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DRAFT CORRECTIVE MEASURES STUDY REPORT ZONE H SOLID WASTE  
MANAGEMENT UNIT 159 (SWMU 159) AND AREA OF CONCERN 653 (AOC 653) CNC  
CHARLESTON SC  
6/17/1999  
ENSAFE

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

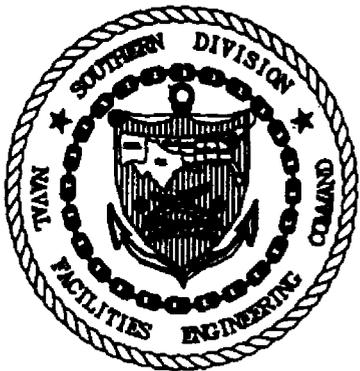


**DRAFT ZONE H, SWMU 159  
CORRECTIVE MEASURES STUDY REPORT  
AND  
DRAFT ZONE H, AOC 653  
CORRECTIVE MEASURES STUDY REPORT**

**SOUTH DIV CONTRACT  
NUMBER: N62467-89-D-0318**

**Prepared for:**

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



**Prepared by:**

**ENSAFE INC.  
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**June 17, 1999  
Revision No.: 0**

**Release of this document requires prior notification of the Commanding Officer of the Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.**



**DEPARTMENT OF THE NAVY**

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

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5090/11

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21 June, 1999

Mr. John Litton, P.E.  
Director, Division of Hazardous and Infectious Waste Management  
SCDHEC-Bureau of Land and Waste Management  
2600 Bull Street  
Columbia, SC 29201

Subj: SUBMITTAL OF DRAFT CORRECTIVE MEASURE STUDY REPORT FOR ZONE  
H, SWMU 159 AND AOC 653

Dear Mr. Litton:

The purpose of this letter is to submit the enclosed Zone H Corrective Measures Study Reports for SWMU 159 and AOC 653 for Naval Base Charleston. The report is submitted to fulfill the requirements of condition IV.E.2 of the RCRA Part B permit issued to the Navy by the South Carolina Department of Health and Environmental Control and the U.S. Environmental Protection Agency (USEPA).

The Navy requests that the Department and the USEPA review and provide comment or approval whichever is appropriate. If you should have any questions please contact Billy Drawdy or David Dodds at (843) 743-9985 and (843) 820-5563 respectively.

Sincerely,

A handwritten signature in cursive script that reads "W. A. Drawdy FOR".

H. N. SHEPPARD II, P.E.  
Caretaker Site Officer  
by direction

Encl:

(1) Zone H, SWMU 159 and AOC 653 Corrective Measure Study Reports, June 17 1999

Copy to:

SCDHEC (Paul Bergstrand, Mihar Mehta)

USEPA (Dann Spariosu)

CSO Naval Base Charleston (Billy Drawdy), SOUTHNAVFACENGCOM (Tony Hunt)

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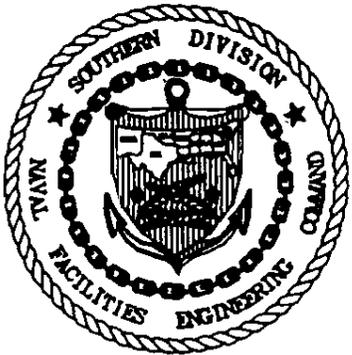


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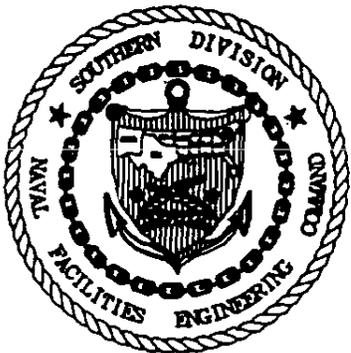


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## ABBREVIATIONS, ACRONYMS, AND SYMBOLS

The following abbreviations, acronyms, and units of measurement are used in this report.

AOC	Area of concern
BEQs	Benzo(a)pyrene equivalents
BTEX	Benzene, toluene, ethylbenzene and xylene
CMS	Corrective Measures Study
COCs	Contaminants of concern
CRP	Community Relations Plan
DET	Environmental Detachment
EPA	Environmental Protection Agency
HSWA	Hazardous and Solid Waste Amendments
ILO	Indeterminate lubricating oil
ISM	Interim stabilization measure
MCL	Maximum contaminant level
$\mu\text{g}/\text{kg}$	micrograms per kilogram
$\mu\text{g}/\text{L}$	micrograms per liter
$\text{mg}/\text{kg}$	milligrams per kilogram
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PIP	Public Involvement Plan
RAB	Restoration Advisory Board
RBC	Risk-based concentration
RBSL	Risk-Based Screening Level
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGOs	Remedial goal options
SAA	Satellite Accumulation Area
SVOCs	Semivolatile organic compounds
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds

## **1.0 INTRODUCTION**

Zone H, SWMU 159 was designated for a Corrective Measures Study (CMS) due to potential groundwater concerns. The CMS Work Plan proposed the installation of two new groundwater monitoring wells at the site. These wells were to be monitored for two quarters to confirm or refute the presence of chlorinated solvent compounds and to determine if remedial action is required.

SWMU 159 was designated for a CMS prior to the evaluation of the interim stabilization measures (ISM) completed by the Environmental Detachment Charleston, South Carolina (Navy DET). The ISM was performed to remove petroleum-related soil contamination from the site. This CMS Report addresses the results of both the CMS sampling and the Navy DET's ISM in terms of a final site remedy. Because the additional CMS sampling determined that groundwater remedial action is not required, it was not necessary to identify and screen technologies or evaluate alternatives as part of this CMS report.

**2.0 SWMU 159 SITE DESCRIPTION**

**2.1 General**

SWMU 159 is south of Buildings 655 and 665 in the south-central portion of Zone H. Building 655 was the former base commissary and Building 665 was the former base package store. A site map for the SWMU 159 area is presented on Figure 1. This SWMU was a former Satellite Accumulation Area (SAA) located in a low area near the southwest corner of Building 665. The former SAA was used to temporarily accumulate and store hazardous materials such as batteries, aerosol cans, and paint waste. An aboveground storage tank containing diesel fuel, a can crusher and small debris piles were also at the unit. Soil, sediment, and surface water were sampled in the RFI to assess any residual contamination from the former storage area.

SWMU 159 is currently not used by either federal or nonfederal tenants. According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future. A tidal marsh adjacent to SWMU 159 could limit potential development through wetland permitting restrictions.

**2.2 RFI/CMS Sampling Results**

**2.2.1 Soil**

Soil samples were collected as part of the RFI investigation in 1995. Nineteen soil samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), metals, cyanide and total petroleum hydrocarbons (TPH). Two samples were duplicated and analyzed for herbicides, hexavalent chromium, organophosphate pesticides, and dioxin. Sixteen soil samples were upper-interval samples and three were lower-interval samples. Sampling locations were selected to address the possible contamination areas listed above. The RFI soil sampling locations are indicated on Figure 1. Soil was not sampled during the CMS investigations.

