOC 667; SWMU 196 & SWMU 17**

**ATTACHMENT 1 FOR RESPONSE TO COMMENT NO. 19 FROM  
MICHAEL DANIELSEN**

not by the validator), then use the R-qualified data in a manner similar to the use of J-qualified data (i.e., use the R-qualified concentrations the same way as positive data that do not have this qualifier). If possible, note whether the R-qualified data are overestimates or underestimates of actual expected chemical concentrations so that appropriate caveats may be attached if data qualified with an R contribute significantly to the risk.

#### 5.4.2 USING THE APPROPRIATE QUALIFIERS

The information presented in Exhibits 5-4 and 5-5 is based on the most recent EPA guidance documents concerning qualifiers: the SOW for Inorganics and the SOW for Organics (EPA 1988b,c) for laboratory qualifiers, and the Functional Guidelines for Inorganics and the Functional Guidelines for Organics (EPA 1988d,e) for validation qualifiers. The types and definitions of qualifiers, however, may be periodically updated within the CLP program. In addition, certain EPA regions may have their own data qualifiers and associated definitions. These regional qualifiers are generally consistent with the Functional Guidelines, but are designed to convey additional information to data users.

In general, the risk assessor should check whether the information presented in this section is current by contacting the appropriate regional CLP or headquarters Analytical Operations Branch staff. Also, if definitions are not reported with the data, regional contacts should be consulted prior to evaluating qualified data. These variations may affect how data with certain qualifiers should be used in a risk assessment. Make sure that definitions of data qualifiers used in the data set for the site have been reported with the data and are current. Never guess about the definition of qualifiers.

### 5.5 COMPARISON OF CONCENTRATIONS DETECTED IN BLANKS WITH CONCENTRATIONS DETECTED IN SAMPLES

Blank samples provide a measure of contamination that has been introduced into a sample set either (1) in the field while the samples were being collected or transported to the laboratory or (2) in the laboratory during sample preparation or analysis. To prevent the inclusion of non-site-related contaminants in the risk assessment, the concentrations of chemicals detected in blanks must be compared with concentrations of the same chemicals detected in site samples. Detailed definitions of different types of blanks are provided in the box on the next page.

Blank data should be compared with results from samples with which the blanks are associated. It is often impossible, however, to determine the association between certain blanks and data. In this case, compare the blank data with results from the entire sample data set. Use the guidelines in the following paragraphs when comparing sample concentrations with blank concentrations.

**Blanks containing common laboratory contaminants.** As discussed in the CLP SOW for Organics (EPA 1988c) and the Functional Guidelines for Organics (EPA 1988e), acetone, 2-butanone (or methyl ethyl ketone), methylene chloride, toluene, and the phthalate esters are considered by EPA to be common laboratory contaminants. In accordance with the Functional Guidelines for Organics (EPA 1988e) and the Functional Guidelines for Inorganics (EPA 1988d), if the blank contains detectable levels of common laboratory contaminants, then the sample results should be considered as positive results only if the concentrations in the sample exceed ten times the maximum amount detected in any blank. If the concentration of a common laboratory contaminant is less than ten times the blank concentration, then conclude that the chemical was not detected in the particular sample and, in accordance with EPA guidance, consider the blank-related concentrations of the chemical to be

## TYPES OF BLANKS

Blanks are analytical quality control samples analyzed in the same manner as site samples. They are used in the measurement of contamination that has been introduced into a sample either (1) in the field while the samples were being collected or transported to the laboratory or (2) in the laboratory during sample preparation or analysis. Four types of blanks – trip, field, laboratory calibration, and laboratory reagent (or method) – are described below. A discussion on the water used for the blank also is provided.

**Trip Blank.** This type of blank is used to indicate potential contamination due to migration of volatile organic chemicals (VOCs) from the air on the site or in sample shipping containers, through the septum or around the lid of sampling vials, and into the sample. A trip blank consists of laboratory distilled, deionized water in a 40-ml glass vial sealed with a teflon septum. The blank accompanies the empty sample bottles to the field as well as the samples returning to the laboratory for analysis; it is not opened until it is analyzed in the lab with the actual site samples. The containers and labels for trip blanks should be the same as the containers and labels for actual samples, thus making the laboratory "blind" to the identity of the blanks.

**Field Blank.** A field blank is used to determine if certain field sampling or cleaning procedures (e.g., insufficient cleaning of sampling equipment) result in cross-contamination of site samples. Like the trip blank, the field blank is a sample of distilled, deionized water taken to the field with empty sample bottles and is analyzed in the laboratory along with the actual samples. Unlike the trip blank, however, the field blank sample is opened in the field and used as a sample would be (e.g., it is poured through cleaned sampling equipment or it is poured from container to container in the vicinity of a gas-powered pump). As with trip blanks, the field blanks' containers and labels should be the same as for actual samples.

**Laboratory Calibration Blank.** This type of blank is distilled, deionized water injected directly into an instrument without having been treated with reagents appropriate to the analytical method used to analyze actual site samples. This type of blank is used to indicate contamination in the instrument itself, or possibly in the distilled, deionized water.

**Laboratory Reagent or Method Blank.** This blank results from the treatment of distilled, deionized water with all of the reagents and manipulations (e.g., digestions or extractions) to which site samples will be subjected. Positive results in the reagent blank may indicate either contamination of the chemical reagents or the glassware and implements used to store or prepare the sample and resulting solutions. Although a laboratory following good laboratory practices will have its analytical processes under control, in some instances method blank contamination cannot be entirely eliminated.

**Water Used for Blanks.** For all the blanks described above, results are reliable only if the water comprising the blank was clean. For example, if the laboratory water comprising the trip blank was contaminated with VOCs prior to being taken to the field, then the source of VOC contamination in the trip blank cannot be isolated (see laboratory calibration blank).

the quantitation limit for the chemical in that sample. Note that if all samples contain levels of a common laboratory contaminant that are less than ten times the level of contamination noted in the blank, then completely eliminate that chemical from the set of sample results.

Blanks containing chemicals that are not common laboratory contaminants. As discussed in the previously referenced guidance, if the blank contains detectable levels of one or more organic or inorganic chemicals that are not considered by EPA to be common laboratory contaminants (e.g., all other chemicals on the TCL), then consider site sample results as positive only if the concentration of the chemical in the site sample exceeds five times the maximum amount detected in any blank. Treat samples containing less than five times the amount in any blank as non-detects and, in accordance with EPA guidance, consider

the blank-related chemical concentration to be the quantitation limit for the chemical in that sample. Again, note that if all samples contain levels of a TCL chemical that are less than five times the level of contamination noted in the blank, then completely eliminate that chemical from the set of sample results.

## 5.6 EVALUATION OF TENTATIVELY IDENTIFIED COMPOUNDS

Both the identity and reported concentration of a tentatively identified compound (TIC) is questionable (see the box on the next page for background on TICs). Two options for addressing TICs exist, depending on the relative number of TICs compared to non-TICs.

## GENERAL COMMENTS

**Comment:**

1. The figures presented in the document are much improved from those submitted in previous reports. Based on SWMU specific maps, it is unclear what criteria are used for the "inferred areas of contamination" in areas where no samples were collected. Please explain the difference between the blue and the red contour lines, "inferred cumulative areas" and the "inferred area above screening criteria" respectively.

**Response:**

*The inferred area contour lines were drawn to encompass the approximate outermost extent of all detected concentrations above the screening criteria.*

**Comment:**

2. Please note that the Department concurs with EPA's comment that the RFI report was poorly edited and difficult to review. However, the new risk assessment format is much improved from the previous RFI submittals. Even though the Department recommends more thorough editing in the future prior to document submittal, no revisions to the existing document, based on this comment, are needed.

**Response:**

*Comment noted. CH2M-Jones documents will address the concerns regarding editing.*

**Comment:**

3. The Zone H Characterization of Background Datasets tables and discussions should include soil types for both surface and subsurface soil samples. As stated in comments for previously submitted documents, background samples should be compared only to similar on-site soil samples.

**Response:**

*Comment noted. An attempt will be made to identify soil types for different areas of CNC. However, it should be noted that majority of the site is disturbed thus limiting areas with native soils. This is also indicated by the observation that surface and subsurface soil inorganic chemicals and PAHs levels are similar. This issue will be discussed in a future scoping meeting.*

## SWMU 159

**Comment:**

4. Analysis of surface and subsurface soil samples did not detect methylene chloride; however methylene chloride was identified as a COPC in groundwater. Please provide information in Section 5 regarding the potential source of the methylene chloride contamination.

**Response:**

*Methylene chloride is suspected to be related to the blank contamination. Appendix C of the CMS Report includes methylene chloride results for the site samples and blank data. The latest round of sampling (shown in Table 4.5 of the document) did not have methylene chloride reported for the wells. Revisions to the report will include additional explanation with similar information.*

## **SWMU 136/AOC 663**

### **Comment:**

The text states that the Navy's Environmental Detachment removed building 851's USTs and associated piping. During the August 7, 2000, Zone H site visit, evidence of the tank removal was visible. No visible evidence of the underground piping removal was observed. Please provide additional information to clarify if the piping excavation was completed.

### **Response:**

*The Rapid Assessment Report for Site 11, Structure 851, Zone H, Charleston Naval Complex prepared by Tetra Tech NUS (dated November 1999) outlines the UST removal activities conducted by the Charleston DET at this site. According to this report, the Charleston DET removed the 500-gallon USTs 851A and 851B and associated piping lines at this site between May 29 and June 5, 1996. The report indicates that the condition of both the USTs was sound, with no evidence of corrosion, pitting or visible holes. Light surface corrosion on the associated piping was also noticed. No petroleum odors were detected during excavation activities.*

*The report indicates that groundwater was encountered in the UST excavation at about 4 ft bgs, but it did not exhibit a sheen to indicate the presence of petroleum hydrocarbons. Soil and groundwater samples were collected from the open excavation and analyzed for BTEX and PAHs.*

## **SWMU 138/AOC 667**

### **Comment:**

During the August 7, 2000 site visit, a drainage ditch which contained wetland vegetation and flowing water was observed on the western edge of SWMU 138/AOC 667 outside of the fence. Based on the information provided on Figure 2.3.3, no samples were collected from this drainage feature. Please evaluate the potential for overland surface runoff, contaminated soil transport, and groundwater to surface water discharge to this adjacent drainage feature.

