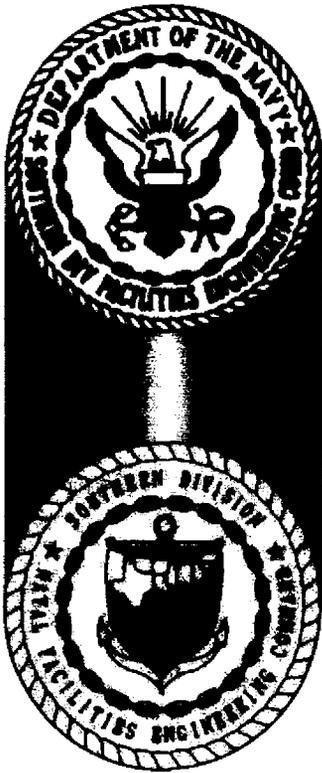


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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ADDENDUM AREA OF CONCERN 572 (AOC 572) ZONE E CNC CHARLESTON SC
6/6/2002
CH2M HILL

RFI REPORT ADDENDUM

Area of Concern 572 Zone E



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

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

C. H. Jones

June 2002

Contract N62467-99-C-0960



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June 6, 2002

Mr. David Scaturro
South Carolina Department of Health and
Environmental Control
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Re: RFI Report Addendum (Revision 1) – AOC 572, Zone E

Dear Mr. Scaturro:

Enclosed please find two sets of replacement pages which serve as Revision 1 of the RFI Report Addendum for AOC 572 in Zone E of the Charleston Naval Complex (CNC). Below is a summary of the material enclosed with this letter, along with the Responses to EPA Comments:

- Revision 1 text and figures to be replaced in the Revision 0 RFI Report Addendum for AOC 572, Zone E, submitted by CH2M-Jones in March 2002.
- Revision 1 covers/spines and flysheets to be replaced in the original Revision 0 RFI Report Addendum 3-ring binder.

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.
Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att

SPECIFIC COMMENTS

EPA Comment 1:

1. Page 2-2, Line 8. The text states that no inorganics exceeded the screening criteria in surface soil. According to the data shown on Figure 2-2, lead had a concentration of 440 mg/kg in sample E572SB006, which did exceed the screening criteria of 400 mg/kg. The text should be edited to state that lead was detected above its screening criteria.

CH2M-Jones Response 1:

Section 2.0 only summarizes the findings of the Zone E RFI Report, Revision 0, and does not include comparison of detections from the initial RFI against current BCT screening criteria. Comparisons with current BCT screening criteria are performed in Section 5.0 of the RFI Report Addendum.

The initial RFI Report compared the detected lead concentrations with the EPA Region III industrial risk-based concentration (RBC) of 1,400 mg/kg, and the 445 mg/kg detection in the surface soil sample at E572SB006 did not exceed this screening criterion. The footnote on Figure 2-2 will be updated to show industrial RBCs, rather than residential RBCs, in order to correlate the legend to the text discussion. Discussions of lead detections above current BCT screening criteria will not be included in Section 2.0 but will be deferred to Section 5.0 as currently presented.

EPA Comment 2:

2. Page 2-4, Line 7. The paragraph states that only BEQs were retained as COCs for surface soils. The text further states that lead was not included as a surface soil COC in the initial RFI because the site wide average lead concentration of 116 mg/kg in surface soils was below the unrestricted land use criterion and Zone E background. However, lead in sample E572SB006 (440 mg/kg) exceed its screening criteria and had a sub-surface concentration of 5,230 mg/kg, therefore, lead should have been considered a COC in surface soil due to a "hot spot" of potential lead contamination. It is recognized that the text presented in this section is based on a historical review of the initial RFI. However, additional text should be added to this section discussing the failure of the initial RFI to address this potential "hot spot" of lead contamination.

CH2M-Jones Response 2:

The text in Section 2.4.1 on page 2-4 will be updated to reflect this information.

EPA Comment 3:

3. Figure 2-2. In this figure, several constituents and their associated concentrations are depicted in bold. It is assumed that the bold values indicate constituents having concentrations greater than their associated screening values. For clarity, the Figure's legend should be edited to state why certain constituents are depicted in a bold font.

CH2M-Jones Response 3:

The legend on Figure 2-2 will be updated to clarify the depictions in bold font.

EPA Comment 4:

4. Figures 4-1 and 4-2. For clarity, legends should be added to these figures.

CH2M-Jones Response 4:

Legends formatted similar to those in Figure 2-2 will be added to these figures.



CH2MHILL

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April 1, 2002

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

Re: RFI Report Addendum (Revision 0) – AOC 572, Zone E

Dear Mr. Scaturo:

Enclosed are two copies of the RFI Report Addendum (Revision 0) for AOC 572 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, should 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
Gary Foster/CH2M HILL, w/att

RFI REPORT ADDENDUM

Area of Concern 572, Zone E



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

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

PREPARED BY
CH2M-Jones

June 2002

*Revision 1
Contract N62467-99-C-0960
158814.ZE.PR.10*

**Certification Page for RFI Report Addendum (Revision 1) –
AOC 572, 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

1 Contents

2	Acronyms and Abbreviations	vi
3	1.0 Introduction	1-1
4	1.1 Background	1-1
5	1.2 Purpose of the RFI Report Addendum	1-2
6	1.3 Report Organization	1-3
7	Figure 1-1 Location of AOC 572 in Zone E.....	1-4
8	Figure 1-2 Site Location of AOC 572	1-5
9	2.0 Summary of RFI Conclusions for AOC 572	2-1
10	2.1 Soil Sampling and Analysis	2-1
11	2.1.1 Surface Soil.....	2-1
12	2.1.2 Subsurface Soil	2-2
13	2.2 Groundwater.....	2-2
14	2.2.1 Shallow Groundwater	2-3
15	2.3 Sediment.....	2-3
16	2.4 RFI Human Health Risk Assessment (HHRA).....	2-3
17	2.4.1 Soils	2-4
18	2.4.2 Groundwater	2-4
19	2.5 RFI Conclusions and Recommendations	2-4
20	Figure 2-1 RFI Sample Locations	2-5
21	Figure 2-2 RFI Soil and Sediment COPC Concentrations	2-6
22	3.0 Summary of Interim Measures and UST/AST Removals at AOC 572	3-1
23	3.1 UST/AST Removals.....	3-1
24	3.2 Interim Measures.....	3-1
25	4.0 Summary of Additional Investigations	4-1
26	4.1 Soil Sampling and Analysis	4-1
27	4.1.1 Surface Soil.....	4-2
28	4.1.2 Subsurface Soil	4-2
29	4.1.3 Groundwater	4-3
30	Table 4-1 Concentrations of Surface Soil COPCs	4-4
31	Table 4-2 Concentrations of Subsurface Soil COPCs	4-7
32	Table 4-3 Concentrations of Surface Soil COPCs (SPLP Analysis).....	4-11
33	Table 4-4 Concentrations of Subsurface Soil COPCs (SPLP Analysis).....	4-12

1 Figure 4-1 Surface and Subsurface Soil COPCs, RFI Sampling Results4-13

2 Figure 4-2 Surface and Subsurface Soil COPCs, 2001 Sampling Results4-14

3 **5.0 COPC/COC Refinement5-1**

4 5.1 COCs in Soil5-1

5 5.1.1 Antimony5-1

6 5.1.2 BEQs.....5-1

7 5.1.3 Lead5-3

8 5.1.4 Tin5-4

9 5.2 COC Summary.....5-4

10 **6.0 Summary of Information Related to Site Closeout Issues6-1**

11 6.1 RFI Status.....6-1

12 6.2 Presence of Inorganics in Groundwater6-1

13 6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the

14 CNC.....6-2

15 6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC6-2

16 6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC....6-2

17 6.6 Potential Migration Pathways to Surface Water Bodies at the CNC.....6-2

18 6.7 Potential Contamination in Oil/Water Separators (OWSs).....6-2

19 6.8 Land Use Control (LUC)6-3

20 Table 6-1 Detected Antimony Concentrations in Shallow Groundwater.....6-4

21 **7.0 Recommendations.....7-1**

22 **8.0 References.....8-1**

23

24 **Appendices**

- 25 **A** Excerpts from the RFI report, including a summary of detections of chemicals and a
- 26 groundwater flow map for the site vicinity.
- 27 **B** Responses to SCDHEC Comments for AOC 572 from the RFI report.
- 28 **C** Site Location Map from Public Works Map of the Charleston Navy Shipyard, dated
- 29 June 1935.
- 30 **D** Analytical Results Summary for Additional Soil and Groundwater Samples.
- 31 **E** Data Validation Summaries.

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	cPAH	carcinogenic polyaromatic hydrocarbons
14	CSI	confirmatory sampling investigation
15	DAF	dilution attenuation factor
16	EnSafe	EnSafe Inc.
17	EPA	U.S. Environmental Protection Agency
18	ft bls	feet below land surface
19	FRE	fixed-point risk evaluation
20	IM	interim measure
21	HHRA	human health risk assessment
22	HI	hazard index
23	LUC	land use controls
24	MCL	maximum contaminant level
25	$\mu\text{g}/\text{kg}$	microgram per kilogram
26	mg/kg	milligram per kilogram
27	NAVBASE	Naval Base
28	NFA	no further action
29	NFI	no further investigation
30	OWS	oil/water separator

1 **Acronyms and Abbreviations, Continued**

2	RBC	risk-based concentration
3	RCRA	Resource Conservation and Recovery Act
4	RFI	RCRA Facility Investigation
5	SAP	sampling and analysis plan
6	SCDHEC	South Carolina Department of Health and Environmental Control
7	SPLP	synthetic precipitation leaching procedure
8	SSL	soil screening level
9	SVOC	semivolatile organic compound
10	SWMU	solid waste management unit
11	TDS	total dissolved solids
12	UST	underground storage tank
13	VOC	volatile organic compound

Section 1.0

1 1.0 Introduction

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

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

11 In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation
12 and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to
13 complete the RCRA Facility Investigation (RFI) for Area of Concern (AOC) 572 in Zone E of
14 the CNC. The site is recommended for no further action (NFA). Figure 1-1 illustrates the
15 location of AOC 572 in Zone E in the CNC. Figure 1-2 provides an aerial view of the site
16 within Zone E.

17 1.1 Background

18 AOC 572 is a former electrical motor steam cleaning area south of Building 177. The steam
19 cleaning operations at this location had ceased by the time of the RFI in 1996. No evidence
20 of the steam cleaning activities is now present. While in operation, wastewater was drained
21 from the steam cleaning area directly to the storm sewer system. No additional information
22 could be found during the RFI regarding the operating practices at this site.

23 A review of historical engineering drawings for this site shows that railroad lines were
24 installed between 1929 and 1935 adjacent to and across AOC 572. According to historical
25 maps, the railroad lines were either paved over or removed sometime around 1940.

26 Materials of concern identified in the *Final Zone E RFI Work Plan* (EnSafe Inc.
27 [EnSafe]/Allen & Hoshall, 1995) include solvents, petroleum hydrocarbons, and heavy
28 metals. This area of Zone E is zoned M2 (industrial). The CNC RCRA Permit identified
29 AOC 572 as requiring a confirmatory sampling investigation (CSI).

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

6 **1.2 Purpose of the RFI Report Addendum**

7 This submittal has been prepared by CH2M-Jones to complete the RFI for AOC 572 in Zone
8 E of the CNC. This RFI Report Addendum includes a summary of previous RFI
9 investigations and conclusions, as well as additional investigations conducted at AOC 572
10 by CH2M-Jones during 2001. This RFI Report Addendum also discusses the results of
11 additional investigations, the refinement of chemicals of potential concern (COPCs) and
12 chemicals of concern (COCs), current site conditions, and surrounding area land use.

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

- 15 • Status of the RFI
- 16 • Presence of metals (inorganics) in groundwater
- 17 • Potential linkage to Solid Waste Management Unit (SWMU) 37, Investigated Sanitary
18 Sewers at the CNC
- 19 • Potential linkage to AOC 699, Investigated Storm Sewers at the CNC
- 20 • Potential linkage of AOC 504, Investigated Railroad Lines at the CNC
- 21 • Potential linkage to surface water bodies (Zone J)
- 22 • Potential contamination associated with oil/water separators (OWSs)
- 23 • Relevance or need for land use controls at the site

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

26 Provided that the information presented in this report is adequate to address these site
27 closeout items, it is expected that the BCT will concur that NFA is appropriate for the site.
28 At that time, a Statement of Basis will be prepared and made available for public comment
29 in accordance with SCDHEC policy. This will allow for public participation in the final
30 remedy selection.

1.3 Report Organization

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

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

2.0 Summary of RFI Conclusions for AOC 572 – Summarizes the conclusions from the RFI investigations and risk evaluations for AOC 572 as presented in the RFI report.

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

4.0 Summary of Additional Investigations – Summarizes information, if any, collected after completion of the RFI report.

5.0 COPC/COC Refinement – Provides further evaluation of COPCs based on RFI and additional data to assess them as COCs.

6.0 Summary of Information Related to Site Closeout Issues – Discusses the various site closeout issues that the BCT agreed to evaluate prior to site closeout.

7.0 Recommendations – Provides recommendations for proceeding with a corrective measures study (CMS).

8.0 References – Lists the references used in this document.

Appendix A – Contains excerpts from the RFI report, including a summary of detections of chemicals and a groundwater flow map for the site vicinity.

Appendix B – Contains responses to SCDHEC comments for AOC 572 from the RFI report.

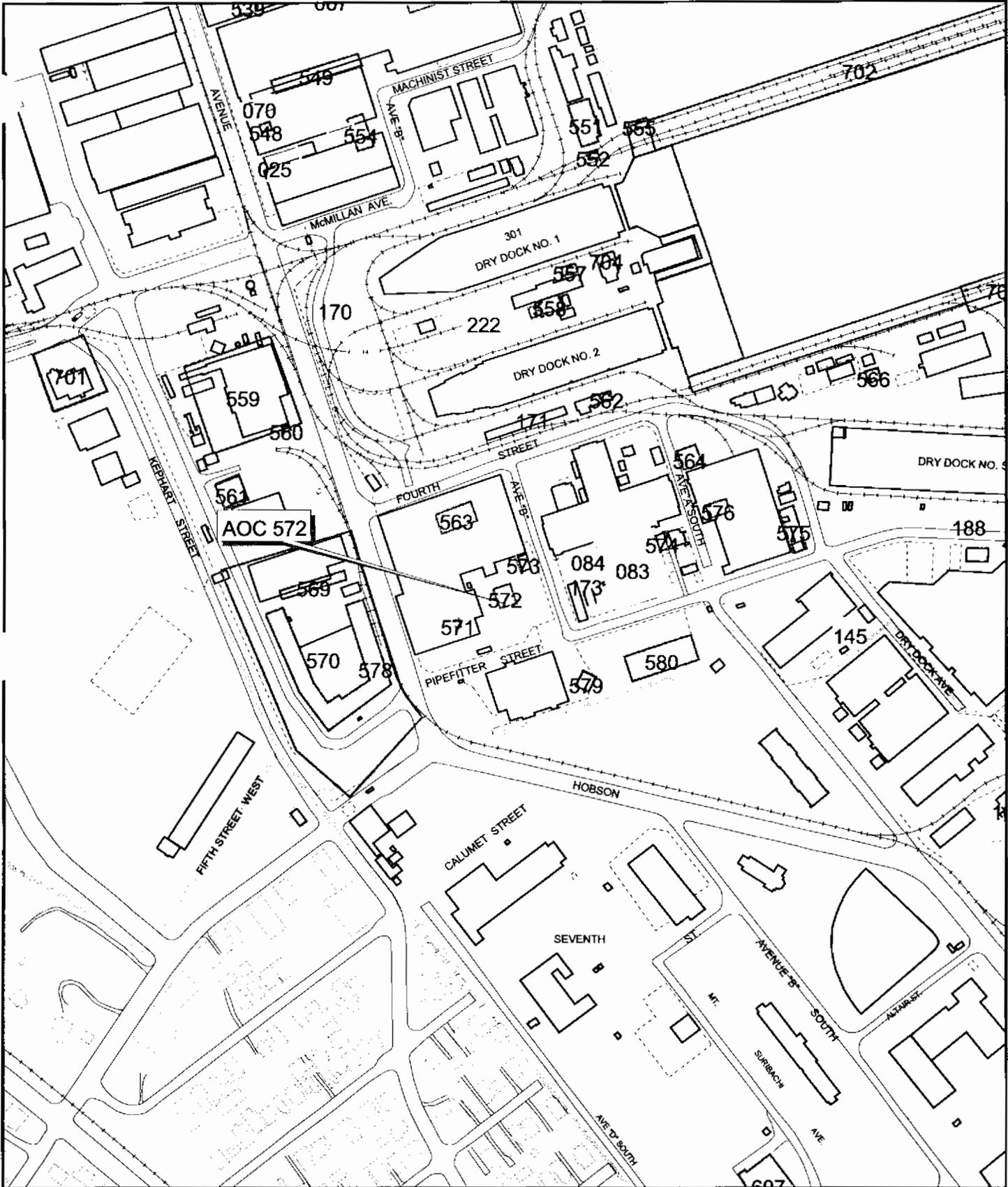
Appendix C – Includes the site location map from the Public Works Map of the Charleston Navy Shipyard, dated June 1935, which depicts the presence of railroad lines at the site.

Appendix D – Analytical Results Summary for Additional Soil and Groundwater Samples

Appendix E – Contains data validation summaries.

All figures and tables appear at the end of their respective sections.

