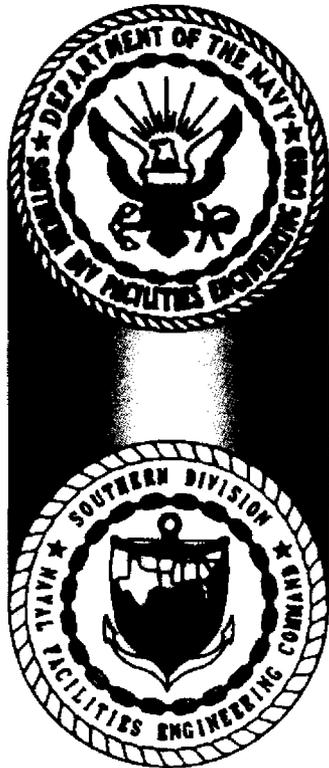


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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT  
ADDENDUM CORRECTIVE MEASURES STUDY WORK PLAN AREA OF CONCERN 573  
(AOC 573) ZONE E CNC CHARLESTON SC  
4/30/2003  
CH2M HILL

# RFI REPORT ADDENDUM

## RFI Report Addendum and CMS Work Plan AOC 573. Zone E



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

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

*CH2M-Jones*

*April 2003*

*Contract N62467-99-C-0960*



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April 30, 2003

Mr. David Scaturo  
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Environmental Control  
Bureau of Land and Waste Management  
2600 Bull Street  
Columbia, SC 29201

Re: RFI Report Addendum and CMS Work Plan (Revision 1) – AOC 573, Zone E

Dear Mr. Scaturo:

Enclosed please find two copies of the RFI Report Addendum and CMS Work Plan (Revision 1) for AOC 573 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is Sam Naik. Please contact him at 770/604-9182, extension 255, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Tim Frederick/Gannett Fleming, Inc., w/att  
Rob Harrell/Navy, w/att  
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August 30, 2002

Mr. David Scaturo  
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Bureau of Land and Waste Management  
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Columbia, SC 29201

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# RFI REPORT ADDENDUM

## RFI Report Addendum and CMS Work Plan AOC 573, Zone E



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

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

PREPARED BY  
***CH2M-Jones***

*April 2003*

Revision 1  
Contract N62467-99-C-0960  
158814.ZE.PR.01

## Certification Page for RFI Report Addendum and CMS Work Plan (Revision 1) – AOC 573, Zone E

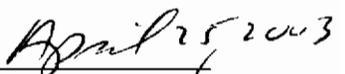
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428



Dean Williamson, P.E.

  
Date

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# 1 **Contents, Continued**

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- 2 **C** Figure C-1, which presents the site location from the Public Works Map of the
- 3 Charleston Navy Shipyard (December 15, 1939)
- 4 **D** Analytical Results Summary (May 2002 Sampling Event)
- 5 **E** Data Validation Reports (May 2002 Sampling Event)
- 6 **F** UCL<sub>95</sub> Estimates for BEQs in Surface Soil at AOC 573
- 7 **G** CH2M-Jones' Responses to EPA Comments on the *RFI Report Addendum and CMS*
- 8 *Work Plan, AOC 573, Zone E, Revision 0*

# 1 Acronyms and Abbreviations

---

2	AOC	Area of concern
3	AST	Aboveground storage tank
4	BCT	BRAC Cleanup Team
5	BEQ	Benzo[a]pyrene equivalent
6	BRAC	Base Realignment and Closure Act
7	BRC	Background reference concentration
8	CA	Corrective action
9	CMS	Corrective measures study
10	CNC	Charleston Naval Complex
11	COC	Chemical of concern
12	COPC	Chemical of potential concern
13	CSI	Confirmatory Sampling Investigation
14	DAF	Dilution attenuation factor
15	DET	Environmental Detachment Charleston
16	EnSafe	EnSafe Inc.
17	EPA	U.S. Environmental Protection Agency
18	FRE	Fixed-point risk evaluation
19	HHRA	Human Health Risk Assessment
20	HI	Hazard index
21	ILCR	Incremental lifetime cancer risk
22	IM	Interim measure
23	LUC	Land use control
24	MCL	Maximum contaminant level
25	MCS	Media cleanup standard
26	$\mu\text{g}/\text{kg}$	Micrograms per kilogram
27	$\mu\text{g}/\text{L}$	Micrograms per liter
28	$\text{mg}/\text{kg}$	Milligrams per kilogram
29	NAVBASE	Naval Base
30	NFA	No further action

# 1 **Acronyms and Abbreviations, Continued**

---

2	NFI	No further investigation
3	OWS	Oil/water separator
4	PCB	Polychlorinated biphenyl
5	POL	Petroleum, oil, and lubricant
6	RAO	Remedial action objective
7	RBC	Risk-based concentration
8	RCRA	Resource Conservation and Recovery Act
9	RFI	RCRA Facility Investigation
10	RGO	Remedial goal option
11	RI	Remedial investigation
12	SAP	Sampling and Analysis Plan
13	SCDHEC	South Carolina Department of Health and Environmental Control
14	SSL	Soil screening level
15	SVOC	Semivolatile organic compound
16	SWMU	Solid waste management unit
17	TDS	Total dissolved solids
18	VOC	Volatile organic compound
19	UST	Underground storage tank



# 1.0 Introduction

---

In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for closure as part of the Defense Base Realignment and Closure Act (BRAC), which regulates closure and transition of property to the community. The Charleston Naval Complex (CNC) was formed as a result of the dis-establishment of the Charleston Naval Shipyard and NAVBASE on April 1, 1996.

Corrective Action (CA) activities are being conducted under the Resource Conservation and Recovery Act (RCRA) with the South Carolina Department of Health and Environmental Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities are performed in accordance with the Final Permit (Permit No. SC0 170 022 560).

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to complete the RCRA Facility Investigation (RFI) for Area of Concern (AOC) 573 in Zone E of CNC. The location of AOC 573 in Zone E is shown in Figure 1-1. Figure 1-2 shows an aerial photograph of the site.

## 1.1 Background

### **AOC 573 – Anodizing Process, Building 177**

AOC 573 is a covered shed where an anodizing process was conducted. The shed is a 3-sided metal attachment to Building 177. The anodizing process included a 2,000-gallon irradiate (chromic acid solution) dipping tank and a spray area with a 110-gallon sump. The sump was used to collect excess spray and rinse water. Metal parts and antennas were dipped or sprayed and rinsed with tap water. This site was contained on three sides by a concrete berm. The fourth side sloped back to the sump. Before 1972, the sump was connected to the stormwater sewer. These operations no longer exist at the site.

AOC 573 is currently used by a vehicle maintenance shop as a storage facility for petroleum, oil, and lubricant (POL) substances. The sump is no longer connected to the sewer system. If the sump fills up, the contents are pumped into 55-gallon drums and are disposed of as hazardous waste.

The materials of concern identified in the *Final Zone E RFI Work Plan, Revision 1* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1995) include acids, hexavalent chromium and other metals, and

1 petroleum hydrocarbons. This area of Zone E is zoned M-2 (industrial). The CNC RCRA  
2 Permit identified AOC 573 as requiring a Confirmatory Sampling Investigation (CSI). A  
3 focused Corrective Measures Study (CMS) Work Plan is also provided in this submittal, in  
4 order to address potential remedies for chemicals of concern (COCs) detected in site surface  
5 soils at AOC 573.

6 A review of historical engineering drawings for this site shows that railroad lines were  
7 previously located along the north, south, and west sides of the metal shed attached to  
8 Building 177 (see Figure C-1 in Appendix C of this document). The railroad lines were  
9 either paved over or removed sometime after 1955.

10 The RFI was initially conducted by the Navy/EnSafe Inc. (EnSafe) team, and the RFI  
11 activities were described in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Regulatory  
12 review was conducted on this document and a draft response to the comments from  
13 SCDHEC was prepared by the Navy/EnSafe team. These comments and responses are  
14 included in Appendix B of this document.

## 15 **1.2 Purpose of the RFI Report Addendum**

16 The purpose of this RFI Report Addendum is to document the results of previous RFI  
17 investigations conducted by the Navy/EnSafe team at AOC 573. This RFI Report  
18 Addendum includes a summary of previous RFI investigations and conclusions, as well as  
19 additional investigations conducted by CH2M-Jones during 2002, at AOC 573. This RFI  
20 Report Addendum also discusses various close-out issues and the findings of previous  
21 investigations, existing site conditions, and surrounding area land use.

22 Prior to changing the status of any site in the CNC RCRA CA permit, the BRAC Cleanup  
23 Team (BCT) agreed that the following issues should be considered:

- 24 • Status of the RFI
- 25 • Presence of metals (inorganics) in groundwater
- 26 • Potential linkage to SWMU 37, Investigated Sanitary Sewers at the CNC
- 27 • Potential linkage to Area of Concern (AOC) 699, Investigated Storm Sewers at the CNC
- 28 • Potential linkage of AOC 504, Investigated Railroad Lines at the CNC
- 29 • Potential linkage to surface water bodies (Zone J)
- 30 • Potential contamination associated with oil/water separators (OWSs)
- 31 • Relevance or need for land use controls (LUCs) at the site

1 Information regarding these issues is also provided in this RFI Report Addendum to  
2 expedite evaluation of closure of the site.

### 3 **1.3 Report Organization**

4 This RFI Report Addendum consists of the following sections, including this introductory  
5 section:

6 **1.0 Introduction** – Presents the purpose of the report and background information relating  
7 to the RFI Report Addendum.

8 **2.0 Summary of RFI Conclusions for AOC 573** – Summarizes the conclusions from the RFI  
9 investigations and risk evaluations for AOC 573 as presented in *the Zone E RFI Report,*  
10 *Revision 0.*

11 **3.0 Interim Measures and UST/AST Removals** – Provides information regarding any  
12 interim measures (IMs) or tank removal activities performed at the site.

13 **4.0 Summary of Additional Investigations** – Summarizes information, if any, collected  
14 after completion of the *Zone E RFI Report, Revision 0 (EnSafe, 1997).*

15 **5.0 COPC/COC Refinement** – Provides further evaluation of chemicals of potential concern  
16 (COPC) based on RFI and additional data to assess them as chemicals of concern  
17 (COCs).

18 **6.0 Summary of Information Related to Site Closeout Issues** – Discusses the various site  
19 closeout issues that the BRAC Cleanup Team (BCT) agreed to evaluate prior to site  
20 closeout.

21 **7.0 Recommendations** – Provides recommendations for proceeding with site closure.

22 **8.0 CMS Work Plan for AOC 573** - Provides a focused workplan for a CMS recommended  
23 for AOC 573.

24 **9.0 References** – Lists the references used in this document.

25 **Appendix A** – Contains excerpts from the *Zone E RFI Report, Revision 0,* including a  
26 summary of detections of chemicals and a groundwater flow map for the site vicinity.

27 **Appendix B** – Contains responses to SCDHEC comments for AOC 573 from the *Zone E RFI*  
28 *Report, Revision 0.*

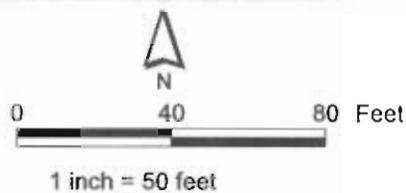
- 1 **Appendix C** – Contains Figure C-1, which presents the site location from the Public Works
- 2 Map of the Charleston Navy Shipyard dated December 15, 1939, and depicts the presence of
- 3 railroad lines at the site.
  
- 4 **Appendix D** – Contains the analytical results summary for the additional soil and
- 5 groundwater samples collected at AOC 573.
  
- 6 **Appendix E** – Contains the data validation reports for these additional data.
  
- 7 **Appendix F** – Contains the UCL<sub>95</sub> Estimates for BEQs in Surface Soil at AOC 573.
  
- 8 All figures and tables appear at the end of their respective sections.





-  Fence
-  Railroads
-  Roads
-  AOC Boundary
-  SWMU Boundary
-  Buildings

 Zone Boundary



**Figure 1-2**  
Aerial Photograph of AOC 573  
AOC 573, Zone E  
Charleston Naval Complex

**Section 2.0**

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## 2.0 Summary of RFI Conclusions for AOC 573

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This section summarizes the results and conclusions from the soil and groundwater investigations conducted at AOC 573 as reported in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Appendix A contains excerpts from the RFI report, including a summary of detections of chemicals and a groundwater flow map for the site vicinity.

As part of the Zone E RFI, soil, groundwater, and sediment investigations were conducted at AOC 573 from 1995 to 1997. The RFI report presented the results of these investigations and conclusions concerning contamination and risk, as summarized in the following sections. A further evaluation of COCs at this site is provided in Section 5.0. Figure 2-1 shows RFI soil, groundwater, and sediment sampling locations.