### **Response:**

*Based on a site visit on January 16, 2001 by SCDHEC and CH2M-Jones personnel, it was determined that the surface elevations do not contribute overland flow of stormwater to this drainage ditch thereby not contributing to contaminated soil transport.*

## **SWMU 17**

### **Comment:**

The discussion of subsurface soil contamination on page 2-5-344 states that the soil to groundwater pathway was considered valid but not significant when SSLs are exceeded in subsurface soil samples but screening levels are not exceeded in groundwater. The Department feels that the soil to groundwater pathway is significant especially if no

monitoring well is located in areas of contaminated surface soil samples. It is recommended that this topic be discussed further among members of the CNC Team.

The text does not include a discussion of indoor air quality for the buildings at SWMU 17. Please revise the document to include this evaluation.

**Response:**

*The data evaluation process discussed on page 2-5-344 in general agreement with EPA's guidance on environmental site investigations. Figures 2.5.2B and 2.5.2C present the sample locations for soils and groundwater respectively. Indoor air sampling issues will be evaluated as part of the CMS Work Plan.*

CHARLESTON NAVAL COMPLEX

RESPONSES TO SCDHEC COMMENTS ON ZONE H DRAFT CMS REPORT  
FOR SWMU 159 AND AOC 653

## General Comments

### Comment:

1. Site Close-out strategies to support NFA recommendation.

At the May, 2000 meeting, the team discussed the need to include/evaluate Oil Water Separators, Zone J, Zone L, inorganics in groundwater, and indoor air quality issues when closing out a SWMU (recommending an NFA). As currently written, the Navy does not evaluate these issues to support their NFA recommendation. The Department will not concur with an NFA recommendation until these issues are addressed.

### Response:

*Oil/water separators (OWS) and inorganics in groundwater are being addressed at this time. The locations of the OWSs have been incorporated into the Geographic Information System (GIS). The relationship of inorganics in groundwater to the various sites and their overall distribution and occurrence are being addressed at the site-specific level as well as on a base-wide level. The relationship of Zone L to the Zone H sites will be evaluated. Zone J evaluation is currently being addressed by EnSafe/Allen & Hoshall, and any connections to the Zone H sites will be evaluated.*

### Comment:

2. DET reports

The Navy has used the completion of Interim Stabilization Measure (ISM) reports to support their RFI addendum recommendations. An example of this is SWMU 159 and AOC 653. The Navy must

- a. Provide a copy of the ISM report to the Department
- b. Incorporate, as deemed appropriate, the necessary information from the ISM report to support the RFI addendum recommendations.

The Department is unable to concur with any recommendations until the Navy provides this information.

### Response:

*The ISM reports have been provided to SCDHEC under separate cover.*

*Information from the ISM reports will be incorporated into the RFI reports as deemed appropriate.*

### Comment:

3. Changes in SWMUs/AOCs due to an ISM

The Navy has included figures in the RFI addendum report for SWMUs/AOCs 136, 663, 666, 138, 667, 197, and 17 that did not represent the current conditions they claimed to represent. An example of this was AOC 666 at which the Charleston DET conducted an ISM. Due to the discrepancies found in that document, the Department requests that the Navy review Figure 4 for AOC 653 and Figure 4 for SWMU 159 to determine if the figures are truly accurate. This report should illustrate pre- and post-ISM conditions of the SWMU/AOC to support the proposed recommendation.

**Response:**

Figure 3 for AOC 159 represents pre-ISM conditions, showing the sample locations from the 1996 initial RFI; Figure 4 for AOC 159 represents post-ISM conditions. A comparison between Figure 4 and Figure B-1A of the Completion Report for Interim Measure–SWMU 159, dated January 1997, prepared by the Navy DET, indicates that Figure 4 is accurate.

Similar verification was provided for AOC 653 to confirm that Figure 3 represents pre-ISM conditions and that Figure 4 represents post-ISM conditions.

**Specific Comments, per SWMU/AOC**

**SWMU 653**

**Navy recommends an NFA**

Based on the information provided in the report, the Department is unable to concur with the Navy's recommendation. The following comment(s) support this decision:

**Comment:**

4. Close-out strategies

The Navy has not addressed the close-out strategies (see General comments).

**Response:**

Please see response to Comment 1.

**Comment:**

5. DET reports

The soil sampled during the initial RFI contained hits of BEQs, and Aroclors 1248 and 1260, which yielded a human health risk of  $9.1E-07$ . Thus the purpose of the ISM was to excavate petroleum-impacted soil, rather than decrease a human health risk value. Nonetheless, the Department still requires particular information in order to make a determination on the Navy's NFA recommendation. Please refer to General Comment #3.

**Response:**

Appropriate information will be included in the report to address the concerns.

**SWMU 159**

**Navy recommends an NFA**

Based on the information provided in the report, the Department is unable to concur with the Navy's recommendation. The following comment(s) support this decision:

**Comment:**

6. Close-out strategies

The Navy has not addressed the close-out strategies (see General comments).

**Response:**

Please see response to Comment 1.

**Comment:**

7. Ecological concerns of the adjacent marsh

The Navy has responded to the Department's June 1999 comment about the lack of discussion on an adjacent marsh area. The Navy responded by saying that the Zone J work plan will be revised to meet the requirements of the new ERA Process document. The Navy further responded by stating that it believes that this evaluation will adequately address any potential ecological concerns for the adjacent wetlands. The Department is stating this information as a reminder, since this addresses one of the close-out strategies.

**Response:**

*Comment noted. Please see response to Comment 1.*

**Comment:**

8. Revised risk values

The Navy claimed that the soil and sediment that contributed to the human health and ecological risk values has been excavated and removed via an ISM conducted by the DET. The Navy has not provided the Department with information to support this claim. The Department requires this information, which would likely include a table showing the results of the confirmatory sampling, and revised human health and ecological risk values, if applicable.

**Response:**

*The Navy DET's Interim Measure Completion Report will be provided to SCDHEC along with analytical reports of confirmatory soil sampling. Section 5 includes a supplemental risk calculation for the methylene chloride detected in groundwater. However, Appendix C includes the common lab contaminants (see Attachment 1) methylene chloride, and acetone analytical data for site samples and the QA/QC samples (field and lab blanks). The 1998 sampling result used for risk calculations was 24 µg/L for methylene chloride. The field blanks from that batch of data had a maximum field blank methylene chloride detection of 26 µg/L. As per guidance, unless 260 µg/L or higher is detected in the site samples, it is not considered site-related (Page 5-16 of Attachment 1). Therefore, there are no COPCs in the site groundwater at SWMU 159, and the risk assessment is overly conservative.*

## General Comments

### Comment:

1. The document appears to be well prepared, with satisfactory illustrations and maps. Revision of some might be required. Please see specific comments.

### Response:

*Comment noted.*

### Comment:

2. This report as presented was supposed to address the CMS activities plus the ISM (Interim Stabilization Measure) in terms of final remedy. Based on the attached document, justification towards an NFA (No Further Action) is not fulfilled. The Department would like to see more soil and groundwater sampling to make sure no risk is posed on human health or the environment.

### Response:

*As summarized on page 3-9, before implementation of the ISM, soil and groundwater at the site did not pose a significant risk to human health or the ecology. Health risks were less than 1 in 1 million. The risks estimated for groundwater were based on arsenic detection below the maximum contaminant level (MCL) but above the risk-based concentration (RBC). Arsenic was detected at similar levels in the grid wells (background), indicating natural conditions*

### Comment:

3. In referring to other relative documents, this document does not bring in some of the important information regarding the geological and hydrogeological settings of the area in concern. This document failed to build a comprehensive correlation with data from adjacent SWMUs and AOCs, and therefore creates data gaps that make it impossible to come to a conclusion. Please revise and include all neighboring SWMUs and AOCs, and any oil-water separators, plus the pertinent hydrogeological data.

### Response:

*The figures in the report will be updated to include the boundaries of neighboring SWMUs/AOCs, direction of stormwater flow, locations of existing USTs/ASTs in the vicinity of this site.*

### Comment:

4. This documents does not relate to the unfinished work in Zone L and Zone J. It does not concur with proposed NFA.

### Response:

*The relationship of Zone L studies to Zone H sites will be evaluated. Zone J evaluation is currently being addressed by EnSafe/Allen & Hoshall. Further details will be added to the report if a relationship is established between Zone J and Zone L studies to the nature of contamination at the site.*

### Comment:

5. Evaluation of the fate and transport potential of the Arsenic as from soil-to-groundwater is insufficient to support the claim that "Arsenic did not have the potential to migrate from soil to groundwater". It is evident that in the subsurface soil concentration of Arsenic exceeds that of the surface soil as proved throughout the current work and the

background correlation reported. For the Department to consider an NFA, the soil-to-groundwater pathway for Arsenic and VOCs must be extensively studied.

**Response:**

*The text on page 1-1 of this report used this argument while drawing a comparison with similar conditions at AOC 663/SWMU 136 within Zone H. The text on Page 1-1 of the document will be revised to exclude this argument in order to clarify the site-specific nature and extent of arsenic contamination.*

**Comment:**

6. The lack of information related to the locations and settings of the oil-water separators form a data gap for present and future evaluation of this site. The Department recommends that the Navy must include OWS (Oil Water Separators) data linkages to all SWMUs and AOCs to help enhance the quality of evaluation and assessment.