Benzo(a)pyrene equivalents (BEQs) were present in one soil sample (159SB011) collected from SWMU 159 at concentrations that resulted in their identification as site contaminants of concern (COCs). The BEQ concentration in the upper-interval sample at this location was 127  $\mu\text{g}/\text{kg}$  (Risk Based Screening Level [RBSL] 88  $\mu\text{g}/\text{kg}$ ). No other COCs were identified in the surface soil for this site. BEQ sample results are summarized in Table 1.

**Table 1**  
**Soil Sampling Data at SWMU 159**

Sample Number	BEQs ( $\mu\text{g}/\text{kg}$ )	ILO (mg/kg)
Screening Level	88	100
159-S-B001-01	0	51
159-S-B001-02	0	71
159-S-B002-01	0	71
159-S-B003-01	0	42
159-S-B004-01	0	53
159-S-B005-01	0	33
159-S-B006-01	0	36
159-S-B007-01	0	29
159-S-B008-01	0	41
159-S-B009-01	0	52
159-S-B010-01	0.18	170
159-S-B011-01	127	72
159-S-B011-02	26.6	68
159-S-B012-01	0	50
159-S-B012-02	30.14	110
159-S-B013-01	0	160
159-S-B014-01	0	88
159-S-B015-01	0	48

**Table 1**  
**Soil Sampling Data at SWMU 159**

Sample Number	BEQs ( $\mu\text{g}/\text{kg}$ )	ILO (mg/kg)
<b>Screening Level</b>	<b>88</b>	<b>100</b>
159-S-B016-01	0	46

*Notes:*

- BEQ — Benzo(a)pyrene Equivalents
  - ILO — Indeterminate Lubricating Oil
  - J — The associated numerical value is an estimated quantity.
- Boxed values indicates sample concentration exceeded the screening value.

This one sample (159SB011) presented surface soil point risk above background greater than 1  
 1E-06 considering a residential scenario. This soil boring location is surrounded by boring 2  
 locations which yielded samples with less-than-RBSL BEQ concentrations. No site point risk 3  
 exceeded 1E-06 in the industrial scenario or hazard in both the residential and industrial scenarios. 4

While not identified as a COC, petroleum hydrocarbons (as indeterminate lubricating oil, [ILO]) 5  
 were detected in all 19 soil samples. The highest ILO concentration (170 mg/kg) was at sample 6  
 location 159SB010. ILO exceeded its screening level of 100 mg/kg in two surface samples and 7  
 one subsurface sample. Petroleum hydrocarbon sampling results are summarized in Table 1. 8

**2.2.2 Groundwater** 9

Groundwater was not monitored in conjunction with the RFI at SWMU 159. However, the project 10  
 team requested that SWMU 159 groundwater be placed in the CMS process due to potential 11  
 groundwater concerns. Trichloroethene was detected in 14 of 16 SWMU 159 surface soil samples 12  
 at concentrations ranging from 3.3 to 21  $\mu\text{g}/\text{kg}$  and in two of three subsurface soil samples at 13  
 concentrations ranging from 9 to 20  $\mu\text{g}/\text{kg}$ . Trichloroethene's maximum concentration was more 14  
 than three orders of magnitude less than the risk-based screening level of 58,000  $\mu\text{g}/\text{kg}$  and less 15  
 than the soil-to-groundwater screening level of 30  $\mu\text{g}/\text{kg}$ . 16

However, based on the project team's concern pertaining to the potential for trichloroethene (TCE) in site groundwater, two shallow groundwater monitoring wells were constructed as part of the CMS in the area of greatest potential for TCE identification. Groundwater was to be monitored at the new wells for two quarters to confirm or refute the presence of chlorinated solvent compounds and to determine if remedial action was required.

Monitoring wells 159001 and 159002 were constructed at the site and were sampled for three rounds. No TCE was detected in either of the CMS wells during any of the three sampling rounds. The only VOCs detected in three rounds of groundwater sampling were acetone and methylene chloride. All other VOC parameters were below the detection limits in both wells for all three rounds. The single estimated acetone detection of 10 µg/L in the second round at 159002 was below the RBC of 370 µg/L. The single estimated methylene chloride detection of 24 µg/L in the first round at 159001 exceeded the MCL of 5 µg/L. The CMS groundwater sampling results are summarized in Table 2.

**Table 2**  
**Groundwater Sampling Data at SWMU 159**

Sample Number	Date	Acetone (µg/L)	Methylene Chloride (µg/L)	Trichloroethene (µg/L)
<b>MCL/RBC</b>		<b>370</b>	<b>5</b>	<b>5</b>
159-G-W001-01	08/13/98	5 UR	24 J	5 U
159-G-W001-02	11/12/98	5 U	5 U	5 U
159-G-WC01-01	03/23/99	5 UR	5 U	5 U
159-G-W002-01	08/13/98	5 UR	5 UJ	5 U
159-G-W002-02	11/11/98	10 J	5 U	5 U
159-G-WC02-01	03/19/99	5 UR	5 U	5 U

**Notes:**

- UR — The material was analyzed, but not detected at the unusable quantitation limit.
  - J — The associated numerical value is an estimated quantity.
  - U — The material was analyzed, but not detected at the listed numerical quantitation limit.
  - UJ — The material was analyzed, but not detected at the estimated numerical quantitation limit.
- Boxed value indicates sample concentration exceeded the MCL/RBC.

Due to the single estimated detection of methylene chloride greater than MCLs, additional data analysis was performed at SWMU 159. The purpose of this data analysis was to determine if the single estimated methylene chloride detection was most likely a laboratory related artifact, or if it should be further considered as a potential COC for the site.

The first consideration was to determine if there was a potential methylene chloride source in the area of SWMU 159. The RFI investigations analyzed 19 soil samples for methylene chloride. All 19 samples, including 16 upper interval samples and three lower interval samples, were less than the methylene chloride detection limits. Since a possible source was not located at SWMU 159, additional soil samples were considered in the area around SWMU 159. The RFI investigations analyzed 8 grid soil samples in the area around SWMU 159. All eight samples, including seven upper interval samples and one lower interval sample were below the methylene chloride detection limits. This indicates that a potential surface soil source for the detection of methylene chloride at monitoring well 159001 is not present in the area around SWMU 159. Methylene chloride grid soil sampling results are summarized in Table 3.

**Table 3**  
**Grid Sample Soil Data Adjacent to SWMU 159**

Sample Number	Methylene Chloride ( $\mu\text{g}/\text{kg}$ )
<b>Screening Level</b>	<b>85,000</b>
GDH-S-B060-01	25 U
GDH-S-B074-01	7 U
GDH-S-B077-01	7 U
GDH-S-B078-01	6 UJ
GDH-S-B078-02	6 U
GDH-S-B090-01	21 UJ
GDH-S-B091-01	12 UJ
GDH-S-B107-01	10 U

**Notes:**

- U — The material was analyzed, but not detected at the listed numerical quantitation limit.
- UJ — The material was analyzed, but not detected at the estimated numerical quantitation limit.

The second consideration was to determine if there were any methylene chloride detections in other shallow groundwater monitoring wells in the area of SWMU 159. Four Zone H grid wells are located in the area of SWMU 159. The analytical results from these grid wells all show methylene chloride results below the detection limits. The grid wells are located up-gradient of, down-gradient from and lateral to the single SWMU 159 well with the methylene chloride detection, 159001. A summary of the grid well results around SWMU 159 for methylene chloride is provided on Table 4.