NOTE: Original figure created in color



- Railroads
- Roads - Lines
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings

Zone Boundary

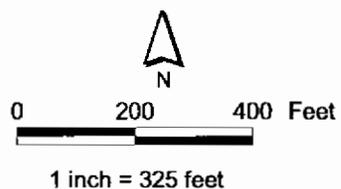


Figure 1-1
Location of AOC 572 in Zone E
Charleston Naval Complex

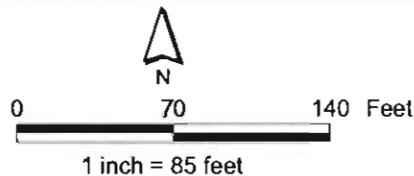
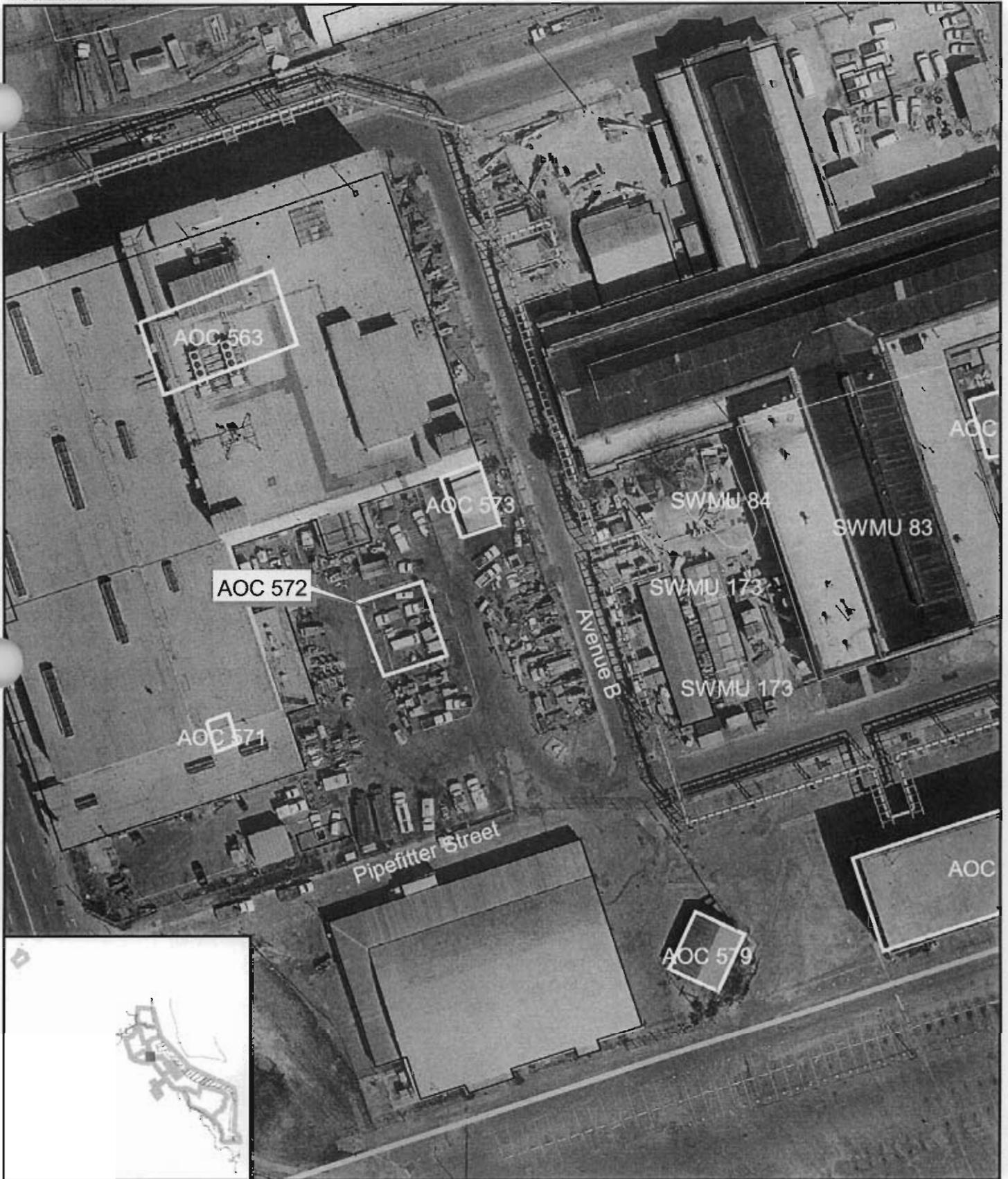


Figure 1-2
Site Location
AOC 572, Zone E
Charleston Naval Complex

CH2MHILL

2.0 Summary of RFI Conclusions for AOC 572

As part of the Zone E RFI, soil and groundwater investigations were conducted at AOC 572 during 1995 and 1996. This section summarizes the results and conclusions from those investigations, which were reported in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Figure 2-1 shows RFI soil and groundwater sampling locations. A further evaluation of COCs at this site is provided in Section 5.0.

2.1 Soil Sampling and Analysis

Soil was sampled during two sampling events at AOC 572. During the first event, eight surface samples and eight co-located subsurface soil samples were collected from the parking area south of Building 177. There are no unpaved surface soils around Building 177. These boring locations were identified as E572SB001 through E572SB008. All these samples represent an investigation area that is currently under an asphalt parking lot. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

During the second sampling event at AOC 572, surface and subsurface soil samples were collected at three additional locations to define the outer extent of the exceedances of SVOCs and metals in soil. These locations were identified as E572SB009 through E572SB011 and analyzed for SVOCs and metals only. Figure 2-1 shows the locations of the RFI soil borings.

2.1.1 Surface Soil

During the initial RFI, surface soil detections of organic chemicals were screened against the U.S. Environmental Protection Agency (EPA) Region III industrial risk-based concentrations (RBCs). Surface soil detections of inorganic chemicals were evaluated against the EPA Region III industrial RBCs and the Zone E background reference concentrations (BRCs). Additionally, SVOCs and inorganic chemicals were screened against EPA's generic soil screening levels (SSLs) (dilution attenuation factor [DAF]=10). The human health risk assessment (HHRA) for AOC 572 evaluated the residential exposure scenario.

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

- 1 • **VOCs:** No VOCs exceeded the screening criteria in surface soils.
- 2 • **SVOCs:** Among detected SVOC compounds, there were three calculated benzo(a)pyrene
3 equivalent (BEQ) concentrations which exceeded the industrial RBC of 780 microgram
4 per kilogram ($\mu\text{g}/\text{kg}$) for benzo(a)pyrene: 1,634 $\mu\text{g}/\text{kg}$ at sample location E572SB003;
5 1,177 $\mu\text{g}/\text{kg}$ at sample location E572SB007; and 1,686 $\mu\text{g}/\text{kg}$ at sample location
6 E572SB011. BEQ calculations were performed using the method adopted by the BCT at
7 the time the RFI report was written (EnSafe, 1997).
- 8 • **Inorganics:** No inorganics exceeded the screening criteria in surface soils.

9 Figure 2-2 shows RFI soil sample locations with detected concentrations of COPCs.

10 **2.1.2 Subsurface Soil**

11 During the initial RFI, subsurface soil detections of organic compounds were compared
12 with generic SSLs (using a DAF=10). Subsurface soil detections of inorganic compounds
13 were compared with generic SSLs (using a DAF=10) and the Zone E BRCs.

14 Detected concentrations of organic and inorganic compounds from subsurface soil samples
15 are as follows:

- 16 • **VOCs:** Detected VOC concentrations did not exceed the screening criteria.
- 17 • **SVOCs:** Detected SVOC concentrations did not exceed the screening criteria.
- 18 • **Inorganics:** Only arsenic and lead exceeded the screening criteria. Arsenic was detected
19 at sample location E572SB007 at a concentration of 24.1 milligrams per kilogram
20 (mg/kg), which exceeded its SSL of 16 mg/kg and its subsurface BRC of 19.9 mg/kg .
21 Lead was detected at sample location E572SB006 at a concentration of 5,230 mg/kg and
22 at sample location E572SB002 at a concentration of 5,460 mg/kg , which exceeded its SSL
23 of 400 mg/kg and its subsurface BRC of 173 mg/kg .

24 Figure 2-2 shows RFI soil sample locations with detected concentrations of COPCs.

25 **2.2 Groundwater**

26 During the initial RFI, three shallow groundwater monitoring wells were installed in the
27 parking area south of Building 177. Each well was sampled four times between 1996 and
28 1997. Groundwater samples were submitted for analysis for VOCs, SVOCs, metals,
29 chlorides, sulfates, and total dissolved solids (TDS). Figure 2-1 shows the groundwater
30 monitoring well locations at the site.

1 During the initial RFI, detections in groundwater samples were compared with the EPA
2 Region III tap water RBCs, maximum contaminant levels (MCLs), and the Zone E BRCs for
3 shallow groundwater.

4 **2.2.1 Shallow Groundwater**

5 The following detections were found in the shallow groundwater samples at this site:

6 **VOCs:** There were no detections of VOC concentrations above the screening criteria.

7 **SVOCs:** There were no detections of SVOC concentrations above the screening criteria.

8 **Inorganics:** The RFI report reported results for the first sampling event only. Among detected
9 inorganic analytes, only iron exceeded both its secondary MCL of 300 µg/L and the tap
10 water RBC of 1,100 µg/L with concentrations of 11,000 µg/L at sample location
11 E572GW001, 4,800 µg/L at sample location E572GW002, and 3,960 µg/L at sample location
12 E572GW003.

13 **2.3 Sediment**

14 The RFI Work Plan for AOC 572 proposed collecting one sediment sample. Accordingly, a
15 sediment sample (E572M0001) was collected in the parking area south of Building 177 and
16 analyzed for VOCs, SVOCs, and metals. This sediment sample was collected from the open
17 parking lot and not from a surface water drainage feature. Figure 2-1 shows the sediment
18 sampling location. During the initial RFI, this detection in the sediment sample was
19 compared with the industrial RBCs for soil.

20 **VOCs:** There were no detections above laboratory detection limits.

21 **SVOCs:** Only BEQs exceeded SVOC screening criteria, with the BEQ concentration of 1,300
22 µg/kg in sample E572M0001 exceeding the benzo(a)pyrene RBC value of 780 µg/kg for
23 soils used during the initial RFI.

24 **Inorganics:** Only arsenic was detected above the soil screening criteria. Arsenic was detected
25 at a concentration of 7.40 mg/kg in sample E572M0001, above its industrial RBC of 3.8
26 mg/kg.

27 **2.4 RFI Human Health Risk Assessment (HHRA)**

28 The *Zone E RFI Report Revision 0* (EnSafe, 1997) used a fixed-point risk evaluation (FRE)
29 approach at this site. The FRE included site resident and site worker exposure scenarios.

1 The detailed risk assessment for the AOC 572 site are presented in Sections 10.36.8.1
2 through 10.36.8.5 of the RFI report.

3 **2.4.1 Soils**

4 The HHRA for AOC 572 considered BEQs and lead as COPCs based on exceedances of the
5 Zone E BRCs and the EPA Region III residential RBCs in use at the time the RFI report was
6 written.

7 For the unrestricted future land use scenario, only BEQs were retained as COCs for surface
8 soils. For the commercial/industrial reuse scenario, only BEQs were retained as COCs in
9 surface soils. Lead was not included as a surface soil COC in the initial RFI because the
10 sitewide average lead concentration of 116 mg/kg in surface soils was below the 400 mg/kg
11 unrestricted land use screening criterion and the Zone E surface soil BRC for lead of 273
12 mg/kg. However, elevated lead concentrations detected in surface and subsurface soil
13 samples above screening criteria during the RFI are further re-evaluated and discussed in
14 Section 5.0. No COCs were identified for subsurface soils at AOC 572.

15 **2.4.2 Groundwater**

16 No COPCs were identified in groundwater at AOC 572.

17 **2.5 RFI Conclusions and Recommendations**

18 The RFI report recommended that a CMS be conducted for surface soil at AOC 572 to
19 address BEQs as COCs.

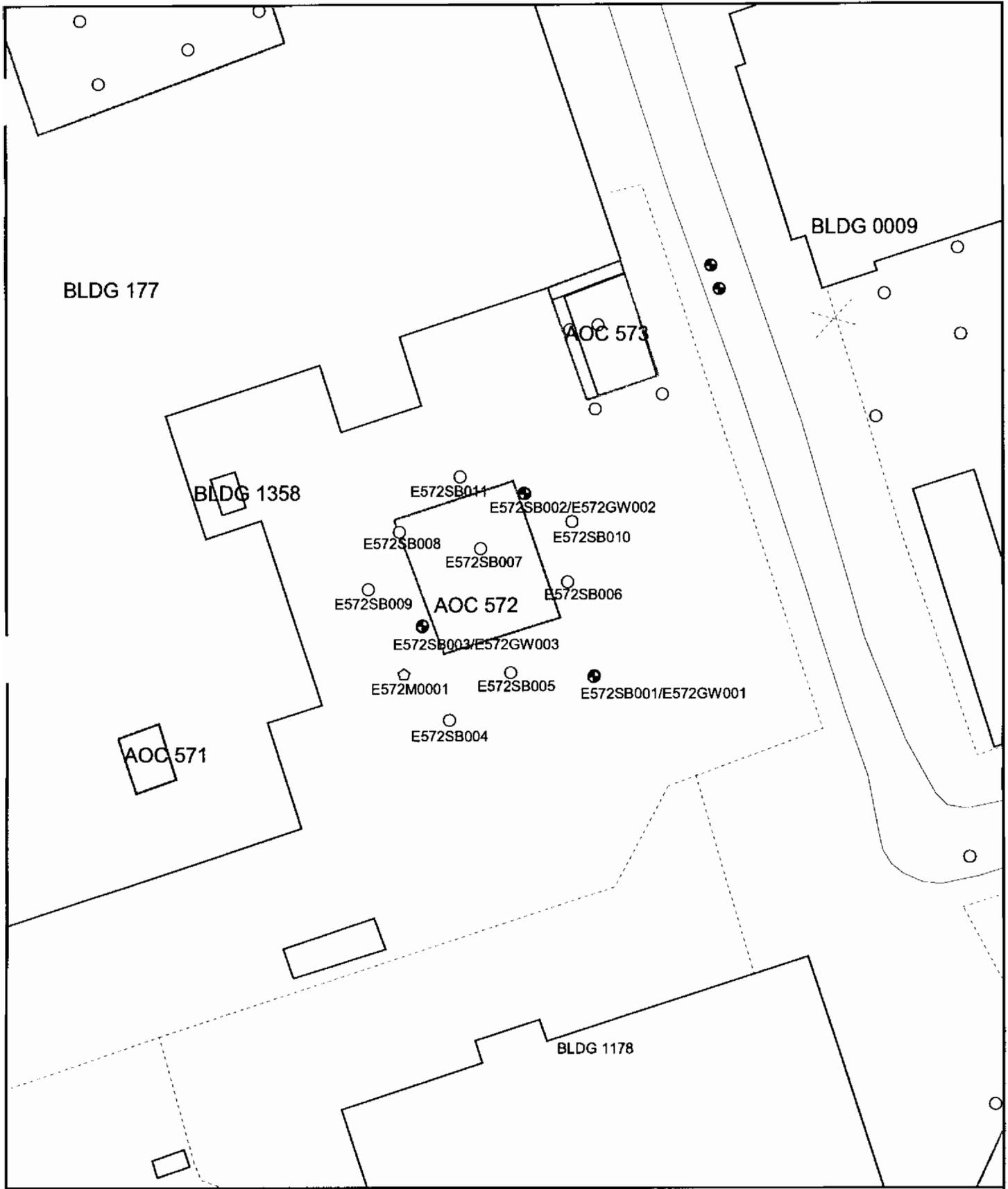
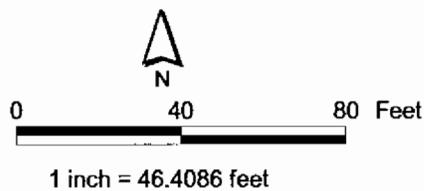
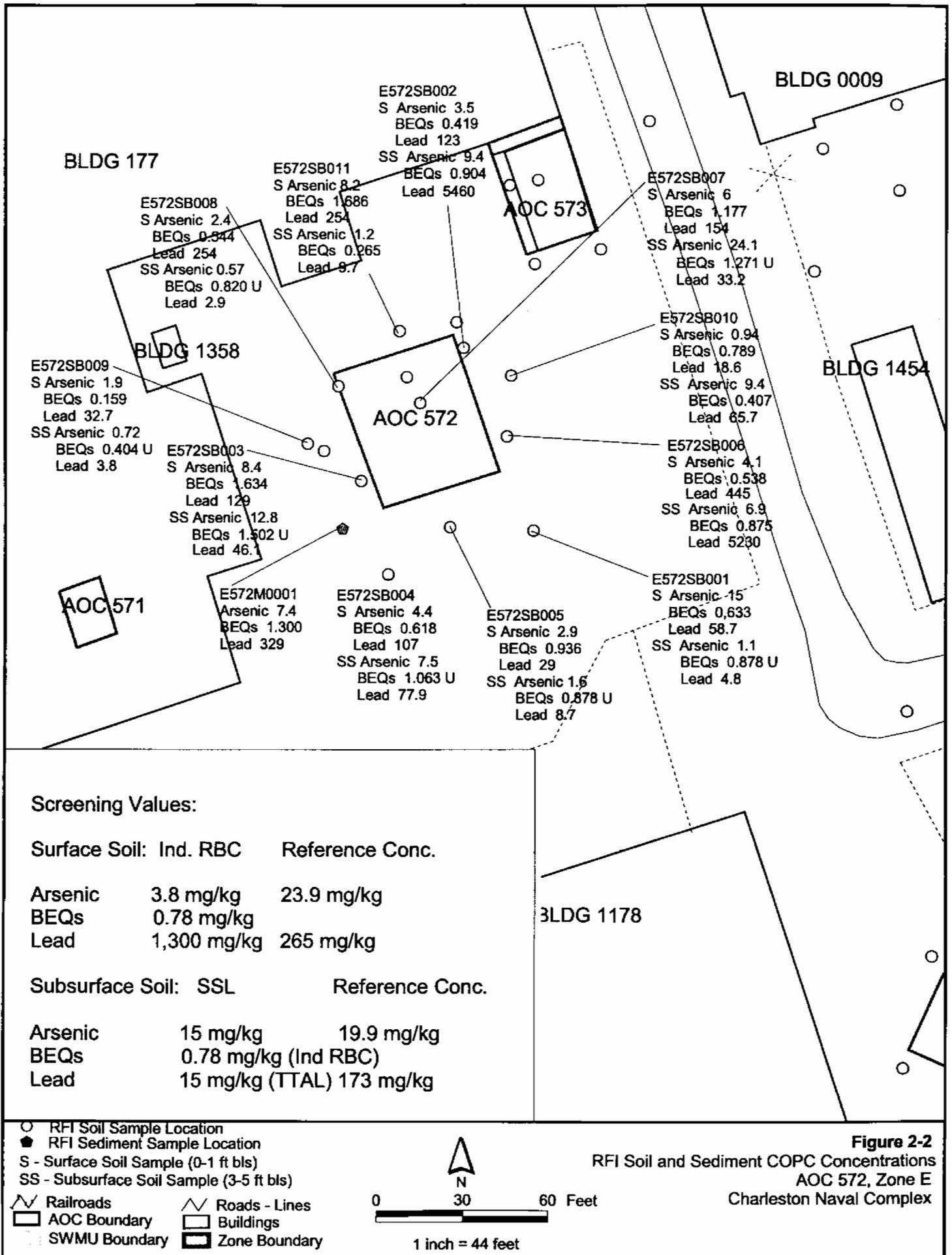


Figure 2-1
RFI Sampling Locations
AOC 572, Zone E
Charleston Naval Complex

- Groundwater Well
- Sediment
- Surface Soil
- Fence
- Railroads
- Roads - Lines
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary





Section 3.0

1 **3.0 Summary of Interim Measures and UST/AST**
2 **Removals at AOC 572**

3 **3.1 UST/AST Removals**

4 There are no records of any underground storage tanks (USTs) or aboveground storage
5 tanks (ASTs) being present at this site.