**Response:**

*The issue of oil/water separators (OWS) is being addressed. The locations of the OWSs have been incorporated into the Geographic Information System (GIS).*

## **Zone H, AOC 653**

**Comment:**

7. Fig 2 failed to show correlation with associated SWMUs and AOCs, and OWS as it should. Building 1508 is associated with SWMU 124; the Satellite Accumulation Area. Building 1347 is associated with SWMUS 92,93 and 115. Building 636 is associated with SWMUs 122, 123, SAA and PSWMUs 92, 93 and 115. None of the information cited, is included on the figures nor commented on, throughout the text. Please revise and include comments on correlations.

**Response:**

*Figure 3 will be updated to show the existing AOCs and SWMUs in the vicinity of AOC 653.*

**Comment:**

8. AST 640 and UST 640B are in the range of 250-300 ft east of AOC 635. Although groundwater flow direction is generally northeast, a correlation might be useful in predicting source and extent of the contaminants in concern. Please check and include relative information.

**Response:**

*The nature and extent of contamination at this site does not indicate a relationship between this site and neighboring SWMUs/AOCs. However, Figure 3 of the report will be updated to include the site features surrounding it.*

**Comment:**

9. Table 3.3 on page 3.6 shows the TPH as non detect out of one round of sampling RFI (1996), while in Section 3.2 Navy DET (Environmental Detachment) ISM stated TPH was detected in all soil samples with a high of 42,000 mg/kg and also exceeded its 100 mg/kg screening level. Please clarify.

**Response:**

*A review of the analytical result reports for soil samples collected during the 1996 RFI effort indicates detections of TPH ranging from 400 to 42,000 mg/kg. Please refer to Table 3.1 Organic Compounds in Soil which reflects the TPH concentrations detected during the RFI prior to soil removal by the Navy DET. An additional table with residual concentrations will be included to reflect current site conditions.*

**Comment:**

10. Section 6.2, 2nd line, SWMU 136/AOC 663 never appeared in any of the maps and figures throughout the document. However, the text has used them for correlation. Please revise and include relative information.

**Response:**

*Section 6.0 is a summary of the discussions from earlier sections. Appropriate figures presented in the earlier sections will be referenced.*

**Comment:**

11. Section 4.1 2nd paragraph, last line. "Fig 3 shows..." Please be advised that wells NBCHGRD003/03D and BCHGRD006/06D were not indicated anywhere in the figure mentioned. Please check and include wells with their relevant parameters.

**Response:**

*Figure 3 includes two background wells identified with slightly different ID numbers, GDH003 and GDH006. These station IDs will be synchronized in the database and GIS figures, and the deep wells referenced in the text will be included in Figure 3.*

**Comment:**

12. All of the figures presented lack information related to the wells parameters. Please revise well locations, depths, groundwater levels and any relevant hydrogeological data.

**Response**

*Appropriate revisions to the figures will be made. Figure 5 shows groundwater elevations and groundwater elevation contours.*

## **Zone H, SWMU 159**

**Comment:**

13. Fig 6 shows TCE concentration values in soil as increasing downgradient (9, 13, 15, 21) mg/kg. In order to thoroughly investigate what is beyond that, the Department believes it is necessary to conduct more sampling downgradient both for the surface and subsurface intervals.

**Response:**

*Downgradient sediment samples 159M0001 and 159M0002 show values of non-detect and 17.0 µg/kg (parts per billion [ppb]), respectively. The apparent increases in the detections of TCE do not show a significant change in the downgradient direction to point to a pattern of migration in the downgradient direction. However, in order to fill a gap in the locations of soil borings, two additional soil borings will be introduced in locations as shown in attached Figure 1. Surface soil samples will*

be collected at these two locations. Subsurface soil samples will also be collected at these three locations if the groundwater elevation is below the subsurface soil sampling interval of 3-5 feet below land surface. Should the elevation of the groundwater at any of these proposed boring locations have caused the saturation of the subsurface interval, no samples will be collected from that particular boring location. If the analytical results from these soil boring samples show TCE contamination above screening levels, additional samples will be collected until the extent of TCE contamination above the screening level is delineated at this site. Additionally, a permanent groundwater monitoring well will be installed in the location shown in Figure 3 – SWMU 159 and soil samples will be collected during the well installation from the upper and lower intervals and analyzed for VOCs.

**Comment:**

14. Fig 3: Sediment sample locations are not indicated in the legend. Please revise and include the information on the figure.

**Response:**

Sediment sampling was performed at the two locations shown on Figure 3. Sample 159M0001 was performed at the end of the storm sewer pipe outfall northwest of SWMU 159, and sample 159M0002 was performed at the end of the ditch leading from the former can crusher on the southwest side of Building 665. The legend for Figure 3 will be updated to include sediment sampling location symbols to complete the illustration.

**Comment:**

15. In order to support the claim that TCE has no potential to migrate from soil to groundwater, the Navy must complete more extensive data research/sampling and include better interpretations to support conclusion.

**Response:**

Comment noted. Additional text describing fate and transport properties of TCE will be included in the revised report.

**Comment:**

16. Section 4.2.1.1, Line 8: The document points out that reviewing archived soil data for three confirmation sample points at AOC 653 were reviewed to help evaluate SWMU 159. Please be advised that no figure throughout the documents ever ties the two sites together. The results of the evaluation are nowhere to be found in the text. For better correlation, please revise and include an illustrating figure connecting the two locations with pertinent hydrological data. Also include the evaluation referenced.

**Response:**

The two sites are located far apart within Zone H. Figure 2.1 from the RFI Addendum will be added to the revised report to clarify their locations.

CHARLESTON NAVAL COMPLEX

RESPONSES TO U.S.E.P.A. COMMENTS ON ZONE H RFI

FOR SWMU 136/AOC 663; AOC 666; SWMU 138/AOC 667; SWMU 196 & SWMU 17

## Major Comments

### AOC 667/SWMU 138

#### Comment:

1. The reason for revisiting this risk assessment was the change in the groundwater risk - based concentration of chloroethane. The current RBC is 3.6 µg/L based on a revision of the oral cancer slope factor based on results from the National Toxicology Program of a rodent inhalation study of chloroethane.<sup>1</sup> NTP concluded that evidence of carcinogenicity was presented for female mice displaying uncommon carcinomas of the uterus and liver tumors. Data for male mice were considered by the investigators to be inadequate to assess carcinogenic activity due to decreased survival not related to carcinogenic effects, although increased incidence of alveolar/bronchiolar tumors were observed in exposed male mice. NTP reported that equivocal evidence was found for male and female rats displaying skin neoplasms and uncommon malignant astrocytomas of the brain, respectively. The oral slope factor was based on uterine tumors in female mice.

The most recent round of sampling showed a concentration of 240 µg/L chloromethane in groundwater. The lifetime risk from consuming this water under a residential scenario would be 1.4E-04. This number includes exposure from ingestion and inhalation during showering. The risk assessment presented in the document wrongly eliminated inhalation during showering as an exposure pathway for chloroethane.

I do not agree with the no further action recommendation presented for AOC 667/SWMU 138. I do recommend that a hydrogeologist determine whether natural attenuation may be a reasonable remedial alternative.

#### Response:

*Comment noted. A natural attenuation evaluation will be conducted for chloroethane and other associated chlorinated solvents observed in the groundwater at AOC 667/SWMU 138.*

### AOC 666

#### Comment:

2. Recent groundwater sampling events have revealed a reduction in vinyl chloride and chloromethane concentrations to non-detect levels. Hence, groundwater is no longer a concern. Seven additional surface and subsurface soil samples were obtained and the exposure point concentrations for arsenic recalculated using the Land method based on these additional samples was 15.5 mg/kg. I calculated the 95% UCL with the Land method as 16.5 mg/kg.

Region 4 has chosen to recommend that arsenic be regulated considering both the carcinogenic and non-carcinogenic endpoints of this chemical. 16.5 mg/kg is below the

---

<sup>1</sup>NTP (National Toxicology Program). 1989. *Toxicology and carcinogenesis studies of chloroethane in F344/N rats and B6C3F1 mice. Inhalation studies*. NTP Technical Report No. 346. National Toxicology Program. Research Triangle Park, NC.

non-cancer residential RBC for arsenic and falls below a 1E-04 risk considering a residential scenario. Therefore, I concur with the no further action recommendation for AOC 666.

**Response:**

*Comment noted. An NFA closure process will be performed for AOC 666 once DHEC comments are resolved.*

**Minor Comments**

**Clarity of Expression and Writing Style**

**Comment:**

2. This is one of the most poorly written documents I have encountered during my tenure at EPA. The services of a competent technical editor should be secured to review future submissions to the Agency.

**Response:**

*Comment noted. Documents produced by CH2M-Jones for this project will have these editing concerns taken into consideration.*

**APPENDIX B**  
**Minutes of the Zone H RFI Scoping Meeting**  
**Response to SCDHEC Comments on the Zone H RFIWPA**

---

**SWMU 136/AOC 663:**

**Comment:**

1. Section 2.2.2. Soil Data Gaps. Page 2-5.
  - Based on the Figure 2-1 the sample locations where the subsurface arsenic hits above background occurred are more that 130 feet away from the referenced SMWU and AOC.
  - There are numerous sample locations between the SWMU/AOC and location for arsenic hits that are below the background.
  - The background value for arsenic subsurface soil is 22.5 mg/kg. The two hits above were detected at 24.8 and 23 mg/kg. Based on the subsurface soil data and the location of the samples with respect to the site, additional subsurface soil sampling may not be necessary.

The Department recommends that the Navy reevaluate the proposed sampling strategy and clarify their path forward.