**Table 4**  
**Shallow Grid Well Data Adjacent to SWMU 159**

Sample Number	Date	Methylene Chloride ( $\mu\text{g/L}$ )
<b>MCL/RBC</b>		<b>5</b>
GDH-G-W001-01	11/03/94	5 U
GDH-G-W002-01	11/04/94	10 U
GDH-G-W011-01	11/21/94	5 U
GDH-G-W011-05	06/03/98	6 U
GDH-G-W011-06	01/18/99	5 U
037-G-WHC2-01	03/22/99	5 U

**Notes:**

U — The material was analyzed, but not detected at the listed numerical quantitation limit.

The analysis of the additional soil and groundwater data indicates that there is no reason to suggest that methylene chloride be considered as a potential groundwater COC at the site. The single isolated detection above the MCL level is suggestive of a laboratory related artifact and requires no further site investigation.

**2.2.3 Sediment**

There were no human health risks greater than 1E-06 in the residential scenario due to surface sediments. Petroleum hydrocarbons (as indeterminate lubricating oil) in SWMU 159 sediments exceeded the screening level of 100 mg/kg at sample locations 159M0001 (2000 mg/kg) and 159M0002 (190 mg/kg).

**2.2.4 Surface Water**

No organic compounds were detected in the single surface water sample collected in conjunction with SWMU 159. No reference (background) surface water data were collected as part of the Zone H RFI. Surface water risk was not formally assessed at SWMU 159. Surface water will not be further evaluated in the CMS.

**2.3 Interim Stabilization Measures**

An ISM was implemented by the Navy DET at the site in September 1996. The purpose of interim measures are to eliminate sources of environmental contamination or to limit the spread of environmental contaminants prior to the completion of the CMS. A completion report summarizing the work performed by the DET during the ISM has been prepared and is dated May 20, 1997. While several VOC and SVOC contaminants were identified in the surface soil of the site during the RFI, only BEQs exceeded the RBSL and only at one sample location. However, indeterminate lubricating oils were detected in all 19 of the soil samples collected. The ILO concentrations varied from 29 mg/kg to 170 mg/kg. Based on this level of petroleum-related contamination, the decision was made to implement an ISM at this site.

The original ISM objective was to remove and dispose of any contaminated soil and sediment in which petroleum hydrocarbon levels exceeded 100 parts per million. During performance of the interim measure, the controlling guidance for soil excavation was changed to soil with

petroleum-related contamination levels exceeding the Region III Residential Risk-Based Concentrations, (RBCs). 1  
2

The following activities were conducted as part of the ISM performed by the Navy DET at this site: 3  
4

- An estimated 16 cubic yards of soil and sediments were removed that contained contamination levels greater than RBCs. 5  
6
- Confirmation samples were taken of the remaining soil to ensure compliance with RBCs. 7
- The site was cleared of all visible debris. 8
- All excavated areas were backfilled with clean soil. 9
- All excavated soil was sampled and characterized as non-hazardous and transported to Building 1601 for storage, awaiting disposal. 10  
11

The RFI soil investigation findings were used to determine the areas to begin excavation of both contaminated soil and sediments. Immunoassay field samples were taken during excavation as a field screening to determine the presence or absence of petroleum-related contaminants. In all, approximately 16 cubic yards of contaminated soil and sediments were excavated from the site. Following all excavation activities, confirmatory samples were taken at the bottom and sidewalls of each of the four excavated areas, for a total of 24 confirmation samples. The samples were each analyzed for four volatile organics (BTEX) and 16 Extractable Organics (PAHs). All 24 samples were below the detection limits for BTEX, and 15 samples were below the detection limits for all PAHs. A single PAH, chrysene, was detected in nine samples. All of these detected 12  
13  
14  
15  
16  
17  
18  
19  
20

concentrations were at least an order of magnitude lower than the Region III Residential Risk-Based Concentration.

The only COCs in the surface soil for the site were BEQs. BEQs were determined to be a COC based on the concentration found at a single point, 159SB011. This one sample point at the site presented a surface soil point risk above background greater than 1E-06. All other points presented surface soil point risk less than 1E-06. The soil surrounding sample point 159SB011 was excavated during the ISM and replaced with clean soil, so this point risk has been removed. SWMU 159 sediment was included in the CMS process on the basis of petroleum hydrocarbon concentrations at two sample locations that exceeded the screening level. The sediment surrounding both of these sample points was excavated during the ISM and replaced with clean soil.

The revised objective of meeting the Region III RBCs was met by the removal of 16 cubic yards of soil and sediment. All excavated soil and sediment were removed from the site and replaced with clean soil. Confirmation samples were collected to document that the remaining soil and sediment met the Region III RBC requirements. All 24 confirmation samples were in compliance with all the RBC requirements.

### 3.0 REMEDIAL OBJECTIVES 1

#### 3.1 Soil Remedial Objectives 2

The only surface soil COCs identified in the RFI was BEQs. Remedial goal options (RGOs) for BEQs were calculated for the residential scenario. Based on a risk range goal from 1E-06 to 1E-04, the RGOs for BEQs ranged from 60  $\mu\text{g}/\text{kg}$  to 6,000  $\mu\text{g}/\text{kg}$ . The Navy DET ISM that was completed at the site removed the single sample point (159SB011) that was producing a surface soil point risk above background greater than 1E-06. The detailed results of the DET ISM activities are provided in the DET Completion Report dated May 20, 1997. Since this point has been removed from the site, there is no longer any surface soil point risk above background in excess of 1E-06. Final soil remedial objectives are not required since the risk-based residential surface soil requirements have been met. 11

#### 3.2 Groundwater Remedial Objectives 12

Because groundwater was not sampled during the RFI, no groundwater remedial objectives were identified. Groundwater was considered during the CMS process to determine if TCE was present in site groundwater. In the two rounds of supplemental CMS sampling at the two new site monitoring wells, TCE was not detected in the groundwater. Since MCLs have been met for all parameters at the site, further groundwater remedial objectives are not required. 17

#### 3.3 Sediment Remedial Objectives 18

No COCs were identified in the sediment at SWMU 159 and no sediment remedial objectives were calculated. SWMU 159 sediment was included in the CMS process on the basis of petroleum hydrocarbon concentrations at two sample locations that exceeded the screening level. The soil surrounding both of these sample points was excavated during the Navy DET ISM and replaced with clean soil. The detailed results of the DET ISM activities are provided in the DET Completion Report dated May 20, 1997. Final sediment remedial objectives are not required. 24

<b>4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES</b>	1
<b>4.1 Soil Remedial Technologies</b>	2
Identification and screening of soil remedial technologies is not warranted for this CMS Report based on the post-ISM confirmation sample results.	3 4
<b>4.2 Groundwater Remedial Technologies</b>	5
Identification and screening of groundwater remedial technologies is not warranted for this CMS Report based on the results of the groundwater sampling performed during the CMS. SWMU 159 shallow groundwater is in compliance with all MCLs.	6 7 8
<b>4.3 Sediment Remedial Technologies</b>	9
Identification and screening of sediment remedial technologies is not warranted for this CMS Report based on the post-ISM confirmation sample results.	10 11