### 2.1 Soil Sampling and Analysis

The RFI at AOC 573 included the collection and analysis of five surface and subsurface soil samples collected during a single sampling event. All soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and pH. Two surface soil samples and two subsurface soil samples were selected as duplicates and analyzed for VOCs, SVOCs, herbicides, organophosphorous pesticides, hexavalent chromium, and dioxins.

#### 2.1.1 Surface Soil Results

During the RFI, surface soil detections of organic compounds were evaluated against the U.S. Environmental Protection Agency (EPA) Region III industrial risk-based concentrations (RBCs) (with a hazard index [HI]=0.1 for noncarcinogens). Surface soil detections of inorganic compounds were evaluated against the EPA Region III industrial RBCs (HI=0.1 for noncarcinogens) and the Zone E background reference concentrations (BRCs).

Detected concentrations of organic and inorganic analytes exceeding their respective criteria were as follows:

**VOCs:** No VOCs exceeded the screening criteria in surface soils.

**SVOCs:** The RFI report stated that among detected SVOC compounds, there were two calculated benzo[a]pyrene (BEQ) concentrations which exceeded the industrial RBC of 780

1 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) for benzo[a]pyrene. These BEQ detections were found in  
2 samples from 573SB002 at 5,700  $\mu\text{g}/\text{kg}$ , and 573SB005 at 891  $\mu\text{g}/\text{kg}$ . BEQ calculations were  
3 performed using the method adopted by the BCT at the time of writing of the *Zone E RFI*  
4 *Report, Revision 0*.

5 **Inorganics:** No inorganic detections exceeded the screening criteria in surface soil.

6 **Pesticides:** Detected pesticide concentrations did not exceed the screening criteria.

## 7 **2.1.2 Subsurface Soil Results**

8 During the RFI, subsurface soil detections of organic compounds were compared with  
9 generic soil screening levels (SSLs) (using a dilution attenuation factor [DAF]=10).

10 Subsurface soil detections of inorganic compounds were compared with generic SSLs (using  
11 a DAF=10) and the Zone E BRCs.

12 Detected concentrations of organic and inorganic compounds from subsurface soil samples  
13 are as follows:

14 **VOCs:** No VOCs exceeded the screening criteria in subsurface soil.

15 **SVOCs:** Detected SVOC concentrations did not exceed the screening criteria.

16 **Inorganics:** Among detected inorganic analytes, barium exceeded the screening criteria.

17 Barium, at a concentration of 98.2 milligrams per kilogram ( $\text{mg}/\text{kg}$ ) at E570SB012, exceeded  
18 both its SSL of 32  $\text{mg}/\text{kg}$  and the Zone E BRC of 94  $\text{mg}/\text{kg}$  in subsurface soil.

19 **Pesticides:** No pesticides were detected in subsurface soil above the laboratory detection  
20 limits.

## 21 **2.2 Groundwater Sampling and Analysis**

22 The RFI for AOC 573 included the installation of one shallow monitoring well, E573GW001  
23 (formerly identified as NBCE573001), and one deep monitoring well, E573GW01D (formerly  
24 identified as NBCE57301D), as shown in Figure 2-1. The groundwater samples were  
25 analyzed for VOCs, SVOCs, metals, pH, chlorides, sulfates, and total dissolved solids (TDS).  
26 One shallow monitoring well sample was selected as a duplicate and sampled for the above  
27 parameters as well as herbicides, organophosphorus pesticides, dioxins, and hexavalent  
28 chromium.

29 During the RFI, each well was sampled four times between 1996 and 1997. Constituents  
30 detected in the groundwater samples were evaluated relative to the EPA Region III tap

1 water RBCs, maximum contaminant levels (MCLs), and the Zone E BRCs for shallow and  
2 deep aquifers.

### 3 **2.2.1 Shallow Groundwater Results**

4 Analyte concentrations in shallow groundwater samples were detected as follows at this  
5 site:

6 **VOCs:** No VOCs were detected in shallow groundwater above laboratory detection limits.

7 **SVOCs:** No SVOCs were detected in shallow groundwater above laboratory detection limits.

8 **Inorganics:** Among detected analytes, iron exceeded screening criteria. Iron, at a  
9 concentration of 5,530 micrograms per liter ( $\mu\text{g}/\text{L}$ ) at E573GW001, exceeded its tap water  
10 RBC of 1,100  $\mu\text{g}/\text{L}$  in shallow groundwater. No primary MCL exists for iron and no shallow  
11 groundwater BRC was developed for iron in Zone E during the RFI.

### 12 **2.2.2 Deep Groundwater Results**

13 Analyte concentrations in deep groundwater samples were detected as follows at this site:

14 **VOCs:** No VOCs were detected in deep groundwater above laboratory detection limits.

15 **SVOCs:** No SVOCs were detected in deep groundwater above laboratory detection limits.

16 **Inorganics:** No inorganic detections in deep groundwater samples exceeded screening  
17 criteria.

## 18 **2.3 Sediment Sampling and Analysis**

19 The RFI investigation for AOC 573 included two sediment samples collected from locations  
20 shown in Figure 2-1. The sediment samples were analyzed for VOCs, SVOCs, metals, and  
21 pH. These sediments were found in the storm drain catch basins and are not true sediments  
22 collected along surface water bodies.

23 Detections in sediment samples were evaluated during the RFI, against the EPA Region III  
24 industrial RBCs (with a HI=0.1 for noncarcinogens).

25 Detected concentrations of organic and inorganic compounds from sediment samples are as  
26 follows:

27 **VOCs:** No VOCs were detected above laboratory detection limits.

28 **SVOCs:** No SVOC detections exceeded the screening criteria in sediment samples.

- 1 **Inorganics:** Among detected inorganic analytes, two metals exceeded their respective  
2 screening criteria:
- 3 • Arsenic exceeded the industrial soil RBC of 3.8 mg/kg at a concentration of 4.9 mg/kg  
4 at E573M0001, and at a concentration of 9.6 mg/kg at E573M0002.
  - 5 • Chromium (total) exceeded the industrial soil RBC for total chromium of 1,000 mg/kg at  
6 a concentration of 7,320 mg/kg at E573M0001.

7 Subsequent to the RFI field investigation, the sediments that were present in the floor drain  
8 at AOC 573 were addressed in the Interim Measure (IM) for AOC 699, conducted by the  
9 Environmental Detachment Charleston (DET) in 1999. As a result, these sediments are no  
10 longer present at this site.

## 11 **2.4 RFI Human Health Risk Assessment (HHRA)**

12 The *Zone E RFI Report Revision 0* used a fixed-point risk evaluation (FRE) approach at this  
13 site. The FRE included site resident and site worker exposure scenarios. The detailed risk  
14 assessment for the AOC 573 site are presented in Section 10.37.8 of the *Zone E RFI Report,*  
15 *Revision 0* (EnSafe, 1997).

### 16 **2.4.1 Soils**

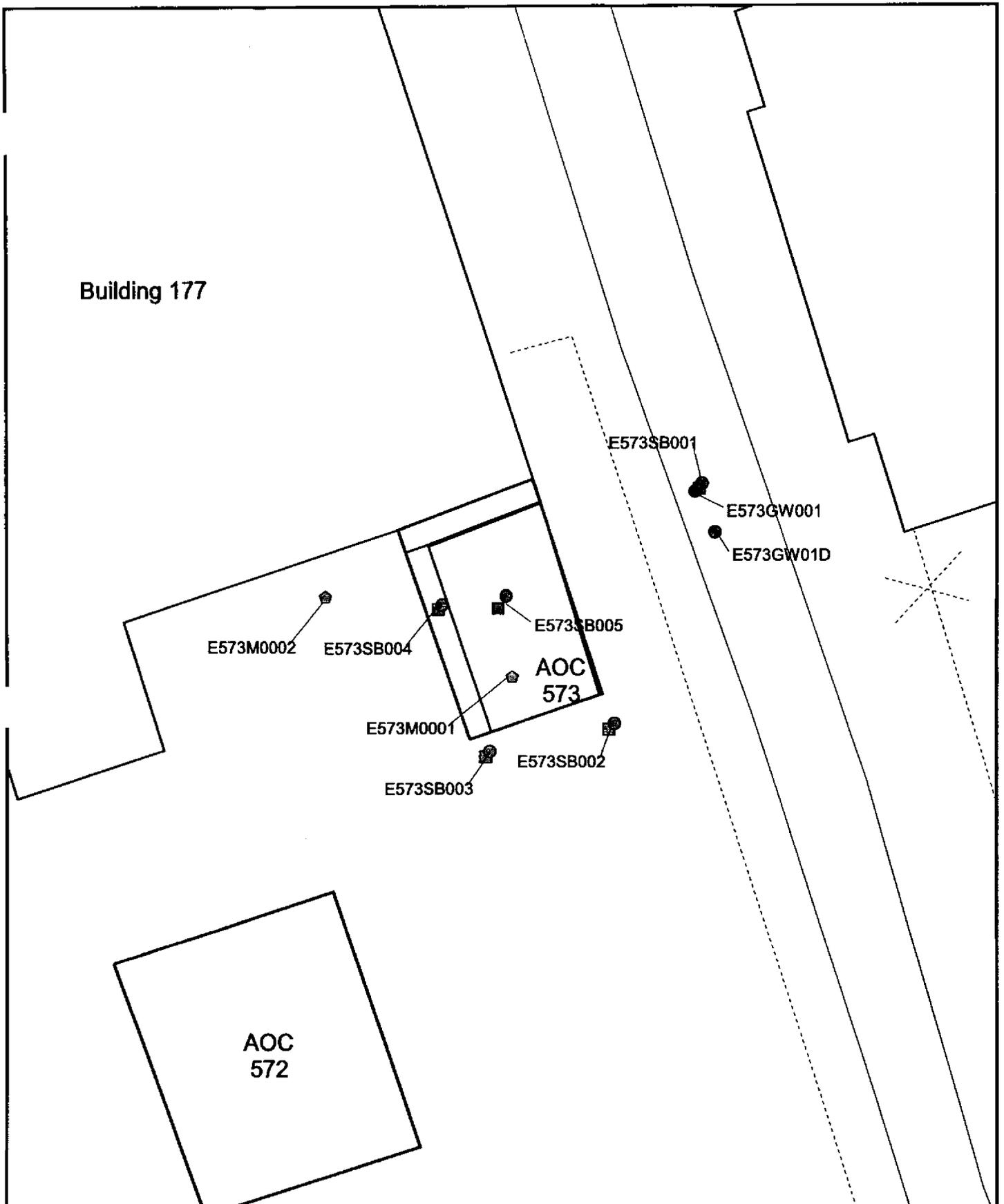
17 BEQs were retained as COCs for surface soil for both the residential and  
18 industrial/commercial land use scenarios. No COCs were identified for subsurface soils at  
19 AOC 573.

### 20 **2.4.2 Groundwater**

21 No COCs were identified for shallow or deep groundwater.

## 22 **2.5 RFI Conclusions and Recommendations**

23 The *Zone E RFI Report, Revision 0* recommended that a CMS be conducted at AOC 573 for  
24 surface soil to address BEQs in surface soil.



**Figure 2-1**  
 AOC 573, Sampling Locations  
 AOC 573, Zone E  
 Charleston Naval Complex



## 1 **3.0 Interim Measures and UST/AST Removals**

---

### 2 **3.1 UST/AST Removals**

3 There are no underground storage tanks (USTs) associated with AOC 573. Four 500-gallon  
4 aboveground storage tanks (ASTs) are located in AOC 573, which is currently used as a fuel  
5 storage shed, as discussed earlier in Section 1.1. The ASTs are used to store motor oil,  
6 lubricating oil, and transmission oil. Drums of transmission oil are also located in the shed.

### 7 **3.2 Interim Measures**

8 An IM was conducted by the Environmental Detachment Charleston (DET) for AOC 699  
9 (January, 1999), which included portions of the storm sewer system associated with AOC  
10 573. The activities conducted for the IM included hydro-blast cleaning of catch basins,  
11 manholes, and associated interconnecting piping. The IM activities are documented in  
12 *Interim Measure Completion Report for AOC 699 Storm Drain Cleaning* (DET, 1999).

13 During this IM, the storm drain and sump located at AOC 573 (sediment sampling locations  
14 E573M0001 and E573M0002) were cleaned. As a result, No Further Action (NFA) for the  
15 sediments in these locations is necessary.



## 1 **4.0 Summary of Additional Investigations**

---

2 This section summarizes the results and conclusions from a soil investigation conducted at  
3 AOC 573 by CH2M-Jones during May 2002 to further delineate the nature and extent of  
4 chromium in soil. The objective of this additional soil sampling was to determine if a  
5 potential subsurface source area of hexavalent chromium was present.

6 A sampling and analysis plan (SAP) for AOC 573 was prepared by CH2M-Jones and  
7 submitted to SCDHEC during April 2002. The soil sampling was conducted during May  
8 2002. Appendix D contains the analytical results summary for the additional soil and  
9 groundwater samples collected at AOC 573. Appendix E contains the data validation  
10 reports for these additional data.