**Response:**

*Comment noted and concurred with. Of the 12 subsurface soil samples, 6 samples showed non-detects, 4 samples showed arsenic concentrations below 5.4 mg/kg, and the remaining 3 samples showed arsenic concentrations at 18.1 mg/kg, 23 mg/kg, and 24.8 mg/kg. These arsenic concentrations indicate that arsenic in subsurface is not a concern at this site and is not a threat to groundwater. Therefore, it is proposed that no additional soil sampling at this site is needed.*

*The only other fieldwork proposed for this site is to re-sample well NBCH663002 for benzene to confirm the absence of benzene (which was non-detect in the last two rounds of sampling at this well) and to re-sample well NBCH663001 to verify the presence of naphthalene detected in 1999. These petroleum-related compounds are attributed to the underground storage tank (UST) that was removed in 1996.*

*Table 3-1 will be updated to reflect the revised sampling plan for SWMU 136/AOC 663. If no benzene is detected above the MCL in well NBCH663002, and if no naphthalene is detected above the MCL in well NBCH663001, then no further action (NFA) under the RFI is warranted at SWMU 136/AOC 663, as agreed to by SCHDEC during the draft comment response resolution phone call held on April 30, 2001. The pathway forward for this site will be based on the results of the RFI fieldwork currently being conducted by CH2M-Jones. Should the fieldwork indicate the absence of the contaminants in the wells being sampled, a CMS work plan for NFA Rationale will be issued to request NFA status for AOC 663. SWMU 136 is currently ready for NFA status and will be included for NFA consideration in the same CMS work plan-NFA Rationale document along with AOC 663.*

**AOC 666:**

**Comment:**

2. Section 2.3.1. Previous Site Investigation. Page 2-11.

This section and throughout this document the term "UTL" is used as screening tool. It appears that the term UTL is interchangeably used for background concentrations. Please clarify the usage of this term throughout the document.

**Response:**

*The term UTL represents the Upper Tolerance Limit number derived by EnSafe from the statistical tests conducted on the background data set for contaminants in Zone H during the initial RFI (Ensafe 1996). The data set was obtained by sampling soils at 104 grid locations within Zone H. This number represents a threshold to compare site concentrations against reference concentrations. The determination of these numbers in the Zone H RFI was based on two types of statistical analyses on the raw data derived from sampling the grid locations. EnSafe used a combination of parametric or non-parametric UTL and a Wilcoxon rank sum test. It is recommended that, in both cases, the numbers derived from these tests should be referred to as "reference concentrations."*

**SWMU 138/AOC 667:**

**Comment:**

3. Please provide the groundwater flow directions for this site on Figure 2-5.

**Response:**

*Figure 2-5 will be updated to indicate groundwater flow direction.*

**Comment:**

4. Section 2.4.3.7. Potential contamination associated with Oil Water Separators. Page 2-23.

From the Figure 2-5 it appears that:

- Only one soil sample is collected within 15 feet of the OWS, presumable from up-gradient direction.
- Two soil samples collected within 30 ft of the OWS.
- No soil samples were collected from the downgradient or sidegradient sides.

The Department recommends a discussion for an acceptable soil investigation strategy for this area. It should be noted that necessary information related to the closure of the referenced OWS should be detailed in the RFI report for this site.

**Response:**

*The oil-water separators (OWSs) are being sampled, as agreed during the scoping meeting. Four surface and subsurface soil samples were introduced during the RFI. Based on distances calculated from the EGIS, soil borings 667SB001, -002, and -003 are within 10 feet of the OWS in the west, north, and east directions, respectively; soil boring 667SB004 is within 20 feet of the OWS on the south side. The general groundwater flow direction is to the east at this site. Figure 2-5 inadvertently showed the OWS farther east than it should be, and the figure will be corrected.*

*There does not appear to be any relation established between the OWS and contaminants detected in soils. Additionally, no chemicals of concern (COCs) were identified in soils at this site during the RFI. Therefore, no additional soil sampling is warranted at this site due to the presence of the OWS.*

---

*An additional groundwater monitoring well is being installed in the downgradient direction to verify the nature of groundwater contamination away from the site.*

**Comment:**

5. The issue regarding adequate investigation of the drainage ditch outside the site was commented on by Susan Byrd and discussed in the scoping meeting held on January 12, 2001. The outcome as the Department understands was, "...conduct a site visit to identify the ditch in the field and discuss the need to evaluate overland surface runoff, the potential for contaminated soil transport and groundwater to surface water discharge to this drainage feature...". This issue has not been resolved. Therefore, please provide the path forward to address this issue.

Also, Susan Byrd is in the process of reviewing the comment responses and scoping minutes. The Department will forward further comments at a later date.

**Response:**

*During the January 2001 BCT Meeting, this site visit was conducted by Tom Beisel, CH2M-Jones, and Elizabeth Frady, SCDHEC Project Engineer, on January 16, 2001. This ditch was observed during the field visit. It was observed that the site layout and general site gradients do not contribute to overland soil transport and contaminant runoff to this ditch. The ditch was approximately 4 feet deep in one location and water was pooled at this location. There were no soil COCs identified at this site during the RFI. Additionally, the ditch is upgradient of the site and it is unlikely that groundwater in this location could be impacted by historic site use.*

*A response to comments from Susan Byrd (dated October 9, 2000) on this ditch was submitted to SCDHEC during January 2000, after the site visit.*

**SWMU 17:**

**Comment:**

6. From the information provided in the referenced work plan and discussion with Sam Naik (CH2MHILL) the COPCs and COCs for soil to groundwater leachability potential are calculated based on the generic DAF of 10 and assuming 25% of the infiltration rate for the SSL. This is not consistent with the discussion that the Department had with the Navy in last few months. The Department would like the Navy to revisit the investigation done to-date to understand whether there are data gaps if COPCs and COCs are developed with site specific DAF and SSLs assuming no reduction in the infiltration rate. The Department is willing to discuss this issue and agree upon a path forward that would streamline addressing this comment.

This issue should be revisited for all sites referenced in this work plan.

**Response:**

*The information provided by CH2M-Jones regarding the use of soil screening levels (SSLs) in the initial RFI was obtained from Table 5.2.1, Section 5 of the initial Zone H RFI (Ensafe 1996). The*

*subsurface soil concentrations were compared against the generic SSLs from the EPA Region III RBC table with a DAF of 10, as well as with the subsurface soil background numbers.*

*During the initial RFI, where the subsurface soil background numbers were higher than the SSLs, the subsurface background number was adopted as a threshold screening goal. This is consistent with present discussions on the SSL issue being evaluated by the BCT.*

*Please note that during the RFI Addendum stage, SSL values corresponding to a DAF of 1 (which is highly conservative) were used at SWMU 17 and SWMU 196. An SSL corresponding to a DAF of 2.2 was used at SWMU 159 during the supplemental investigation for trichloroethene (TCE), as indicated in the SWMU 159 Draft CMS Report (Ensafe 2000). Determination of an appropriate SSL for SWMU 17 is being addressed in the CMS effort for this site. Based on recent discussions, the BCT is under consensus that no additional field investigation is necessary at SWMU 17 under the scope of the RFI. Additional information necessary for the Corrective Measures at this site will be addressed during the CMS stage.*

**Comment:**

7. Section 2.5.3. Groundwater Data Gaps & Sampling Plan to Close Data Gaps. Page 2-29.

The second paragraph lists a number of figures from the previous RFI Report and states that, "The following figures in the RFI Addendum Report will be updated to close open-ended contours as appropriate...". The Department would like to understand how this task would be accomplished. The Department believes that the open-ended contour represents a data gap where the contaminant extent has not been fully defined. Based on the review of the RFI Report Addendum the following observations were noted:

- Figures 2.5.40, 2.5.41, 2.5.44, 2.5.47, 2.5.57, should be added to the list of figures where the extent has not been defined completely.

**Response:**

*Please see responses to comment nos. 17 and 18 from Michael Danielsen on this document.*

*It is important to note that several wells at this site have been sampled during 4 to 5 sampling events from 1994 through 1998, and provide sufficient historic data on the extent of contamination at this site.*

- The contour lines drawn around the contaminant indicating the extent is dashed line meaning "inferred" and not based on the field data. It is recognized that it is difficult to collect the field data required to define the plume. It should also be recognized that the outer most extent of the contamination must be clearly understood and illustrated.

**Response:**

*Please see responses to comment nos. 17 and 18 from Michael Danielsen on this document.*

- The RFI provides the maps for every single constituent but does not provide illustration of the contaminants (or suite of contaminants) together for this site. This is essential in understanding where the various contaminants are in

relation to each other and also helps to understand the outermost extent of all contaminants.

**Response:**

*Please see figures 2.5.4.A, 2.5.4.B, 2.5.4.C, and 2.5.4.D of the Zone H RFI that provided such illustrations.*

Finally, the Department would like to discuss these issues and come to a resolution of how these data gaps will be filled and what is the best course of action for SWMU 17.

**Response:**

*Please see responses to comment nos. 17 and 18 from Michael Danielsen on this document.*

**Comment:**

8. Figure 2-7. Please provide a legend table indicating the various well identification symbols used on this figure. For example: Provide the information regarding the difference between H017GWO02 and H017GW002 or H017GWB08 and H017GW008. Also provide the groundwater and surface water flow direction for this figure. This will help to expedite the review of the referenced RFI Work Plan.

**Response:**

*The following list provides the naming conventions for the various wells installed at SWMU 17. This information was derived from various sections of the RFI Addendum Report for SWMU 17 (Ensafe 2000).*

1. Wells with 'GWB' nomenclature (e.g. H017GWB01) – installed to assess the boiler fuel pipeline as a potential source.
2. Wells with 'GWT' nomenclature (e.g. H017GWT01) – installed to assess the aboveground storage tank (AST) as a potential source.
3. Wells with 'GWO' nomenclature (e.g. H017GWO01) – installed to assess the oil-water separator (OWS) as a potential source.
4. Wells with 'GWW' nomenclature (e.g. H017GWW01) – installed to delineate dissolved phase groundwater contamination by chlorobenzene.
5. Wells with 'GWL' and 'GWD' nomenclature (e.g. H017GWL01) – installed to delineate the physical extent of NAPL in groundwater.

*Please also refer to Section 2.5.3 (pages 2-5-55 through 2-5-62) and Table 2.5.29 (page 2-5-223) of the Zone H RFI Addendum Report (Ensafe 2000) for an explanation of the objectives behind these well installations.*

*The above information on well identification will be added to the Zone H RFI Work Plan Addendum.*

**SWMU 159:**

**Comment:**

9. Section 2.6.1. Previous Site Investigation. Page 2-36.

This section states that an interim measure (IM) work was conducted to excavate the petroleum contaminated soil and sediments. This IM work also removed the soils with high BEQs. Please show the excavated area on Figure 2-8 to understand the current condition of the site. Also, there is a CMS Work Plan for this site that the Department has reviewed. The Department would like to discuss the strategy to streamline the documentation and proposed field investigation work for this site in order to facilitate the expedited path forward.