6 **3.2 Interim Measures**

7 There were no IMs conducted at the site.

1 **4.0 Summary of Additional Investigations**

2 This section summarizes the results and conclusions from the soil investigations conducted
3 at AOC 572 by CH2M-Jones during November and December 2001 to further delineate the
4 nature and extent of antimony, BEQs, lead, and tin. These investigations were prompted by
5 a comparison of detected concentrations from the initial RFI soil sampling data provided in
6 the *Zone E RFI Report, Revision 0* (EnSafe, 1997) with screening criteria for unrestricted land
7 use, which showed that some of the detected site constituents exceeded the current
8 screening criteria.

9 Based on an evaluation of the data collected during the RFI and a comparison to COPC
10 screening criteria currently used by the BCT, BEQs, and lead in surface soil required
11 additional evaluation. Antimony and lead in subsurface soil showed exceedances of the
12 SSLs and the maximum reported value in Zone E background subsurface soil samples. Tin
13 in subsurface soil exceeded the maximum value reported in Zone E background subsurface
14 soil samples. These elevated antimony, lead, and tin concentrations in the subsurface soil
15 sample were detected in RFI soil boring E572SB002 and suggested that a subsurface source
16 of contamination might be present in this area. In order to assess this possibility, additional
17 subsurface soil sampling was conducted.

18 A sampling and analysis plan (SAP) for AOC 572 was prepared by CH2M-Jones and
19 submitted to SCDHEC. The soil sampling was conducted during November and December
20 2001.

21 **4.1 Soil Sampling and Analysis**

22 To further delineate metals and SVOC exceedances in surface and subsurface soils, 13
23 additional surface soil samples and 13 co-located subsurface soil samples were collected
24 from areas surrounding previous RFI borings which showed chemical concentrations
25 exceeding screening criteria at AOC 572. These boring locations were identified as
26 E572SB012 through E572SB025.

27 Samples E572SB014 through E572SB017 were analyzed only for SVOCs. Samples
28 E572SB012, E572SB013, and E572SB018 through E572SB024 were analyzed for tin, lead, and
29 antimony. Sample E572SB025 was analyzed for SVOCs, antimony, tin, and lead. Two RFI
30 soil boring locations, E572SB002 (which showed elevated lead and tin concentrations in
31 subsurface soil) and E572SB006 (which showed elevated lead concentrations in subsurface

1 soil), were resampled to verify these elevated concentrations, and the new borings were
2 respectively identified as E572SB0012 and E572SB013. At these new resampling locations,
3 subsurface samples were collected from the 1-3 feet below land surface (ft bls) and 3-5 ft bls
4 depth intervals in order to verify the presence of tin and lead. Additionally, samples
5 collected at E572SB012 were analyzed for metals using the synthetic precipitation leaching
6 procedure (SPLP) to assess the leachability of metals from soil and determine possible
7 leachability to groundwater at this location. Figure 4-1 shows RFI soil boring locations with
8 detected COPC concentrations and 2001 sampling locations where the additional soil
9 sampling was conducted. Tables 4-1 and 4-2 show the results from BEQ and inorganics
10 analysis for surface and subsurface soil samples, and Tables 4-3 and 4-4 show the results
11 from the SPLP analysis of surface and subsurface soil samples respectively.

12 **4.1.1 Surface Soil**

13 Surface soil detections of organic compounds were evaluated against the EPA Region III
14 residential RBCs (with a hazard index [HI]=0.1 for noncarcinogens). Surface soil detections
15 of inorganic compounds were evaluated against the EPA Region III residential RBCs
16 (HI=0.1 for noncarcinogens) and the range of concentrations in Zone E grid samples.

17 Figure 4-2 shows the detected concentrations of inorganics and BEQs in surface soil samples
18 at the site. Detected concentrations of organic and inorganic analytes exceeding their
19 respective criteria were as follows:

- 20 • **SVOCs:** BEQs were detected at all five locations sampled. The calculated BEQ values
21 ranged from 280.6 µg/kg to 650.9 µg/kg. None of the concentrations exceeded the CNC
22 BEQ sitewide reference concentration of 1,304 µg/kg for surface soil.
- 23 • **Inorganics:** No inorganics exceeded the screening criteria in surface soils. Detected
24 concentrations of inorganics in SPLP samples do not indicate that the metals are
25 leaching into the groundwater.

26 **4.1.2 Subsurface Soil**

27 Subsurface soil detections were compared with generic SSLs (using a DAF=10). Subsurface
28 soil detections of inorganic compounds were also compared with the range of
29 concentrations in Zone E grid samples.

30 Figure 4-2 shows the detected concentrations of inorganics and BEQs in subsurface soil
31 samples at the site. Detected concentrations of organic and inorganic analytes exceeding
32 their respective criteria are as follows:

- 1 • **SVOCs:** BEQ concentrations at the five new BEQ sampling locations ranged from 468.6
2 $\mu\text{g}/\text{kg}$ to 1,632.8 $\mu\text{g}/\text{kg}$, with BEQ concentrations at one location (E572SB015 of 1,632.8
3 $\mu\text{g}/\text{kg}$) exceeding the CNC BEQ sitewide reference concentration of 1,400 $\mu\text{g}/\text{kg}$ for
4 subsurface soil.
- 5 • **Inorganics:**
- 6 • Lead was detected at a concentration of 2,360 mg/kg in E572SB022, which is above
7 its SSL of 400 mg/kg . This sample is located under asphalt pavement.
- 8 • During the initial RFI, antimony was detected in subsurface soil above its SSL and
9 Zone E BRC at sampling location E572SB002. Soil boring E572SB013 was advanced
10 during the 2001 sampling at this location to verify the antimony concentrations.
11 Antimony was not detected in the subsurface soil samples in either the 1-3 ft or the
12 3-5 ft bls depth interval at this location.
- 13 • During the initial RFI, tin was detected at a concentration of 202 mg/kg at sampling
14 location E572SB002. During the 2001 resampling at this location, tin concentrations
15 in subsurface soil samples at this location was not detected above laboratory
16 detection limits from either the 1-3 or 3-5 ft bls depth interval.
- 17 No other inorganics exceeded the screening criteria in subsurface soils.

18 **4.1.3 Groundwater**

19 The three existing wells at AOC 572–E572SB001, E572SB002, and E572SB003 (see Figure 2-
20 2)—had not been sampled since 1996. Therefore, the wells were sampled for antimony, lead,
21 tin and organotins as part of the SAP field investigation. No analyzed constituents were
22 detected above laboratory detection limits in the groundwater samples.

TABLE 4-1
 Concentrations of Surface Soil COPCs
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	EPA Region III Residential RBC (mg/kg)	Surface Soil BRC (mg/kg)	SSL (mg/kg)	Comments				
Antimony	E572SB001	1.20	J	3.1	1.77	2.5	RFI Sample				
	E572SB002	0.46	U				RFI Sample				
	E572SB003	0.49	U				RFI Sample				
	E572SB004	0.78	J				RFI Sample				
	E572SB005	0.49	U				RFI Sample				
	E572SB006	0.48	U				RFI Sample				
	E572SB007	0.49	U				RFI Sample				
	E572SB008	0.45	U				RFI Sample				
	E572SB009	0.40	U				RFI Sample				
	E572SB010	0.31	U				RFI Sample				
	E572SB011	0.36	U				RFI Sample				
	E572SB012	0.52	U				Nov-Dec 2001 Samples				
	E572SB013	0.54	UJ				Nov-Dec 2001 Samples				
	E572SB018	0.72	UJ				Nov-Dec 2001 Samples				
	E572SB021	0.65	UJ				Nov-Dec 2001 Samples				
	E572SB022	0.53	UJ				Nov-Dec 2001 Samples				
	E572SB023	0.53	UJ				Nov-Dec 2001 Samples				
	E572SB024	0.97	UJ				Nov-Dec 2001 Samples				
	E572SB025	0.56	U				Nov-Dec 2001 Samples				
	BEQs ^a	E572SB001	0.63				=	NA	1.304	NA	RFI Sample
		E572SB002	0.42				=				RFI Sample
		E572SB003	1.63				=				RFI Sample
		E572SB004	0.62				=				RFI Sample
		E572SB005	0.47				U				RFI Sample
		E572SB006	0.54				=				RFI Sample
E572SB007		1.18	=	RFI Sample							
E572SB008		0.54	=	RFI Sample							
E572SB009		0.16	=	RFI Sample							
E572SB010		0.79	=	RFI Sample							

TABLE 4-1
 Concentrations of Surface Soil COPCs
RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	EPA Region III Residential RBC (mg/kg)	Surface Soil BRC (mg/kg)	SSL (mg/kg)	Comments	
BEQs ^a	E572SB011	1.69	=	NA	1.304	NA	RFI Sample	
	E572SB014	0.63	=				Nov-Dec 2001 Samples	
	E572SB015	0.46	=				Nov-Dec 2001 Samples	
	E572SB016	0.28	=				Nov-Dec 2001 Samples	
	E572SB017	0.57	=				Nov-Dec 2001 Samples	
	E572SB025	0.71	=				Nov-Dec 2001 Samples	
Lead	E572SB001	58.7	J	400	265	400	RFI Sample	
	E572SB002	123	=				RFI Sample	
	E572SB003	129	=				RFI Sample	
	E572SB004	107	=				RFI Sample	
	E572SB005	9.0	=				RFI Sample	
	E572SB006	445	=				RFI Sample	
	E572SB007	154	=				RFI Sample	
	E572SB008	110	=				RFI Sample	
	E572SB009	32.7	=				RFI Sample	
	E572SB010	18.6	=				RFI Sample	
	E572SB011	254	=				RFI Sample	
	E572SB012	19.9	=				Nov-Dec 2001 Samples	
	E572SB013	114	=				Nov-Dec 2001 Samples	
	E572SB019	14.6	=				Nov-Dec 2001 Samples	
	E572SB020	33	=				Nov-Dec 2001 Samples	
	E572SB021	153	=				Nov-Dec 2001 Samples	
	E572SB022	177	=				Nov-Dec 2001 Samples	
	E572SB023	94.3	=				Nov-Dec 2001 Samples	
	E572SB024	243	=				Nov-Dec 2001 Samples	
	E572SB025	40.4	=				Nov-Dec 2001 Samples	
	Average Lead Concentration		116					
	Tin	E572SB001	3.60	=	4,700	59.4	NA	RFI Sample
		E572SB002	4.30	=				RFI Sample

TABLE 4-1
 Concentrations of Surface Soil COPCs
RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	EPA Region III Residential RBC (mg/kg)	Surface Soil BRC (mg/kg)	SSL (mg/kg)	Comments
Tin	E572SB003	13.20	=				RFI Sample
	E572SB004	5.40	=	4,700	59.4	NA	RFI Sample
	E572SB005	2.40	U				RFI Sample
	E572SB006	3.70	=				RFI Sample
	E572SB007	8.90	=				RFI Sample
	E572SB008	2.60	=				RFI Sample
	E572SB009	2.20	=				RFI Sample
	E572SB010	1.90	=				RFI Sample
	E572SB011	5.00	=				RFI Sample
	E572SB012	0.42	J				Nov-Dec 2001 Samples
	E572SB013	3.15	=				Nov-Dec 2001 Samples
	E572SB019	1.11	U				Nov-Dec 2001 Samples
	E572SB020	2.20	U				Nov-Dec 2001 Samples
	E572SB021	4.23	=				Nov-Dec 2001 Samples
	E572SB022	6.10	=				Nov-Dec 2001 Samples
	E572SB023	2.73	=				Nov-Dec 2001 Samples
	E572SB024	6.59	=				Nov-Dec 2001 Samples
	E572SB025	1.53	U				Nov-Dec 2001 Samples

^a BEQ concentrations are derived from calculations made per the Technical Memorandum, *Technical Information for Development of Background BEQ Values* (CH2M-Jones, February 2001).

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.

UJ Indicates that the concentration was not detected and is estimated.

TABLE 4-2
 Concentrations of Subsurface Soil COPCs
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	SSL DAF=10 (mg/kg)	Subsurface Soil BRC (mg/kg)	Comments
Antimony	E572SB001	0.45	UJ	2.5	1.6	RFI Sample
	E572SB002	23.5	=			RFI Sample
	E572SB003	0.75	U			RFI Sample
	E572SB004	0.59	J			RFI Sample
	E572SB005	0.46	U			RFI Sample
	E572SB006	0.62	U			RFI Sample
	E572SB007	2.6	J			RFI Sample
	E572SB008	0.43	U			RFI Sample
	E572SB009	0.32	U			RFI Sample
	E572SB010	0.39	U			RFI Sample
	E572SB011	0.32	U			RFI Sample
	E572SB012(1-3)	0.88	J			Nov-Dec 2000 Samples
	E572SB012	0.82	J			Nov-Dec 2000 Samples
	E572SB013(1-3)	0.76	UJ			Nov-Dec 2000 Samples
	E572SB013	0.54	UJ			Nov-Dec 2000 Samples
	E572SB018	0.66	UJ			Nov-Dec 2000 Samples
	E572SB021	0.76	UJ			Nov-Dec 2000 Samples
	E572SB022	0.96	UJ			Nov-Dec 2000 Samples
	E572SB023	0.72	UJ			Nov-Dec 2000 Samples
	E572SB024	0.49	UJ			Nov-Dec 2000 Samples
	E572SB025	0.63	U			Nov-Dec 2000 Samples

TABLE 4-2
 Concentrations of Subsurface Soil COPCs
RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	SSL DAF=10 (mg/kg)	Subsurface Soil BRC (mg/kg)	Comments
BEQs ^a	E572SB001	0.88	U	NA	1.4	RFI Sample
	E572SB002	0.90	=			RFI Sample
	E572SB003	1.50	U			RFI Sample
	E572SB004	1.06	U			RFI Sample
	E572SB005	0.88	U			RFI Sample
	E572SB006	0.88	=			RFI Sample
	E572SB007	1.27	U			RFI Sample
	E572SB008	0.82	U			RFI Sample
	E572SB009	0.40	U			RFI Sample
	E572SB010	0.41	=			RFI Sample
	E572SB011	0.27	=			RFI Sample
	E572SB014	0.49	=			Nov-Dec 2000 Samples
	E572SB015	1.63	=			Nov-Dec 2000 Samples
	E572SB016	0.47	=			Nov-Dec 2000 Samples
	E572SB017	0.64	=			Nov-Dec 2000 Samples

TABLE 4-2
 Concentrations of Subsurface Soil COPCs
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	SSL DAF=10 (mg/kg)	Subsurface Soil BRC (mg/kg)	Comments			
Lead	E572SB001	4.80	J	400	173	RFI Sample			
	E572SB002	5,460	=			RFI Sample-resampled			
	E572SB003	46.10	=			RFI Sample			
	E572SB004	77.90	=			RFI Sample			
	E572SB005	8.70	=			RFI Sample			
	E572SB006	5,230	=			RFI Sample-resampled			
	E572SB007	33.2	=			RFI Sample			
	E572SB008	2.9	=			RFI Sample			
	E572SB009	3.8	=			RFI Sample			
	E572SB010	65.7	=			RFI Sample			
	E572SB011	9.7	=			RFI Sample			
	E572SB012(1-3)	48.1	=			Nov-Dec 2000 Samples			
	E572SB012	360	=			Nov-Dec 2000 Samples			
	E572SB013(1-3)	34.6	=			Nov-Dec 2000 Samples			
	E572SB013	11.3	=			Nov-Dec 2000 Samples			
	E572SB019	4.87	=			Nov-Dec 2000 Samples			
	E572SB020	11.6	=			Nov-Dec 2000 Samples			
	E572SB021	10.5	=			Nov-Dec 2000 Samples			
	E572SB022	2,360	=			Nov-Dec 2000 Samples			
	E572SB023	35.4	=			Nov-Dec 2000 Samples			
	E572SB024	6.61	=			Nov-Dec 2000 Samples			
	E572SB025	9.87	UJ			Nov-Dec 2000 Samples			
	Average Lead Concentrations (including all sample results)		687						
	Average Lead Concentrations (without RFI samples E572SB002 and E572SB006)		197						

TABLE 4-2
 Concentrations of Subsurface Soil COPCs
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Qualifier	SSL DAF=10 (mg/kg)	Subsurface Soil BRC (mg/kg)	Comments
Tin	E572SB001	2.3	U	NA	9.23	RFI Sample
	E572SB002	202	=			RFI Sample
	E572SB003	3.8	U			RFI Sample
	E572SB004	4.1	J			RFI Sample
	E572SB005	2.3	U			RFI Sample
	E572SB006	9.2	=			RFI Sample
	E572SB007	4.8	J			RFI Sample
	E572SB008	2.1	U			RFI Sample
	E572SB009	0.85	J			RFI Sample
	E572SB010	8.2	=			RFI Sample
	E572SB011	0.86	U			RFI Sample
	E572SB012(1-3)	1.05	J			Nov-Dec 2000 Samples
	E572SB012	2.93	=			Nov-Dec 2000 Samples
	E572SB013(1-3)	1.1	J			Nov-Dec 2000 Samples
	E572SB013	0.67	U			Nov-Dec 2000 Samples
	E572SB019	0.36	U			Nov-Dec 2000 Samples
	E572SB020	0.63	U			Nov-Dec 2000 Samples
	E572SB021	1.14	U			Nov-Dec 2000 Samples
	E572SB022	4.83	=			Nov-Dec 2000 Samples
	E572SB023	1.82	U			Nov-Dec 2000 Samples
	E572SB024	0.29	U			Nov-Dec 2000 Samples
	E572SB025	0.79	U			Nov-Dec 2000 Samples

- ^a BEQ concentrations are derived from calculations made per the Technical Memorandum, *Technical Information for Development of Background BEQ Values* (CH2M-Jones, February 2001).
- 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 available
- U Indicates that the concentration was not detected.
- UJ Indicates that the concentration was not detected and is estimated.

TABLE 4-3
 Concentrations of Surface Soil COPCs (SPLP Analysis)
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Units	Qualifier
Arsenic, SPLP	E572SB012	26	mg/L	U
	E572SB013	26	mg/L	U
Barium, SPLP	E572SB012	9.18	mg/L	J
	E572SB013	11.7	mg/L	J
Cadmium, SPLP	E572SB012	4.16	mg/L	U
	E572SB013	4.16	mg/L	U
Chromium, SPLP	E572SB012	5.7	mg/L	U
	E572SB013	5.7	mg/L	U
Lead, SPLP	E572SB012	24.3	mg/L	U
	E572SB013	24.3	mg/L	U
Mercury, SPLP	E572SB012	0.64	mg/L	U
	E572SB013	0.64	mg/L	U
Selenium, SPLP	E572SB012	34.9	mg/L	U
	E572SB013	34.9	mg/L	U
Silver, SPLP	E572SB012	6.66	mg/L	U
	E572SB013	6.66	mg/L	U

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.

mg/L Milligrams per liter

U Indicates that the concentration was not detected.