### 11 **4.1 Soil Sampling and Analysis**

12 One RFI soil boring location E573SB005 (which showed elevated chromium [total]  
13 concentrations in subsurface soil of 375 mg/kg), was resampled during May 2002 to verify  
14 these concentrations, and the new boring was identified as E573SB009. Three new soil  
15 boring locations were sampled to further delineate chromium concentrations. At this  
16 resampling location and new sampling locations, surface and subsurface samples were  
17 collected from the 0 to 1 foot below land surface (ft bls), 1 to 3 ft bls, and 3 to 5 ft bls depth  
18 intervals. At location E573SB006 an obstruction was encountered at the the 3 to 5 ft bls  
19 depth interval, preventing sample collection at this depth. Figure 4-1 shows the locations  
20 where soil sampling was conducted.

#### 21 **4.1.1 Surface Soil Results**

22 Surface soil detections of inorganic compounds were evaluated against the EPA Region III  
23 residential RBCs (HI=0.1 for noncarcinogens) and the range of Zone E background  
24 concentrations from grid samples.

25 Figure 4-1 shows the detected concentrations of chromium (total) and hexavalent chromium  
26 in soil at the site. Total chromium concentrations are assumed to be the sum of trivalent  
27 chromium (Cr3) and hexavalent chromium (Cr6) concentrations. Detected concentrations of  
28 inorganic analytes exceeding their respective criteria were as follows:

1 **Inorganics:**

- 2 • Chromium (total) at a concentration of 51.7 mg/kg at location E573SB006, exceeded the  
3 hexavalent chromium residential RBC (23 mg/kg; HI=0.1) , but not the trivalent  
4 chromium residential RBC of 12,000 mg/kg (HI=0.1).

5 No hexavalent chromium detections exceeded the residential RBC of 23 mg/kg (HI=0.1).

6 **4.1.2 Subsurface Soil Results**

7 Subsurface soil inorganic detections were compared with generic SSLs (using a DAF=10)  
8 and the range of Zone E background concentrations from grid samples.

9 Detected concentrations of inorganic compounds from subsurface soil samples exceeding  
10 their respective criteria are as follows:

11 **Inorganics:**

- 12 • Chromium (total) at locations E573SB007 and E573SB009 exceeded both its SSL of 19  
13 mg/kg and the chromium (total) maximum Zone E subsurface soil background  
14 concentration (75 mg/kg), at concentrations ranging from 84 mg/kg to 201 mg/kg.

15 Table 4-1 shows the results of the additional chromium sampling.

16 No hexavalent chromium detections exceeded its SSL of 19 mg/kg.

17 Chromium as a COPC is further discussed in Section 5.0.

**TABLE 4-1**  
 Detected Concentrations of Chromium in Surface and Subsurface Soil – Additional Sampling  
 RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex

Parameter	Station ID	Sample ID	Concentration	Qualifier	Date Collected	EPA Region III Residential RBC	SSL	Zone E Background Range of Conc.
<b>Chromium (Total)</b>	<b>Surface Soil</b>		<b>(mg/kg)</b>			23	19	2.3 - 567
	E573SB006	573SB00601	51.7	J	05/17/2002			
	E573SB007	573SB00701	15.3	J	05/17/2002			
	E573SB008	573SB00801	22.2	J	05/17/2002			
	E573SB009	573SB00901	14.4	J	05/17/2002			
	<b>Subsurface Soil</b>		<b>(mg/kg)</b>			23	19	1.6 - 75
	E573SB006	573SB00603	62.3	J	05/17/2002			
	E573SB007	573SB00703	75.0	J	05/17/2002			
	E573SB007	573SB00702	<b>84.0</b>	J	05/17/2002			
	E573SB008	573SB00803	9.9	J	05/17/2002			
	E573SB008	573SB00802	10.6	J	05/17/2002			
	E573SB009	573SB00903	<b>201.0</b>	J	05/17/2002			
	E573SB009	573SB00902	<b>112.0</b>	J	05/17/2002			
	<b>Chromium (VI)</b>	<b>Surface Soil</b>		<b>(mg/kg)</b>			23	19
E573SB006		573SB00601	0.547	=	05/17/2002			
E573SB007		573SB00701	0.045	J	05/17/2002			
E573SB008		573SB00801	0.250	U	05/17/2002			
E573SB009		573SB00901	0.039	J	05/17/2002			
<b>Subsurface Soil</b>		<b>(mg/kg)</b>			23	19	NA	
E573SB006		573SB00603	0.250	U	05/17/2002			
E573SB007		573SB00703	0.241	J	05/17/2002			
E573SB007		573SB00702	2.780	U	05/17/2002			
E573SB008		573SB00803	0.250	U	05/17/2002			
E573SB008		573SB00802	0.250	U	05/17/2002			
E573SB009		573SB00903	3.080	=	05/17/2002			
E573SB009		573SB00902	3.330	U	05/17/2002			

<sup>a</sup> BEQ calculation method based on background PAHs study report, *Technical Information for Development of Background BEQ values (CH2M-Jones, February 2001)*.

Concentrations in bold and outlined text exceed the appropriate screening criteria.

= Indicates that the analyte is detected at the concentration shown.

J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

U Indicates that the concentration was not detected.

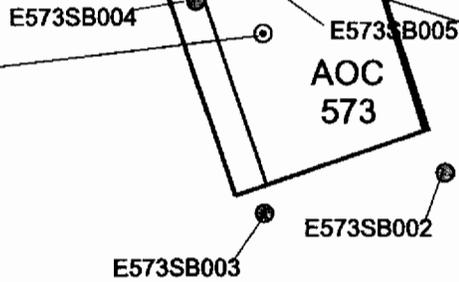
NA Screening criteria not available for the referenced compound.

Building 177

E573SB009	
Chromium, Total	Chromium VI
0-1'	0-1'
14.4 mg/kg J	0.039 mg/kg J
1-3'	1-3'
201 mg/kg J	3.08 mg/kg
3-5'	3-5'
112 mg/kg J	3.33 mg/kg U

E573SB008	
Chromium, Total	Chromium VI
0-1'	0-1'
22.2 mg/kg J	0.25 mg/kg U
1-3'	1-3'
9.9 mg/kg J	0.25 mg/kg U
3-5'	3-5'
10.6 mg/kg J	0.25 mg/kg U

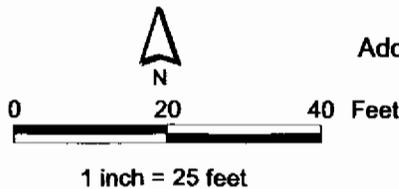
E573SB006	
Chromium, Total	Chromium VI
0-1'	0-1'
51.7 mg/kg J	0.547 mg/kg
1-3'	1-3'
62.3 mg/kg J	0.25 mg/kg U



E573SB007	
Chromium, Total	Chromium VI
0-1'	0-1'
15.3 mg/kg J	0.045 mg/kg J
1-3'	1-3'
75 mg/kg J	0.241 mg/kg J
3-5'	3-5'
84 mg/kg J	2.78 mg/kg U

Screening Criteria (mg/kg):  
 Cr (Total)  
 SSL = 19  
 Surface Soil Max. Bkgrd. Conc. = 567  
 Subsurface Soil Max. Bkgrd. Conc. = 75  
 Cr (VI)  
 Residential RBC = 23 mg/kg

- ⊙ 2002 Soil Sampling Location
- ⊗ RFI Soil Boring Location
- - - Fence
- ≡ Railroads
- ≡ Roads
- Buildings
- ▭ AOC Boundary
- ▭ Zone Boundary



**Figure 4-1**  
 Additional Soil Sampling Results, May 2002  
 AOC 573, Zone E  
 Charleston Naval Complex



## 1 5.0 COPC/COC Refinement

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2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified BEQs as surface soil COCs for  
3 AOC 573, for the unrestricted (i.e., residential) and future industrial land use scenarios.  
4 Chromium was identified as a soil COPC in Section 4.0 of this RFI Report Addendum.  
5 These chemicals are further discussed below.

6 In addition, the BCT has agreed that detections of VOCs in soil should be rescreened using  
7 generic SSLs based on a DAF=1. This section presents of the results of this additional  
8 screening.

### 9 5.1 COCs in Soil

#### 10 5.1.1 BEQs

11 Table 5-1 lists detected BEQ concentrations in surface soils from the RFI sampling. During  
12 the RFI, BEQ concentrations in surface soil exceeded the CNC surface soil BEQ sitewide  
13 reference concentration of 1,304 µg/kg at one RFI location (E573SB002 at 5,700 µg/kg).

14 No BEQs were detected in subsurface soil or groundwater above laboratory detection limits  
15 at this site, indicating that BEQs are not a leaching concern at this site. However, since BEQs  
16 in surface soil at the maximum detected concentration at E573SB002 exceed the CNC  
17 surface soil BEQ sitewide reference concentrations, they will be retained as a COC for the  
18 unrestricted and industrial land use scenarios.

#### 19 5.1.2 Chromium

20 Chromium toxicity is significantly influenced by its valence state. For example, the  
21 residential RBC for hexavalent chromium (HI=0.1) is 26 mg/kg, while the residential RBC  
22 for the less toxic trivalent chromium (HI=0.1) is 12,000 mg/kg. Similarly, the EPA Region III  
23 SSL for trivalent chromium is 7 orders of magnitude greater than that of hexavalent  
24 chromium, due to the extremely low leachability and low toxicity of trivalent chromium.

25 During the COPC screening, typically the hexavalent chromium RBC and SSL are used as a  
26 conservative measure. However, once chromium is determined to be a COPC, it is useful to  
27 assess whether chromium is truly present at a site in hexavalent form.

28 The additional subsurface investigation for chromium conducted by CH2M Jones at AOC  
29 573 was conducted to assess whether a subsurface source area of hexavalent chromium was

1 present at the site. For this reason, soil samples were analyzed for both total and hexavalent  
2 chromium. The results indicate that hexavalent chromium concentrations at the site are  
3 very low. The greatest concentration of hexavalent chromium detected in the soil samples  
4 collected during May 2002 was 3.08 mg/kg, well below the generic SSL for hexavalent  
5 chromium of 19 mg/kg and residential RBC (HI = 0.1) of 23 mg/kg. Table 5-1 shows the  
6 detected concentrations of chromium in surface and subsurface soils, at AOC 573.

7 Because the data indicate that hexavalent chromium is not present at the site above its  
8 COPC screening criteria (RBC and SSL), chromium is not considered a COC for the site.

9 Chromium was detected in one out of eight groundwater samples during the four RFI  
10 sampling events. Groundwater sampling results for chromium are provided in Appendix  
11 A. This single detection at a concentration of 10 micrograms per liter ( $\mu\text{g/L}$ ) at E573GW01D  
12 did not exceed the MCL for chromium of 100  $\mu\text{g/L}$ , indicating that chromium is not a  
13 leaching concern, and that there is no impact to groundwater from chromium  
14 concentrations in soil at the site. Based on these considerations, chromium is not considered  
15 a COC in soils at this site.

### 16 **5.1.3 Soil VOC Screening using SSL at DAF=1**

17 Soil VOC detections were compared to SSLs at DAF=1, and no detections in surface and  
18 subsurface soil exceeded the screening criteria. A summary of VOCs detected in soils and  
19 their respective SSLs (DAF = 1) are presented in Table 5-2.