**Response:**

*Figure 2-8 will be updated to show the excavated areas from the IM effort, as illustrated in Figure 4 of the SWMU 159 Draft CMS Report (Ensafe 2000). This CMS Report describes the COPCs, COCs, and the results of the risk assessment.*

*TCE was examined during investigations conducted subsequent to the initial RFI due to detections of TCE in soil samples ranging from 3.3 micrograms/kilogram ( $\mu\text{g}/\text{kg}$ ) to 21  $\mu\text{g}/\text{kg}$ . These levels are three orders of magnitude below the RBC for TCE of 58,000  $\mu\text{g}/\text{kg}$ . Additionally, site-specific SSL was calculated for the site with a DAF of 2.2 (highly conservative), and the SSL for TCE derived was 32.5  $\mu\text{g}/\text{kg}$ . The highest surface soil concentration of TCE detected at this site was 21  $\mu\text{g}/\text{kg}$ ; 20  $\mu\text{g}/\text{kg}$  for subsurface soil, which is well below the site-specific TCE SSL of 32.5  $\mu\text{g}/\text{kg}$ .*

*Two groundwater wells were installed during the supplemental sampling effort, which followed the initial RFI, to address concerns about potential migration of TCE into groundwater. These wells were installed in areas that would have the most potential for TCE presence. TCE was not detected above detection limits in groundwater in any of the three sampling events at either well. The Draft CMS Report recommended NFA for this site.*

*Additional fieldwork at this site required by SCDHEC includes installation of three soil borings and one additional monitoring well to be sampled for volatile organic compounds (VOCs) to close a spatial gap in soil and groundwater sampling on the southern side of the site.*

*In order to expedite the path forward and streamline documentation, as suggested by this comment, the results of the additional investigation along with conclusions and recommendations for the path forward will be compiled into a small report and attached to a copy of the SWMU 159 Draft CMS Report (Ensafe 2000) previously submitted to SCDHEC. Close-out issues have already been discussed in this RFI Work Plan Addendum, and copies of the Navy Detachment's IM Report, requested by SCDHEC, have been provided to SCDHEC during previous comment resolution meetings. Should the additional fieldwork not indicate the presence of site contaminants, SWMU 159 is proposed to be considered for NFA status, and a CMS Work Plan for NFA Rationale will be prepared and submitted to SCDHEC for consideration of NFA status for this site.*

10. Figure 2-8. Indicates a catch basin in the nearby vicinity of SWMU 159. The Department would like to note that future investigation of the catch basin and storm water pathway could potentially alter the decisions for this site.

**Response:**

*The catch basin appears to be connected only to roof drains from adjacent Building 655 (former commissary building). According to the SMWU 159 Draft CMS Report (Ensafe, 2000), it drains a localized area of the parking lot. Soils and sediments at the outfall from the pipe draining this catch basin were excavated and disposed of off site during the IM work conducted at the site. The excavation was performed to remove potential contamination that may have been introduced into the catch basin and thereby the outfall, from the past storage of solid waste and the hydraulic can crusher use at SWMU 159. No sources of contamination existed at the site at the conclusion of the IM, which removed and disposed of these sources of contamination.*

*No further evaluation of this catch basin is warranted under the Zone H RFI. Any further evaluation of the catch basin is proposed to be included in the Zone J RFI.*

**AOC 653:**

**Comment:**

11. Figure 2-9. Please revise this figure to show all area that has been excavated. This would help to understand the current condition of the site for supporting the no further investigation and no further action decisions.

**Response:**

*A copy of Figure 4 of the AOC 653 Draft CMS Report, which shows the excavated areas, will be provided as an attachment to these responses to comments.*

**SWMU 196:**

**Comment:**

12. The referenced work plan does not proposed any strategy for investigative work to complete the delineation of extent of groundwater plume, nature and extent of soils (both surface and subsurface), sediments, and information needed to understand the ecological impacts associated with the known release of contamination to the surface water body. The Department recognizes that the Navy may have two different contractors working on different media and exposure pathways. Due to the complexity of this site and administrative issues it more important that the Department understand the overall approach to this site.

The purpose of the interim measure conducted recently was to delineate the source area. This data will help facilitate the interim measure work to control the migration of contaminants to the surface water body and removal of major source area.

It was the Departments understanding that the investigation work associated with this site will be proposed and accomplished through the RFI work plan. The Department recommends that the Navy provide an outline for accomplishing the investigation and corrective action work for this site.

**Response:**

*The RFI Addendum (Ensafe, May 2000) showed the extent of surface and subsurface soil contamination at the site. During the comment resolution meeting on January 12, 2001, it was agreed between CH2M-Jones and SCDHEC that no further soil sampling is necessary to complete the delineation of site contaminants. The SCDHEC engineer present at the meeting requested that a site visit be conducted to appraise herself of site conditions after having a chance to review the RFI Addendum subsequent to the comment resolution meeting held on January 12, 2001. This site visit was conducted soon after, with Tom Beisel (CH2M-Jones), during the January BCT Meeting. The SCDHEC site engineer expressed satisfaction with the extent of soil and sediment sampling conducted at the site for delineation of soil and sediment contamination. The RFI Addendum Report describes the surface water sampling conducted at the site.*

*The Interim Measure for source area delineation conducted by CH2M-Jones identified the vertical and horizontal profile of the groundwater contaminant plume leading to Shipyard Creek. Additional groundwater sampling and investigation will be performed if necessary to provide information to support the remedial design chosen for this site.*

*For the scope of an RFI, the determination of the nature and extent of contamination in soils, sediments and surface water is deemed complete at this site. An IM for source area delineation has been completed, and a second Interim Measure for source control is being initiated at this site. A CMS effort will be initiated based on the results of the IM for source control.*

## **General Comments**

### **Comment:**

1. The Workplan Addendum did not address SWMU 196. While SWMU 196 was discussed in the scoping meeting, and it was decided to delay the decision for additional sampling until the project engineer had looked over the material fully, therefore future sampling cannot be ruled out at this time. Please see Mihir Mehta's comment #12.

### **Response:**

*Comment noted. The SCDHEC engineer accompanied Tom Beisel of CH2M-Jones to SWMU 196 during the January BCT Meeting (which was held soon after the comment resolution and scoping meeting for this Work Plan Addendum) and appraised herself of the site conditions. She indicated that she was satisfied with the extent of the investigation and delineation of contaminants in soils, sediments, and surface water. An interim measure has been conducted to delineate the source area of groundwater contamination at the site. During the CMS stage, CH2M-Jones may conduct additional groundwater sampling to provide additional data for the remedial design chosen for this site. At the present time, the contaminant nature and extent determination under the scope of an RFI is deemed complete at this site.*

*Please also see response to Mihir Mehta's comment no. 12.*

### **Comment:**

2. The linkage of several SWMUs/AOCs includes references to samples taken in the vicinity of sanitary sewer lines. The Department has previously asked the question of how close were these samples physically taken in relation to the depths of the sewer lines. The Department has yet to receive any response as to whether these samples are close enough to adequately characterize these areas for environmental/ human risk analysis. Please clarify.

### **Response:**

*The Draft Zone L RFI Report, Section 10, Vol. 2 of 12 (EnSafe, 1998) indicates that hand auger soil boring samples were collected at two intervals (0-1 ft upper interval and 3-5 ft lower interval). Direct-push technology (DPT) soil samples were collected just above the water table. DPT groundwater samples were collected up to a depth of approximately 15 feet below land surface (ft bls).*

*Based on information obtained from the sewer line surveys conducted during the Zone L investigations, the invert elevations ranged from 6 ft bls to 13 ft bls. Groundwater DPT samples were collected at or below the pipe invert elevation. The sample locations were determined based on the sampling scheme provided in the Zone L RFI Work Plan (EnSafe, 1995). Samples were collected at manhole locations, and approximately every 200 ft along the sewer line.*

*The information for the sampling effort conducted near the sanitary sewer lines can be found in the Zone L RFI Work Plan (EnSafe, 1995) and the Zone L RFI Report (EnSafe, 1998).*

*With the exception of SWMU 17, there is no evidence from the RFI efforts at the sites included in this RFI Work Plan Addendum that either a source of contamination currently exists or that migration of*

*site contaminants to the sewer system is occurring. Also, no data indicate that a release from the sewers to the groundwater has occurred near these sites. Therefore, no further field investigation of the linkage between the SWMUs/AOCs included in this RFI Work Plan Addendum and the sewer systems is necessary.*

**Comment:**

Furthermore, the references of DPT samples being too turbid and not being used for comparison to RBCs/MCLs are moot. If samples were deemed too turbid then resampling would be needed to make a scientific determination and not just "writing" the samples off as being too turbid. Please revise to clarify these issues. Also the Department discourages the use of DPT data, for various reasons (which turbidity is one), for making risk management decisions. Permanent monitoring wells are better suited for basing SWMU and AOC decisions.

**Response:**

*The DPT groundwater samples taken during the Zone L RFI were analyzed for volatile organic compounds (VOCs), metals, and cyanide. For the sites included in this RFI Work Plan Addendum, there were no exceedances of VOCs or cyanide above the tapwater risk-based concentrations (RBCs) in the DPT groundwater samples.*

*Several rounds of site-specific investigations that were conducted (as indicated in the initial RFI Report and the RFI Addendum Report) at the sites discussed in this RFI Work Plan Addendum have demonstrated, with the use of permanent monitor wells and soil borings, that site contaminants have not migrated beyond the potential influence areas of these SWMUs/AOCs. The risk assessments conducted for these sites as part of the Zone H RFI have identified no metal contaminants of concern (COCs) in groundwater at these sites. The data used for this risk assessment were obtained from sampling the permanent monitor wells at these sites installed as part of the Zone H RFI and not the DPT sampling data derived from the Zone L sampling.*

**Comment:**

During the Scoping meeting held at the SCDHEC offices in Columbia on 1-15-01, the team discussed contingency plans for some sites. This workplan includes only a portion of these contingency plans. Please revise to include all contingency plans as discussed.