<b>5.0</b>	<b>DETAILED EVALUATION OF ALTERNATIVES</b>	1
<b>5.1</b>	<b>Evaluation of Soil Remedial Alternatives</b>	2
	Detailed evaluation of soil remedial alternatives is not warranted for this CMS Report based on the post-ISM confirmation sampling results.	3 4
<b>5.2</b>	<b>Evaluation of Groundwater Remedial Alternatives</b>	5
	Detailed evaluation of groundwater remedial alternatives is not warranted during this CMS Report. This is based on the results of the groundwater sampling performed during the CMS. SWMU 159 shallow groundwater is in compliance with all MCL levels.	6 7 8
<b>5.3</b>	<b>Evaluation of Sediment Remedial Alternatives</b>	9
	Detailed evaluation of sediment remedial alternatives is not warranted for this CMS Report based on the post-ISM confirmation sampling results.	10 11

<b>6.0</b>	<b>RECOMMENDATIONS</b>	1
<b>6.1</b>	<b>Soil Recommendations</b>	2
	Based on post-ISM confirmation sample results, the petroleum-impacted soil has been removed from the site and SWMU 159 is recommended for no further corrective action under the RCRA CMS process.	3 4 5
<b>6.2</b>	<b>Groundwater Recommendations</b>	6
	Based on the CMS sampling results that documented shallow groundwater compliance with all MCLs, SWMU 159 shallow groundwater is recommended for no further corrective action under the RCRA CMS process.	7 8 9
<b>6.3</b>	<b>Sediment Recommendations</b>	10
	Based on post-ISM confirmation sample results, the petroleum-impacted sediment has been removed from the site and SWMU 159 is recommended for no further corrective action under the RCRA CMS process.	11 12 13

**7.0 PUBLIC INVOLVEMENT PLAN**

**7.1 General**

The following Public Involvement Plan (PIP) is included as part of this report in accordance with the EPA’s guidance on RCRA CMS. This PIP reflects and summarizes information prepared and presented in the Navy’s Community Relations Plan (CRP), prepared for Charleston Naval Complex in 1995.

Under RCRA, there is no required interaction with the community during the Corrective Measures Study process. Public input is required to be solicited only at the beginning of the permitting process, or during certain permit modifications. Therefore, the Navy has outlined a voluntary program of informing local communities throughout the entire RCRA Corrective Action process. Activities are detailed in the 1995 CRP for the Charleston Naval Complex.

However, because the CMS process results in a modification to the facility’s RCRA permit, certain provisions are made to solicit the public’s input on the preferred alternative (as the reason for the modification). The requirements are identical to those required for a draft permit.

Two primary objectives are stated in the CRP:

- To initiate and sustain community involvement.
- To provide a mechanism for communicating to the public.

**7.2 RFI Public Involvement Plan**

To achieve these objectives, the CRP identifies public involvement and outreach activities at each step of the Corrective Action process. For example, the following activities have been designated for the completion of the RFI. All have been accomplished.

- Update and publicize the information repository. 1
  - Continue to publicize the point of contact. 2
  - Update the mailing list. 3
  - Distribute fact sheets and/or write articles to explain RFI findings. 4
  - Inform community leaders of the completion and results of the RFI. 5
  - Update and continue to provide, whenever possible, presentations for informal community groups. 6  
7
  - Update the community on results of the RFI through public Restoration Advisory Board meetings. 8  
9
- 7.3 CMS Public Involvement Plan** 10
- During the Corrective Measures Study, the following activities will be carried out as part of the 11  
Navy’s current and ongoing community involvement program. 12
- Distribute a fact sheet and/or write articles for publication that report CMS 13  
recommendations. 14
  - Continue to update the mailing list. 15
  - Continue to respond to requests for speaking engagements. 16
  - Update the community on CMS status through public Restoration Advisory Board 17  
meetings. 18

**7.4 Statement of Basis Public Involvement Plan**

Upon completion of the Corrective Measures Study, when the preferred alternative has been proposed, the following activities are required if a modification to the RCRA permit is required. If a permit modification is not necessary, the Navy may choose to implement all, some, or none of the following actions, depending on the level of public interest or concern:

- A Statement of Basis will be prepared, explaining the proposed remedy and the method by which it was chosen. The Statement of Basis acts as a summary of the CMS.
- A 45-day comment period will be provided to allow community members the opportunity to review and comment on the preferred alternative. The comment period may be as short as 30 days in cases where no permit modification is necessary, but a public comment period is warranted.
- Availability of the comment period and Statement of Basis will be announced in a public notice.
- The community will be provided an update on the proposed remedy through the informal and publicized Restoration Advisory Board meetings.

In addition, the following activities will be carried out, as identified in the CRP:

- Update and publicize the information repository.
- Publicize the environmental point of contact.
- Continue to update the mailing list.

**7.5 Restoration Advisory Board**

The RAB is a key component of this community outreach program. It is through the RAB that the Navy has a regular, scheduled, and publicized forum for interfacing with community members on the progress of the environmental program, including CMS. In addition, RAB members are key instruments in measuring community interest in specific issues and knowledge of them. A Community Relations Subcommittee to the RAB has been tasked with identifying issues and information to be addressed by the Navy.

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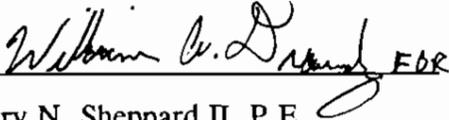
**8.0 REFERENCES**

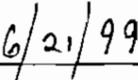
- EnSafe/Allen & Hoshall, Inc. (1996). *Final RCRA Facility Investigation Report, Zone H, Naval Base Charleston*, Volumes I, II, III, IV, V, VI and VII, Memphis, Tennessee, July 5, 1996.
- EnSafe/Allen & Hoshall, Inc. (1997). *Final Comprehensive Corrective Measures Study Project Management Plan and Work Plan*, Volumes I and II, Memphis, Tennessee, June 25, 1997.
- EnSafe Inc. (1998). *Zone H, Corrective Measures Study Work Plan*, Memphis, Tennessee, April 13, 1998.
- Environmental Detachment Charleston, South Carolina (1997); *Completion Report, Interim Stabilization Measure for SWMU 159*, Naval Base Charleston, Charleston, South Carolina; May 20, 1997

**9.0 SIGNATORY REQUIREMENT**

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA Part B Permit (EPA SCO 170 022 560) states: *All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with Section 40 CFR 270.11.* The certification reads as follows:

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*

  
Henry N. Sheppard II, P.E.  
Caretaker Site Office, Charleston

  
Date

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



**DRAFT ZONE H, AOC 653  
CORRECTIVE MEASURES STUDY REPORT**

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

**Prepared for:**

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



**Prepared by:**

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**June 17, 1999  
Revision No.: 0**

**Release of this document requires prior notification of the Commanding Officer of the Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.**

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## ABBREVIATIONS, ACRONYMS, AND SYMBOLS

The following abbreviations, acronyms, and units of measurement are used in this report.