## 20 **5.2 COC Summary**

21 BEQs have been retained as a surface soil COC for the unrestricted and industrial land use  
22 scenarios at AOC 573.

**TABLE 5-1**  
 Detected Concentrations of BEQs and Chromium in Surface and Subsurface Soil  
 RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex

Parameter	Station ID	Sample ID	Concentration	Qualifier	Date Collected	EPA Region III Residential RBC	SSL	Zone E Background Range of Conc.	
<b>BEQs <sup>a</sup></b>	<b>Surface Soil</b>		<b>(µg/kg)</b>			88	NA	1,304	
	E573SB001	573SB00101	843.5	U	10/31/1995				
	E573SB002	573SB00201	5,704.5	=	09/11/1995				
	E573SB003	573SB00301	631.83	=	09/11/1995				
	E573SB004	573SB00401	385.66	=	09/13/1995				
	E573SB005	573SB00501	891.24	=	09/11/1995				
	<b>Subsurface Soil</b>						88	NA	1,400
	E573SB001	573SB00102	1,386.6	U	10/31/1995				
	E573SB002	573SB00202	1,617.7	U	09/11/1995				
	E573SB003	573SB00302	1,271.1	U	09/11/1995				
<b>Chromium (Total)</b>	<b>Surface Soil</b>		<b>(mg/kg)</b>			23	19	2.3 - 567	
	E573SB002	573SB00201	11.5	J	09/11/1995				
	E573SB004	573SB00401	7.2	=	09/13/1995				
	E573SB005	573SB00501	9.5	J	09/11/1995				
	E573SB003	573SB00301	11.7	J	09/11/1995				
	E573SB001	573SB00101	6.3	=	10/31/1995				
	E573SB006	573SB00601	51.7	J	05/17/2002				
	E573SB007	573SB00701	15.3	J	05/17/2002				
	E573SB008	573SB00801	22.2	J	05/17/2002				
	E573SB009	573SB00901	14.4	J	05/17/2002				
	<b>Subsurface Soil</b>		<b>(mg/kg)</b>				23	19	1.6 - 75
	E573SB004	573SB00402	2.3	=	09/13/1995				
	E573SB002	573SB00202	38.4	J	09/11/1995				
	E573SB003	573SB00302	16.7	J	09/11/1995				
	E573SB005	573SB00502	445.0	J	09/11/1995				
	E573SB001	573SB00102	19.4	=	10/31/1995				
	E573SB006	573SB00603	62.3	J	05/17/2002				
	E573SB007	573SB00703	75.0	J	05/17/2002				
	E573SB007	573SB00702	84.0	J	05/17/2002				
	E573SB008	573SB00803	9.9	J	05/17/2002				
E573SB008	573SB00802	10.6	J	05/17/2002					
E573SB009	573SB00903	201.0	J	05/17/2002					
E573SB009	573SB00902	112.0	J	05/17/2002					
<b>Chromium (VI)</b>	<b>Surface Soil</b>		<b>(mg/kg)</b>			23	19	NA	
	E573SB006	573SB00601	0.547	=	05/17/2002				
	E573SB007	573SB00701	0.045	J	05/17/2002				
	E573SB008	573SB00801	0.250	U	05/17/2002				
	E573SB009	573SB00901	0.039	J	05/17/2002				

**TABLE 5-1**  
 Detected Concentrations of BEQs and Chromium in Surface and Subsurface Soil  
 RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex

Parameter	Station ID	Sample ID	Concentration	Qualifier	Date Collected	EPA Region III Residential RBC	SSL	Zone E Background Range of Conc.
Chromium (VI)	<b>Subsurface Soil</b>		<b>(mg/kg)</b>			23	19	NA
	E573SB006	573SB00603	0.250	U	05/17/2002			
	E573SB007	573SB00703	0.241	J	05/17/2002			
	E573SB007	573SB00702	2.780	U	05/17/2002			
	E573SB008	573SB00803	0.250	U	05/17/2002			
	E573SB008	573SB00802	0.250	U	05/17/2002			
	E573SB009	573SB00903	3.080	=	05/17/2002			
	E573SB009	573SB00902	3.330	U	05/17/2002			

<sup>a</sup> BEQ calculation method based on background PAHs study report, *Technical Information for Development of Background BEQ values (CH2M-Jones, February 2001)*.

Concentrations in bold and outlined text exceed the appropriate screening criteria.

= Indicates that the analyte is detected at the concentration shown.

J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

U Indicates that the concentration was not detected.

NA Screening criteria not available for the referenced compound.

**TABLE 5-2**  
 Detected Concentrations of VOCs Acetone, Carbon Disulfide, and Total Xylenes in Soil  
 RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex

Parameter	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC (HI=0.1)	SSL (DAF=1)	Zone E Background Range of Conc.
<b>Acetone</b>								
<b>Surface Soil</b>								
	E573SB002	E573SB00201	0.022	=	9/11/1995	780	0.8	NA
	E573SB003	E573SB00301	0.046		9/11/1995			
<b>Subsurface Soil</b>								
	E573SB002	E573SB00202	0.072	=	9/11/1995	780	0.8	NA
	E573SB003	E573SB00302	0.054		9/11/1995			
<b>Carbon Disulfide</b>								
<b>Subsurface Soil</b>								
	E573SB001	E573SB00102	0.006	J	10/31/1995	782	2	NA
<b>Total Xylenes</b>								
<b>Surface Soil</b>								
	E573SB003	E573SB00301	0.001	J	9/11/1995	15,643	9	NA

All values are presented in units of milligrams per kilogram (mg/kg).

- = Indicates that the analyte was detected at the concentration shown.
- J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
- NA Not applicable

**Section 6.0**

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## 6.0 Summary of Information Related to Site Closeout Issues

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### 6.1 RFI Status

The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs/AOCs within Zone E of the CNC, including AOC 573.

In accordance with the RFI completion process, if a determination of No Further Investigation (NFI) is made upon completion of the RFI, then a site may proceed to either NFA status or to a CMS. The RFI for AOC 573 identified BEQs as a COC for surface soil. Based on the discussion presented in Section 5.0 above, BEQs have been retained as a surface soil COC for the unrestricted (i.e., residential) land use scenario at AOC 573. No other COCs have been identified at this site for soil, sediment, or groundwater. A focused CMS is proposed for this site. Section 8.0 of this document presents a CMS Work Plan.

The remaining subsections address the issues that the BCT agreed to evaluate prior to site closeout.

### 6.2 Presence of Inorganics in Groundwater

For the purpose of site closeout documentation, the inorganics in groundwater issue refers to the occasional or intermittent detection of several metals (primarily arsenic, thallium, and antimony) in groundwater at concentrations above the applicable MCL, preceded or followed by detections of these same metals below the MCL or below the practicable quantitation limit.

There were no detections of antimony or arsenic in shallow wells above the laboratory detection limits. There was only one detection of thallium during the four RFI groundwater sampling events. The detection at a concentration of 3.2 µg/L exceeded the MCL of 2 µg/L, but was below the Zone E shallow groundwater maximum background concentration for thallium of 6 µg/L.

1 An intermittent detection of thallium in shallow groundwater at the site above the MCL  
2 does not point to a site-specific source, but can be attributed to natural occurrence. Table 6-1  
3 shows thallium concentrations from the RFI groundwater sampling at AOC 573. There were  
4 no detections of antimony, arsenic, or thallium in deep wells above the laboratory detection  
5 limits as indicated in Table 6-1. Further evaluation of this issue is not warranted.

### 6 **6.3 Potential Linkage to SWMU 37, Investigated Sanitary** 7 **Sewers at the CNC**

8 There are no data suggesting that there was an impact to the sanitary sewers from this site.  
9 Therefore, further evaluation of this issue is not warranted.

### 10 **6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at** 11 **the CNC**

12 No COCs requiring further evaluation were identified at this site and no data suggest that  
13 impacts to the storm sewers have been caused by this site. The site drained directly to the  
14 storm sewers when it operated but the connection from the sump to the storm sewer is now  
15 closed and the entire area formerly operated as AOC 573 is now completely paved. Based  
16 on these findings, further evaluation of this issue is not warranted.

### 17 **6.5 Potential Linkage to AOC 504, Investigated Railroad Lines** 18 **at the CNC**

19 The nearest existing railroad line to AOC 573 is approximately 259 feet northwest of the site.  
20 There is no known linkage between AOC 573 and the investigated railroad lines of AOC  
21 504, so further evaluation of this issue is not warranted.

### 22 **6.6 Potential Migration Pathways to Surface Water Bodies at** 23 **the CNC**

24 The nearest surface water body to AOC 573 is the Cooper River, which lies approximately  
25 600 feet northeast of the site. The only potential migration pathway from the site to surface  
26 water is via overland flow via stormwater runoff. The entire site is covered with pavement,  
27 which eliminates contact of surface soil with stormwater. Similarly, runoff directed to the  
28 storm sewer system, which discharges to the Cooper River, does not contact the soil.  
29 Further evaluation of this issue is not warranted.

1 **6.7 Potential Contamination in Oil/Water Separators (OWSs)**

2 There are no OWSs associated with AOC 573. In addition, there is no reference to an OWS  
3 at the site in the *Oil Water Separator Data* report, Department of the Navy, September 2000.  
4 Therefore, further evaluation of this issue is not warranted.

5 **6.8 Land Use Controls (LUC)**

6 The CNC BCT has agreed that all of Zone E will have at least some LUCs and restrictions.  
7 At a minimum, these LUCs are likely to include restrictions against unrestricted land use.  
8 These LUCs will be applied at AOC 573.

**TABLE 6-1**  
 Antimony, Arsenic, and Thallium in Groundwater  
 RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex

Location	Sample Collection Date	Antimony		Arsenic		Thallium	
		Concentration (µg/L)	Qualifier	Concentration (µg/L)	Qualifier	Concentration (µg/L)	Qualifier
<b>MCL</b>		6		50		2	
<b>EPA Region III Tap Water RBC (HI=0.1)</b>		1.5		0.045		0.26	
E573GW001	04/09/1996	4.0	U	5.0	U	5.0	U
E573GW001	07/22/1996	2.2	UJ	2.5	U	<b>3.2</b>	J
E573GW001	11/18/1996	2.1	U	2.5	U	4.8	U
E573GW001	01/29/1997	2.1	U	2.5	U	3.8	U
E573GW01D	04/09/1996	4.0	U	5.0	U	5.0	U
E573GW01D	07/23/1996	2.1	UJ	4.4	U	2.7	U
E573GW01D	11/18/1996	2.1	U	2.5	U	4.0	U
E573GW01D	01/29/1997	2.1	U	2.5	U	2.7	U

Concentrations in bold and outlined text exceed the appropriate screening criteria.

- = Indicates that the analyte is detected at the concentration shown.
- J Indicates an estimated value. A "J" qualifier may signify that the concentration is below the PQL, or that the "J" has been applied as a result of the data validation.
- U Indicates analyte not detected above laboratory detection limit.

µg/L micrograms per liter

HI Hazard index

## 1 **7.0 Recommendations**

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2 AOC 573 is a covered shed where an anodizing process was conducted. The shed is a 3-  
3 sided metal attachment to Building 177. The anodizing process included a 2,000-gallon  
4 irradiate (chromic acid solution) dipping tank and a spray area with a 110-gallon sump. The  
5 sump was used to collect excess spray and rinse water. Metal parts and antennas were  
6 dipped or sprayed and rinsed with tap water. This site was contained on three sides by a  
7 concrete berm. The fourth side sloped back to the sump. Before 1972, the sump was  
8 connected to the stormwater sewer. These operations no longer exist at the site.

9 AOC 573 is currently used by a vehicle maintenance shop as a storage facility for POL  
10 substances. The sump is plugged. If the sump fills up, the contents are pumped into  
11 55-gallon drums and are disposed as hazardous waste.

12 The CNC RCRA Permit identified AOC 573 as requiring a CSI.

13 The *Zone E RFI Report, Revision 0* identified BEQs in surface soil as a COC for unrestricted  
14 and industrial land use, and recommended that a CMS be undertaken to address BEQs in  
15 surface soil at the AOC 573 site. Further evaluation of COCs as discussed in Section 5.0  
16 indicates that elevated BEQ concentrations in surface soil at one location are above  
17 background levels. Therefore, BEQs are being retained as a surface soil COC for the  
18 unrestricted land use scenario at AOC 573. No other COCs have been identified at this site.  
19 A focused CMS is proposed to be performed to address the elevated BEQ concentration in  
20 surface soils at this site. Section 8.0 of this RFI Report Addendum presents a CMS Work  
21 Plan for AOC 573.





## 1 **8.0 CMS Work Plan**

---

2 BEQs were identified as COCs in surface soil. Because there is no exposed surface soil at the  
3 site with elevated concentrations of BEQs, there is currently no unacceptable exposure or  
4 risk from these COCs; however, it is feasible that in the future, should site conditions  
5 change, some exposure could occur. Therefore, a CMS should be conducted to evaluate  
6 potential corrective measures and identify an appropriate remedy for the site.

7 This section presents a focused CMS work plan. Media cleanup standards are identified for  
8 COCs and potential remedies that should be evaluated are also presented.

### 9 **8.1 Remedial Action Objectives**

10 Remedial action objectives (RAOs) are medium-specific goals that the remedial actions are  
11 designed to accomplish in order to protect human health and the environment by  
12 preventing or reducing exposures under current and future land use conditions. The RAOs  
13 identified for the surface soil at AOC 573 are being chosen to prevent ingestion and  
14 direct/dermal contact with surface soil containing COCs at unacceptable levels. No  
15 remedial actions are required for subsurface soil or groundwater at AOC 573.

### 16 **8.2 Remedial Goal Options and Media Cleanup Standards**

17 Throughout the process of remediating a hazardous waste site, a risk manager uses a  
18 progression of increasingly acceptable site-specific media levels in considering remedial  
19 alternatives. Under the RCRA program, remedial goal options (RGOs) and media cleanup  
20 standards (MCSs) are developed at the end of the risk assessment in the RFI/Remedial  
21 Investigation (RI) programs, before completion of the CMS.