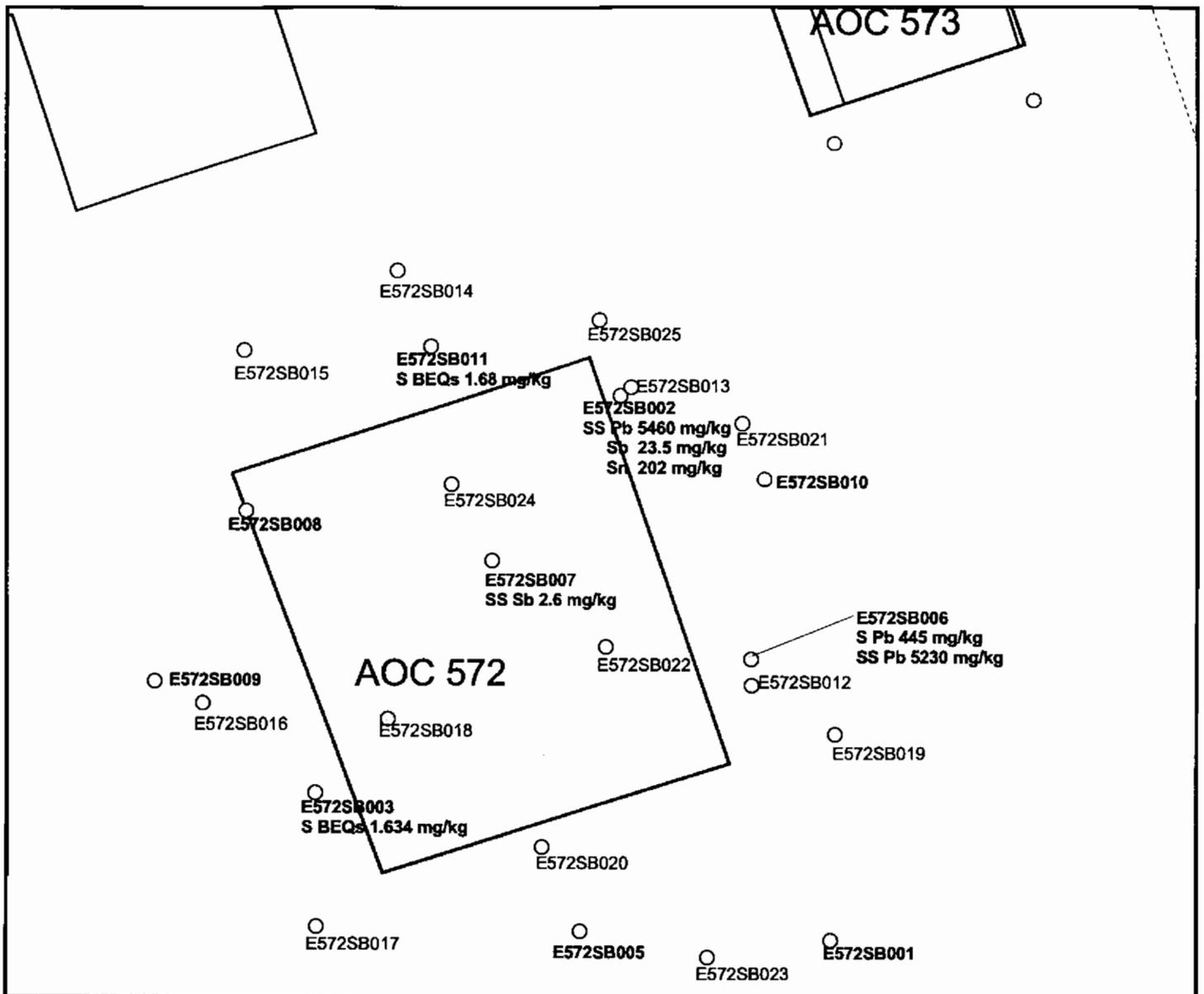
TABLE 4-4
 Concentrations of Subsurface Soil COPCs (SPLP analysis)
 RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Parameter	Location	Result	Units	Qualifier
Arsenic, SPLP	E572SB012	28.3	mg/L	J
	E572SB013(1-3)	26	mg/L	U
	E572SB013	26	mg/L	U
Barium, SPLP	E572SB012	11.4	mg/L	J
	E572SB013(1-3)	28.3	mg/L	J
	E572SB013	9.89	mg/L	J
Cadmium, SPLP	E572SB012	4.16	mg/L	U
	E572SB013(1-3)	4.16	mg/L	U
	E572SB013	4.16	mg/L	U
Chromium, SPLP	E572SB012	5.7	mg/L	U
	E572SB013(1-3)	5.7	mg/L	U
	E572SB013	5.7	mg/L	U
Lead, SPLP	E572SB012	24.3	mg/L	U
	E572SB013(1-3)	24.3	mg/L	U
	E572SB013	24.3	mg/L	U
Mercury, SPLP	E572SB012	0.64	mg/L	U
	E572SB013(1-3)	0.64	mg/L	U
	E572SB013	0.64	mg/L	U
Selenium, SPLP	E572SB012	34.9	mg/L	U
	E572SB013(1-3)	34.9	mg/L	U
	E572SB013	34.9	mg/L	U
Silver, SPLP	E572SB012	6.66	mg/L	U
	E572SB013(1-3)	6.66	mg/L	U
	E572SB013	6.66	mg/L	U

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.

mg/L Milligrams per liter

U Indicates that the concentration was not detected.



Screening Values

Surface Soil: Res Criteria Zone E Background

BEQs 1.304 mg/kg (CNC Ref. Conc.)
 Lead 400 mg/kg 265 mg/kg

Subsurface Soil: SSL Zone E Background

Antimony 2.50 mg/kg 1.6 mg/kg
 Lead 400 mg/kg 173 mg/kg
 Tin NA 155 mg/kg

Note: Soil boring locations shown in bold are RFI sample locations.

- Surface and Subsurface Soil Sampling Locations
- S - Surface Soil (0-1 ft bls)
- SS - Subsurface Soil (3-5 ft bls)
- ⚡ Railroads
- ⚡ Roads - Lines
- ▭ AOC Boundary
- ▭ Zone Boundary
- ⋯ SWMU Boundary
- ▭ Buildings

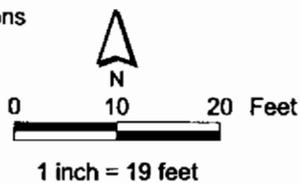
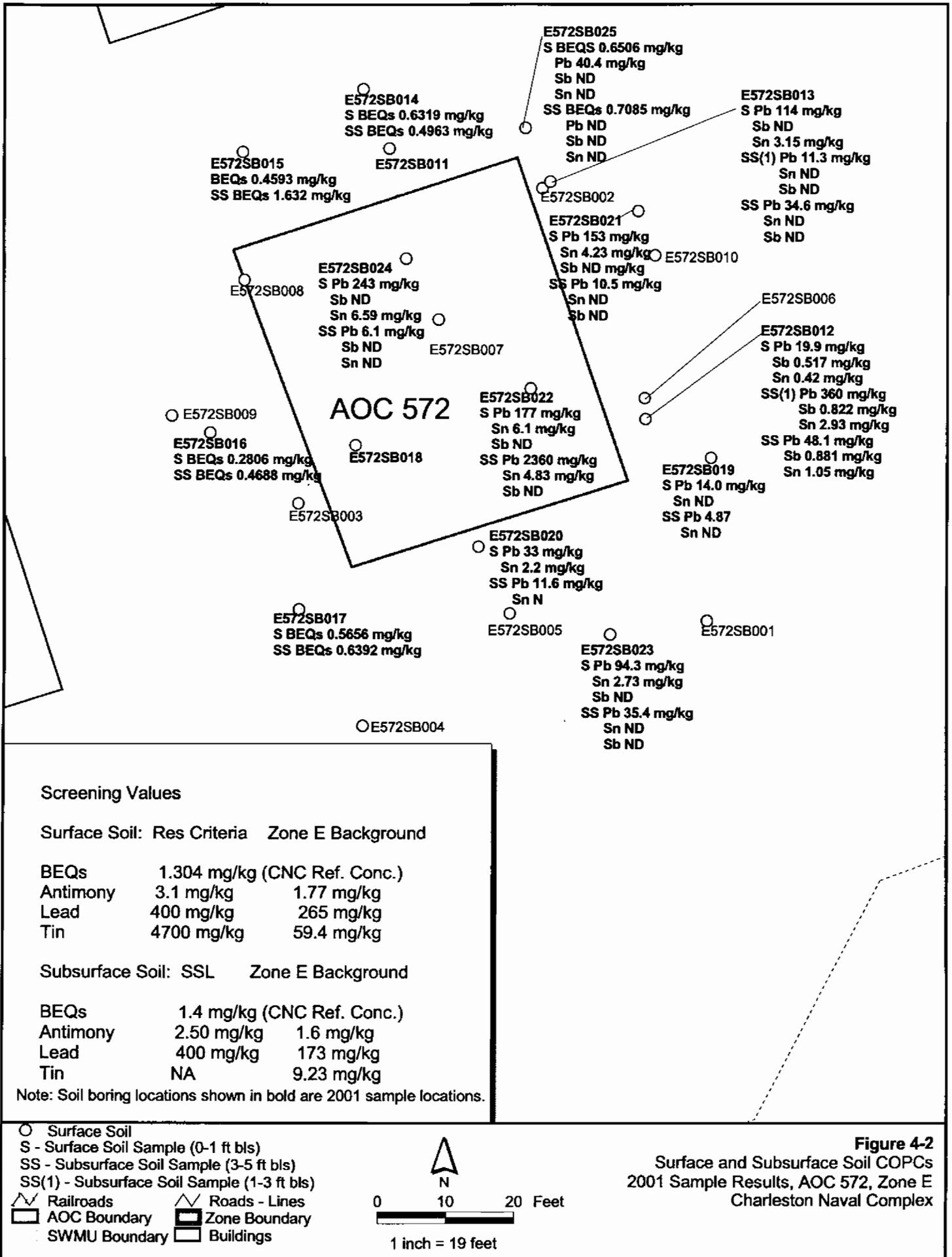


Figure 4-1
 RFI Soil COPCs and 2001 Sampling Locations
 AOC 572, Zone E
 Charleston Naval Complex



Section 5.0

1 **5.0 COPC/COC Refinement**

2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified BEQs as COCs for surface soil at
3 AOC 572 under the future industrial land use scenario. Screening of the RFI detections
4 against current screening criteria adopted by the BCT identified exceedances of the
5 unrestricted land use criteria in surface soil for lead and in subsurface soil for antimony,
6 BEQs, tin, and lead. The nature of occurrence and the relevance of these chemicals at these
7 sites are further discussed below. No groundwater COCs were identified during either the
8 initial RFI or the resampling as part of RFI Addendum investigation conducted by CH2M-
9 Jones during November and December 2001.

10 **5.1 COCs in Soil**

11 **5.1.1 Antimony**

12 During the initial RFI, antimony was detected in subsurface soil at E572SB002 at a
13 concentration of 23.5 mg/kg, which exceeded its SSL of 2.50 mg/kg and the maximum
14 value detected in Zone E background samples (7.4 mg/kg). During the 2001 sampling, soil
15 boring E572SB013 was advanced at this location to verify the antimony concentration.
16 Antimony was not detected above the laboratory detection limit (0.54 mg/kg) in the
17 subsurface soil samples from either the 1-3 ft bls depth interval or the 3-5 ft bls depth
18 interval, indicating that the previous RFI detection was probably an anomaly. Furthermore,
19 the 2001 sampling detections do not indicate the presence of source material for antimony at
20 this location. Table 4-2 shows detected concentrations of antimony in subsurface soils at this
21 site.

22 Antimony was not detected in groundwater above laboratory detection limits in the four
23 RFI sampling events or the fifth sampling event in 2001. Based on these observations,
24 antimony is not considered a COC at this site.

25 **5.1.2 BEQs**

26 **BEQs in Surface Soil**

27 Table 4-1 lists detected BEQ concentrations in surface soils from both the RFI and the 2001
28 sampling. During the initial RFI, BEQ concentrations in surface soil exceeded the CNC BEQ
29 BRC of 1.304 mg/kg at two RFI locations: 1.63 mg/kg at E572SB003 and 1.69 mg/kg at
30 E572SB011. Additional samples collected around these locations during 2001 did not show
31 BEQ exceedances of the screening criteria. Figure 4-2 shows the detected concentrations of

1 BEQs in surface soils at the site from the 2001 sampling. All of these samples are under an
2 asphalt parking lot, which could be a source of the detected BEQs. Direct exposure to these
3 exceeded BEQ concentrations is not a concern in this highly industrial area of Zone E. All of
4 the detected BEQs are likely associated with the asphalt material that is extensive in this
5 area or the previous presence of railroad lines at the site, and not likely associated with site
6 operations at AOC 572. The average subsurface soil BEQ concentration at AOC 572 is 0.71
7 mg/kg, which is below the CNC BEQ sitewide reference concentration and leachability-
8 based value. For these reasons, BEQs are not considered COCs for surface soil at this site.

9 **BEQs in Subsurface Soil**

10 During the initial RFI, BEQs were not detected in subsurface soil above the CNC BEQ
11 sitewide reference concentration of 1,400 µg/kg for subsurface soil. During the 2001
12 sampling, BEQs in subsurface soil exceeded the screening criteria at only one location,
13 E572SB015, at a concentration of 1,630 µg/kg. Table 4-2 and Figure 4-2 show the detected
14 concentrations of BEQs in subsurface soils at the site from the 2001 sampling. These
15 detected subsurface soil BEQs might be related to extensive soil disturbance, historical
16 operations at this site which are typical of older industrial areas, and/or asphalt materials
17 being pushed down to the subsurface depths during sampling.

18 Figure C-1 in Appendix C shows the presence of historic railroad lines at the site as
19 depicted on the Public Works Map of the CNC, dated November 23, 1940. These railroad
20 lines were located in areas where higher detections of BEQs were found during the RFI and
21 the 2001 sampling. In Public Works Maps from 1955 onward, these railroad line locations
22 appear to have been paved over and they are currently paved over with asphalt.

23 The recent background concentration sampling effort conducted at the CNC for arsenic and
24 BEQs along the railroad lines indicated a distribution of elevated concentrations of BEQs in
25 surface soils around railroad lines and paved areas. Details of this investigation are found in
26 *Technical Memorandum: Results from Additional Background Sampling of the CNC Railroad Lines*
27 *and Naval Annex (Zone K)* (CH2M-Jones, 2001). The range of railroad background BEQ
28 concentrations detected during the BEQ sampling along the railroad lines during this
29 investigation ranged from 87 µg/kg to 5,133 µg/kg. The areas with elevated BEQ
30 concentrations in surface and subsurface soil at AOC 572 are located within or adjacent to
31 these historic railroad lines and do not exceed the upperbound of the range of BEQ
32 background concentrations from the study mentioned above, which is 5,133 µg/kg.
33 Additionally, the areas with elevated BEQ concentrations are located under asphalt
34 pavement. Thus, there is no direct contact with these soils at the present time and
35 leachability is limited.

1 There is only one detection of BEQs above screening criteria in subsurface soils. In both
2 surface and subsurface soil samples, detected concentrations of the seven individual
3 carcinogenic polycyclic aromatic hydrocarbons (cPAHs) that are included in the calculated BEQ
4 concentrations did not exceed their respective SSLs. Additionally, BEQ compounds were
5 not detected in the groundwater, even in wells adjacent to the sampling locations that
6 showed the highest BEQ detections, as previously discussed. This indicates that the BEQs in
7 soils do not pose a threat to groundwater via leaching.

8 For these reasons, BEQs are not considered COCs for subsurface soil at this site.

9 **5.1.3 Lead**

10 **Lead in Surface Soil**

11 During the initial RFI, lead was detected in one surface soil sample at sampling location
12 E572SB006 at a concentration of 445 mg/kg, which exceeded its unrestricted land use
13 screening goal of 400 mg/kg and the range of lead detected in Zone E grid samples. During
14 the 2001 sampling, this location was resampled. The surface soil sample collected from the
15 new boring E572SB012 showed a lead concentration of 19.9 mg/kg, below the unrestricted
16 land use criterion of 400 mg/kg. Based on the 2001 resampling data, it does not appear that
17 there is wide-spread occurrence of elevated lead concentrations in surface soil at AOC 572.
18 Observed lead concentrations are generally within the Zone E BRC, and the site average for
19 detected lead concentrations (116 mg/kg) is well below unrestricted land use-based
20 screening value of 400 mg/kg. Therefore, lead is not considered a COC for surface soil at
21 this site. Table 4-1 shows detected concentrations of lead in surface soils at AOC 572.

22 **Lead in Subsurface Soil**

23 During the initial RFI, lead was detected in two subsurface soil samples: 5,469 mg/kg at
24 sample location E572SB002 and 5,230 mg/kg at sample location E572SB006, which exceeded
25 the SSL of 400 mg/kg and the maximum value detected in Zone E grid samples. During the
26 2001 investigation, a soil sample (E572SB013) was taken immediately adjacent to the former
27 E572SB002 location and another soil sample (E572SB012) was taken adjacent to the
28 E572SB006 location and analyzed for lead. These samples were taken at the 1-3 ft bls and 3-5
29 ft bls depth intervals in order to verify the presence of source material for lead
30 contamination. Lead was not detected above either the SSL or the Zone E subsurface soil
31 BRC at these two locations (see Table 4-2). At E572SB022, a new location sampled during
32 the 2001 investigation, lead was detected in the subsurface soil sample at a concentration of
33 2,360 mg/kg, which exceeds its SSL of 400 mg/kg and the range of background samples for
34 Zone E. The subsurface average concentration for lead detects using all data (including

1 historically high detections from the RFI at E572SB002 and E572SB006 that were not
2 confirmed to be present in the 2001 sampling) was estimated at 687 mg/kg. The subsurface
3 average lead concentration after eliminating these two historically high detections is 197
4 mg/kg, which is below the SSL of 400 mg/kg.

5 Although an isolated location (at E572SB022) showed elevated lead detection in the
6 subsurface soil, average subsurface soil concentrations are below leachability-based
7 screening criteria (SSL), and the SPLP analytical results (see Table 4-4) indicate that lead at
8 the site is not soluble in groundwater.

9 Additionally, there was only a one-time detection of lead in one of three monitoring wells at
10 the site during four RFI sampling events. The concentration detected, 3.5 µg/L, is below the
11 drinking water target treatment level of 15 µg/L. This indicates that lead from subsurface
12 soil is not leaching into groundwater at this site. Additionally, the SPLP samples collected
13 at E572SB012, which is co-located with the location that reported the highest lead
14 concentration during the RFI (E572SB006), had no detectable levels of lead during the 2001
15 sampling. Table 4-4 shows the SPLP analysis results. The results indicate that lead is not
16 likely to leach into groundwater, even if no pavement is present, because the lead in the soil
17 at the site is not in soluble form. There is no evidence of lead leaching or migrating from
18 soil, as the groundwater at the site did not show lead detections above background levels.
19 Additionally, there is no direct exposure to human receptors. For these reasons, lead is not
20 considered a COC at this site.