AOC	Area of concern
BEQs	Benzo(a)pyrene equivalents
BTEX	Benzene, toluene, ethylbenzene and xylene
CMS	Corrective Measures Study
COCs	Contaminants of concern
CRP	Community Relations Plan
DET	Environmental Detachment
EPA	Environmental Protection Agency
HSWA	Hazardous and Solid Waste Amendments
ILO	Indeterminate lubricating oil
ISM	Interim stabilization measure
MCL	Maximum contaminant level
$\mu\text{g}/\text{kg}$	micrograms per kilogram
$\mu\text{g}/\text{L}$	micrograms per liter
$\text{mg}/\text{kg}$	milligrams per kilogram
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PIP	Public Involvement Plan
RAB	Restoration Advisory Board
RBC	Risk-based concentration
RBSL	Risk-Based Screening Level
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGOs	Remedial goal options
SAA	Satellite Accumulation Area
SVOCs	Semivolatile organic compounds
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds

## **1.0 INTRODUCTION**

Zone H, AOC 653 was designated for a Corrective Measures Study, (CMS), due to potential arsenic concerns in the groundwater. The CMS Work Plan proposed that a single new groundwater monitoring well be constructed at the site. This new well, and nearby grid well pairs GDH003/03D and GDH006/06D, would be monitored for two quarters for arsenic and VOCs. The additional groundwater monitoring would confirm or refute the presence of arsenic and determine if groundwater remedial action is required.

AOC 653 was designated for CMS prior to the evaluation of the interim stabilization measures (ISM) completed by the Environmental Detachment Charleston, South Carolina (Navy DET). The ISM was performed to remove petroleum-related soil contamination from the site. This CMS Report addresses the results of both the CMS sampling and the Navy DET's ISM in terms of a final site remedy. Because additional CMS sampling determined that groundwater remedial action is not required, it was not necessary to identify and screen technologies or evaluate alternatives as part of this CMS report.

**2.0 AOC 653 SITE DESCRIPTION**

**2.1 General**

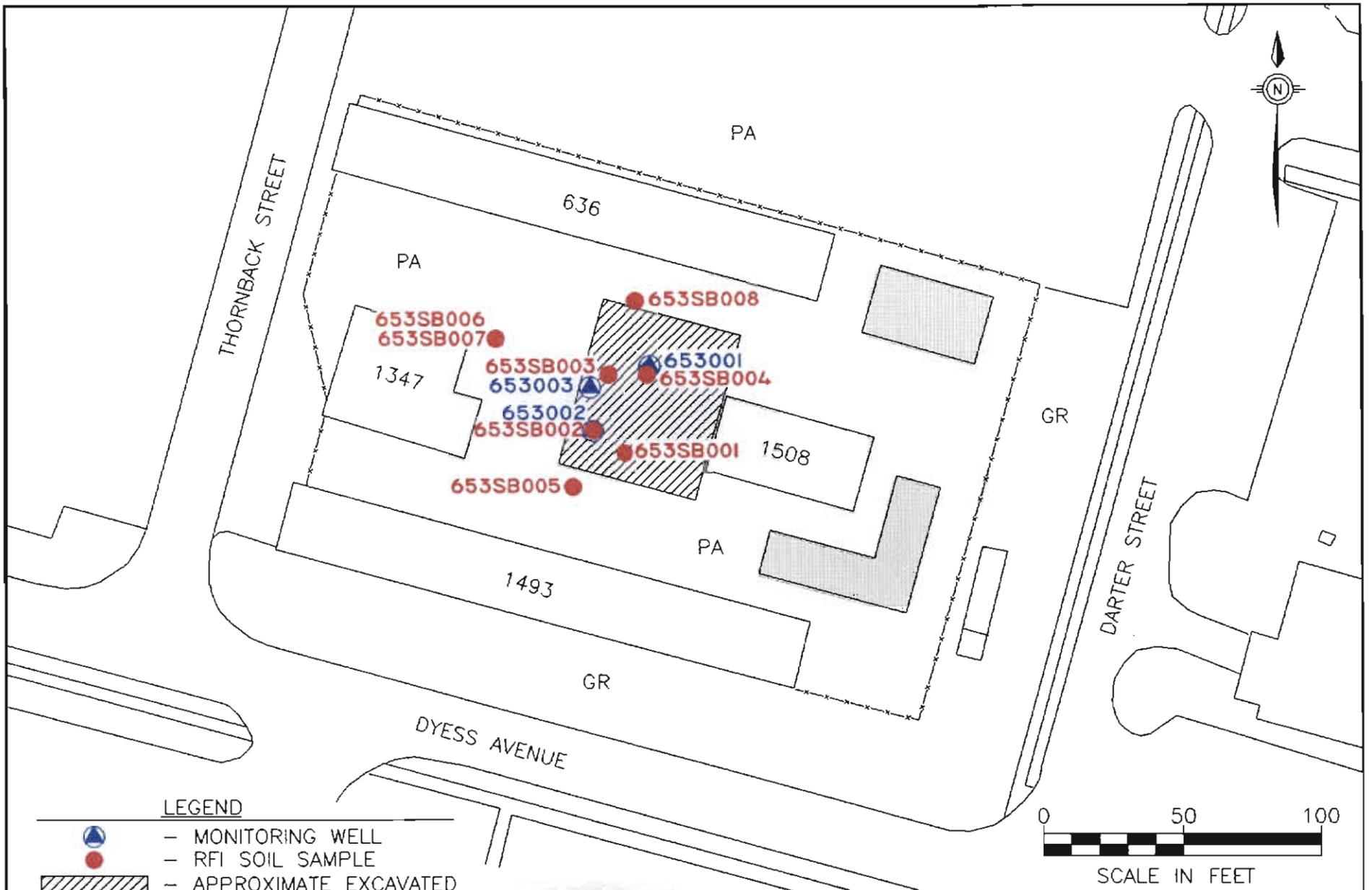
AOC 653 is a former hydraulic fluid storage tank at the west end of Building 1508, one of the four buildings that made up the former automotive hobby shop complex. Other buildings in the complex are 636, 1347, 1493, 1508 and several other structures. A site map for AOC 653 is provided on Figure 1. In 1972, the surface area around the hobby shop was soil or some other unconsolidated material. In 1974, it was paved and auto lifts were added to the west end of Building 1508. Various paints, solvents, thinners and petroleum products have been used and stored onsite. The use of the hydraulic fluid tank was initially discontinued due to suspected leakage. The DET later physically removed the tank from the site during an ISM. Soil and groundwater were sampled at AOC 653 to investigate the possible presence of residual contamination from the leaking tank and other possible spills.

The AOC 653 site is currently used by the United States Coast Guard, a recent federal tenant of the former naval base, for boat and trailer storage. The area excavated by the DET during the ISM has been backfilled with sand and gravel. The other surface area inside the fence remains paved with asphalt. According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for future industrial purposes, which is consistent with its current use.

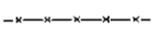
**2.2 RFI/CMS Sampling Results**

**2.2.1 Soil**

Soil samples were collected as part of the RCRA Facility Investigations in 1995. Six first-round soil samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), metals, total petroleum hydrocarbons (TPH), and cyanide. One sample was duplicated and analyzed for herbicides, hexavalent chromium, dioxins, and organophosphate pesticides. A second round of eight soil samples were analyzed for SVOCs, pesticides and dioxins. Soil was sampled near the hydraulic



**LEGEND**

-  - MONITORING WELL
-  - RFI SOIL SAMPLE
-  - APPROXIMATE EXCAVATED AREA BY NAVY DET ISM
-  - US COAST GUARD BOAT AND TRAILER STORAGE
-  - FENCE LINE
- PA - PAVEMENT
- GR - GRASS



ZONE H  
 CMS REPORT  
 CHARLESTON NAVAL COMPLEX  
 CHARLESTON, S.C.