**Response:**

*Contingency plans were discussed with respect to AOC 666 (new shallow monitor well installation) and SWMU 159 (investigation of the presence of trichloroethene (TCE) in soils on the southern side of the site).*

*The contingency plan for AOC 666 is presented in Table 3-1. Should the new monitor well at AOC 666 present significantly high concentrations of site-related contaminants, consideration will be made to evaluate whether a deep well installation will be necessary. The text on page 2-16, under Section 2.3.4, will be updated to include a similar contingency plan.*

*The contingency plan for soil sampling for SWMU 159 is included in the text under Section 2.6.3, and indicates that additional soil borings will be performed if samples from the proposed locations*

*show significant concentrations of TCE well above the RBCs and soil screening levels (SSLs). This information was inadvertently omitted from Table 3-1. Table 3-1 will be updated to reflect this contingency plan.*

**Comment:**

Also the last statement made in the Scoping Meeting minutes, "SCDHEC agreed that the minimal additional sampling agreed upon during this meeting would complete the determination of the nature and extent of contamination at the site," is inaccurate. The SCDHEC project engineer stated that the work plan had not been reviewed completely and that she would reserve final approval on the work plan until the review was completed. Please omit this statement from the minutes.

**Response:**

*Comment noted. The minimal additional sampling agreed to between SCHDEC and CH2M-Jones is in response to SCDHEC comments to confirm the absence of site contaminants farther away from the SWMU/AOC footprints, as a final step in completing the RFI at these sites. According to SCDHEC comments on the RFI Addendum Report (EnSafe, 2000), these additional investigations are required to meet the conditions to either move these sites from the RFI stage to the CMS stage, or to grant the status of No Further Action (NFA) to these sites. The last statement in the Scoping Meeting minutes only implies that if these additional investigations agreed to by SCDHEC demonstrate that site contaminants are not present above screening goals, then these sites are candidates for the next stage (either CMS or NFA status). The meeting minutes will be revised to include this supplemental information.*

**Comment:**

3. This Workplan document includes the SCDHEC comments and resolutions for the RFI Report. It should also include the 1-15-01 revised Scoping Meeting minutes.

**Response:**

*Comment noted. The Zone H Comment Resolution and Scoping Meeting minutes will be attached to the RFI Work Plan Addendum.*

**Comment:**

This Workplan does not address 21 other sites in Zone H that have yet to be closed. Please note that future workplans may need to be submitted for sites not covered by this workplan.

**Response:**

*Comment noted. Several SWMUs and AOCs within Zone H are co-located within a bigger SWMU (e.g., Combined SWMU 9 contains SWMUs 9, 19, 20, 121, AOCs 649, 650, and 651; Combined SWMU 14 contains SWMUs 14, 15, AOCs 670 and 684). Some additional sites were either transferred to the Subtitle I (underground storage tank [UST]) program or have been assigned NFA status during the Zone H RFI comment resolution process between 1996-2000.*

## **Specific Comments**

### **Comment:**

4. Page 2-3, Section 2.2, SWMU 136/AOC 663, first paragraph

The text states, "This section provides a brief background of site conditions and outlines the proposed sample locations and analysis required to further investigate the presence of arsenic contamination in surface and subsurface soils and to verify the levels of naphthalene in groundwater at SWMU 138/AOC 663." This statement does not agree with the statement made on page 2-1, where benzene is also included. Please revise to clear up this discrepancy.

### **Response:**

*The text on this page will be revised to include benzene sampling for groundwater in monitor well NBCH663002. Please refer to the text on page 2-8, Section 2.2.5.2, which states that monitor well NBCH663002 will be sampled for BTEX and naphthalene. The last two sampling events conducted at this well during the RFI Addendum effort presented no detections of benzene in groundwater. This additional sampling event is being conducted in response to SCDHEC comments on the RFI Addendum (see comment # 17 from Mike Danielsen, SCDHEC comments dated September 8, 2000).*

*The text in this section will also be revised to exclude soil sampling for arsenic since it has been shown to be well within naturally occurring background levels of arsenic at the site (see comment #1 from Mihir Mehta and response to the comment).*

### **Comment:**

5. Page 2-3, Section 2.2.1, Previous Site Investigations, third paragraph

This section references the background concentration of arsenic as 15mg/kg and the residential RBC in the same sentence, but does not provide a numeric figure for the residential RBC. This can be read as though the background and residential RBC is the same numeric value. (The residential RBC value is 4.3mg/kg.) Please avoid this ambiguity in future documents.

### **Response:**

*Comment noted. Please note that the residential RBC value for arsenic is 0.43 mg/kg.*

### **Comment:**

6. Page 2-5, Section 2.2.1, Previous Site Investigations, second paragraph

This paragraph states that SCDHEC requested that BEHP be added to the groundwater monitoring analytes. However, the RFI addendum Report concluded that BEHP was a lab contaminant. The RFI Report was never approved by the Department, therefore the analyte should be retained, as requested, until this issue is resolved.

**Response:**

*The intent of this paragraph is simply to provide a synopsis of historic site investigations and comments on the RFI work.*

*The determination of BEHP as a laboratory artifact was adequately demonstrated in the Zone H RFI Addendum Report. This concern was also adequately addressed in the response to comments on the RFI Addendum Report (see response to comment # 19 from Michael Danielsen, SCDHEC comments on RFI Addendum Report, September 8, 2000). These comment responses were submitted to SCDHEC in November 2000, along with a copy of the relevant EPA guidance on evaluation of common laboratory contaminants. This comment and response were again discussed during the comment resolution and scoping meeting. No determination was made at this meeting to retain BEHP as a site contaminant.*

**Comment:**

7. Page 2-10, Figure 2-2

This figure indicates the groundwater flow for SWMU 136 and the additional well location. However the figure used to determine the new well location in the 1-30-01 Scoping Meeting indicated a different groundwater flow direction. Figure 2-2 shows the additional well upgradient. If the figures are alike, the well placement, as shown on Figure 2-2, will need to be relocated. Please review and revise where needed.

**Response:**

*Figure 2-2 will be updated for clarity and the well location will be selected appropriately.*

**Comment:**

8. Page 2-16, Section 2.3.4.1, Oil-Water Separator Sampling and Analysis

This text states that a sample will be taken from the contents (if any) of the OWS and analyzed by USEPA methods for VOCs, SVOCs, total metals, pesticides, and PCBs to characterize the contents. The Department wants to clarify that any sludge in the tank should be considered as tank contents and would require sampling.

**Response:**

*Text will be updated. Table 3-1 shows that one sample per media will be collected.*

**Comment:**

9. Page 2-16, Section 2.3.4.2, Groundwater Sampling and Analysis

This section discusses the proposal for one well and the location of which it will be located. However, this section does not make mention of the contingent plan for additional sampling that was agreed on during the Zone H scoping meeting at SCDHEC on 1-30-01. Please revise as needed.

**Response:**

*The text will be updated. Please see response to comment #3 above.*

**Comment:**

10. Page 2-18, Figure 2-4

This figure indicates the groundwater flow for AOC 666. However the figure used to determine the new well location in the 1-30-01 Scoping Meeting indicated a different groundwater flow direction. If memory serves correct the groundwater flow direction was more to the north than figure 2-5 shows. If this is not the case the well placement will need to be relocated. Please revise if needed.

**Response:**

*The groundwater flow direction shown in Figure 2-4 was based on the groundwater flow direction indicated in Figures 2.2.2 and 2.2.3 of the Zone H RFI Addendum Report (Ensafe, 2000). The location of the proposed new monitor well will be reevaluated and the well placement will be relocated if necessary, upon discussion with SCDHEC.*

**Comment:**

11. Page 2-20, Section 2.4.1, Previous Site Investigations, second paragraph

This paragraph states that DPT wells were used to make COC determinations. The Division of Hydrogeology must point out that DPT points are primarily used as a screening tool to place permanent monitoring wells. Therefore, COCs must be determined with repeatable monitoring technologies such as permanent wells. Please revise and propose alternative method to determine COCs.

**Response:**

*The intent of this paragraph is only to provide a synopsis of previous investigations conducted per the approved RFI Work Plans. The groundwater COCs evaluated at this site were not based on DPT sampling, but on analytical results from samples collected from repeatable monitoring technologies such as permanent (monitor) wells. Supporting information can be found in Section 2.3 of the Zone H RFI Addendum Report (Ensafe, 2000).*

**Comment:**

12. Page 2-24, Section 2.4.4, Sampling and Analysis Plan to Close Data Gaps

This section describes the analysis for an additional groundwater monitoring well. However the text does not state that the analysis will include VOCs, SVOCs, and total metals as agreed to during the Zone H scoping meeting held at SCDHEC offices in Columbia 1-30-01. Please revise as needed.

**Response:**

*The text states that analyses will be conducted for VOCs (the site groundwater COC under consideration during the RFI Addendum effort was chloroethane, which was deemed to be a*

*degradation product of the VOCs 1,1-DCE, 1,1-DCA and 1,2-DCA). Semivolatile organic compounds (SVOCs) and metals were not shown to be COCs in groundwater at the site, but are included for analyses in response to SCDHEC's request.*

**Comment:**

13. Page 2-24, Section 2.4.4, Sampling and Analysis plan to Close Data Gaps

This section states the analytical parameter for the additional groundwater monitoring well to be for VOCs. However during the 1-30-01 Scoping Meeting was agreed to analyze for VOCs, SVOCs, and metals. This section also does not include the sampling of the OWS for VOCs, SVOCs, metals, and PCBs, as agreed during the 1-30-01 Scoping Meeting. The proposed sampling was to take a sample of each media present in the tank including sludge. Please revise to include the OWS sampling and the omitted SVOC and metal analysis.