21 **5.1.4 Tin**

22 During the initial RFI, tin was detected at sample location E572SB002 at a concentration of
23 202 mg/kg. During the 2001 resampling at this location, tin was not detected above
24 laboratory detection limits in either the 1-3 ft bls or the 3-5 ft bls depth interval, indicating
25 that there is no source material for tin contamination at this location.

26 Tin was not detected above its Zone E background range in surface or subsurface samples
27 at this site. Additionally, there was only a one-time detection of tin at 3.6 mg/L (tap water
28 RBC is 2,200 µg/L) in one of three wells which have been sampled during five sampling
29 events. Based on these observations, tin is not considered a COC at this site.

30 **5.2 COC Summary**

31 No COCs that require further action are identified at AOC 572.

1 **6.0 Summary of Information Related to Site** 2 **Closeout Issues**

3 **6.1 RFI Status**

4 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs and AOCs within Zone
5 E of the CNC, including AOC 572.

6 In accordance with the RFI completion process, if a determination of no further
7 investigation (NFI) is made upon completion of the RFI, then a site may proceed to either
8 NFA status or a CMS. The RFI for AOC 572 identified BEQs as COCs for surface soils.
9 Several metals in soil exceeded their COPC screening criteria. However, after assessing the
10 data, no COCs were identified for this site.

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

13 **6.2 Presence of Inorganics in Groundwater**

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

19 There were no detections of antimony in shallow wells above the laboratory detection
20 limits. There were no detections of arsenic above the MCL in samples from the shallow
21 groundwater monitoring wells. Although two intermittent detections of thallium above the
22 MCL occurred in shallow groundwater at the site (see Table 6-1), thallium was not
23 identified as a COC in groundwater because these detections were preceded and succeeded
24 by detections below laboratory detection limits. Further evaluation of this issue is not
25 warranted.

6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the CNC

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

6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC

No COCs are present at AOC 572. No direct connection from this site to the storm sewers are known to exist. Although the site drained directly to the storm sewers when it was in operation, the site is now closed and AOC 572 is completely paved. AOC 699 has been closed with an NFA designation. The Navy is evaluating separately the potential for contaminated stormwater runoff to migrate from the CNC. Based on these findings and considerations, further evaluation of this issue is not warranted.

6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC

The nearest railroad line to AOC 572 is approximately 285 feet west of the site. There is no known linkage between AOC 572 and the investigated railroad lines of AOC 504, so further evaluation of this issue is not warranted.

6.6 Potential Migration Pathways to Surface Water Bodies at the CNC

The nearest surface water body to AOC 572 is the Cooper River, which lies approximately 1,600 feet east of the site. The only potential migration pathway from the site to surface water is via overland flow via stormwater runoff. The entire site is covered with pavement, which eliminates contact of surface soil with stormwater. Similarly, runoff directed to the storm sewer system, which discharges to the Cooper River, does not contact the soil. Further evaluation of this issue is not warranted.

6.7 Potential Contamination in Oil/Water Separators (OWSs)

There are no OWSs associated with AOC 572. In addition, there is no reference to an OWS at the site in the *Oil Water Separator Data* report, Department of the Navy, September 2000. Therefore, further evaluation of this issue is not warranted.

1 **6.8 Land Use Control (LUC)**

2 The BCT has agreed that all of Zone E will have at least some land use controls and
3 restrictions. At a minimum, these land use controls are likely to include restrictions against
4 unrestricted land use. Because there are no COCs at AOC 572, no LUCs are necessary. The
5 site is recommended for NFA.

TABLE 6-1
 Detected Thallium Concentrations in Shallow Groundwater
RFI Report Addendum, AOC 572, Zone E, Charleston Naval Complex

Station ID	Sample ID	Result μg/L	Qualifier	Date Collected
EPA Region III Tap Water		1.5		
RBC				
MCL		2.0		
E572GW001	572GW00101	5.00	U	04/01/1996
E572GW001	572GW00102	2.70	U	07/23/1996
E572GW001	572GW00103	3.10	J	11/18/1996
E572GW001	572GW00104	10.80	U	01/30/1997
E572GW002	572GW00201	5.00	U	04/01/1996
E572GW002	572GW00202	4.90	J	07/23/1996
E572GW002	572GW00203	2.70	U	11/18/1996
E572GW002	572GW00204	5.40	U	01/31/1997
E572GW003	572GW00301	5.00	U	04/02/1996
E572GW003	572GW00302	5.70	U	07/24/1996
E572GW003	572GW00303	2.70	U	11/18/1996
E572GW003	572GW00304	4.90	U	01/31/1997

μg/L Micrograms per liter

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.

MCL Maximum Contaminant Level

U Indicates that the concentration was not detected.

1 **7.0 Recommendations**

2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified BEQs in surface soil as COCs for
3 AOC 572. Based on the evaluation of the data and site conditions as discussed in this RFI
4 Report Addendum, BEQs in site soils are not identified as COCs for the unrestricted and
5 industrial land use scenarios. Several metals exceeded COPC screening criteria in a few
6 samples, but these were determined not to be COCs. Resampling several locations that
7 originally reported elevated lead did not confirm similar high concentrations. Leachability
8 test results did not indicate that lead is significantly leachable. Site groundwater did not
9 show the presence of metals (including lead) above background levels. Therefore, no COCs
10 are identified for the site.

11 AOC 572 is recommended for NFA status in the RCRA Corrective Action Permit for CNC.

12 Provided that the information presented in this report is adequate to address RFI
13 completion and site closeout issues, it is expected that the BCT will concur that NFA is
14 appropriate for AOC 572. After BCT concurrence for NFA, a Statement of Basis will be
15 prepared and made available for public comment to allow for public participation in the
16 final remedy selection, in accordance with SCDHEC policy.

1 8.0 References

- 2 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. 1997.
- 3 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, NAVBASE Charleston*. July
4 1995.
- 5 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, NAVBASE Charleston*.
6 June 1995.
- 7 CH2M-Jones. *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in*
8 *Background Soil and Groundwater at the CNC*. 2001.
- 9 CH2M-Jones. *Technical Memorandum: Results from Additional Background Sampling of the CNC*
10 *Railroad Lines and Naval Annex (Zone K)*. CNC. August 2001.

Table 10.36.A
 Chemicals Present in Site Samples
 AOC 572 - Surface Soil
 NAVBASE - Charleston
 Charleston, South Carolina

Parameter	Frequency of Detection		Range of Detection		Average Detected Conc.	Range of SQL		Screening Concentrations			Units	Number Exceeding		
								Residential RBC	Industrial RBC	Reference		Res.	Ind.	Ref.
Carcinogenic PAHs														
B(a)P Equiv. * *	10	11	137.05	1666.4	685	1871.91	1871.91	88	780	NA	UG/KG	10	3	
Benzo(a)anthracene *	10	11	69	1000	376	810	810	880	7800	NA	UG/KG	2		
Benzo(b)fluoranthene *	5	11	100	1000	472	340	840	880	7800	NA	UG/KG	1		
Chrysene	10	11	86	1400	553	810	810	88000	780000	NA	UG/KG			
Dibenz(a,h)anthracene *	7	11	43	390	210	740	810	88	780	NA	UG/KG	5		
Indeno(1,2,3-cd)pyrene	9	11	71	660	313	740	810	880	7800	NA	UG/KG			
Benzo(k)fluoranthene	10	11	70	1700	486	810	810	8800	78000	NA	UG/KG			
Benzo(a)pyrene * *	10	11	91	1100	443	810	810	88	780	NA	UG/KG	10	2	
Inorganics														
Aluminum (Al)	11	11	1000	7940	4311	NA	NA	7800	100000	26600	MG/KG	1		
Antimony (Sb)	2	11	0.78	1.2	0.99	0.31	0.49	3.1	82	1.77	MG/KG			
Arsenic (As)	11	11	0.94	15	5.25	NA	NA	0.43	3.8	23.9	MG/KG	11	6	
Barium (Ba)	11	11	9.7	77.3	46.92	NA	NA	550	14000	130	MG/KG			
Beryllium (Be)	9	11	0.29	0.74	0.43	0.17	0.46	0.15	1.3	1.7	MG/KG	9		
Cadmium (Cd)	6	11	0.12	0.67	0.25	0.04	0.12	3.9	100	1.5	MG/KG			
Calcium (Ca)	N	11	1460	51100	11606	NA	NA	NA	NA	NA	MG/KG			
Chromium (Cr)	11	11	3.1	13.8	6.64	NA	NA	39	1000	94.6	MG/KG			
Cobalt (Co)	11	11	0.48	384	39.33	NA	NA	470	12000	19	MG/KG		1	
Copper (Cu)	11	11	12.8	155	49.05	NA	NA	310	8200	66	MG/KG		3	
Iron (Fe)	N	11	2290	12000	5738	NA	NA	NA	NA	NA	MG/KG			
Lead (Pb) *	11	11	9	445	131	NA	NA	400	1300	265	MG/KG	1	1	
Magnesium (Mg)	N	11	160	3050	600	NA	NA	NA	NA	NA	MG/KG			
Manganese (Mn)	11	11	19.6	169	78.3	NA	NA	180	4700	302	MG/KG			
Mercury (Hg)	11	11	0.08	0.45	0.14	NA	NA	2.3	61	2.6	MG/KG			
Nickel (Ni)	11	11	2.2	46.7	8.80	NA	NA	160	4100	77.1	MG/KG			
Potassium (K)	N	9	318	930	620	209	228	NA	NA	NA	MG/KG			
Selenium (Se)	4	11	0.39	0.77	0.61	0.31	0.62	39	1000	1.7	MG/KG			
Silver (Ag)	5	11	0.26	10.8	3.05	0.23	0.25	39	1000	NA	MG/KG			
Sodium (Na)	N	10	72.9	301	158	72.5	72.5	NA	NA	NA	MG/KG			
Tin (Sn)	10	11	1.9	13.2	5.08	2.4	2.4	4700	6100	59.4	MG/KG			
Vanadium (V)	11	11	3.2	19.4	8.08	NA	NA	55	1400	94.3	MG/KG			
Zinc (Zn)	11	11	25.9	286	113	NA	NA	2300	61000	827	MG/KG			
Semivolatile Organics														
Acenaphthene	3	11	86	520	235	340	840	470000	12000000	NA	UG/KG			
Acenaphthylene	2	11	76	130	103	380	850	310000	8200000	NA	UG/KG			
Anthracene	5	11	98	260	154	380	840	2300000	61000000	NA	UG/KG			
Benzo(g,h,i)perylene	9	11	80	800	383	740	810	310000	8200000	NA	UG/KG			
Benzoic acid	2	11	40	130	85	1700	4100	31000000	100000000	NA	UG/KG			
Dibenzofuran	3	11	97	200	132	340	850	31000	820000	NA	UG/KG			
Fluoranthene	10	11	150	2200	691	810	810	310000	8200000	NA	UG/KG			
Fluorene	2	11	100	350	225	340	850	310000	8200000	NA	UG/KG			
2-Methylnaphthalene	4	11	97	1100	392	340	840	310000	8200000	NA	UG/KG			
4-Methylphenol	1	11	81	81	81	340	850	39000	1000000	NA	UG/KG			
Naphthalene	5	11	38	1100	470	380	840	310000	8200000	NA	UG/KG			
Phenanthrene	10	11	54	1500	457	810	810	310000	8200000	NA	UG/KG			
Pyrene	10	11	120	1700	612	810	810	230000	6100000	NA	UG/KG			
Volatile Organics														
Acetone	8	8	19	150	54.63	NA	NA	780000	20000000	NA	UG/KG			
Methylene chloride	7	8	3	20	8.14	27	27	85000	760000	NA	UG/KG			

* - Identified as a residential COPC
 ** - Identified as an industrial COPC
 N - Essential nutrient
 MG/KG - milligram per kilogram
 µ/KG - microgram per kilogram
 - Sample quantitation limit
 LC - Risk-based concentration
 NA - Not applicable

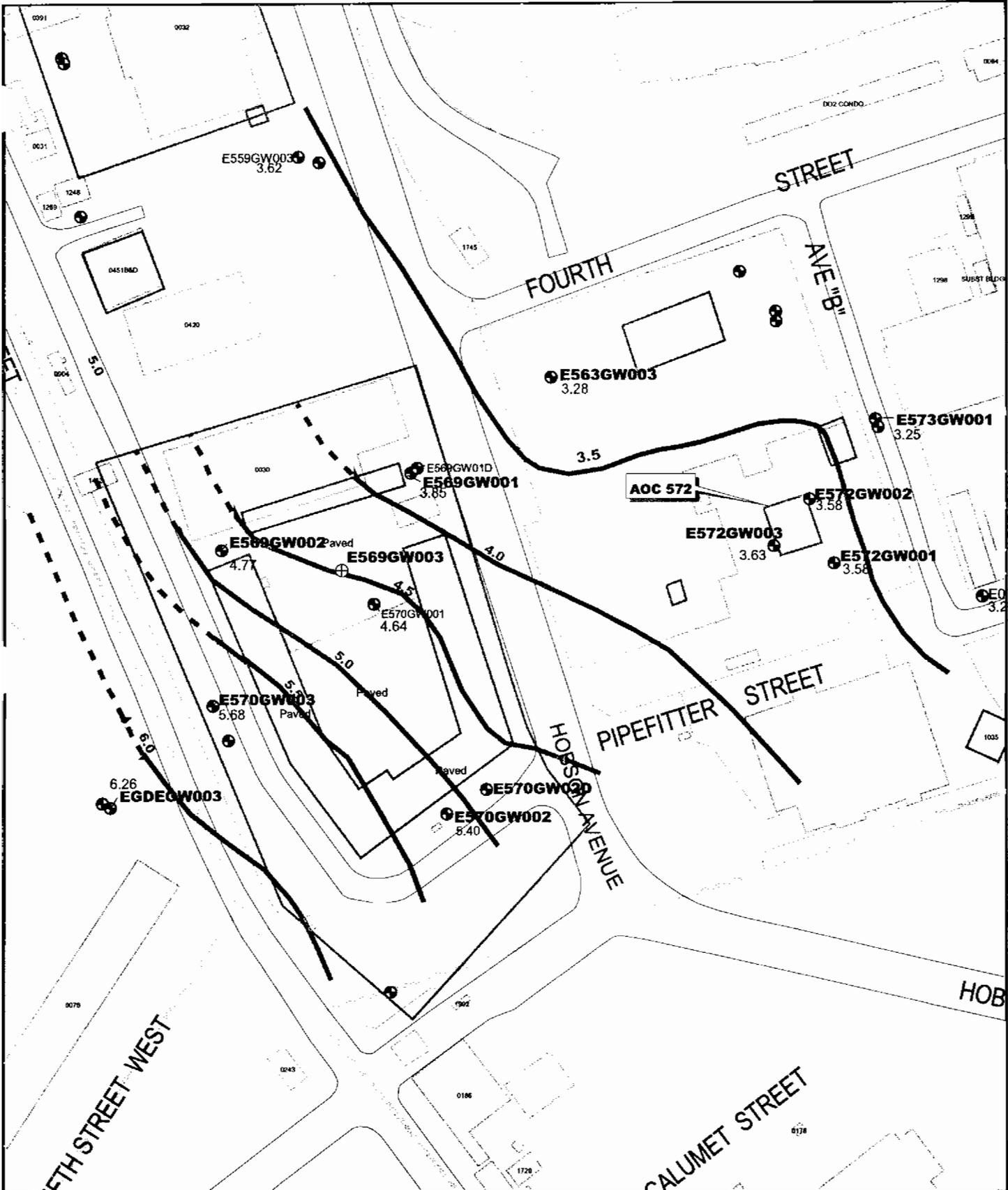
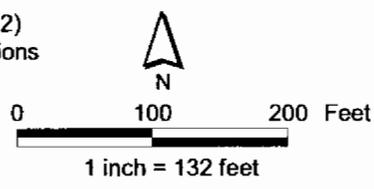


Figure A-1
 Shallow Groundwater Potentiometric Map
 AOC 572, Zone E
 Charleston Naval Complex

- Shallow Groundwater Elevations (January 2002)
- Existing Monitor Well with Groundwater Elevations in feet above mean sea level
- Roads - Lines
- AOC Boundary
- Buildings
- SWMU Boundary
- Zone Boundary



Appendix B

**Responses To Comments from Dynamac/Gannett Fleming
for Draft Zone E RCRA Facility Investigation Report (EnSafe, 1999)
Charleston Naval Complex**

AOC 572

Comment

Section 10.36.4, Page 10.36-13, Line 3: The text states that only one metal (iron) in shallow groundwater exceeded its tap-water RBC. This statement is incorrect. Arsenic and manganese also exceeded their respective tap-water RBC, according to Table 10.36.4.2 (page 10.36-12). The text should be corrected.

Navy/EnSafe Team Response:

The text will be revised to reflect this correction.

CH2M-Jones Response:

Comment noted. This correction will be incorporated in the Zone E RFI Report Addendum, Revision 0.

Note: SCDHEC had no site-specific comments for AOC 572 as part of their comments on the Zone E RFI Report Addendum, Revision 0.