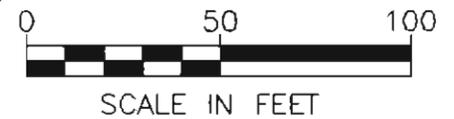


FIGURE 1  
 AOC 653  
 SITE MAP

tank to identify any possible contamination. Soil sampling locations are shown on Figure 1. No surface soil contaminants of concern, (COCs), were identified for this site. The total surface soil risk under both residential and industrial scenarios was below 1E-06. No soil was sampled during the CMS investigations.

Although TPH was not identified as a COC, total petroleum hydrocarbons (as TPH) was detected in all soil samples. The highest TPH concentration (42,000 mg/kg) was at sample location 653SB003. TPH in all four surface interval samples exceeded its screening level of 100 mg/kg. Only two second-interval samples were analyzed for TPH and in both samples TPH exceeded its screening level. TPH analytical results indicated that AOC 653 was contaminated with petroleum hydrocarbons. Petroleum hydrocarbon sampling results are summarized in Table 1.

**Table 1**  
**Soil Sampling Data for AOC 653**

Sample Number	Total Petroleum Hydrocarbons (mg/kg)
<b>Screening Level</b>	<b>100</b>
653-S-B001-01	5,100
653-S-B001-02	400
653-S-B002-01	730
653-S-B003-01	31,000
653-C-B003-01	42,000
653-S-B003-02	440
653-S-B004-01	2,700
653-S-B006-01	NS
653-S-B006-02	NS
653-S-B007-01	NS
653-S-B007-02	NS
653-S-B008-01	NS
653-S-B008-02	NS

*Notes:*

NS — Not sampled

Boxed value indicates sample concentration exceeded screening value.

### **2.2.2 Groundwater**

Two monitoring wells were installed to sample shallow groundwater near AOC 653. First-round samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide and TPH. Based on first-round sampling results, second, third and fourth-round samples were analyzed for SVOCs, pesticides, and metals.

The sole contributor to groundwater risk and hazard at this site is arsenic. Arsenic was detected at concentrations exceeding its MCL in only one of the two groundwater monitoring wells at the site. In addition, the groundwater from this well (653001) exceeded the arsenic MCL of 50  $\mu\text{g/L}$  only once during four quarters of sampling, (54.1  $\mu\text{g/L}$ ).

During the DET activities, both of the previous groundwater monitoring wells at the site were removed (653001 and 653002). Based on the Project Team's concern pertaining to potential arsenic in groundwater, a single new groundwater monitoring well (653003) was constructed at the site in the area of greatest potential for impact from former site activities. Groundwater was to be monitored for two quarters during the CMS to determine whether arsenic was present and to determine if remedial action is required. Two nearby grid well pairs, (GDH003/03D and GDH006/06D), were also to be analyzed during the two additional rounds of CMS sampling. A site map showing the location of all current and previous monitoring wells is provided on Figure 2. The arsenic sampling results for all RFI and CMS sampling performed at this site are summarized in Table 2.

**Table 2**  
**Groundwater Sampling Data for AOC 653**

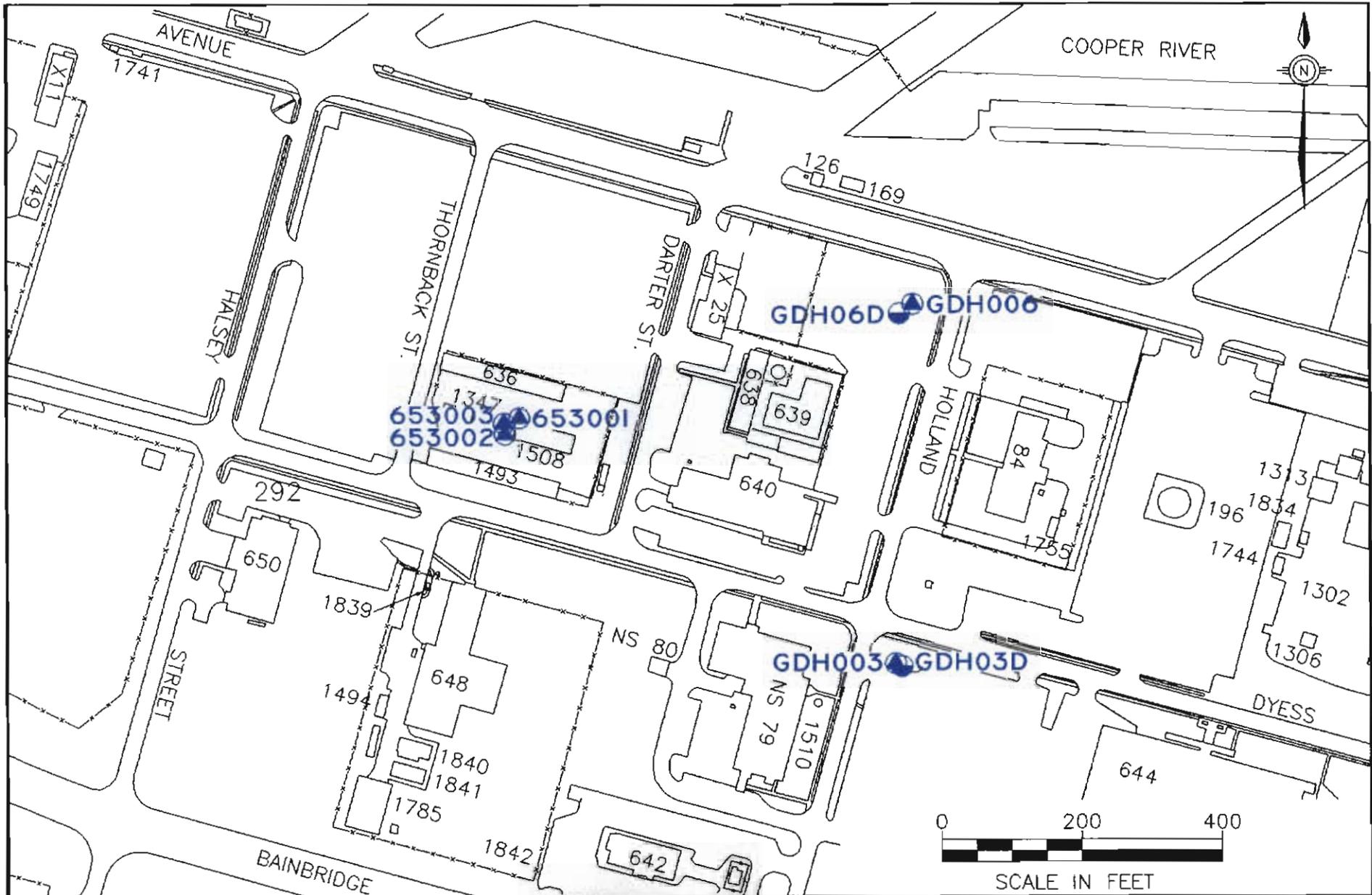
Sample Number	Date	Arsenic ( $\mu\text{g/L}$ )
<b>MCL</b>		<b>50</b>
<b>Background</b>	<b>Shallow</b>	<b>21.5</b>
	<b>Deep</b>	<b>8.2</b>
653-G-W001-01	11/04/94	28.4 U
653-G-W001-02	04/05/95	38.6
653-H-W001-02	04/05/95	34.5
653-G-W001-03	09/27/95	54.1
653-G-W001-04	03/27/96	45
653-G-W002-01	11/04/94	14.3 U
653-G-W002-02	04/05/95	17 UJ
653-G-W002-03	09/27/95	23.4
653-G-W002-04	03/27/96	10.1
653-G-W003-02	11/12/98	9.2 J
653-G-W003-03	01/20/99	3.8 J
GDH-G-W003-01	11/01/94	26.6 U
GDH-G-W003-02	03/28/95	24.8
GDH-G-W003-03	10/04/95	41 J
GDH-G-W003-04	04/08/96	42.1
GDH-G-W003-05	07/27/98	43
GDH-G-W003-06	11/11/98	41.9
GDH-G-W006-01	11/18/94	7.2 J
GDH-H-W006-01	11/18/94	7.3
GDH-G-W006-02	03/28/95	7.3
GDH-G-W006-03	10/09/95	42.7
GDH-H-W006-03	10/09/95	43.4
GDH-G-W006-04	04/10/96	27.8
GDH-H-W006-04	04/10/96	26.9
GDH-G-W006-05	07/27/98	13.9 U
GDH-G-W006-06	11/11/98	49.6