22 RGOs can be based on a variety of criteria, such as specific incremental lifetime cancer risk  
23 (ILCR) levels (e.g., 1E-04, 1E-05, or 1E-06), HI levels (e.g., 0.1, 1.0, 3.0), or site background  
24 concentrations. For a particular RGO, specific MCSs can be determined as target  
25 concentration values. Achieving these MCSs is accepted as demonstrating that RGOs and  
26 RAOs have been achieved. Achieving these goals should promote the protection of human  
27 health and the environment, while achieving compliance with applicable state and federal  
28 standards.

1 The exposure media of concern for AOC 573 is surface soil impacted by BEQs. Because  
2 AOC 573 is located within a highly developed area of the CNC and there are no surface  
3 water bodies in the immediate vicinity of the site, ecological exposures were not considered  
4 applicable for evaluation.

5 For BEQs, the target MCS for surface soil should be the sitewide BRC of 1,304 µg/kg  
6 developed by the BCT. Other potential RGOs, such as the 1E-06 incremental cancer risk  
7 level were considered but regarded as not applicable because the site background  
8 concentrations of BEQs are significantly greater than this level.

### 9 **8.3 Potential Remedies to Evaluate**

10 Because of the small size of this site and the relatively small quantity of contaminated  
11 surface soil, the list of practicable remedial alternatives for this site is limited. The two  
12 presumptive remedies that will be evaluated as part of the CMS include:

- 13
- 14 • Soil excavation and offsite disposal
- 15 • Land use controls (LUCs)
- 16

### 17 **8.4 Focused CMS Approach**

18 The focused CMS will consist of the following tasks that will be performed in the order  
19 presented below:

- 20 1. The corrective measure alternatives described above will be screened using several  
21 criteria and decision factors.
- 22 2. A preferred corrective measure alternative will be selected.
- 23 3. The CMS and preferred corrective measure alternative will be documented in the CMS  
24 report.

### 25 **8.5 Approach to Evaluating Corrective Measure Alternatives**

26 According to the RCRA permit issued by SCDHEC (SCDHEC, 1998), the alternatives will be  
27 evaluated with the following five standards:

- 28 1. Protecting human health and the environment.
- 29 2. Attaining media cleanup standards (RGOs).

- 1 3. Controlling the source of releases to minimize future releases that may pose a threat to  
2 human health and the environment.
- 3 4. Complying with applicable standards for the management of wastes generated by  
4 remedial activities.
- 5 5. Other factors include (a) long-term reliability and effectiveness; (b) reduction in toxicity,  
6 mobility, or volume of wastes; (c) short-term effectiveness; (d) implementability; and  
7 (e) cost.

8 Each of the five standards is defined in more detail below:

- 9 1. **Protecting human health and the environment.** The alternatives will be evaluated on  
10 the basis of their ability to protect human health and the environment. The ability of an  
11 alternative to achieve this standard may or may not be independent of its ability to  
12 achieve the other four standards. For example, an alternative may be protective of  
13 human health, but may not be able to attain the MCSs if the MCSs are not directly tied  
14 to protecting human health.
- 15 2. **Attaining media cleanup standards (RGOs).** The alternatives will be evaluated on the  
16 basis of their ability to achieve the RGOs defined in this CMS Work Plan. Another  
17 aspect of this standard is the timeframe to achieve the RGOs. Estimates of the timeframe  
18 for the alternatives to achieve RGOs will be provided.
- 19 3. **Controlling the source of releases.** This standard deals with the control of releases of  
20 contamination from the source (the area in which the contamination originated).
- 21 4. **Complying with applicable standards for management of wastes.** This standard deals  
22 with the management of wastes derived from implementing the alternatives, for  
23 example, treatment or disposal of excavated material. The soil removal alternative will  
24 be designed to comply with all applicable standards for management of remediation  
25 wastes. Consequently, this standard will not be explicitly included in the detailed  
26 evaluation presented in the CMS but will be part of a work plan specific to the removal  
27 action should a removal action become the chosen alternative.
- 28 5. **Other factors.** Five other factors are to be considered if an alternative is found to meet  
29 the four standards described above. These other factors are as follows:
  - 30 a. Long-term reliability and effectiveness  
31 The two alternatives will be evaluated on the basis of their reliability, and the  
32 potential impact should the chosen alternative fail. In other words, a qualitative

1 assessment will be made as to the chance of the alternative's failure and the  
2 consequences of that failure.

3 b. Reduction in the toxicity, mobility, or volume of wastes

4 Alternatives with technologies that reduce the toxicity, mobility, or volume of the  
5 contamination will be generally favored over those that do not. Consequently, a  
6 qualitative assessment of this factor will be performed for each alternative.

7 c. Short-term effectiveness

8 Alternatives will be evaluated on the basis of the risk they create during the  
9 implementation of the remedy. Factors that may be considered include fire,  
10 explosion, and exposure of workers to hazardous substances.

11 d. Implementability

12 The alternatives will be evaluated for their implementability by considering any  
13 difficulties associated with conducting the alternatives (such as the construction  
14 disturbances they may create), operation of the alternatives, and the availability of  
15 equipment and resources to implement the technologies comprising the alternatives.

16 e. Cost

17 A net present value of each alternative will be developed. These cost estimates will  
18 be used for the relative evaluation of the alternatives, not to bid or budget the work.  
19 The estimates will be based on information available at the time of the CMS and on a  
20 conceptual design of the alternative. They will be "order-of-magnitude" estimates  
21 with a generally expected accuracy of -50 percent to +50 percent for the scope of  
22 action described for each alternative. The estimates will be categorized into capital  
23 costs and operations and maintenance costs for each alternative.

24 In addition to the criteria described above, the alternatives will be evaluated for their ability  
25 to achieve all contractual obligations of CH2M-Jones and the Navy.

## 26 **8.6 Focused CMS Report**

27 A focused CMS Report will be prepared to present the identification, development, and  
28 evaluation of potential corrective measures for AOC 573. A proposed outline of the report,  
29 as shown in Table 8-1, provides an example of the report format and content.

**TABLE 8-1**  
 Outline of Focused CMS Report for AOC 573  
*RFI Report Addendum & CMS Work Plan, AOC 573, Zone E, Charleston Naval Complex*

<b>Section No.</b>	<b>Section Title</b>
<b>1.0</b>	<b>Introduction</b>
1.1	Corrective Measures Study Purpose and Scope
1.2	Report Organization
1.3	Background Information
1.3.1	Facility Description
1.3.2	Site History and Background
1.3.2.1	Nature and Extent of Contamination
1.3.2.2	Summary of Risk Assessment
<b>2.0</b>	<b>Remedial Goal Objectives</b>
<b>3.0</b>	<b>Detailed Analysis of Focused Alternatives</b>
3.1	Approach
3.2	Evaluation Criteria
3.3	Description of Alternatives
3.3.1	Alternative 1: Soil removal and Offsite Disposal
3.3.2	Alternative 2: Land Use Controls
3.4	Detailed Analysis of Alternatives
3.4.1	Analysis of Alternative 1
3.4.2	Analysis of Alternative 2
3.5	Comparative Analysis of Alternatives
<b>4.0</b>	<b>Recommended Remedial Alternative</b>
<b>5.0</b>	<b>References</b>
<b>Appendix A</b>	<b>Corrective Measure Alternative Cost Estimates<sup>b</sup></b>
	List of Tables
	List of Figures

<sup>a</sup> Additional alternatives will be analyzed as found necessary.

<sup>b</sup> Additional appendices will be added, if necessary.



## 1 9.0 References

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- 2 CH2M-Jones. *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in*  
3 *Background Soil and Groundwater at the CNC*. 2001.
- 4 CH2M-Jones. *Technical Memorandum: Results from Additional Background Sampling of the CNC*  
5 *Railroad Lines and Naval Annex (Zone K)*. CNC. August 2001.
- 6 South Carolina Department of Health and Environmental Control, Final RCRA Part B  
7 Permit No. SC0 170 022 560.
- 8 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. November 1997.
- 9 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, Naval Base Charleston*. June  
10 1995.
- 11 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, Naval Base Charleston*.  
12 June 1995.
- 13 EnSafe Inc. *Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report*.  
14 July 1995.
- 15 USEPA, *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Draft*  
16 *Final*, OSWER- 9355.4-24, August 2001.

**Appendix A**

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Chemicals Detected in Zone E Soil Samples  
AOC 573

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
<b><i>Volatile Organic Compounds (ug/kg)</i></b>						
2-Hexanone	573SB005	ND	6.00	NA	NA	NA
4-Methyl-2-Pentanone (MIBK)	573SB005	ND	5.00	NA	NA	NA
Acetone	573SB001	48.00	ND	780000.00	NA	NA
	573SB002	30.50	72.00			
	573SB003	46.00	45.00			
	573CB005	ND	23.00			
	573SB001	ND	6.00	780000.00	NA	NA
Carbon disulfide	573SB001	ND	6.00	780000.00	NA	NA
Xylene (Total)	573SB003	1.00	ND	16000000.00	NA	NA
<b><i>Semi-volatile Compounds (ug/kg)</i></b>						
2-Chlorophenol	573SB001	54.00	ND	390000.00	NA	NA
4-Chloro-3-methylphenol	573CB001	80.00	ND	NA	NA	NA
Acenaphthene	573SB002	200.00	ND	470000.00	NA	NA
Anthracene	573SB002	575.00	ND	23000000.00	NA	NA
	573SB002	2650.00	ND	880.00	NA	NA
	573SB003	160.00	220.00			
	573SB004	160.00	ND			
	573SB005	450.00	ND			
Benzo(a)pyrene	573SB002	2400.00	ND	88.00	NA	NA
	573SB003	210.00	230.00			
	573SB004	150.00	ND			
	573SB005	570.00	ND			
	573SB002	4600.00	ND	880.00	NA	NA
Benzo(b)fluoranthene	573SB004	120.00	ND			
	573SB005	610.00	ND			
	573SB002	1490.00	ND	310000.00	NA	NA
Benzo(g,h,i)perylene	573SB003	170.00	180.00			
	573SB004	140.00	ND			
	573SB005	430.00	ND			
	573SB002	1750.00	ND	8800.00	NA	NA
	573SB003	210.00	300.00			
Benzo(k)fluoranthene	573SB004	150.00	ND			
	573SB005	450.00	ND			
	573SB004	88.00	ND	31000000.00	NA	NA
	573CB001	48.00	ND	46000	NA	NA
	573CB002	170.00	ND	32000.00	NA	NA
Chrysene	573SB002	2900.00	ND	88000.00	NA	NA
	573SB003	230.00	250.00			
	573SB004	160.00	ND			
	573SB005	740.00	ND			
	573SB002	695.00	ND	88000.00	NA	NA
Dibenz(a,h)anthracene	573SB005	170.00	ND			
	573SB002	5100.00	ND	3100000.00	NA	NA
	573SB003	240.00	400.00			
Fluoranthene	573SB004	250.00	ND			
	573SB005	620.00	ND			

Chemicals Detected in Zone E Soil Samples  
AOC 573

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
Fluorene	573SB002	175.00	ND	310000.00	NA	NA
Indeno(1,2,3-cd)pyrene	573SB002	1380.00	ND	880.00	NA	NA
	573SB003	130.00	130.00			
	573SB004	110.00	ND			
	573SB005	400.00	ND			
	573CB005	ND	230.00	NA	NA	NA
Phenanthrene	573SB002	2650.00	ND	310000.00	NA	NA
	573CB003	ND	320.00			
	573SB004	160.00	ND			
	573SB005	240.00	ND			
	573SB001	96.00	ND	230000.00	NA	NA
Pyrene	573SB002	4300.00	ND			
	573SB003	230.00	330.00			
	573SB004	280.00	ND			
	573SB005	540.00	ND			
<i>Chlorinated Pesticides (ug/kg)</i>						
4,4'-DDD	573SB002	4.90	ND	2700.00	NA	NA
4,4'-DDE	573SB002	5.44	ND	19000.00	NA	NA
Endrin	573SB002	7.52	ND	2300	NA	NA
<i>Dioxin/Dibenzofuran (ng/kg)</i>						
1234678-HpCDD	573SB001	1.07	ND	NA	NA	NA
	573SB002	2.81	ND			
	573SB003	ND	0.89			
	573SB005	ND	2.32			
	573SB001	0.78	ND	NA	NA	NA
1234678-HpCDF	573SB002	2.53	ND			
	573SB003	ND	10.40			
	573SB003	ND	1.06	NA	NA	NA
123478-HxCDF	573SB002	0.23	ND	NA	NA	NA
123678-HxCDF	573SB001	20.05	ND	NA	NA	NA
	573SB002	69.03	ND			
	573SB003	ND	6.99			
	573SB005	ND	35.51			
	573SB001	1.96	ND	NA	NA	NA
OCDF	573SB003	ND	20.10			
	573SB001	2.35	ND	NA	NA	NA
Total Hepta-Dioxins	573SB002	4.28	ND			
	573SB003	ND	1.90			
	573SB005	ND	7.42			
	573SB002	2.53	ND	NA	NA	NA
Total Hepta-Furans	573SB003	ND	10.40			
	573SB001	0.39	ND	NA	NA	NA
Total Hexa-Dioxins	573SB002	0.78	ND			
	573SB005	ND	4.70			
	573SB002	1.61	ND	NA	NA	NA
Total Hexa-Furans						