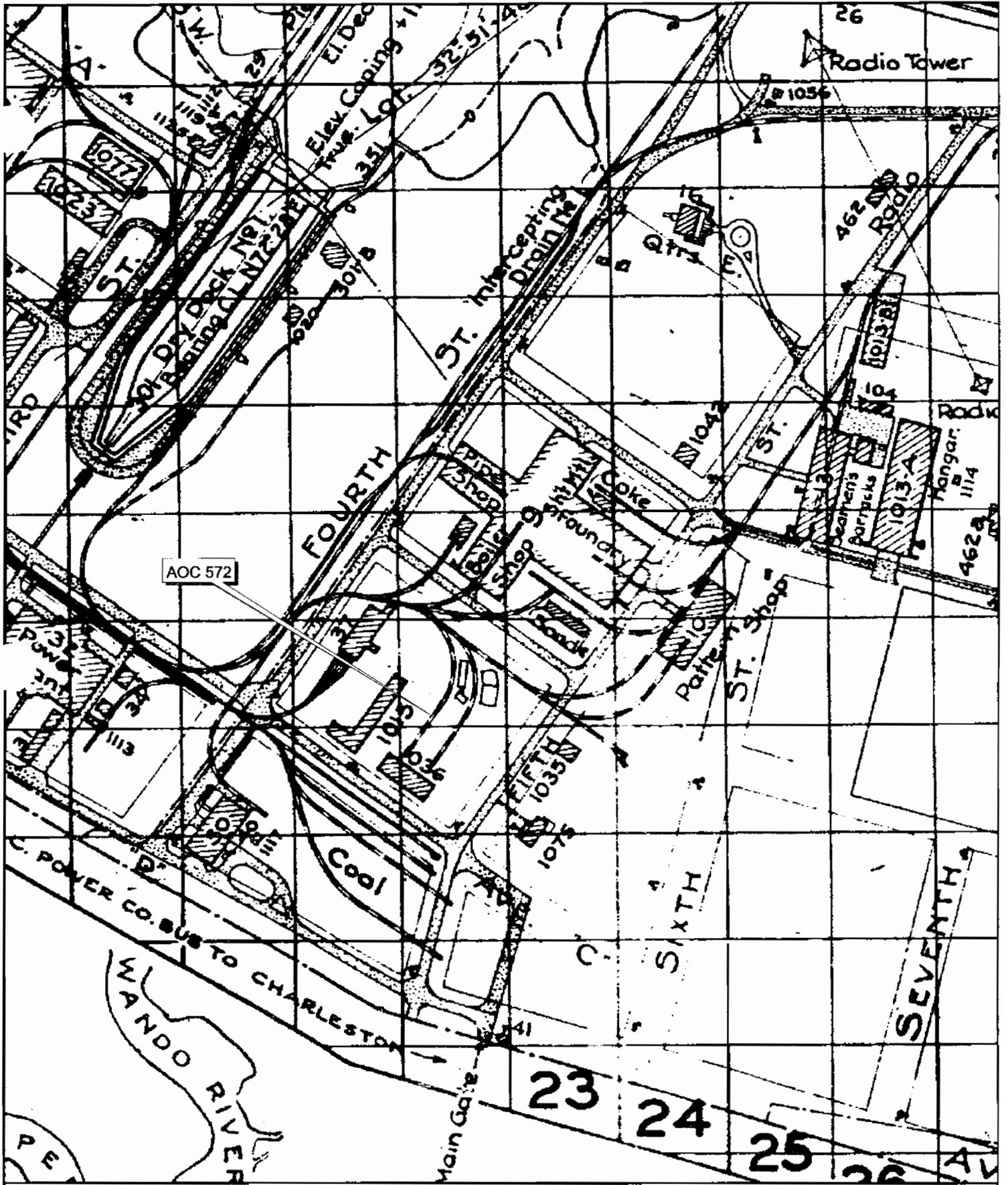


Figure C-1
 June 30, 1995 Historical Public Works Map
 AOC 572, Zone E
 Charleston Naval Complex

MEMORANDUM

CH2MHILL

Data Validation Summary - Charleston Naval Complex - Zone E, AOC 572

TO: Sam Naik/CH2M HILL/ATL

FROM: Amy Juchem/CH2M HILL/GNA
Herb Kelly/CH2M HILL/GNA

DATE: March 26, 2002

The purpose of this memorandum is to present the results of the data validation process for the samples collected in Zone E, AOC 572. The samples were collected between the dates of November 28 and November 30, 2001.

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: SW-846 8270 Semivolatile Organic Compounds (SVOC), Organotins using the Uhler & Durell method, and Metals following SW-846 6010/7000 Series methodology.

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

<u>Code</u>	<u>Definition</u>
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	Date Collected	Matrix	Lab Sample ID	Sample Type	Upper Depth	Lower Depth	VOC SW6270	ORGANOTIN	Metals SW6010	SPEP Metals SW6010	SPEP Mercury SW7470
52802	E572SB025	572SB02501	11/28/01	SO	52802001	N	0	1	X		X		
52802	E572SB025	572SB02501MS	11/28/01	SO	1200117768	MS	0	1	X				
52802	E572SB025	572SB02501SD	11/28/01	SO	1200117769	SD	0	1	X				
52802	E572SB025	572SB02501MS	11/28/01	SO	1200117928	MS	0	1			X		
52802	E572SB025	572SB02501SD	11/28/01	SO	1200117929	SD	0	1			X		
52802	E572SB025	572SB02502	11/28/01	SO	52802002	N	3	5	X		X		
52802	E572SB025	572CB02502	11/28/01	SO	52802003	FD	3	5	X		X		
52802	E572SB021	572SB02101	11/28/01	SO	52802004	N	0	1			X		
52802	E572SB021	572SB02102	11/28/01	SO	52802005	N	3	5			X		
52802	E572SB022	572SB02201	11/28/01	SO	52802006	N	0	1			X		
52802	E572SB022	572SB02202	11/28/01	SO	52802007	N	3	5			X		
52802	E572SB024	572SB02401	11/28/01	SO	52802008	N	0	1			X		
52802	E572SB024	572SB02402	11/28/01	SO	52802009	N	3	5			X		
52802	E572SB019	572SB01901	11/28/01	SO	52802010	N	0	1			X		
52802	E572SB019	572SB01902	11/28/01	SO	52802011	N	3	5			X		
52802	E572SB020	572SB02001	11/28/01	SO	52802012	N	0	1			X		
52802	E572SB020	572SB02002	11/28/01	SO	52802013	N	3	5			X		
52802	E572SB018	572SB01801	11/28/01	SO	52802014	N	0	1			X		
52802	E572SB018	572SB01802	11/28/01	SO	52802015	N	3	5			X		
52802	E572SB014	572SB01401	11/28/01	SO	52802016	N	0	1	X				

SWQ	Sample ID	Sample ID	Date Collected	Method	Sample ID	Sample Type	Depth	Depth	SWQ	SWQ	SWQ	SWQ	SWQ	SWQ
52802	E572SB014	572SB01402	11/28/01	SO	52802017	N	3	5	X					
52802	E572SB015	572SB01501	11/28/01	SO	52802018	N	0	1	X					
52802	E572SB015	572SB01502	11/28/01	SO	52802019	N	3	5	X					
52802	E572SB016	572SB1601	11/28/01	SO	52802020	N	0	1	X					
52802	E572SB016	572SB01602	11/28/01	SO	52802021	N	3	5	X					
52802	E572SB017	572SB01701	11/28/01	SO	52802022	N	0	1	X					
52802	E572SB017	572SB01702	11/28/01	SO	52802023	N	3	5	X					
52802	E572SB013	572SB01301	11/30/01	SO	52802024	N	0	1		X	X			
52802	E572SB013	572SB01301MS	11/30/01	SO	1200117793	MS	0	1		X				
52802	E572SB013	572SB01301SD	11/30/01	SO	1200117794	SD	0	1		X				
52802	E572SB013	572SB01301MS	11/30/01	SO	1200119459	MS	0	1			X			
52802	E572SB013	572SB01301SD	11/30/01	SO	1200119460	SD	0	1			X			
52802	E572SB013	572CB01301	11/30/01	SO	52802025	FD	0	1		X	X			
52802	E572SB013	572SB01303	11/30/01	SO	52802026	N				X	X			
52802	E572SB013	572SB01302	11/30/01	SO	52802027	N	3	5		X	X			
52802	E572SB023	572SB02301	11/28/01	SO	52802028	N	0	1			X			
52802	E572SB023	572SB02302	11/28/01	SO	52802029	N	3	5			X			
52802-B	E572SB013	572SB01301	11/30/01	SO	52805001	N	0	1				X	X	
52802-B	E572SB013	572SB01301MS	11/30/01	SO	1200118580	MS	0	1					X	
52802-B	E572SB013	572SB01301SD	11/30/01	SO	1200118581	SD	0	1					X	
52802-B	E572SB013	572SB01301MS	11/30/01	SO	1200118761	MS	0	1				X		
52802-B	E572SB013	572SB01301SD	11/30/01	SO	1200118762	SD	0	1				X		

Site	Station ID	Sample ID	Date Collected	Matrix	Lab Sample ID	Sample Type	Depth (ft)	Depth (m)	SVOC SW8270	ORGANIC IN PESTICIDES	Lead SW846	SP1 Metals SW846	SP1 Mercury SW846
52802-B	E572SB013	572CB01301	11/30/01	SO	52805002	FD	0	1				X	X
52802-B	E572SB013	572SB01303	11/30/01	SO	52805003	N						X	X
52802-B	E572SB013	572SB01302	11/30/01	SO	52805004	N	3	5				X	X
52808	FIELDQC	572EB012L1	11/28/01	WQ	52808001	EB			X		X		
52808	FIELDQC	572EB012L1MS	11/28/01	WQ	1200117882	MS					X		
52808	FIELDQC	572EB012L1SD	11/28/01	WQ	1200117883	SD					X		
52808	E572GW001	572GW001L1	11/30/01	WG	52808002	N					X		
52808	E572GW002	572GW002L1	11/30/01	WG	52808003	N					X		
52808	E572GW003	572GW003L1	11/30/01	WG	52808004	N					X		
52808	E572GW003	572HW003L1	11/30/01	WG	52808005	FD					X		
52808	FIELDQC	572EW001L1	11/30/01	WQ	52808006	EB					X		

MATRIX CODE

SO - Soil
WG - Groundwater
WQ - Water QC Samples

SAMPLE TYPE CODE

EB - Equipment Blank
FD - Field Duplicate
N - Native Sample
MS - Matrix Spike
SD - Matrix Spike Duplicate

ANALYSIS CODE

SVOC - Semivolatile Organic Compounds

Organic Parameters

Quality Control Review

The following list represents the QA/QC measures that were reviewed during the data quality evaluation procedure for organic data.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method 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.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/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.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – 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.
- **GC/MS Tuning** – The mass spectrum of the tuning compound is evaluated for method compliance. The criteria are established to verify the proper mass assignment and mass resolution.
- **Initial Calibration** – The initial calibration ensures that the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest.
- **Continuing Calibration** – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds.
- **Internal Standards** – The internal standards (retention time and response) are evaluated for method compliance. The internal standards are used in quantitation of the target parameters and monitor the instrument sensitivity and response for stability during each analysis.

Semivolatile Organic Compounds (SVOC) Analyses

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

Holding Times

All holding times were met except for samples 52802003 / 572CB02502. This sample was re-extracted 16 days beyond holding time due to lab error. All values were qualified as estimated, 'J' for detects and 'UJ' for non-detects.

Blanks

The SVOC target parameters detected in blank samples are listed in [Table 2](#).

TABLE 2

Blank Contamination: SVOCs

Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID
52802	SBLK02	1200126117	MB	Diethylphthalate	33.0	µg /Kg	52802003	<330.0 µg/Kg
				Bis(2-ethylhexyl)phthalate	41.6	µg /Kg	52802003	<416.0 µg/Kg
52808	52808001	572EB012L1	EB	Bis(2-ethylhexyl)phthalate	0.18	µg /L	52802 – All 52808 – All	<59.4 µg/Kg <1.8 µg/L
52808	SBLK01	1200117783	MB	Bis(2-ethylhexyl)phthalate	0.21	µg /L	52808 – All	<2.1 µg/L

If a target parameter determined to be a common contaminant was reported in a field sample, and the concentration was below the level determined to be due to blank contamination, the following actions were taken:

- If the concentration was above the reporting limit, the numeric result was unchanged, but it was flagged "U", as undetected.
- If the concentration was below the reporting limit, the numeric result was changed to the value of the reporting limit, and it was flagged "U", as undetected.

The results qualified due to blank contamination are listed in Attachment 1.

Calibrations

All initial and continuing calibration criteria were met except as noted in [Table 3](#) below.

TABLE 3

Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: SVOCs
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

MSD4-CCAL-12/07, 0758	Bis(2-chloroethyl)ether	23.9% high	52802001, 52802002, 52802016, 52802017, 52802018, 52802019, 52802020, 52802021, 52802022, 52802023
	2-Methyl-4,6-dinitrophenol	22.5% high	
	Dibenzo(a, h)anthracene	21.4% low	
MSD4-ICAL-12/26, 2232	Naphthalene	$R^2=0.980$	52802003
	4-Nitrophenol	19.5% RSD	
MSD4-CCAL-12/06, 1007	Bis(2-chloroethyl)ether	21.6% high	52808001
	Benzo(k)fluoranthene	20.2% high	

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent Relative Standard Deviation (%RSD) or correlation coefficient (R^2) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was low in the continuing calibration standards, detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was high in the continuing calibration standards, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.
- When the Average Relative Response Factor (RRF) was low in the initial calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.
- When the Relative Response Factor (RRF) was low in the continuing calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.

Organotin Analyses

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

Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in [Table 4](#) below. No flags are applied due to Field Duplicate precision.

TABLE 4

Field Duplicate RPDs Out of QC Limits: Organotin
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Sample ID	Sample Name	Parameter	Concentration	QC Limit	RPD	Flag
52802	572SB01301 / 572CB01301	Dibutyltin	68.9 µg /Kg	200	Non-detect	35
		Tributyltin	355.0 µg /Kg	200	Non-detect	35
* - out of control limits						

Recoveries - MS/MSD and LCS/LCSD

All Matrix Spike (MS), Matrix Spike Duplicate (MSD), Laboratory Control Sample (LCS) and Laboratory Control Duplicate Sample (LCSD) recoveries were within acceptable quality control limits, except as noted in [Table 5](#) below.

TABLE 5

MS/MSD and LCS/LCSD Recoveries Out of QC Limits: Organotin
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Sample ID	Sample Name	Parameter	Recovery	QC Limit	RPD	Flag
52802	572SB01301MS/ MSD	Dibutyltin	253* / 301*	50-150		52802024 No Flags Applied
		Monobutyltin	159* / 398*	50-150		52802024 Detects-J
		Tributyltin	0* / 0*	50-150		52802024 No Flags Applied
52808	572EW001L1MS/ MSD	Dibutyltin	126 / 199*	50-150	45	52808006 No Flags Applied (EB)
		Monobutyltin	174* / 127	50-150	31	
		Tributyltin	149 / 38*	50-150	118	
52808	QC1200118LCS/ LCSD	Monobutyltin	155* / 164*	50-150		52808 - All Detects-J
* - out of control limits						

Calibrations

All initial and continuing calibration criteria were met except as noted in **Table 6** below.

TABLE 6

Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Organotin
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Initial Calibration Criteria	Continuing Calibration Criteria	Sample ID	Sample Description
MSD6-ICAL-12/11, 1123	Tetrabutyltin	17.4% RSD	52802 – All
	Tributyltin	24.2% RSD	52808 – All
	Dibutyltin	28.3% RSD	
	Monobutyltin	23.9% RSD	

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent Relative Standard Deviation (%RSD) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.

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 7](#).

TABLE 7

Blank Contamination: Metals
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

52802	CCB		CCB	Antimony	5.17	µg/L	<1.29 mg/Kg
				Lead	3.41	µg/L	<0.853 mg/Kg
				Tin	4.92	µg/L	<1.23 mg/Kg
52802	1200117926	1200117926	MB	Lead	0.431	mg/Kg	<2.16 mg/Kg
				Tin	0.388	mg/Kg	<1.94 mg/Kg
52802	52808001	572EB012L1	EB	Lead	3.40	µg/L	<0.850 mg/Kg
52802-B	CCB		CCB	Arsenic	2.73	µg/L	<13.65 µg/L
				Barium	0.338	µg/L	<1.69 µg/L
				Cadmium	0.644	µg/L	<3.22 µg/L
				Lead	2.64	µg/L	<13.2 µg/L
				Silver	0.752	µg/L	<3.76 µg/L
52802-B	1200118759	1200118759	MB	Chromium	8.33	µg/L	<41.65 µg/L
52802-B	52808001	572EB012L1	EB	Lead	3.40	µg/L	<17.0 µg/L

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.

The results qualified due to blank contamination are listed in Attachment 1.

Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in **Table 8** below. No flags are applied due to Field Duplicate precision.

TABLE 8
Field Duplicate RPDs Out of QC Limits: Metals
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Event ID	Sample ID	Element	Concentration	RPD (%)	QC Limit (%)	Flag
52802	572SB01301 / 572CB01301	Lead	114 mg/Kg	59 mg/Kg	63.6	35

Recoveries - MS/MSD and LCS/LCSD

All Matrix Spike (MS), Matrix Spike Duplicate (MSD), Laboratory Control Sample (LCS) and Laboratory Control Duplicate Sample (LCSD) recoveries were within acceptable quality control limits, except as noted in **Table 9** below.

TABLE 9
MS/MSD and LCS/LCSD Recoveries Out of QC Limits: Metals
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

Event ID	Sample ID	Element	Recovery (%)	QC Limit (%)	QC Limit Range	Flag
52802	572SB02501MS/MSD	Antimony	70.4* / 70.2*	80-120	52802 – All	Detects-J, non-detects-UJ
52802	572SB01301MS/MSD	Antimony	56.2* / 55.8*	80-120	52802 – All	Detects-J, non-detects-UJ

* - out of control limits

Rejected Data

No data was rejected for this sampling event.