**Table 2**  
**Groundwater Sampling Data for AOC 653**

Sample Number	Date	Arsenic ( $\mu\text{g/L}$ )
<b>MCL</b>		<b>50</b>
<b>Background</b>	<b>Shallow</b>	<b>21.5</b>
	<b>Deep</b>	<b>8.2</b>
GDH-G-W03D-01	11/01/94	3.8 U
GDH-G-W03D-02	03/28/95	2.6 U
GDH-G-W03D-03	10/09/95	2.6 J
GDH-G-W03D-04	04/09/96	4.6 U
GDH-G-W03D-05	07/27/98	4.6 U
GDH-G-W03D-06	11/11/98	2.9 U
GDH-G-W06D-01	11/18/94	8.2 J
GDH-G-W06D-02	03/28/95	2.6 U
GDH-G-W06D-05	07/27/98	4.5 U
GDH-G-W06D-06	11/12/98	2.9 U

*Notes:*

- U — The material was analyzed but not detected at the listed numerical quantitation limit.
  - UJ — The material was analyzed but not detected at the estimated numerical quantitation limit.
  - J — The associated numerical value is an estimated quantity.
- Boxed value indicates sample concentration exceeded MCL.



- LEGEND
-  - SHALLOW MONITORING WELL
  -  - DEEP MONITORING WELL



ZONE H  
 CMS REPORT  
 CHARLESTON NAVAL COMPLEX  
 CHARLESTON, S.C.

FIGURE 2  
 AOC 653  
 MONITORING WELL LOCATION MAP

The new monitoring well was constructed at the site. This new well, along with the two nearby grid-well pairs was sampled for two rounds. The arsenic concentration in all five wells was below the maximum contaminant level in both additional CMS sampling rounds. The only VOC detected in two rounds of CMS supplemental groundwater sampling at the five wells was acetone. All other VOC parameters were below the detection limits in all five wells for both rounds. During both sampling rounds at well GDH003, acetone was detected at 10  $\mu\text{g/L}$  and 190  $\mu\text{g/L}$ . During one round of sampling at monitoring well GDH06D, acetone was detected at 10  $\mu\text{g/L}$ . All of these values are below the acetone tap-water risk-based concentration (RBC) of 370  $\mu\text{g/L}$ .

### **2.2.3 Sediment**

Sediment was not sampled at AOC 653.

### **2.2.4 Surface Water**

Surface water was not sampled at AOC 653.

## **2.3 Interim Stabilization Measures**

The DET performed an ISM at the site in December of 1996. Such interim measures are designed to eliminate sources of environmental contamination or to limit the spread of environmental contaminants before completion of the CMS. A completion report summarizing the work performed by the DET during the ISM has been prepared and is dated July 7, 1997. Although TPH was not identified as a COC, it was detected in all soil samples. The highest TPH concentration (42,000 mg/kg) was at sample location 653SB003. The screening level of 100 mg/kg was exceeded in all four surface interval samples. Only two second-interval samples were analyzed for TPH and both exceeded the screening level. Based on this level of petroleum-related contamination, the decision was made to implement an ISM at this site.

The objective of the ISM was to remove petroleum-related soil contamination from the site. The original guidance for soil excavation was to remove and dispose of any contaminated soil having TPH levels greater than 100 mg/kg. During performance of the interim measure, the controlling guidance for soil excavation was changed to soil with petroleum-related contamination exceeding the Region III Residential Risk-Based Concentrations.

The following activities were conducted as part of the ISM performed by the DET at this site:

- A metal structure housing the hydraulic lifts was removed and disposed.
- Approximately 4,500 ft<sup>2</sup> of asphalt were removed and disposed.
- Approximately 1,000 ft<sup>2</sup> of concrete pad were removed and disposed.
- All hydraulic components, including rams, supply tanks and a vault, were removed, decontaminated, and disposed.
- An estimated 700 cubic yards of contaminated soil containing levels greater than RBCs was removed.
- Confirmation samples were taken of the remaining sidewalls and bottom of the excavated area to ensure compliance with RBCs.
- The site was cleared of all visible debris and all excavated areas were backfilled with clean soil.

- All excavated soil was sampled and characterized as non-hazardous and stockpiled onsite awaiting disposal.

The findings of the RFI soil investigation were used to determine the areas to begin excavation. Immunoassay field samples were taken during excavation as a field screening to determine whether petroleum-related contaminants were present. Following all excavation activities, confirmatory samples were taken at the bottom and sidewalls of all four excavated areas. A total of 16 confirmation samples were taken and analyzed for 4 volatile organics (BTEX), 16 extractable organics (PAHs), and 8 RCRA metals. All 16 samples were below the detection limits for BTEX. Most samples, (13), were below the detection limits for all PAHs. Of the three samples in which PAHs were detected, only one sample contained a benzo(a)pyrene detection (285  $\mu\text{g}/\text{kg}$ ) above the residential RBC (87  $\mu\text{g}/\text{kg}$ ). All 16 confirmation samples exceeded the RBC for arsenic. However, of these 16 samples, only one (38.2  $\text{mg}/\text{kg}$ ) exceeded the background reference concentration for arsenic (22.5  $\text{mg}/\text{kg}$ ). All other metals were below the residential RBC value.

No COCs were identified for the surface soil during the RFI. The total surface soil risk under both residential and industrial scenarios was below  $1\text{E}-06$ . The revised objective of meeting the Region III RBCs was generally met by the removal of 700 cubic yards of soil. All excavated soil was removed from the site and replaced with clean soil. Confirmation samples were collected to document that the remaining soil met the Region III RBC requirements. Fifteen out of 16 confirmation samples complied with all petroleum related organic RBC requirements.