Chemicals Detected in Zone E Soil Samples  
AOC 573

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *	
Total Penta-Furans	573SB003	ND	2.18				
	573SB002	1.62	ND	NA	NA	NA	
	573SB002	1.30	ND	NA	NA	NA	
	573SB005	ND	0.75				
	573SB002	0.88	ND	NA	NA	NA	
Total Tetra-Furans	573SB002	0.88	ND	NA	NA	NA	
	<i>Inorganic Compounds (mg/kg)</i>						
	Aluminum (Al)	573SB001	5045.00	3580.00	7800.00	26000	41100
		573SB002	3630.00	11200.00			
		573SB003	4760.00	4900.00			
573SB004		7580.00	6110.00				
573SB005		2420.00	2735.00				
Antimony (Sb)	573SB001	ND	0.57	3.10	1.77	1.6	
	573SB002	0.62	ND				
	573SB003	1.30	ND				
	573SB005	0.71	0.58				
	573SB001	1.80	6.80	0.43	23.9	19.9	
Arsenic (As)	573SB002	6.60	13.40				
	573SB003	16.00	9.40				
	573SB004	2.90	1.20				
	573SB005	3.40	3.75				
	573SB001	34.15	8.40	550.00	130	94.1	
Barium (Ba)	573SB002	32.90	29.60				
	573SB003	31.00	34.65				
	573SB004	20.90	14.70				
	573SB005	22.00	82.65				
	573SB001	0.55	0.47	0.15	1.7	2.71	
Beryllium (Be)	573SB002	0.38	1.20				
	573SB003	1.10	0.53				
	573SB004	0.58	0.60				
	573SB005	0.15	0.32				
	573SB001	ND	0.22	3.90	1.5	0.96	
Cadmium (Cd)	573SB002	0.31	0.28				
	573SB003	ND	0.30				
	573SB005	0.26	0.25				
	573SB001	11190.00	31700.00	NA	NA	NA	
	573SB002	5785.00	40700.00				
Calcium (Ca)	573SB003	28800.00	38450.00				
	573SB004	4050.00	1670.00				
	573SB005	7120.00	26550.00				
	573SB001	5.50	19.40	39.00	94.6	75.2	
	573SB002	8.65	38.40				
Chromium (Cr)	573SB003	11.70	17.15				
	573SB004	7.20	2.30				
	573SB005	9.50	375.00				
	573SB001	7.10	1.40	470.00	19	14.9	
	573SB002	19.25	4.50				

Chemicals Detected in Zone E Soil Samples  
AOC 573

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	573SB003	4.30	2.30			
	573SB004	17.40	1.10			
	573SB005	3.50	0.88			
Copper (Cu)	573SB001	3.35	3.40	310.00	66	152
	573SB002	38.55	9.70			
	573SB003	10.90	14.95			
	573SB004	9.10	1.70			
	573SB005	236.00	6.35			
Iron (Fe)	573SB001	2470.00	5360.00	2300.00	NA	NA
	573SB002	6945.00	20600.00			
	573SB003	38500.00	8245.00			
	573SB004	4570.00	1730.00			
	573SB005	3910.00	3290.00			
Lead (Pb)	573SB001	7.35	3.60	400.00	265	173
	573SB002	177.50	15.00			
	573SB003	26.00	88.70			
	573SB004	66.00	ND			
	573SB005	70.50	21.50			
Magnesium (Mg)	573SB001	402.50	1030.00	NA	NA	NA
	573SB002	235.50	4960.00			
	573SB003	501.00	2975.00			
	573SB004	373.00	242.00			
	573SB005	396.00	1680.00			
Manganese (Mn)	573SB001	148.50	40.70	180.00	302	881
	573SB002	58.35	213.00			
	573SB003	133.00	71.85			
	573SB004	26.50	28.60			
	573SB005	37.20	30.55			
Mercury (Hg)	573SB001	0.04	ND	2.30	2.6	1.59
	573SB002	0.11	0.05			
	573SB003	0.05	0.21			
	573SB004	0.12	ND			
	573SB005	0.35	0.03			
Nickel (Ni)	573SB001	3.70	16.60	160.00	77.1	57
	573SB002	11.00	14.90			
	573SB003	5.20	7.80			
	573SB004	3.60	2.10			
	573SB005	4.40	6.60			
Potassium (K)	573SB001	862.00	1220.00	NA	NA	NA
	573SB002	537.00	3220.00			
	573SB003	670.00	1275.00			
	573SB004	807.00	356.00			
	573SB005	632.00	609.00			
Selenium (Se)	573SB001	ND	1.20	39.00	1.7	2.4
	573SB002	0.57	2.20			
	573SB003	0.61	1.10			
	573SB005	ND	0.72			

**Chemicals Detected in Zone E Soil Samples**  
AOC 573

<b>Name</b>	<b>ID</b>	<b>Surface Conc.</b>	<b>Subsurface Conc.</b>	<b>RBC (THQ=.1)</b>	<b>Surface UTL</b>	<b>Subsurface UTL *</b>
Silver (Ag)	573CB002	1.30	ND	39.00	NA	NA
Sodium (Na)	573SB001	141.00	675.00	NA	NA	NA
	573SB002	ND	399.00			
	573SB003	ND	286.00			
	573SB004	113.00	ND			
	573SB005	ND	327.00			
Tin (Sn)	573SB002	3.05	ND	4700.00	59.4	9.23
	573SB005	7.00	ND			
Vanadium (V)	573SB001	4.35	11.40	55.00	94.3	155
	573SB002	10.80	35.10			
	573SB003	24.20	16.45			
	573SB004	7.20	1.90			
	573SB005	6.20	8.35			
Zinc (Zn)	573SB001	9.00	21.70	2300.00	827	886
	573SB002	128.50	54.40			
	573SB003	56.60	130.00			
	573SB004	33.20	4.90			
	573SB005	148.00	17.35			

**Notes:**

ND: Not Detected

NS: No Sample Taken/Sample Not Analyzed

NA: Not applicable

For compounds detected in both the primary and duplicate sample, the concentration for both detections are averaged and listed as one detection.

For compounds that were detected in only one of the primary or duplicate sample, the value of the detection was used.

\* Surface soil samples will be used for human health risk assessment for the Zone E report.

Chemicals Detected in Zone E Groundwater Samples  
AOC 573

Name	Location	Round 1 Conc.	Round 2 Conc.	Round 3 Conc.	Round 4 Conc.	RBC (THQ=.1)	UTL	MCL
<i>Dioxin, Dibenzofuran (ug/l)</i>								
1234678-HpCDD	573HW001	NS	2.94	NS	NS	NA	NA	NA
234678-HxCDF	573HW001	NS	2.65	NS	NS	NA	NA	NA
OCDD	573HW001	NS	14.20	NS	NS	NA	NA	NA
OCDF	573HW001	NS	2.94	NS	NS	NA	NA	NA
Total Hexa-Furans	573HW001	NS	2.65	NS	NS	NA	NA	NA
<i>Other Compounds (mg/l)</i>								
Chloride	573GW00	ND	17.60	17.40	6.70	NA	NA	NA
	573GW01	ND	73.50	118.00	92.10			
Sulfate	573GW00	152.00	60.35	89.40	41.50	NA	NA	NA
	573GW01	ND	28.10	26.80	23.40			
Total Dissolved Solids (TDS)	573GW00	726.00	448.00	476.00	342.00	NA	NA	NA
	573GW01	522.00	582.00	520.00	480.00			
<i>Inorganic Compounds (ug/l)</i>								
Aluminum (Al)	573GW00	ND	25.60	ND	22.05	3700	7.9	200
	573GW01	ND	1450.00	ND	50.90		319	
Antimony (Sb)	573GW00	ND	ND	2.30	ND	1.5	NA	6
Arsenic (As)	573GW00	ND	ND	2.80	ND	0.05	18.7	50
Barium (Ba)	573GW00	ND	29.50	34.05	28.60	260	211	2000
	573GW01	ND	37.30	27.00	29.30		218	
Beryllium (Be)	573GW00	ND	0.35	ND	ND	0.02	0.43	4
Cadmium (Cd)	573GW00	ND	0.75	ND	ND	18	NA	0.005
	573GW01	ND	0.57	ND	ND		NA	
Calcium (Ca)	573GW00	139500.00	837500.00	98550.00	74900.00	NA	NA	NA
	573GW01	83800.00	89300.00	72500.00	77800.00		NA	
Chromium (Cr)	573GW01	ND	10.00	ND	D	3700	15.5	100
Cobalt (Co)	573GW00	ND	1.35	ND	0.92	220	2.5	NA
Copper (Cu)	573GW00	ND	ND	1.10	ND	150	2.7	1300
Iron (Fe)	573GW00	5320.00	3860.00	4225.00	3670.00	1100	NA	NA
	573GW01	802.00	1430.00	246.00	121.00		NA	
Lead (Pb)	573GW01	ND	4.30	ND	ND	15	NA	15
Magnesium (Mg)	573GW00	30000.00	16200.00	19200.00	14750.00	NA	NA	NA
	573GW01	16100.00	15100.00	16200.00	16200.00		NA	
Manganese (Mn)	573GW00	506.50	281.00	294.00	209.50	84	2560	NA
	573GW01	245.00	162.00	91.20	127.00		869	
Nickel (Ni)	573GW00	ND	1.00	ND	ND	73	15.2	100
	573GW01	ND	5.00	ND	ND		42.2	
Potassium (K)	573GW00	15800.00	9860.00	11450.00	9965.00	NA	NA	NA
	573GW01	9220.00	8800.00	8390.00	9160.00		NA	
Sodium (Na)	573GW00	ND	26350.00	26300.00	14050.00	NA	NA	NA
	573GW01	ND	88200.00	107000.00	100000.00		NA	
Thallium (Tl)	573GW00	ND	3.20	ND	ND	0.29	5.4	2
Tin (Sn)	573GW00	ND	2.90	ND	ND	2200	NA	NA
	573GW01	ND	4.80	ND	ND		NA	
Vanadium (V)	573GW01	1.30	10.30	ND	0.84	26	5.3	NA

**Chemicals Detected in Zone E Groundwater Samples  
AOC 573**

<b>Name</b>	<b>Location</b>	<b>Round 1 Conc.</b>	<b>Round 2 Conc.</b>	<b>Round 3 Conc.</b>	<b>Round 4 Conc.</b>	<b>RBC (THQ=.1)</b>	<b>UTL</b>	<b>MCL</b>
-------------	-----------------	--------------------------	--------------------------	--------------------------	--------------------------	-------------------------	------------	------------

Notes:

ND: Not Detected

NS: No Sample Taken/Sample Not Analyzed

NA: Not applicable

For compounds detected in both the primary and duplicate sample, the concentration for both detections are averaged and listed as one detection.

For compounds that were detected in only one of the primary or duplicate sample, the value of the detection was used.



**Figure A-1**  
 Shallow Groundwater Contour Map, May 2002  
 AOC 573  
 Charleston Naval Complex

**Appendix B**

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**Comment Prepared by Eric F. Cathcart, SCDHEC**

**AOC 573**

**SCDHEC Comment 60:**

Information contained in the Zone E RFI Presubmittal review for AOC 573 states that the site has been recommended for interim measures for the removal of sediment from the catch basins based on results of the sediment samples. If the sediment removal has been performed, confirmatory samples should be collected and reported to evaluate post-interim measure conditions and understanding residual contamination, if any, left in place.

**Navy/EnSafe Response:**

The catch basin was cleaned during interim measures conducted by the Environmental Detachment Charleston. Cleaning removed all sediment from the catch basin, therefore, there is nothing left to sample for confirmation. Details of the cleaning can be found in the Closure Report for AOC 699 Storm Drain Cleaning prepared on March 8, 1999. These results will be summarized in the Final Zone E RFI Report.

**CH2M-Jones Response 60:**

*No additional response.*

**Comment Prepared by Dynamac/Gannett Fleming**

**Dynamac/Gannett Fleming Comment 1:**

Section 10.37.4, Page 10.37-14, Line 3: The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Manganese also exceeded its tap-water RBC, according to Table 10.37.4.1 (page 10.37-13). The text should be corrected.

**Navy/EnSafe Response:**

The text will be revised to reflect this correction.

**CH2M-Jones Response 1:**

*No additional response.*

**Dynamac/Gannett Fleming Comment 2:**

Section 10.37.6, Page 10.37-18, Line 11: The text states that lead was detected above its industrial RBC in sediment. This statement is incorrect. Lead was detected at a maximum of 405 mg/kg, which was below the industrial soil RBC of 1,300 mg/kg, according to Table 10.37.6.2 (page 10.37-17). The text should be corrected.