Conclusion

A review of the analytical data submitted regarding the investigation of selected sites in Zone E, AOC 572 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 those specific 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 - Change Qualifiers and Results
 Zone E, AOC 572 - N 1 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
52802	METAL	SW6010	572CB01301	52802025	SO	ANTIMONY	0.505	U	0.505	UJ	mg/kg	MS
52802	METAL	SW6010	572CB02502	52802003	SO	Tin (Sn)	0.569	J	0.569	U	mg/kg	BL
52802	METAL	SW6010	572CB02502	52802003	SO	ANTIMONY	0.668	U	0.668	UJ	mg/kg	MS
52802	METAL	SW6010	572SB01301	52802024	SO	ANTIMONY	0.535	U	0.535	UJ	mg/kg	MS
52802	METAL	SW6010	572SB01302	52802027	SO	Tin (Sn)	0.665	J	0.665	U	mg/kg	BL
52802	METAL	SW6010	572SB01302	52802027	SO	ANTIMONY	0.536	U	0.536	UJ	mg/kg	MS
52802	METAL	SW6010	572SB01303	52802026	SO	ANTIMONY	0.756	U	0.756	UJ	mg/kg	MS
52802	METAL	SW6010	572SB01303	52802026	SO	Tin (Sn)	1.1	J	1.1	U	mg/kg	BL
52802	METAL	SW6010	572SB01801	52802014	SO	ANTIMONY	0.72	J	0.72	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB01802	52802015	SO	ANTIMONY	0.663	J	0.663	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB01901	52802010	SO	Tin (Sn)	1.11	J	1.11	U	mg/kg	BL
52802	METAL	SW6010	572SB01902	52802011	SO	Tin (Sn)	0.356	J	0.356	U	mg/kg	BL
52802	METAL	SW6010	572SB02002	52802013	SO	Tin (Sn)	0.632	J	0.632	U	mg/kg	BL
52802	METAL	SW6010	572SB02101	52802004	SO	ANTIMONY	0.694	J	0.694	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB02102	52802005	SO	Tin (Sn)	1.14	J	1.14	U	mg/kg	BL
52802	METAL	SW6010	572SB02102	52802005	SO	ANTIMONY	0.763	J	0.763	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB02201	52802006	SO	ANTIMONY	0.531	U	0.531	UJ	mg/kg	MS
52802	METAL	SW6010	572SB02202	52802007	SO	ANTIMONY	0.959	J	0.959	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB02301	52802028	SO	ANTIMONY	0.531	U	0.531	UJ	mg/kg	MS
52802	METAL	SW6010	572SB02302	52802029	SO	ANTIMONY	0.721	U	0.721	UJ	mg/kg	MS
52802	METAL	SW6010	572SB02302	52802029	SO	Tin (Sn)	1.82	J	1.82	U	mg/kg	BL
52802	METAL	SW6010	572SB02401	52802008	SO	ANTIMONY	0.966	J	0.966	UJ	mg/kg	BL, MS
52802	METAL	SW6010	572SB02402	52802009	SO	Tin (Sn)	0.286	J	0.286	U	mg/kg	BL
52802	METAL	SW6010	572SB02402	52802009	SO	ANTIMONY	0.49	U	0.49	UJ	mg/kg	MS
52802	METAL	SW6010	572SB02501	52802001	SO	Tin (Sn)	1.53	J	1.53	U	mg/kg	BL
52802	METAL	SW6010	572SB02502	52802002	SO	LEAD	9.87	=	9.87	UJ	mg/kg	MS
52802	METAL	SW6010	572SB02502	52802002	SO	Tin (Sn)	0.798	J	0.798	U	mg/kg	BL

Attachment 1 - Changed Qualifiers and Results
 Zone E, AOC 572 - Nov '01 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
52802	ORGANOTIN	ORGANOTIN	572CB01301	52802025	SO	Dibutyltin	1.06	U	1.06	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572CB01301	52802025	SO	Monobutyltin	1.06	U	1.06	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572CB01301	52802025	SO	Tetrabutyltin	1.06	U	1.06	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572CB01301	52802025	SO	Tributyltin	1.06	U	1.06	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01301	52802024	SO	Dibutyltin	68.9	=	68.9	J	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01301	52802024	SO	Monobutyltin	1.11	U	1.11	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01301	52802024	SO	Tributyltin	355	=	355	J	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01301	52802024	SO	Tetrabutyltin	1.11	U	1.11	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01302	52802027	SO	Dibutyltin	1.04	U	1.04	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01302	52802027	SO	Tributyltin	1.04	U	1.04	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01302	52802027	SO	Tetrabutyltin	1.04	U	1.04	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01302	52802027	SO	Monobutyltin	1.04	U	1.04	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01303	52802026	SO	Monobutyltin	1.42	U	1.42	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01303	52802026	SO	Tetrabutyltin	1.42	U	1.42	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01303	52802026	SO	Tributyltin	1.42	U	1.42	UJ	ug/kg	IC
52802	ORGANOTIN	ORGANOTIN	572SB01303	52802026	SO	Dibutyltin	1.42	U	1.42	UJ	ug/kg	IC
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4-DICHLOROPHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-CHLOROPHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-CHLORONAPHTHALENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	ACENAPHTHENE	430	U	430	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-CHLOROPHENYL PHENYL ETHER	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	DIBENZ(a,h)ANTHRACENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	DIBENZOFURAN	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	3,3'-DICHLOROBENZIDINE	946	U	946	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	1,2-DICHLOROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	1,4-DICHLOROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-CHLORO-3-METHYLPHENOL	430	U	430	UJ	ug/kg	HT

Attachment 1 - Change Qualifiers and Results
 Zone E, AOC 572 - N 1 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
52802	SVOA	SW8270	572CB02502	52802003	SO	DIETHYL PHTHALATE	50.9	J	473	UJ	ug/kg	BL, HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4-DIMETHYLPHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	DIMETHYL PHTHALATE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4,6-DINITRO-2-METHYLPHENOL	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	DI-n-BUTYL PHTHALATE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	DI-n-OCTYLPHTHALATE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4-DINITROPHENOL	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	1,3-DICHLOROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	ACENAPHTHYLENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-NITROPHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4-DINITROTOLUENE	430	U	430	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-BROMOPHENYL PHENYL ETHER	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	bis(2-ETHYLHEXYL) PHTHALATE	116	J	473	UJ	ug/kg	BL, HT
52802	SVOA	SW8270	572CB02502	52802003	SO	Bis(2-Chloroisopropyl)Ether	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-CHLOROETHYL ETHER	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	bis(2-CHLOROETHOXY) METHANE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	CHRYSENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	ANTHRACENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-CHLOROANILINE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZO(a)ANTHRACENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	Benzoic acid	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZO(a)PYRENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZO(b)FLUORANTHENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZO(g,h,i)PERYLENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZO(k)FLUORANTHENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	Benzyl alcohol	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	CARBAZOLE	473	U	473	UJ	ug/kg	HT

Attachment 1 - Changed Qualifiers and Results
Zone E, AOC 572 - Nov '01 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
52802	SVOA	SW8270	572CB02502	52802003	SO	BENZYL BUTYL PHTHALATE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	PYRENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4,6-TRICHLOROPHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-NITROANILINE	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	1,2,4-TRICHLOROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,6-DINITROTOLUENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	PHENOL	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	PENTACHLOROPHENOL	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	4-NITROPHENOL	2290	U	2290	UJ	ug/kg	HT, IC
52802	SVOA	SW8270	572CB02502	52802003	SO	NITROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	3-NITROANILINE	2290	U	2290	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-NITROANILINE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	N-NITROSODIPHENYLAMINE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	NAPHTHALENE	473	U	473	UJ	ug/kg	HT, IC
52802	SVOA	SW8270	572CB02502	52802003	SO	Diphenylamine	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-METHYLPHENOL (o-CRESOL)	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	3-Methylphenol/4-Methylphenol	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	ISOPHORONE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	INDENO(1,2,3-c,d)PYRENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	HEXACHLOROETHANE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	HEXACHLOROBENZENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	HEXACHLOROCYCLOPENTADIENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	HEXACHLOROBUTADIENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	FLUORANTHENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	FLUORENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2-METHYLNAPHTHALENE	473	U	473	UJ	ug/kg	HT
52802	SVOA	SW8270	572CB02502	52802003	SO	2,4,5-TRICHLOROPHENOL	2290	U	2290	UJ	ug/kg	HT

Attachment 1 - Change Qualifiers and Results
 Zone E, AOC 572 - N. 1 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
52802	SVOA	SW8270	572SB01401	52802016	SO	DIBENZ(a,h)ANTHRACENE	388	U	388	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB01401	52802016	SO	bis(2-ETHYLHEXYL) PHTHALATE	14.2	J	388	U	ug/kg	BL
52802	SVOA	SW8270	572SB01402	52802017	SO	bis(2-ETHYLHEXYL) PHTHALATE	21.5	J	341	U	ug/kg	BL
52802	SVOA	SW8270	572SB01402	52802017	SO	DIBENZ(a,h)ANTHRACENE	341	U	341	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB01501	52802018	SO	bis(2-ETHYLHEXYL) PHTHALATE	9.3	J	355	U	ug/kg	BL
52802	SVOA	SW8270	572SB01501	52802018	SO	DIBENZ(a,h)ANTHRACENE	355	U	355	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB01602	52802021	SO	bis(2-ETHYLHEXYL) PHTHALATE	13.5	J	360	U	ug/kg	BL
52802	SVOA	SW8270	572SB01602	52802021	SO	DIBENZ(a,h)ANTHRACENE	360	U	360	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB01701	52802022	SO	bis(2-ETHYLHEXYL) PHTHALATE	40.9	J	433	U	ug/kg	BL
52802	SVOA	SW8270	572SB01701	52802022	SO	DIBENZ(a,h)ANTHRACENE	433	U	433	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB01702	52802023	SO	bis(2-ETHYLHEXYL) PHTHALATE	19.8	J	393	U	ug/kg	BL
52802	SVOA	SW8270	572SB01702	52802023	SO	DIBENZ(a,h)ANTHRACENE	393	U	393	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB02501	52802001	SO	DIBENZ(a,h)ANTHRACENE	374	U	374	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB02502	52802002	SO	bis(2-ETHYLHEXYL) PHTHALATE	15.8	J	450	U	ug/kg	BL
52802	SVOA	SW8270	572SB02502	52802002	SO	DIBENZ(a,h)ANTHRACENE	450	U	450	UJ	ug/kg	CC
52802	SVOA	SW8270	572SB1601	52802020	SO	bis(2-ETHYLHEXYL) PHTHALATE	17.8	J	385	U	ug/kg	BL
52808	METAL	SW6010	572GW001L1	52808002	WG	LEAD	3.83	=	3.83	U	ug/L	BL
52808	METAL	SW6010	572GW002L1	52808003	WG	LEAD	2.8	J	2.8	U	ug/L	BL
52808	METAL	SW6010	572GW003L1	52808004	WG	LEAD	2.96	J	2.96	U	ug/L	BL
52808	METAL	SW6010	572HW003L1	52808005	WG	LEAD	3.25	=	3.25	U	ug/L	BL

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

<u>Code</u>	<u>Definition</u>
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	Date Collected	Matrix	Lab Sample ID	Sample Type	Upper Depth	Lower Depth	ORGANOTIN	Metals SW6010	SPLP Metals SW6010	SPLP Mercury SW7470
53910	E572SB012	572SB01201	12/21/01	SO	53910001	N	0	1	X	X		
53910	E572SB012	572SB01201MS	12/21/01	SO	1200128209	MS	0	1		X		
53910	E572SB012	572SB01201SD	12/21/01	SO	1200128210	SD	0	1		X		
53910	E572SB012	572SB01203	12/21/01	SO	53910002	N			X	X		
53910	E572SB012	572SB01202	12/21/01	SO	53910003	N	3	5	X	X		
53911	E572SB012	572SB01201	12/21/01	SO	53911001	N	0	1			X	X
53911	E572SB012	572SB01201MS	12/21/01	SO	1200128204	MS	0	1			X	
53911	E572SB012	572SB01201SD	12/21/01	SO	1200128205	SD	0	1			X	
53911	E572SB012	572SB01201MS	12/21/01	SO	1200130052	MS	0	1				X
53911	E572SB012	572SB01201SD	12/21/01	SO	1200130053	SD	0	1				X
53911	E572SB012	572SB01203	12/21/01	SO	53911002	N					X	X
53911	E572SB012	572SB01202	12/21/01	SO	53911003	N	3	5			X	X
53912	FIELDQC	572EB013L1	12/21/01	WQ	53912001	EB			X	X		
53912	FIELDQC	572EB013L1MS	12/21/01	WQ	1200128526	MS				X		
53912	FIELDQC	572EB013L1SD	12/21/01	WQ	1200128527	SD				X		

MATRIX CODE

SO - Soil

WQ - Water QC Samples

SAMPLE TYPE CODE

EB - Equipment Blank

N - Native Sample

MS - Matrix Spike

SD - Matrix Spike Duplicate

Organic Parameters

Quality Control Review

The following list represents the QA/QC measures that were reviewed during the data quality evaluation procedure for organic data.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method 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.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – 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.
- **GC/MS Tuning** – The mass spectrum of the tuning compound is evaluated for method compliance. The criteria are established to verify the proper mass assignment and mass resolution.
- **Initial Calibration** – The initial calibration ensures that the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest.
- **Continuing Calibration** – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds.
- **Internal Standards** – The internal standards (retention time and response) are evaluated for method compliance. The internal standards are used in quantitation of the target parameters and monitor the instrument sensitivity and response for stability during each analysis.

Organotin Analyses

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

Recoveries - LCS/LCSD

All Laboratory Control Sample (LCS) and Laboratory Control Duplicate Sample (LCSD) recoveries were within acceptable quality control limits, except as noted in [Table 2](#) below.

TABLE 2

LCS/LCSD Recoveries Out of QC Limits: Organotin
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

53912	QC1200127384LCS/ QC1200127385LCSD	Dibutyltin	46* / 48*	50-150	572EB013L1	No Flags (EB)
		Monobutyltin	259* / 252*	50-150	572EB013L1	
* - out of control limits						

Calibrations

All initial and continuing calibration criteria were met except as noted in [Table 3](#) below.

TABLE 3

Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Organotin
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

MSD7-ICAL-1/8/02, 11:19	Tetrabutyltin	15.7 high	SDG 53910 – All Samples SDG 53912 – All Samples
	Monobutyltin	26.6% high	

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent Relative Standard Deviation (%RSD) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.

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.
- **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 4](#).

TABLE 4

Blank Contamination: Metals
Charleston Naval Complex, Zone E, AOC 572, Charleston, SC

53911	CCB		CCB	Barium	0.412	µg/L	<2.06 µg/L
	1200127394	1200127394	MB	Mercury	0.981	µg/L	<4.905 µg/L

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.

Matrix Spike/Matrix Spike Duplicate

The percent recoveries for the matrix spike and matrix spike duplicate for Antimony in SDG 53910 were 75.4 percent and 78.7 percent respectively. The samples in this SDG were qualified as estimated, 'J' for detects and 'UJ' for non-detects, due to the percent recoveries for the matrix spike and matrix spike duplicate falling below the lower acceptance limit of 80 percent.

Rejected Data

No data was rejected for this sampling event.

Conclusion

A review of the analytical data submitted regarding the investigation of selected sites in Zone E, AOC 572 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 those specific 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 572 - Dec '01 - Data Validation

SDG	Parameter Class	Analytical Method	Sample ID	Lab Sample ID	Matrix	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reason
53910	METAL	SW6010	572SB01201	53910001	SO	ANTIMONY	0.517	U	0.517	UJ	mg/kg	MS
53910	ORGANOTIN	ORGANOTIN	572SB01201	53910001	SO	Tetrabutyltin	0.988	U	0.988	UJ	ug/kg	IC
53910	ORGANOTIN	ORGANOTIN	572SB01201	53910001	SO	Monobutyltin	0.988	U	0.988	UJ	ug/kg	IC
53910	ORGANOTIN	ORGANOTIN	572SB01202	53910003	SO	Tetrabutyltin	1.24	U	1.24	UJ	ug/kg	IC
53910	ORGANOTIN	ORGANOTIN	572SB01202	53910003	SO	Monobutyltin	1.24	U	1.24	UJ	ug/kg	IC
53910	ORGANOTIN	ORGANOTIN	572SB01203	53910002	SO	Tetrabutyltin	1.08	U	1.08	UJ	ug/kg	IC
53910	ORGANOTIN	ORGANOTIN	572SB01203	53910002	SO	Monobutyltin	1.08	U	1.08	UJ	ug/kg	IC

Analytical Summary

03/29/2006 3:57 PM

StationID	E572SB014	E572SB014	E572SB015	E572SB015	E572SB016	E572SB016	E572SB017	E572SB017	E572SB025	E572SB025	
SampleID	572SB01401	E572SB01402	E572SB01501	572SB01502	572SB01601	572SB01602	572SB01701	572SB01702	572SB02501	572SB02502	
DateCollected											
DateAnalyzed											
SDGNumber	52802	52802	52802	52802	52802	52802	52802	52802	52802	52802	
Parameter	Units										
Benzo(a)Anthracene	ug/Kg	388 U	71.5 J	355 U	908 =	385 U	360 U	433 U	393 U	172 J	16.7 J
Chrysene	ug/Kg	15.4 J	82.4 J	355 U	974 =	90.3 J	360 U	27.8 J	393 U	159 J	11.5 J
Benzo(b)Fluoranthene	ug/Kg	91.8 J	202 J	81.2 J	1570 =	279 J	65.5 J	110 J	82.8 J	374 J	92.4 J
Benzo(k)Fluoranthene	ug/Kg	388 U	341 U	355 U	367 U	385 U	9 J	11.7 J	393 U	374 U	10.1 J
Benzo(a)Pyrene	ug/Kg	388 U	117 J	58.7 J	1070 =	166 J	64 J	74.7 J	393 U	210 J	450 U
Indeno(1,2,3-c,d)pyrene	ug/Kg	388 U	64.5 J	355 U	672 =	94.1 J	360 U	35 J	393 U	99.3 J	450 U
Dibenz(a,h)anthracene	ug/Kg	388 UJ	341 UJ	355 UJ	245 J	56 J	360 UJ	433 UJ	393 UJ	374 UJ	450 UJ
Benzo(g,h,i)Perylene	ug/Kg	388 U	64.8 J	355 U	766 =	73.6 J	360 U	433 U	393 U	110 J	450 U
BEQs											
Benzo(a)Anthracene	ug/Kg	19.4 U	7.15 J	17.75 U	90.8 =	19.25 U	18 U	43.3 U	19.65 U	17.2 J	1.67 J
Chrysene	ug/Kg	0.0154 J	0.0824 J	0.1775 U	0.974 =	0.0903 J	0.18 U	0.0278 J	0.1965 U	0.159 J	0.0115 J
Benzo(b)Fluoranthene	ug/Kg	9.18 J	20.2 J	8.12 J	157 =	27.9 J	8.55 J	11 J	8.28 J	37.4 J	9.24 J
Benzo(k)Fluoranthene	ug/Kg	1.94 U	1.705 U	1.775 U	1.835 U	1.925 U	0.09 J	0.117 J	1.965 U	1.87 U	0.101 J
Benzo(a)Pyrene	ug/Kg	194 U	117 J	58.7 J	1070 =	166 J	64 J	74.7 J	196.5 U	210 J	225 U
Indeno(1,2,3-c,d)pyrene	ug/Kg	19.4 U	6.45 J	17.75 U	67.2 =	9.41 J	18 U	3.5 J	19.65 U	9.93 J	22.5 U
Dibenz(a,h)anthracene	ug/Kg	388 UJ	341 UJ	355 UJ	245 J	56 J	360 UJ	433 UJ	393 UJ	374 UJ	450 UJ
BEQ Concentration		831.9	493.6	459.3	1632.8	280.6	468.8	565.6	639.2	650.6	708.5