**Response:**

*Section 2.4.4 and Table 3-1 will be updated to include sampling of the OWS for SVOCs and metals at this site.*

**Comment:**

14. Page 2-24, Figure 2-5

This figure indicates the groundwater flow for AOC 666, but not for SWMU 138/AOC 667. Without the groundwater shown at SWMU 138/AOC, it is not clear if the proposed groundwater well sample location is up or down gradient of the site. Please revise.

**Response:**

*Figure 2-5 will be revised to show groundwater flow direction at AOC 667.*

**Comment:**

15. Page 2-29, Section 2.5.2, Soil Data Gaps and Sampling Plan to Close Data Gaps

The text states that the soil borings 017SWB02 and 017SWT02 are shown on figure 2-7. The location 017SWB02 was not located on referenced figure. Please revise as needed.

**Response:**

*Figure 2-7 will be updated.*

**Comment:**

16. Page 2-29, Section 2.5.3, Groundwater Data Gaps and Sampling Plan to Close data Gaps

The figures with open-ended isocontours listed for revision in this section do not include figure 2.5.40.

**Response:**

*This figure represents the **estimated** benzidine concentration (56 micrograms per liter [ $\mu\text{g/L}$ ] with a 'J' qualifier) from the March 1995 sampling event. During the scoping meeting, CH2M-Jones*

*provided a database report of 300 basewide benzidine sample results at Charleston Naval Complex. 299 of the 300 sample results show a 'U' value; the only sample result with an estimated detection was at well 017005 (shown in figure 2.5.40). Please refer to page 2-5-253 of the Zone H RFI Addendum, which states that "benzidine was not detected at this location in any of the four subsequent sampling events." Based on the agreement made during the scoping meeting, an additional sampling event for SVOCs will be conducted at well 017005.*

**Comment:**

Also the following figures indicate where extent has not been completely defined:

**Response:**

*It is important to note that the fuel oil spill which is believed to have contributed to the hydrocarbon contamination at SWMU 17 occurred in June 1987 (a transformer fluid leak is believed to have occurred in 1984). In the 11 years between the spill event and the July 1998 sampling, the wells in the downgradient direction (017005, 017006, 017007, and 017008) have shown little or no VOC/SVOC contamination, thereby indicating that very little, if any, northward migration of contaminants from the original spill areas has occurred. This also indicates that in the short 17-month time period between the July 1998 sampling event and the December 2000 sampling event, the boundary of non-detects shown during the July 1998 sampling event (for the contaminants depicted in the following figures of concern) would not have migrated faster than in the past 14 years to alter the scenario of contamination extent during the December 2000 sampling event, especially given the low hydraulic gradient in this area. Therefore, the results of the July 1998 and the December 2000 sampling events should be considered concurrently in order to understand the nature and extent of contamination at this site.*

*It is also important to note that this observation was pointed out to SCDHEC during the scoping meeting held in January, and it was agreed upon by SCDHEC that the compounds represented by the figures in the comments below were adequately delineated, with the exception of a concern for methylene chloride (a common laboratory artifact) and benzidine.*

**Comment**

Figure 2.5.47, 2.5.57, has not been delineated to the north.

**Response:**

*Figure 2.5.47 represents 1,2-dichlorobenzene (1,2-DCB) concentrations from the December 1999 sampling event. Please refer to Figure 2.5.46 in conjunction with this figure. Figure 2.5.46 shows that the four wells to the north of the site (wells 017005, 017006, 017007, and 017008) showed a non-detect result for 1,2-DCB during the July 1998 sampling event. Additionally, 1,2-DCB results for wells 017005, 017006, 017007, and 017008 have been non-detects ('U' values). Please review page 2-5-267, which explains that the plume has been delineated between the July 1998 and December 1999 data and bound by non-detects. It is unlikely that the configuration of 1,2-DCB contamination in groundwater has changed significantly during the time period between July 1998 and December 1999. The calculated migration rate for 1,2-DCB at SWMU 17 is approximately 0.72ft per year, assuming parameters consistent with the hydrogeology within Zone H. Dichlorobenzenes are on the list of COCs for this site and are being addressed in the CMS stage. It is important to note that with the exception of the free-product sample from well 017002, 1,2-DCB concentrations at this site have*

*not exceeded the maximum contaminant level (MCL) of 600 µg/L, and have been mostly below detection limits in the other wells at this site.*

*The extent of 1,2-DCB at this site has been delineated adequately in all directions.*

*Figure 2.5.57 represents a similar situation to that of Figure 2.5.47, with the exception of 1,2,4-trichlorobenzene (1,2,4-TCB). The same explanation is true for 1,2,4-TCB at this site. Please refer to page 2-5-282 of the Zone H RFI Addendum for additional information on the occurrence of 1,2,4-TCB at this site.*

*The extent of 1,2,4-TCB at this site has been delineated adequately in all directions.*

**Comment:**

Figure, 2.5.49, 2.5.51, 2.5.55 has not been delineated to the north, or west.

**Response:**

*Figure 2.5.49 (December 1999 sampling event information) should be reviewed in conjunction with Figure 2.5.48, which shows that 1,3-dichlorobenzene detections were bound by non-detects to the north and west during the July 1998 sampling event. See previous response. A similar explanation applies for this compound at this site.*

*Figure 2.5.51 should be reviewed in conjunction with Figure 2.5.50, which together show the boundary of non-detects around the 1,4-dichlorobenzene (1,4-DCB) detections. 1,4-DCB has been delineated adequately at this site. 1,4-DCB is also being considered as a COC during the CMS process.*

*Figure 2.5.55 should be reviewed in conjunction with Figure 2.5.54, which together show the boundary of non-detects around the detections of naphthalene.*

**Comment:**

Figure 2.5.44, 2.5.45, 2.5.49, has not been delineated to the north, west, or east.

**Response:**

*Figure 2.5.44 (December 1999 sampling event information) should be reviewed in conjunction with Figure 2.5.43 (July 1998 sampling event information) which will show that the 2-chlorophenol has been bounded in all directions with non-detects. Figure 2.5.49 was addressed in a previous response.*

*Figure 2.5.45 shows a localized exceedance of dibenzofuran at one location at 3 µg/L (slightly above the RBC of 2.4 µg/L). It has been bounded by the boiler room on the west and non-detects on the north and east, and detection below RBC on the south side. Additionally, this is not a site COC and does not warrant further delineation.*

*Figure 2.5.49 has already been addressed in previous comment and response.*

**Comment:**

Figure 2.5.33, has not been delineated to the west

**Response:**

*Figure 2.5.33 (July 1998 sampling event information) should be reviewed in conjunction with Figure 2.5.34 (December 2000 sampling event information), which will show that benzene has been well-delineated at this site. Benzene is considered a COC for the CMS at this site.*

**Comment:**

Figure 2.5.61 has not been delineated to the south, or east.

**Response:**

*Figure 2.5.61 (December 2000 sampling event information) should be reviewed in conjunction with Figure 2.5.60 (July 1998 sampling event information) which will show that Aroclor-1260 is well-delineated at this site.*

*Based on recent discussions, the BCT agrees that no additional field investigation is necessary at SWMU 17 under the scope of the RFI. Additional information necessary for the corrective measures at this site will be dealt with during the CMS stage.*

**Comment:**

The figures listed above either have a "NS" or "NI" label adjacent to groundwater monitoring points where the Navy must determine the extent of groundwater contamination.

Please explain how these data gaps will be filled without additional groundwater samples.

**Response:**

*Please see response to comment #8 from Mihir Mehta on this RFI Work Plan Addendum, as well as the above responses and Section 2.5.3 of the Zone H RFI Addendum. The 'NI' labels represent well locations that were "not installed" (as indicated in the legend for these figures) during the July 1998 sampling event, but were installed in 1999. The figures illustrating the July 1998 sampling events should not have shown these 'NI' locations. The 'NS' labels represent well locations that were "not sampled" (as indicated in the legend for these figures). A review of Section 2.5.3 of the Zone H RFI Addendum indicates that the wells that show 'NS' were not sampled for several reasons. Some of the wells (on the northern side of the site) showed a non-detect for SVOCs, and other wells were installed not for sampling for SVOCs but specifically to investigate the presence of NAPLs. These explanations were provided during the scoping meeting held in January 2001.*

*As explained in the previous comment responses, these perceived "data gaps" are due to a representation of separate sampling events on separate figures, and the contaminants illustrated in these figures of concern are adequately delineated for the scope of an RFI.*

**Comment:**

17. Page 2-38, Data gaps and Sampling Plan to Close Data Gaps

The text states that two additional soil borings will be introduced at locations identified as 159SB017 and 159SB019. During the Zone H Scoping meeting held at the SCDHEC offices on 1-15-01, the team agreed that at least one groundwater well would be added. The text does

not specify that soil boring 159SB018 will be sampled and then converted into a groundwater monitoring well. Also this location is not indicated on figure 2-8. Please revise as needed.

**Response:**

*Section 2.6.3 and Figure 2-7 do indicate that a new groundwater monitor well (identified as H159GW003 in Figure 2-7) will be installed and soil samples from the well boring will be collected from the upper (0-1 ft) and lower (3-5 ft) intervals. Table 3-1 will be updated to clarify the installation of the new monitor well.*

**Comment:**

18. Pages 3-2 through 3-3, Table 3-1

Table 3-1 presents a summary of the proposed sampling and Analysis plans for Zone H.

**SWMU 136/AOC 663:**The Department agrees on the actions proposed.

**AOC 666:** The Department does not agree with the table. The analysis for pesticides has been omitted from the text. Please revise table to include pesticides for the OWS analysis.

**SWMU 138/AOC 667:** The Department does not agree with the table. The analysis for SVOCs and total metals has been omitted from the groundwater analyte list. Please revise table.

**SWMU 17:** The Department does not agree with the table summary. The analysis for PCBs was omitted from the soil boring analytes. Please revise the table.