**Navy/EnSafe Response :**

The text will be revised to reflect this correction.

**CH2M-Jones Response 2:**

No additional response.







Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB006		E573SB006		E573SB007		E573SB007		
SampleID	573SB00601 (0-1ft)		573SB00603 (1-3 ft)		573CB00703 (1-3 ft)		573SB00701 (0-1ft)		
DateCollected	5/7/2002		5/7/2002		5/7/2002		5/7/2002		
DateExtracted	5/17/2002		5/17/2002		5/17/2002		5/17/2002		
DateAnalyzed	5/21/2002		5/21/2002		5/21/2002		5/21/2002		
SDGNumber	60030		60030		60030		60030		
Parameter	Units								
Chromium, Total	mg/kg	51.7	J	62.3	J	189	J	15.3	J



Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB007	E573SB007	E573SB008	E573SB008					
SampleID	573SB00702 (3-5 ft)	573SB00703 (1-3 ft)	573SB00801 (0-1ft)	573SB00802 (3-5ft)					
DateCollected	5/7/2002	5/7/2002	5/7/2002	5/7/2002					
DateExtracted	5/17/2002	5/17/2002	5/17/2002	5/17/2002					
DateAnalyzed	5/21/2002	5/21/2002	5/21/2002	5/21/2002					
SDGNumber	60030	60030	60030	60030					
Parameter	Units								
Chromium, Total	mg/kg	84	J	75	J	22.2	J	10.6	J

Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB008		E573SB009		E573SB009		E573SB009		
SampleID	573SB00803 (1-3 ft)		573SB00901 (0-1ft)		573SB00902 (3-5 ft)		573SB00903 (1-3 ft)		
DateCollected	5/7/2002		5/7/2002		5/7/2002		5/7/2002		
DateExtracted	5/17/2002		5/17/2002		5/17/2002		5/17/2002		
DateAnalyzed	5/21/2002		5/21/2002		5/21/2002		5/21/2002		
SDGNumber	60030		60030		60030		60030		
Parameter	Units								
Chromium, Total	mg/kg	9.87	J	14.4	J	112	J	201	J

Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB006		E573SB006		E573SB006		E573SB006		
SampleID	573SB00601 (0-1ft)		573SB00601 (0-1ft)		573SB00603 (1-3 ft)		573SB00603 (1-3 ft)		
DateCollected	5/7/2002		5/7/2002		5/7/2002		5/7/2002		
DateExtracted			5/17/2002				5/17/2002		
DateAnalyzed	5/8/2002		5/21/2002		5/8/2002		5/21/2002		
SDGNumber	60030		60030		60030		60030		
Parameter	Units								
Chromium (Hexavalent)	mg/kg		0.547	=			0.25	U	
pH	SU	8.16	=			8.82	=		

Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB007	E573SB007	E573SB007	E573SB007	
SampleID	573CB00703 (1-3 ft)	573CB00703 (1-3 ft)	573SB00701 (0-1ft)	573SB00701 (0-1ft)	
DateCollected	5/7/2002	5/7/2002	5/7/2002	5/7/2002	
DateExtracted		5/17/2002		5/17/2002	
DateAnalyzed	5/8/2002	5/21/2002	5/8/2002	5/21/2002	
SDGNumber	60030	60030	60030	60030	
Parameter	Units				
Chromium (Hexavalent)	mg/kg	0.457	U	0.0453	J
pH	SU	8.44	=	8.77	=

Analytical Data Summary

08/27/2002 3:08 PM

		E573SB007	E573SB007	E573SB007	E573SB007
<b>StationID</b>		E573SB007	E573SB007	E573SB007	E573SB007
<b>SampleID</b>		573SB00702 (3-5 ft)	573SB00702 (3-5 ft)	573SB00703 (1-3 ft)	573SB00703 (1-3 ft)
<b>DateCollected</b>		5/7/2002	5/7/2002	5/7/2002	5/7/2002
<b>DateExtracted</b>			5/17/2002		5/17/2002
<b>DateAnalyzed</b>		5/8/2002	5/21/2002	5/8/2002	5/21/2002
<b>SDGNumber</b>		60030	60030	60030	60030
<b>Parameter</b>	<b>Units</b>				
Chromium (Hexavalent)	mg/kg		2.78	U	
pH	SU	8.06	=		8.46 =
					0.241 J

Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB008		E573SB008		E573SB008		E573SB008		
SampleID	573SB00801 (0-1ft)		573SB00801 (0-1ft)		573SB00802 (3-5ft)		573SB00802 (3-5ft)		
DateCollected	5/7/2002		5/7/2002		5/7/2002		5/7/2002		
DateExtracted			5/17/2002				5/17/2002		
DateAnalyzed	5/8/2002		5/21/2002		5/8/2002		5/21/2002		
SDGNumber	60030		60030		60030		60030		
Parameter	Units								
Chromium (Hexavalent)	mg/kg		0.25	U			0.25	U	
pH	SU	8.59	=		8	=			

Analytical Data Summary

08/27/2002 3:08 PM

StationID	E573SB008	E573SB008	E573SB009	E573SB009	
SampleID	573SB00803 (1-3 ft)	573SB00803 (1-3 ft)	573SB00901 (0-1ft)	573SB00901 (0-1ft)	
DateCollected	5/7/2002	5/7/2002	5/7/2002	5/7/2002	
DateExtracted		5/17/2002		5/17/2002	
DateAnalyzed	5/8/2002	5/21/2002	5/8/2002	5/21/2002	
SDGNumber	60030	60030	60030	60030	
Parameter	Units				
Chromium (Hexavalent)	mg/kg	0.25	U	0.0393	J
pH	SU	8.47	=	8.53	=

Analytical Data Summary

08/27/20 3:08 PM

StationID	E573SB009	E573SB009	E573SB009	E573SB009			
SampleID	573SB00902 (3-5 ft)	573SB00902 (3-5 ft)	573SB00903 (1-3 ft)	573SB00903 (1-3 ft)			
DateCollected	5/7/2002	5/7/2002	5/7/2002	5/7/2002			
DateExtracted		5/17/2002		5/17/2002			
DateAnalyzed	5/8/2002	5/21/2002	5/8/2002	5/21/2002			
SDGNumber	60030	60030	60030	60030			
Parameter	Units						
Chromium (Hexavalent)	mg/kg		3.33	U		3.08	=
pH	SU	7.82	=			8.45	=



## Data Validation Summary - Charleston Naval Complex - Zone E, AOC 573

TO: Sam Natk/CH2MHILL/ATL

FROM: Amy Juchem/CH2MHILL/GNA  
Herb Kelly/CH2MHILL/GNA

DATE: July 18, 2002

The purpose of this memorandum is to present the results of the data validation process for the samples collected AOC 573 in Zone E. The samples were collected on May 7, 2002.

The specific samples and analytical fractions reviewed are summarized below in Table 1.

The Quality Control areas that were review and the resulting findings are documented within each subsection that follows. This data was validated for compliance with the analytical method requirements. This process also included a review of the data to assess the accuracy, precision, and completeness based upon procedures described in the guidance documents such as the Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Data Review (EPA 1994)* and *National Functional Guidelines for Organic Data Review (EPA 1999)*. Quality assurance/quality control (QA/QC) summary forms and data reports were reviewed.

Samples were submitted to General Engineering Laboratories, Inc., in Charleston, South Carolina, for the following analyses: Chromium following SW-846 6010 Series methodology, Hexavalent Chromium following method SW-846 7196, and pH following method SW-846 9045.

Sample results that were not within the acceptance limits were appended with a qualifying flag, which consisted of a single- or double-letter code that indicated a possible problem with the data. The qualifying flags originated during the data review and validation processes. These also include the secondary, or the two-digit "sub-qualifier" flags. The secondary qualifiers provide the reasoning behind the assignment of a qualifier flag to the data. The secondary qualifiers are presented and defined below.

Attachment 1 lists the changes in data qualifiers, due to the validation process.

The following primary flags were used to qualify the data:

- [=] Detected. The analyte was analyzed for and detected at the concentration shown.
- [J] Estimated. The analyte was present but the reported value may not be accurate or precise.
- [U] Undetected. The analyte was analyzed for but not detected above the method detection limit.
- [UJ] Detection limit estimated. The analyte was analyzed for but qualified as not detected; the result is estimated.
- [R] Rejected. The data is not useable.

### Secondary Data Validation Qualifiers

Code	Definition
2S	Second Source
BL	Blank
BD	Blank Spike/Blank Spike Duplicate or (LCS/LCSD) Precision
BS	Blank Spike/LCS
CC	Continuing Calibration Verification
DL	Dilution
FD	Field Duplicate
HT	Holding Time
IB	In-Between (metals - B's → J's )
IC	Initial Calibration
IS	Internal Standard
LD	Lab Duplicate
LR	Concentration exceeded Linear Range
MD	MS/MSD or LCS/LCSD Precision
MS	Matrix Spike/Matrix Spike Duplicate
OT	Other (see DV worksheet)
PD	Pesticide Degradation
PS	Post Spike
RE	Re-extraction/Re-analysis
SD	Serial Dilution
SS	Spiked Surrogate
TN	Tune

Table 1 - Chemical Analytical Methods – Field and Quality Control Samples

SDG	Station ID	Sample ID	Lab Sample ID	Date Collected	Matrix	Sample Type	Upper Depth	Lower Depth	Metals SW6010B	Hexavalent Chromium SW7196A	pH SW9045C
60029	FIELDQC	573EB006M1	60029001	05/07/02	WQ	EB			X	X	
60029	FIELDQC	573EB006M1LR	1200211747	05/07/02	WQ	LR				X	
60029	FIELDQC	573EB006M1MS	1200211748	05/07/02	WQ	MS				X	
60029	FIELDQC	573EB006M1SD	1200211749	05/07/02	WQ	SD				X	
60029	LABQC	1200211750	1200211750		WQ	BS				X	
60029	LABQC	1200215718	1200215718		WQ	LB			X		
60029	LABQC	1200215722	1200215722		WQ	BS			X		
60029	LABQC	1200211746	1200211746		WQ	LB				X	
60030	E573SB006	573SB00601	60030001	05/07/02	SO	N	0	1	X	X	X
60030	E573SB006	573SB00603	60030002	05/07/02	SO	N	3	5	X	X	X
60030	E573SB007	573SB00701	60030003	05/07/02	SO	N	0	1	X	X	X
60030	E573SB007	573SB00703	60030004	05/07/02	SO	N	3	5	X	X	X
60030	E573SB007	573CB00703	60030005	05/07/02	SO	FD	3	5	X	X	X
60030	E573SB007	573SB00702	60030006	05/07/02	SO	N	3	5	X	X	X
60030	E573SB008	573SB00801	60030007	05/07/02	SO	N	0	1	X	X	X
60030	E573SB008	573SB00803	60030008	05/07/02	SO	N	3	5	X	X	X
60030	E573SB008	573SB00802	60030009	05/07/02	SO	N	3	5	X	X	X
60030	E573SB009	573SB00901	60030010	05/07/02	SO	N	0	1	X	X	X
60030	E573SB009	573SB00903	60030011	05/07/02	SO	N	3	5	X	X	X
60030	E573SB009	573SB00902	60030012	05/07/02	SO	N	3	5	X	X	X
60030	E573SB006	573SB00601LR	1200211820	05/07/02	SO	LR	0	1			X

SDG	Station ID	Sample ID	Lab Sample ID	Date Collected	Matrix	Sample Type	Upper Depth	Lower Depth	Metals SW6010B	Hexavalent Chromium SW7196A	pH SW9045C
60030	E573SB009	573SB00903LR	1200211821	05/07/02	SO	LR	3	5			X
60030	E573SB006	573SB00601LR	1200212770	05/07/02	SO	LR	0	1		X	
60030	E573SB006	573SB00601MS	1200212773	05/07/02	SO	MS	0	1		X	
60030	E573SB006	573SB00601SD	1200212774	05/07/02	SO	SD	0	1		X	
60030	E573SB006	573SB00601MS	1200215819	05/07/02	SO	MS	0	1	X		
60030	E573SB006	573SB00601SD	1200215820	05/07/02	SO	SD	0	1	X		
60030	LABQC	1200211822	1200211822		SQ	BS					X
60030	LABQC	1200212769	1200212769		SQ	LB				X	
60030	LABQC	1200212776	1200212776		SQ	BS				X	
60030	LABQC	1200218045	1200218045		SQ	LB			X		
60030	LABQC	1200218046	1200218046		SQ	BS			X		

**MATRIX CODE**

SO - Soil  
SQ - Soil QC Samples  
WQ - Water QC Samples

**SAMPLE TYPE CODE**

BS - Blank Spike  
EB - Equipment Blank  
FD - Field Duplicate  
LB - Laboratory Blank  
N - Native Sample  
MS - Matrix Spike  
SD - Matrix Spike Duplicate  
LR - Laboratory Replicate

## Inorganic Parameters

### Quality Control Review

The following list represents the QA/QC measures that are typically reviewed during the data quality evaluation procedure for inorganic parameters.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Sample preparation, initial calibration blanks/continuing calibration blanks, and equipment blanks were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", in which target parameters have been added prior to digestion/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **Pre/Post Digestion Spike (MS/MSD)** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **ICP Interference Check Sample** – This sample verifies the lab's interelement and background correction factors.
- **Initial Calibration Verification** – This parameter ensures that the instrument is capable of producing acceptable quantitative data for the target analyte list to be measured.
- **Continuing Calibration Verification** – This one-point, mid-range parameter establishes that the initial calibration is still valid by checking the performance of the instrument on a continual basis.
- **ICP Serial Dilution** – The serial dilution of samples quantitated by ICP determines whether or not significant physical or chemical interferences exist due to the sample matrix.