Analytical Data Summary

03/29/2002 3:57 PM

		E572GW001		E572GW002		E572GW003	
		572GW001L1		572GW002L1		572GW003L1	
		11/30/2001 12:00 AM		11/30/2001 12:00 AM		11/30/2001 12:00 AM	
		12/06/2001		12/06/2001		12/06/2001	
		52808		52808		52808	
Parameter	Units						
Antimony	ug/L	5.08	U	5.08	U	5.08	U
Lead	ug/L	3.83	U	2.8	U	2.96	U
Tin (Sn)	ug/L	1.94	U	1.94	U	1.94	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB014	E572SB014	E572SB015	E572SB015	
SampleID	572SB01401 (0-1ft)	572SB01402 (3-5ft)	572SB01501 (0-1ft)	572SB01502 (3-5ft)	
DateCollected	11/28/2001 12:00 AM	11/28/2001 12:00 AM	11/28/2001 12:00 AM	11/28/2001 12:00 AM	
DateAnalyzed	12/07/2001	12/07/2001	12/07/2001	12/07/2001	
SDGNumber	52802	52802	52802	52802	
Parameter	Units				
1,2,4-Trichlorobenzene	ug/kg	388	U	341	U
1,2-Dichlorobenzene	ug/kg	388	U	341	U
1,3-Dichlorobenzene	ug/kg	388	U	3.6	J
1,4-Dichlorobenzene	ug/kg	388	U	341	U
2,4,5-Trichlorophenol	ug/kg	1880	U	1650	U
2,4,6-Trichlorophenol	ug/kg	388	U	341	U
2,4-Dichlorophenol	ug/kg	388	U	341	U
2,4-Dimethylphenol	ug/kg	388	U	341	U
2,4-Dinitrophenol	ug/kg	1880	U	1650	U
2,4-Dinitrotoluene	ug/kg	352	U	310	U
2,6-Dinitrotoluene	ug/kg	388	U	341	U
2-Chloronaphthalene	ug/kg	388	U	341	U
2-Chlorophenol	ug/kg	388	U	5.4	J
2-Methylnaphthalene	ug/kg	388	U	5.2	J
2-Methylphenol (o-Cresol)	ug/kg	388	U	341	U
2-Nitroaniline	ug/kg	388	U	341	U
2-Nitrophenol	ug/kg	388	U	341	U
3,3'-Dichlorobenzidine	ug/kg	774	U	680	U
3-Methylphenol/4-Methylphenol	ug/kg	388	U	341	U
3-Nitroaniline	ug/kg	1880	U	1650	U
4,6-Dinitro-2-methylphenol	ug/kg	1880	U	1650	U
4-Bromophenyl Phenyl Ether	ug/kg	388	U	341	U
4-Chloro-3-methylphenol	ug/kg	352	U	310	U
4-Chloroaniline	ug/kg	388	U	341	U
4-Chlorophenyl Phenyl Ether	ug/kg	388	U	341	U
4-Nitroaniline	ug/kg	1880	U	1650	U
4-Nitrophenol	ug/kg	1880	U	1650	U
Acenaphthene	ug/kg	352	U	6	J
Acenaphthylene	ug/kg	388	U	4.9	J
Anthracene	ug/kg	388	U	8.4	J
Benzo(a)Anthracene	ug/kg	388	U	71.5	J
Benzo(a)Pyrene	ug/kg	388	U	117	J
Benzo(b)Fluoranthene	ug/kg	91.8	J	202	J
Benzo(g,h,i)Perylene	ug/kg	388	U	46.6	J
Benzo(k)Fluoranthene	ug/kg	388	U	341	U
Benzoic acid	ug/kg	1880	U	1650	U
				1720	U
				1780	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB016		E572SB016		E572SB017		E572SB017		
SampleID	572SB01602 (3-5ft)		572SB1601 (0-1ft)		572SB01701 (0-1ft)		572SB01702 (3-5ft)		
DateCollected	11/28/2001 12:00 AM								
DateAnalyzed	12/07/2001		12/07/2001		12/07/2001		12/07/2001		
SDGNumber	52802		52802		52802		52802		
Parameter	Units								
1,2,4-Trichlorobenzene	ug/kg	360	U	385	U	433	U	393	U
1,2-Dichlorobenzene	ug/kg	360	U	385	U	433	U	393	U
1,3-Dichlorobenzene	ug/kg	360	U	385	U	433	U	393	U
1,4-Dichlorobenzene	ug/kg	360	U	385	U	433	U	393	U
2,4,5-Trichlorophenol	ug/kg	1740	U	1860	U	2100	U	1900	U
2,4,6-Trichlorophenol	ug/kg	360	U	385	U	433	U	393	U
2,4-Dichlorophenol	ug/kg	360	U	385	U	433	U	393	U
2,4-Dimethylphenol	ug/kg	360	U	385	U	433	U	393	U
2,4-Dinitrophenol	ug/kg	1740	U	1860	U	2100	U	1900	U
2,4-Dinitrotoluene	ug/kg	327	U	350	U	394	U	357	U
2,6-Dinitrotoluene	ug/kg	360	U	385	U	433	U	393	U
2-Chloronaphthalene	ug/kg	360	U	385	U	433	U	393	U
2-Chlorophenol	ug/kg	360	U	385	U	433	U	393	U
2-Methylnaphthalene	ug/kg	4.6	J	385	U	7.1	J	393	U
2-Methylphenol (o-Cresol)	ug/kg	360	U	385	U	433	U	393	U
2-Nitroaniline	ug/kg	360	U	385	U	433	U	393	U
2-Nitrophenol	ug/kg	360	U	385	U	433	U	393	U
3,3'-Dichlorobenzidine	ug/kg	718	U	768	U	865	U	785	U
3-Methylphenol/4-Methylphenol	ug/kg	360	U	385	U	433	U	393	U
3-Nitroaniline	ug/kg	1740	U	1860	U	2100	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	1740	U	1860	U	2100	U	1900	U
4-Bromophenyl Phenyl Ether	ug/kg	360	U	385	U	433	U	393	U
4-Chloro-3-methylphenol	ug/kg	327	U	350	U	394	U	357	U
4-Chloroaniline	ug/kg	360	U	385	U	433	U	393	U
4-Chlorophenyl Phenyl Ether	ug/kg	360	U	385	U	433	U	393	U
4-Nitroaniline	ug/kg	1740	U	1860	U	2100	U	1900	U
4-Nitrophenol	ug/kg	1740	U	1860	U	2100	U	1900	U
Acenaphthene	ug/kg	327	U	350	U	12.8	J	357	U
Acenaphthylene	ug/kg	360	U	385	U	433	U	393	U
Anthracene	ug/kg	360	U	5.8	J	433	U	393	U
Benzo(a)Anthracene	ug/kg	360	U	385	U	433	U	393	U
Benzo(a)Pyrene	ug/kg	64	J	166	J	74.7	J	393	U
Benzo(b)Fluoranthene	ug/kg	85.5	J	279	J	110	J	82.8	J
Benzo(g,h,i)Perylene	ug/kg	360	U	73.6	J	433	U	393	U
Benzo(k)Fluoranthene	ug/kg	9	J	385	U	11.7	J	393	U
Benzoic acid	ug/kg	1740	U	1860	U	2100	U	1900	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB025	E572SB025
SampleID	572SB02501 (0-1ft)	572SB02502 (3-5ft)
DateCollected	11/28/2001 12:00 AM	11/28/2001 12:00 AM
DateAnalyzed	12/07/2001	12/07/2001
SDGNumber	52802	52802

Parameter	Units				
1,2,4-Trichlorobenzene	ug/kg	374	U	450	U
1,2-Dichlorobenzene	ug/kg	374	U	450	U
1,3-Dichlorobenzene	ug/kg	374	U	450	U
1,4-Dichlorobenzene	ug/kg	374	U	450	U
2,4,5-Trichlorophenol	ug/kg	1810	U	2180	U
2,4,6-Trichlorophenol	ug/kg	374	U	450	U
2,4-Dichlorophenol	ug/kg	374	U	450	U
2,4-Dimethylphenol	ug/kg	374	U	450	U
2,4-Dinitrophenol	ug/kg	1810	U	2180	U
2,4-Dinitrotoluene	ug/kg	340	U	409	U
2,6-Dinitrotoluene	ug/kg	374	U	450	U
2-Chloronaphthalene	ug/kg	374	U	450	U
2-Chlorophenol	ug/kg	374	U	450	U
2-Methylnaphthalene	ug/kg	10.6	J	450	U
2-Methylphenol (o-Cresol)	ug/kg	374	U	450	U
2-Nitroaniline	ug/kg	374	U	450	U
2-Nitrophenol	ug/kg	374	U	450	U
3,3'-Dichlorobenzidine	ug/kg	747	U	898	U
3-Methylphenol/4-Methylphenol	ug/kg	374	U	450	U
3-Nitroaniline	ug/kg	1810	U	2180	U
4,6-Dinitro-2-methylphenol	ug/kg	1810	U	2180	U
4-Bromophenyl Phenyl Ether	ug/kg	374	U	450	U
4-Chloro-3-methylphenol	ug/kg	340	U	409	U
4-Chloroaniline	ug/kg	374	U	450	U
4-Chlorophenyl Phenyl Ether	ug/kg	374	U	450	U
4-Nitroaniline	ug/kg	1810	U	2180	U
4-Nitrophenol	ug/kg	1810	U	2180	U
Acenaphthene	ug/kg	10.5	J	9.7	J
Acenaphthylene	ug/kg	374	U	450	U
Anthracene	ug/kg	26.6	J	450	U
Benzo(a)Anthracene	ug/kg	172	J	16.7	J
Benzo(a)Pyrene	ug/kg	210	J	450	U
Benzo(b)Fluoranthene	ug/kg	374	J	92.4	J
Benzo(g,h,i)Perylene	ug/kg	110	J	450	U
Benzo(k)Fluoranthene	ug/kg	374	U	10.1	J
Benzoic acid	ug/kg	1810	U	2180	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB025		E572SB025		
SampleID	572SB02501 (0-1ft)		572SB02502 (3-5ft)		
DateCollected	11/28/2001 12:00 AM		11/28/2001 12:00 AM		
DateAnalyzed	12/07/2001		12/07/2001		
SDGNumber	52802		52802		
Parameter	Units				
Benzyl alcohol	ug/kg	374	U	450	U
Benzyl Butyl Phthalate	ug/kg	374	U	450	U
bis(2-Chloroethoxy) Methane	ug/kg	374	U	450	U
bis(2-Chloroethyl) ether (2-Chloroethyl) ether	ug/kg	374	U	450	U
Bis(2-Chloroisopropyl) Ether	ug/kg	374	U	450	U
bis(2-Ethylhexyl) Phthalate	ug/kg	374	U	450	U
Carbazole	ug/kg	10.3	J	450	U
Chrysene	ug/kg	159	J	11.5	J
Di-n-butyl Phthalate	ug/kg	374	U	450	U
Di-n-octylphthalate	ug/kg	374	U	450	U
Dibenz(a,h)anthracene	ug/kg	374	UJ	450	UJ
Dibenzofuran	ug/kg	8.6	J	5.8	J
Diethyl Phthalate	ug/kg	374	U	450	U
Dimethyl Phthalate	ug/kg	374	U	450	U
Diphenylamine	ug/kg	374	U	450	U
Flouranthene	ug/kg	196	J	14.6	J
Fluorene	ug/kg	8.5	J	450	U
Hexachlorobenzene	ug/kg	374	U	450	U
Hexachlorobutadiene	ug/kg	374	U	450	U
Hexachlorocyclopentadiene	ug/kg	374	U	450	U
Hexachloroethane	ug/kg	374	U	450	U
Indeno(1,2,3-c,d)pyrene	ug/kg	99.3	J	450	U
Isophorone	ug/kg	374	U	450	U
N-Nitrosodiphenylamine	ug/kg	374	U	450	U
Naphthalene	ug/kg	19.9	J	450	U
Nitrobenzene	ug/kg	374	U	450	U
Pentachlorophenol	ug/kg	1810	U	2180	U
Phenanthrene	ug/kg	79.4	J	11.1	J
Phenol	ug/kg	374	U	450	U
Pyrene	ug/kg	206	J	13.8	J

Analytical Data Summary

03/29/2002 3:57 PM

		E572SB012		E572SB012		E572SB012	
		572SB01201 (0-1ft)		572SB01202 (3-5ft)		572SB01203 (-ft)	
		12/21/2001 12:00 AM		12/21/2001 12:00 AM		12/21/2001 12:00 AM	
		01/10/2002		01/10/2002		01/10/2002	
		53910		53910		53910	
Parameter	Units						
Dibutyltin	ug/kg	0.988	U	1.24	U	1.08	U
Monobutyltin	ug/kg	0.988	UJ	1.24	UJ	1.08	UJ
Tetrabutyltin	ug/kg	0.988	UJ	1.24	UJ	1.08	UJ
Tributyltin	ug/kg	0.988	U	1.24	U	1.08	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB012	E572SB012	E572SB012	E572SB012	E572SB012	E572SB012	E572SB012			
SampleID	572SB01201 (0-1ft)	572SB01201 (0-1ft)	572SB01201 (0-1ft)	572SB01202 (3-5ft)	572SB01202 (3-5ft)	572SB01202 (3-5ft)	572SB01203 (
DateCollected	12/21/01 12:00 AM	12/21/01 12:00								
DateAnalyzed	12/31/2001	12/31/2001	01/08/2002	12/31/2001	12/31/2001	01/08/2002	12/31/200			
SDGNumber	53910	53911	53911	53910	53911	53911	53910			
Parameter	Units									
Antimony	mg/kg	0.517	UJ			0.822	J			0.881
Arsenic, SPLP	ug/L			26	U			28.3	J	
Barium, SPLP	ug/L			9.18	J			11.4	J	
Cadmium, SPLP	ug/L			4.16	U			4.16	U	
Chromium, SPLP	ug/L			5.7	U			5.7	U	
Lead, SPLP	ug/L			24.3	U			24.3	U	
Lead	mg/kg	19.9	=			360	=			48.1
Mercury, SPLP	ug/L					0.642	U			0.642
Selenium, SPLP	ug/L			34.9	U			34.9	U	
Silver, SPLP	ug/L			6.66	U			6.66	U	
Tin (Sn)	mg/kg	0.42	J			2.93	=			1.05

Analytical Data Summary

03/29/2002 3:57 PM

StationID	2	E572SB012	E572SB012	E572SB013	E572SB013	E572SB013	E572SB013			
SampleID	(-ft)	572SB01203 (-ft)	572SB01203 (-ft)	572SB01301 (0-1ft)	572SB01301 (0-1ft)	572SB01301 (0-1ft)	572SB01302 (3-5ft)			
DateCollected	AM	12/21/01 12:00 AM	12/21/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM			
DateAnalyzed	1	12/31/2001	01/08/2002	12/08/2001	12/08/2001	12/10/2001	12/08/2001			
SDGNumber		53911	53911	52802	52802-B	52802-B	52802			
Parameter	Units									
Antimony	mg/kg	J			0.535	UJ			0.536	UJ
Arsenic, SPLP	ug/L		26	U			26	U		
Barium, SPLP	ug/L		12	J			11.7	J		
Cadmium, SPLP	ug/L		4.16	U			4.16	U		
Chromium, SPLP	ug/L		5.7	U			5.7	U		
Lead, SPLP	ug/L		24.3	U			24.3	U		
Lead	mg/kg	=			114	=			11.3	=
Mercury, SPLP	ug/L			0.642	U			0.642	U	
Selenium, SPLP	ug/L		34.9	U			34.9	U		
Silver, SPLP	ug/L		6.66	U			6.66	U		
Tin (Sn)	mg/kg	J			3.15	=			0.665	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB013	E572SB013	E572SB013	E572SB013	E572SB013	E572SB018	E572SB01
SampleID	572SB01302 (3-5ft)	572SB01302 (3-5ft)	572SB01303 (-ft)	572SB01303 (-ft)	572SB01303 (-ft)	572SB01801 (0-1ft)	572SB01802 (3
DateCollected	11/30/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM	11/30/01 12:00 AM	11/28/01 12:00 AM	11/28/01 12:00
DateAnalyzed	12/08/2001	12/10/2001	12/08/2001	12/08/2001	12/10/2001	12/06/2001	12/06/200
SDGNumber	52802-B	52802-B	52802	52802-B	52802-B	52802	52802
Parameter	Units						
Antimony	mg/kg		0.756	UJ		0.72	UJ 0.663
Arsenic, SPLP	ug/L	26 U			26 U		
Barium, SPLP	ug/L	9.89 J			28.3 J		
Cadmium, SPLP	ug/L	4.16 U			4.16 U		
Chromium, SPLP	ug/L	5.7 U			5.7 U		
Lead, SPLP	ug/L	24.3 U			24.3 U		
Lead	mg/kg		34.6	=			
Mercury, SPLP	ug/L		0.642 U			0.642 U	
Selenium, SPLP	ug/L	34.9 U			34.9 U		
Silver, SPLP	ug/L	6.66 U			6.66 U		
Tin (Sn)	mg/kg		1.1	U			

Analytical Data Summary

03/29/2002 3:57 PM

StationID	8	E572SB019	E572SB019	E572SB020	E572SB020	E572SB021	E572SB021						
SampleID	-5ft	572SB01901 (0-1ft)	572SB01902 (3-5ft)	572SB02001 (0-1ft)	572SB02002 (3-5ft)	572SB02101 (0-1ft)	572SB02102 (3-5ft)						
DateCollected	AM	11/28/01 12:00 AM	11/28/01 12:00 AM	11/28/01 12:00 AM	11/28/01 12:00 AM	11/28/01 12:00 AM	11/28/01 12:00 AM						
DateAnalyzed	1	12/06/2001	12/06/2001	12/06/2001	12/06/2001	12/06/2001	12/06/2001						
SDGNumber		52802	52802	52802	52802	52802	52802						
Parameter	Units												
Antimony	mg/kg	UJ				0.694	UJ	0.763	UJ				
Arsenic, SPLP	ug/L												
Barium, SPLP	ug/L												
Cadmium, SPLP	ug/L												
Chromium, SPLP	ug/L												
Lead, SPLP	ug/L												
Lead	mg/kg	14.6	=	4.87	=	33	=	11.6	=	153	=	10.5	=
Mercury, SPLP	ug/L												
Selenium, SPLP	ug/L												
Silver, SPLP	ug/L												
Tin (Sn)	mg/kg	1.11	U	0.356	U	2.2	=	0.632	U	4.23	=	1.14	U

Analytical Data Summary

03/29/2002 3:57 PM

StationID	E572SB022		E572SB022		E572SB023		E572SB023		E572SB024		E572SB024		E572SB02		
SampleID	572SB02201 (0-1ft)		572SB02202 (3-5ft)		572SB02301 (0-1ft)		572SB02302 (3-5ft)		572SB02401 (0-1ft)		572SB02402 (3-5ft)		572SB02501 (0		
DateCollected	11/28/01 12:00 AM		11/28/01 12:00												
DateAnalyzed	12/06/2001		12/06/2001		12/08/2001		12/08/2001		12/06/2001		12/06/2001		12/06/200		
SDGNumber	52802		52802		52802		52802		52802		52802		52802		
Parameter	Units														
Antimony	mg/kg	0.531	UJ	0.959	UJ	0.531	UJ	0.721	UJ	0.966	UJ	0.49	UJ	0.564	
Arsenic, SPLP	ug/L														
Barium, SPLP	ug/L														
Cadmium, SPLP	ug/L														
Chromium, SPLP	ug/L														
Lead, SPLP	ug/L														
Lead	mg/kg	177	=	2360	=	94.3	=	35.4	=	243	=	6.61	=	40.4	
Mercury, SPLP	ug/L														
Selenium, SPLP	ug/L														
Silver, SPLP	ug/L														
Tin (Sn)	mg/kg	6.1	=	4.83	=	2.73	=	1.82	U	6.59	=	0.286	U	1.53	

Analytical Data Summary

03/29/2002 3:57 PM

	StationID	5	E572SB025	
	SampleID	-1ft)	572SB02502 (3-5ft)	
	DateCollected	AM	11/28/01 12:00 AM	
	DateAnalyzed		12/06/2001	
	SDGNumber		52802	
Parameter	Units			
Antimony	mg/kg	U	0.628	U
Arsenic, SPLP	ug/L			
Barium, SPLP	ug/L			
Cadmium, SPLP	ug/L			
Chromium, SPLP	ug/L			
Lead, SPLP	ug/L			
Lead	mg/kg	=	9.87	UJ
Mercury, SPLP	ug/L			
Selenium, SPLP	ug/L			
Silver, SPLP	ug/L			
Tin (Sn)	mg/kg	U	0.798	U