**SWMU 159:** The Department does not agree with the table summary. The additional groundwater well has been omitted. Please revise the table.

**Response:**

*Table 3-1 will be updated accordingly.*

## Zone H RFI Comment Resolution and Scoping Meeting

**ATTENDEES:** Paul Bergstrand, SCDHEC  
Mike Danielsen, SCDHEC  
Elizabeth Frady, SCDHEC  
Mihir Mehta, SCDHEC  
Tom Beisel, CH2M-Jones  
Sam Naik, CH2M-Jones

**COPIES:** Tony Hunt, Navy  
Dann Spariosu, USEPA  
Gary Foster, CH2M-Jones  
Dean Williamson, CH2M-Jones

**FROM:** Sam Naik

**DATE:** January 15, 2001

The Zone H RFI Addendum Comment Resolution and Scoping Meeting was held on January 12, 2001 at the SCDHEC offices in Columbia, SC. The meeting was held between 9 AM and 4:30 PM. Paul Bergstrand and Mihir Mehta also participated briefly during the afternoon session of the meeting.

Discussions were held on the November 2000 CH2M-Jones responses to SCDHEC comments on the Zone H RFI Addendum Report and Draft CMS Report for SWMU 159 and AOC 653 (issued by SCDHEC during September 2000) as well as the RFI Addendum Work Plan Scoping Package provided by CH2M-Jones to SCDHEC during December 2000 (the 'scoping package' referred hereafter in this meeting summary).

The following items were discussed pertaining to the different sites under consideration and are listed on a site-by-site basis:

### General

SCDHEC indicated that the CH2M-Jones responses (Rev. 0) to SCDHEC comments were satisfactory overall and that some responses needed further discussion in the meeting. These comments are highlighted in the following sections under each site. It was agreed that CH2M-Jones would re-issue the responses to comments and scoping packages in final form based on the resolutions of this meeting. It was also agreed that the scoping package would be revised based on the meeting resolutions and would serve as the basis for preparing the RFI Work Plan Addendum for those sites requiring RFI completion and closeout. CH2M-Jones proposed that the closeout issues would be addressed in the RFI Work Plan Addendum document.

With regard to the format of the final RFI document (whether errata pages and updated text pages to the RFI Addendum prepared by Ensafe in May 2000 would be sufficient), SCDHEC indicated that this issue will be given further consideration and will be discussed between SCDHEC and CH2M-Jones. CH2M-Jones indicated that the updates to the text and figures which will be required as a result of the comment resolution and additional sampling, would be minimal and would not warrant a reproduction of the entire Zone H RFI

Addendum Report (originally prepared by Ensafe), and that insertion of errata pages and updated text and tables where necessary should fulfill the requirement for a complete self-contained RFI Addendum document.

- 1. AOC 653:** SCDHEC indicated that comment responses were satisfactory. It was agreed by SCDHEC that AOC 653 is a candidate for No Further Action (NFA). Since the Draft CMS Report was prepared by Ensafe, SCDHEC prefers to have CH2M-Jones resubmit the AOC 653 report as a Revision 1 CMS Report to satisfy the requirements of RFI completion. This document is to be followed by a CMS Work Plan – Rationale for No Further Action document which would include a discussion of the close-out issues pertaining to the relevance of inorganics in groundwater, Zone L and Zone J investigations as well as linkages with oil-water separators.
- 2. SWMU 159:** SCDHEC indicated that comment responses were satisfactory. The proposed locations of the three additional soil borings to verify the presence of trichloroethene (TCE) in soil was agreeable to SCDHEC. In addition, it was agreed that a permanent shallow monitoring well would be installed instead of one of the three proposed soil borings (159SB018 ) and soil samples would be collected from this location during well installation. SCDHEC suggested reviewing the SSL calculations for the site to ensure that the SSL adopted by the RFI was sufficiently protective of groundwater.
- 3. SWMU 136/AOC 663:** SCDHEC indicated that comment responses were satisfactory. CH2M-Jones will clarify in the RFI Addendum Work Plan what screening criteria were used for soil and groundwater in the Rapid Assessment Reports conducted at the site by Tetra Tech NUS subsequent to the Navy DET's ISM at AOC 663. CH2M-Jones will clarify in the RFI Work Plan if the Navy DET removed all UST pipeline during the UST removal at AOC 663, and an estimate of the volume of soil removed during the DET if such information is available.  
The scoping package had proposed two rounds of groundwater sampling at existing monitoring well NBCH663001, NBCH663002 and NBCH136001 for VOCs. It was agreed that only one round of sampling for BTEX will be necessary at only one well NBCH663002, in order to confirm the absence of benzene at this well.  
The scoping package also proposed two additional soil borings to verify arsenic concentrations in the surface and subsurface soil. These proposed locations and sampling are acceptable to SCDHEC.  
  
It was agreed that after the additional soil and groundwater sampling was performed as per the resolutions of this meeting, AOC 663 was a candidate for transfer to the Subtitle I UST program.
- 4. AOC 666:** SCDHEC indicated that comment responses were satisfactory. The scoping package proposed sampling the contents of the oil-water separator at this site for VOCs, SVOCs, metals and PCBs. It was agreed that the present contents of the oil-water separator would be checked to see if there was more than one matrix present in the oil-water separator (i.e., solid/sludge/oil/water). Sampling will be done according to the findings of the nature of the contents in the oil-water separator.

The scoping package proposes the installation of a permanent shallow monitoring well east of AOC 666 but west of the stormwater sewer line to be sampled for VOC/SVOC/metals. The proposed location and sampling parameters for this well were acceptable to SCDHEC. A contingency plan to install a deep well at this location will be considered and discussed should the samples from this proposed shallow well show significantly high contamination.

5. **SWMU 138/AOC 667:** SCDHEC indicated that comment responses were satisfactory. It was agreed that sampling of the contents of the existing oil-water separator would be added to the scoping package to verify if the oil-water separator may be the source of the low-level chloroethane detected in an early round of groundwater sampling. SCDHEC requires that the oil-water separator be sampled for VOCs, SVOCs, metals and PCBs. CH2M-Jones will indicate the location of the oil-water separator in Figure 3 of the scoping package.

The scoping package proposes the installation of an additional shallow groundwater monitoring well downgradient of the site. The location of the well installation was acceptable to SCDHEC. This well will be sampled for VOCs/SVOCs/metals.

A discussion was conducted on a comment from Susan Byrd, SCDHEC on the RFI Addendum that a drainage ditch outside the site fence observed by SCDHEC during an August 7, 2000 site visit which contained flowing water should be evaluated. It was agreed that CH2M-Jones would conduct a sitewalk to identify this ditch in the field, and discuss the need to evaluate overland surface runoff, the potential for contaminated soil transport and groundwater-to-surface water discharge to this drainage feature which SCDHEC has requested.

6. **SWMU 196:** SCDHEC indicated that comment responses were satisfactory. Comment no. 32 on this site from Mike Danielsen, SCDHEC requested additional information on the site geology and hydrogeology. CH2M-Jones' response to this comment was that similar information has been provided in Appendix A of the SWMU 196 Interim Measure Work Plan for Source Area Delineation. Mike will review this document to determine if the information in the IM Work Plan is sufficient to satisfy this comment. Mike requested CH2M-Jones to verify if the temporary wells installed during the RFI at this site were abandoned with concrete mixed into the bentonite slurry or if it was only bentonite in the slurry. CH2M-Jones will verify this with Ensafe and provide the information to SCDHEC in the revised response to comments. It was agreed that the number of soil and groundwater sampling locations installed at the site during the RFI Addendum (Ensafe, 2000) and the Interim Measure for Source Area Delineation (CH2M-Jones, 2000) were adequate to cover the contaminated areas for nature and extent determinations.

SCDHEC had indicated that the past uses of the concrete pads found across Shipyard Creek towards SWMU 9 should be checked into. CH2M-Jones indicated that this was being done and a search of the Navy map archives for this area will be done, and if any information is available from this search, SCDHEC will be appraised of it.

It was agreed that no additional sampling for soil, surface water or sediment is needed at this site, and that the findings of the source area delineation work from the Interim Measure conducted during Dec 2000-Jan 2001 will be incorporated into the RFI Work

---

Plan Addendum. The scoping package will not need revision, except to remove references to SWMU 20 investigations in the scoping package and the RFI Work Plan Addendum.

7. **SWMU 17:** SCDHEC indicated that comment responses were satisfactory. Response to comment no. 56 from Mike Danielsen will be changed to say that monitoring well 017002 which showed contamination historically will be considered in the Corrective Measures Study for evaluation. The original response to this comment had indicated that well 017002 would be sampled before completion of the RFI Addendum. Figures 2.5.33, 2.5.35, 2.5.38, 2.5.39, 2.5.45, 2.5.49, 2.5.51, 2.5.55, 2.5.56, 2.5.61 will be corrected to close open-ended contours as indicated in the response to comments originally. Item 6 of the scoping package proposed re-sampling well 017002 for SVOCs to address an implied data gap for 1,2,4-trichlorobenzene. This will be deleted in the revised scoping package. Instead, the scoping package will include one round of sampling from well 017004 (to be sampled for SVOCs to verify the levels of benzidine) and one round of sampling for VOCs from well 017009 to provide a third data point at this well for verification of the absence of methylene chloride. The sampling for benzidine and methylene chloride are being performed to verify if they are only laboratory contaminants based on a one-time occurrence among several rounds of sampling, and their absence at other wells at this site and basewide at CNC.

It was agreed that two soil boring locations where visual observations were used will be resampled. These were the former locations of soil borings 017SWB02 and 017SWT02.

It was agreed that the possibility of the presence of a UST under Room 2-167 (Diesel Lab) of Building FBM 61 will be investigated during the CMS effort. The presence or absence of such UST has not been confirmed either in the RFI Addendum or in the EBSL Building Phase I survey.

SCDHEC agreed that the minimal additional sampling agreed upon during this meeting would complete the determination of the nature and extent of contamination at the site.