## Metals Analyses

The QA/QC parameters for the Metals analyses for all of the samples were within acceptable control limits, except as noted below.

### Blanks

The Metals target parameters detected in blank samples are listed in Table 2.

**TABLE 2**

Blank Contamination; Metals

Charleston Naval Complex, Zone E, AOC 573, Charleston, SC

SDG	Lab Sample ID	Sample ID	Sample Type	Parameter	Lab Result	Units	Flag Concentrations
60029	CCB		CCB	Chromium	1.34	ug/L	6.7 ug/L
60029	1200215718	1200215718	MB	Chromium	0.829	ug/L	4.145 ug/L
60029 / 60030	60029001	573EB006M1	EB	Chromium	0.950	ug/L	0.2375 mg/Kg

If a target parameter was reported in a field sample, and the concentration was below the level determined to be due to blank contamination (5 times the concentration in the associated QC blank samples), it was flagged as "U", not detected. Initial and continuing calibration blanks were also evaluated for possible contamination.

No results were qualified due to blank contamination.

### Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted below.

- The percent Difference for Chromium in the Native/Field Duplicate sample 573SB00703/573CB00703 was 86.4 percent. No flags were applied due to Field Duplicate precision.

## Recoveries – Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Laboratory Control Sample (LCS)

All Matrix Spike (MS), Matrix Spike Duplicate (MSD) and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 3 below.

**TABLE 3**

MS/MSD Recoveries Out of QC Limits: Metals

Charleston Naval Complex, Zone E, AOC 573, Charleston, SC

SDC	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
60030	573SB00601MS/MSD	Chromium	127.7* / 237.2*	80-120	60030 – All	J Detects only

\* - out of control limits

## General Chemistry Analyses

The QA/QC parameters for the Hexavalent chromium and pH analyses for all of the samples were within acceptable control limits, except as noted below.

### Holding Times

- Sample 60029001 was received by the lab with insufficient time to analyze for Hexavalent chromium within the twenty-four hour holding time. The sample was analyzed within 30 minutes past holding time. No flags were applied since this sample is an equipment blank.
- All samples were received with insufficient time to analyze for pH within holding time. Samples ideally should be analyzed for pH immediately after collection. The lab received the samples the day after collection. No flags are applied for pH.

## Rejected Data

No data were rejected for this sampling event.

## Conclusion

A review of the analytical data submitted regarding the investigation of Zone E, AOC 573, at the Charleston Naval Complex, Charleston, South Carolina by CH2M HILL has been completed. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures have been adequately completed, and that the analytical results should be considered usable as qualified.

The analytical data had minor QC concerns as indicated above; however, it did not affect data usability for the analytical results. The validation review demonstrated that the analytical systems were generally in control and the data results can be used in the decision making process.

Attachment 1 - Changed Qualifiers and Results  
 Zone E, AOC 573 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
60030	573SB00701	60030003	SO	GENCHEM	SW7196A	Chromium (Hexavalent)	0.0453	J	0.0453	J	mg/kg	IB
60030	573SB00703	60030004	SO	GENCHEM	SW7196A	Chromium (Hexavalent)	0.241	J	0.241	J	mg/kg	IB
60030	573SB00901	60030010	SO	GENCHEM	SW7196A	Chromium (Hexavalent)	0.0393	J	0.0393	J	mg/kg	IB
60030	573CB00703	60030005	SO	METAL	SW6010B	CHROMIUM, TOTAL	189	N*	189	J	mg/kg	MS
60030	573SB00601	60030001	SO	METAL	SW6010B	CHROMIUM, TOTAL	51.7	N*	51.7	J	mg/kg	MS
60030	573SB00603	60030002	SO	METAL	SW6010B	CHROMIUM, TOTAL	62.3	N*	62.3	J	mg/kg	MS
60030	573SB00701	60030003	SO	METAL	SW6010B	CHROMIUM, TOTAL	15.3	N*	15.3	J	mg/kg	MS
60030	573SB00702	60030006	SO	METAL	SW6010B	CHROMIUM, TOTAL	84	N*	84	J	mg/kg	MS
60030	573SB00703	60030004	SO	METAL	SW6010B	CHROMIUM, TOTAL	75	N*	75	J	mg/kg	MS
60030	573SB00801	60030007	SO	METAL	SW6010B	CHROMIUM, TOTAL	22.2	N*	22.2	J	mg/kg	MS
60030	573SB00802	60030009	SO	METAL	SW6010B	CHROMIUM, TOTAL	10.6	N*	10.6	J	mg/kg	MS
60030	573SB00803	60030008	SO	METAL	SW6010B	CHROMIUM, TOTAL	9.87	N*	9.87	J	mg/kg	MS
60030	573SB00901	60030010	SO	METAL	SW6010B	CHROMIUM, TOTAL	14.4	N*	14.4	J	mg/kg	MS
60030	573SB00902	60030012	SO	METAL	SW6010B	CHROMIUM, TOTAL	112	N*	112	J	mg/kg	MS
60030	573SB00903	60030011	SO	METAL	SW6010B	CHROMIUM, TOTAL	201	N*	201	J	mg/kg	MS

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: ZE573-041802-01 page 1 of 2

Laboratory: GEL		Site Name: Zone E, AOC 573	
Project Name: Charleston Navy Complex		TAT: 10 day package	
Project Number: 158814.PM.04		Level: Level 3	
Project Manager: Tom Beisel/ATL		Address: GNV: 3011 SW Williston Rd., Gainesville, FL 32605	
CHS 2470 Mall Dr. Suite B, N Charleston, SC 29406			
Send Report To: see back of COC		EDD: CNC format	

Lab Batch/SDG:  
60029Z/60030Z  
W 3

Sample ID	Sample Description	Depth		Date & Time Collected	Matrix	# of containers	Containers				Comments	
		Begin	End				1-4 ounce jar	250mL HDPE, HNO3	500mL HDPE			
573SB00601	E573SB006	0	1	5-7-02/1150	SO	1	X	X	X			
573SB00603	E573SB006	1	3	5-7-02/1200	SO	1	X	X	X			
573SB00602	E573SB006	3	5	5-7-02/	SO	X	X	X				← * Sample NOT TAKEN due obstruction
573SB00701	E573SB007	0	1	5-7-02/1230	SO	1	X	X	X			
573SB00703	E573SB007	1	3	5-7-02/1240	SO	1	X	X	X			
573CB00703	E573SB007	1	3	5-7-02/1250	SO	1	X	X	X			
573SB00702	E573SB007	3	5	5-7-02/1300	SO	1	X	X	X			
573SB00801	E573SB008	0	1	5-7-02/1030	SO	1	X	X	X			RCRA
573SB00803	E573SB008	1	3	5-7-02/1040	SO	1	X	X	X			
573SB00802	E573SB008	3	5	5-7-02/1050	SO	1	X	X	X			Samples complete
573SB00901	E573SB009	0	1	5-7-02/1110	SO	1	X	X	X			
573SB00903	E573SB009	1	3	5-7-02/1120	SO	1	X	X	X			
573SB00902	E573SB009	3	5	5-7-02/1130	SO	1	X	X	X			
573EB006M1	E573EB006			5-7-02/1210	SQ	3				X	X	EB NO EB FOR PH

Sampled By: ANDREW O'CONNOR; Aron Sha Date/Time: 5-7-02

Relinquished by: [Signature] Date/Time: 5-8-02/0845

Additional Samplers: [Blank]

Received By Lab: [Signature] Date/Time: 5/8/02 0845

Relinquished by: [Blank] Date/Time: [Blank]

Received By: [Blank] Date/Time: [Blank]

Shipped Via: UPS FedEx Hand Other Tracking#: [Blank]

Receipt Exceptions: [Blank]



UCL95 Estimates for BEQs in Surface Soil at AOC 573

Site AOC 573  
 Media Surface Soil  
 Units ug/kg  
 Chemical BEQs  
 CASRN

**STATISTICS**

N	5
Detects	4
FOD	80%
Mean of Detect	1915.7
Min of Detect	385.7
Max of Detect	<b>5704.5</b>
Best Estimate of Mean (arithmetic)	3124.5
Best Estimate of Mean (geometric)	891.6
Nondetects at 1/2 DL	YES

**95% UPPER CONFIDENCE LIMITS FOR MEAN**

UCL95 Normal	3804.4	
<i>t</i> -statistic	2.13	
UCL95 Lognormal	23656.9	Exceeds Max Detect
<i>H</i> -statistic	4.91	
UCL95 Nonparametric	0.000	
UCL95 Bootstrap	<b>3124.5</b>	

**DISTRIBUTION TESTING**

Population is best described as:	LOGNORMAL
$W_{normal}$	0.632
$W_{log}$	0.813
$W_{\alpha=0.05}$	0.762

Notes:

1. If population does not fit normal or lognormal distribution, check Q-Q plots and W-test values. The population may be close enough to one of those distributions to subjectively select a normal or lognormal distribution.
2. For site data, if the selected UCL95 exceeds the Max Detect, the Max Detect should be chosen as the EPC.
3. Lognormal UCL or UTL values calculated for less than 30 samples may be widely inflated.
4. If there is >90% nondetection, it is generally impossible to calculate a UTL or UCL with any level of confidence.

# CH2MHILL TRANSMITTAL

**To:** David Scaturo  
South Carolina Department of Health  
and Environmental Control  
Bureau of Land and Waste  
Management  
2600 Bull Street  
Columbia, SC 29201

**From:** Dean Williamson/CH2M-Jones

**Date:** April 25, 2003

**Re:** CH2M-Jones' Responses to Comments by EPA regarding the *RFI Report Addendum/CMS Work Plan, AOC 573, Zone E* (Revision 0)

Quantity	Description
2	CH2M-Jones' Responses to Comments by SCDHEC regarding the <i>RFI Report Addendum/CMS Work Plan, AOC 573, Zone E</i> (Revision 0) – Originally Submitted on August 30, 2002

If material received is not as listed, please notify us at once

Remarks:

Copy To:

Tim Frederick/Gannett Fleming, Inc., w/att  
Rob Harrell/Navy, w/att  
Gary Foster/CH2M-Jones, w/att

**RFI Report Addendum/CMS Work Plan, AOC 573, Zone E, Revision 0**

**EPA Specific Comments**

1. Page 25

It is inappropriate to compare these BEQ concentrations to elevated "railroad BRCs" where railroad tracks no longer exist. Speculations and/or demonstrations of any prior existence of railroad tracks is irrelevant and in admissible.

**CH2M-Jones Response:**

*Appropriate revisions will be made to the text which reflect the comment above. References to the railroad tracks will be deleted in Revision 1 of this RFIRA/CMSWP.*

2. Page 26

It appears that BEQs should also be considered as an industrial worker COC.

**CH2M-Jones Response:**

*We agree. BEQs are identified as a COC for both the unrestricted and industrial land use scenarios in section 7.0, page 7-1, line 14. The text in Section 5.0 and other necessary locations in the report will be revised to indicate that BEQs are a COC for both the unrestricted and industrial land use scenarios.*

3. Page 26, Sequence number: 2

The 95% UCL of the mean site BEQ concentrations should not be compared to a BRC based on a range maximum. It would be allowable to compare the site UCL(95) to the UCL(95) of sample concentrations used in the background study.

**CH2M-Jones Response:**

*The reference concentrations for BEQs are 2 times the mean values (not maximum value as implied in the comment). The UCL<sub>95</sub> estimate is the upper-bound estimate of the mean. The 2 times the mean value used for background as recommended by EPA Region 4 is based on the principle that such a value represents an approximation of the upper-bound estimate of the mean, more similar to the upper tolerance limit (UTL<sub>95</sub>). The estimated mean for the site is 1,915 µg/kg, and 2 times the mean site concentration is 3,830 µg/kg, compared to a background 2 times mean value of 1,304 µg/kg. The text will be edited to remove comparison between UCL<sub>95</sub> concentrations and replace it with 2 times mean site concentration against background value.*

4. Page 27

BEQs should be considered as a COC for future worker, as well.

**CH2M-Jones Response:**

*Please see response to Comment No. 2 above.*