### 3.0 REMEDIAL OBJECTIVES 1

#### 3.1 Soil Remedial Objectives 2

Because no surface soil COCs were identified for this site, soil remedial objectives were not 3  
developed during the RFI. The DET ISM completed at the site resulted in the removal of 4  
approximately 700 cubic yards of petroleum-impacted soil. Results of the ISM activities are 5  
provided in the DET completion report dated July 7, 1997. Final soil remedial objectives are not 6  
required for this site since all risk-based residential surface soil requirements have been met. 7

#### 3.2 Groundwater Remedial Objectives 8

The only groundwater COC identified in the RFI was arsenic. The background arsenic 9  
concentration in shallow site groundwater is 21.5  $\mu\text{g}/\text{L}$  with an MCL value of 50  $\mu\text{g}/\text{L}$ . Arsenic 10  
exceeded its MCL in only one of four rounds at a single well during the RFI sampling. 11

Arsenic was considered during the CMS process to determine if it was present in shallow 12  
groundwater at consistent concentrations exceeding MCLs. The additional CMS investigations 13  
documented that arsenic was not present in site groundwater at concentrations exceeding the MCL. 14  
Since MCLs have been met for all parameters at the site, additional groundwater remedial 15  
objectives are not required. 16

**4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES** 1

**4.1 Soil Remedial Technologies** 2

Identification and screening of soil remedial technologies is not warranted for this CMS Report 3  
based on the post-ISM confirmation sample results. 4

**4.2 Groundwater Remedial Technologies** 5

Identification and screening of groundwater remedial technologies is not warranted for this CMS 6  
Report based on the results of the additional CMS groundwater sampling. AOC 653 shallow 7  
groundwater complies with all MCL levels. 8

<b>5.0</b>	<b>DETAILED EVALUATION OF ALTERNATIVES</b>	1
<b>5.1</b>	<b>Evaluation of Soil Remedial Alternatives</b>	2
	Detailed evaluation of soil remedial alternatives is not warranted for this CMS Report based on the post-ISM confirmation sampling results.	3 4
<b>5.2</b>	<b>Evaluation of Groundwater Remedial Alternatives</b>	5
	Detailed evaluation of groundwater remedial alternatives is not warranted for this CMS Report. This is based on the results of the additional groundwater sampling performed during the CMS. AOC 653 shallow groundwater is in compliance with all MCL levels.	6 7 8

**6.0 RECOMMENDATIONS**

1

**6.1 Soil Recommendations**

2

No surface soil COCs were identified for AOC 653. Based on post-ISM confirmation sample results, the petroleum-impacted soil has been removed from the site and AOC 653 is recommended for no further corrective action under the RCRA CMS process.

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**6.2 Groundwater Recommendations**

6

AOC 653 shallow groundwater is recommended for no further corrective action under the RCRA CMS process based on CMS sampling results that documented that shallow groundwater at the site complies with MCLs.

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**7.0 PUBLIC INVOLVEMENT PLAN**

1

**7.1 General**

2

The following Public Involvement Plan (PIP) is included as part of this report in accordance with the EPA’s guidance on RCRA CMS. This PIP reflects and summarizes information prepared and presented in the Navy’s Community Relations Plan (CRP), prepared for Charleston Naval Complex in 1995.

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Under RCRA, there is no required interaction with the community during the Corrective Measures Study process. Public input is required to be solicited only at the beginning of the permitting process, or during certain permit modifications. Therefore, the Navy has outlined a voluntary program of informing local communities throughout the entire RCRA Corrective Action process. Activities are detailed in the 1995 CRP for the Charleston Naval Complex.

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However, because the CMS process results in a modification to the facility’s RCRA permit, certain provisions are made to solicit the public’s input on the preferred alternative (as the reason for the modification). The requirements are identical to those required for a draft permit.

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Two primary objectives are stated in the CRP:

15

- To initiate and sustain community involvement.
- To provide a mechanism for communicating to the public.

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**7.2 RFI Public Involvement Plan**

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To achieve these objectives, the CRP identifies public involvement and outreach activities at each step of the Corrective Action process. For example, the following activities have been designated for the completion of the RFI. All have been accomplished.

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- Update and publicize the information repository. 1
  - Continue to publicize the point of contact. 2
  - Update the mailing list. 3
  - Distribute fact sheets and/or write articles to explain RFI findings. 4
  - Inform community leaders of the completion and results of the RFI. 5
  - Update and continue to provide, whenever possible, presentations for informal community groups. 6  
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  - Update the community on results of the RFI through public Restoration Advisory Board meetings. 8  
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- 7.3 CMS Public Involvement Plan** 10
- During the Corrective Measures Study, the following activities will be carried out as part of the Navy’s current and ongoing community involvement program. 11  
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- Distribute a fact sheet and/or write articles for publication that report CMS recommendations. 13  
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  - Continue to update the mailing list. 15
  - Continue to respond to requests for speaking engagements. 16
  - Update the community on CMS status through public Restoration Advisory Board meetings. 17  
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**7.4 Statement of Basis Public Involvement Plan**

Upon completion of the Corrective Measures Study, when the preferred alternative has been proposed, the following activities are required if a modification to the RCRA permit is required. If a permit modification is not necessary, the Navy may choose to implement all, some, or none of the following actions, depending on the level of public interest or concern:

- A Statement of Basis will be prepared, explaining the proposed remedy and the method by which it was chosen. The Statement of Basis acts as a summary of the CMS.
- A 45-day comment period will be provided to allow community members the opportunity to review and comment on the preferred alternative. The comment period may be as short as 30 days in cases where no permit modification is necessary, but a public comment period is warranted.
- Availability of the comment period and Statement of Basis will be announced in a public notice.
- The community will be provided an update on the proposed remedy through the informal and publicized Restoration Advisory Board meetings.

In addition, the following activities will be carried out, as identified in the CRP:

- Update and publicize the information repository.
- Publicize the environmental point of contact.
- Continue to update the mailing list.

**7.5 Restoration Advisory Board**

The RAB is a key component of this community outreach program. It is through the RAB that the Navy has a regular, scheduled, and publicized forum for interfacing with community members on the progress of the environmental program, including CMS. In addition, RAB members are key instruments in measuring community interest in specific issues and knowledge of them. A Community Relations Subcommittee to the RAB has been tasked with identifying issues and information to be addressed by the Navy.

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**8.0 REFERENCES**

EnSafe/Allen & Hoshall, Inc. (1996). *Final RCRA Facility Investigation Report, Zone H, Naval Base Charleston*, Volumes I, II, III, IV, V, VI and VII, Memphis, Tennessee, July 5, 1996. 1  
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EnSafe/Allen & Hoshall, Inc. (1997). *Final Comprehensive Corrective Measures Study Project Management Plan and Work Plan*, Volumes I and II, Memphis, Tennessee, June 25, 1997. 5  
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EnSafe Inc. (1998). *Zone H, Corrective Measures Study Work Plan*, Memphis, Tennessee, April 13, 1998. 7  
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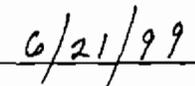
Environmental Detachment Charleston, South Carolina (1997); *Completion Report, Interim Stabilization Measure for AOC 653*, Naval Base Charleston, Charleston, South Carolina; July 7, 1997. 9  
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**9.0 SIGNATORY REQUIREMENT**

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA Part B Permit (EPA SCO 170 022 560) states: *All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with Section 40 CFR 270.11.* The certification reads as follows:

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*

  
Henry N. Sheppard II, P.E.  
Caretaker Site Office, Charleston

  
Date