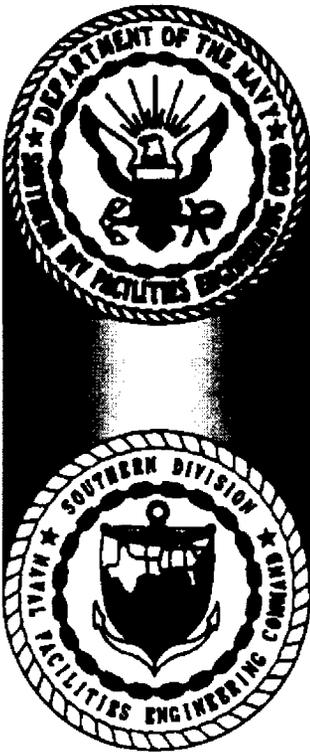


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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ADDENDUM SOLID WASTE MANAGEMENT UNIT 11 (SWMU 11) ZONE G CNC
CHARLESTON SC
8/1/2001
CH2M HILL

RFI REPORT ADDENDUM

Solid Waste Management Unit 11, Zone G



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

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

CH2M Jones

August 2001

Contract N62467-99-C-0960

RFI REPORT ADDENDUM

Solid Waste Management Unit 11, Zone G



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

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

PREPARED BY
CH2M-Jones

August 2001

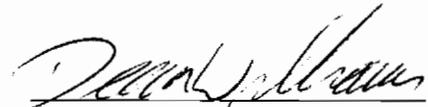
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Contract N62467-99-C-0960
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Certification Page for RFI Report Addendum – SWMU 11, Zone G

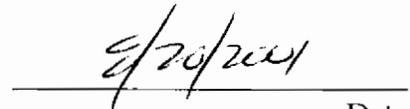
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

Temporary Permit No. T2000342



Dean Williamson, P.E.



Date



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26		1998)	

1 Acronyms and Abbreviations

2	AOC	area of concern
3	BCT	BRAC Cleanup Team
4	BRAC	Base Realignment and Closure Act
5	BRC	background reference concentration
6	CA	corrective action
7	CMS	corrective measures study
8	CNC	Charleston Naval Complex
9	COC	chemical of concern
10	COPC	chemical of potential concern
11	DAF	dilution attenuation factor
12	DET	Environmental Detachment Charleston
13	DPT	direct-push technology
14	EnSafe	EnSafe Inc.
15	EPA	U.S. Environmental Protection Agency
16	ft ³	cubic feet
17	ft bls	feet below land surface
18	HHRA	human health risk assessment
19	HI	hazard index
20	IM	interim measure
21	MCL	maximum contaminant level
22	µg/L	microgram per liter
23	mg/kg	milligram per kilogram
24	NAVBASE	Naval Base
25	NFA	no further action
26	OWS	oil/water separator
27	PCB	polychlorinated biphenyl
28	RBC	risk-based concentration
29	RCRA	Resource Conservation and Recovery Act
30	RFA	RCRA Facility Assessment

1	RFI	RCRA Facility Investigation
2	SCDHEC	South Carolina Department of Health and Environmental Control
3	SPLP	synthetic precipitation leaching procedure
4	SSL	soil screening level
5	SSV	sediment screening value
6	SVOC	semivolatile organic compound
7	SWMU	solid waste management unit
8	TCDD	tetrachlorodibenzo-p-dioxin
9	TEQ	TCDD equivalency quotient
10	ThQ	target hazard quotient
11	TOC	total organic carbon
12	VOC	volatile organic compound
13	y ³	cubic yard

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 Solid Waste Management Unit (SWMU)
14 11 in Zone G of the CNC. Figure 1-1 illustrates the location of Zone G within the CNC.

15 1.1 Background

16 SWMU 11 is located near the interchange formed by the junction of Bainbridge Avenue and
17 Viaduct Road. From the early 1940s to the early 1970s, the site contained Building 131, an
18 acetylene plant. Acetylene was made from reacting carbide with water at this facility, and
19 was piped to the shipyard for use in base activities. The acetylene generation process
20 created a byproduct of water saturated with calcium hydroxide. This byproduct was
21 pumped into two former diked holding ponds adjacent to Building 131 to the south. These
22 former ponds covered an approximate 2.75-acre area. Unknown quantities of this water-
23 calcium hydroxide byproduct were dumped into these former holding ponds, which
24 discharged supernatant into Shipyard Creek. The former ponds were filled and the area is
25 currently an open space, covered with grass and pavement. However, it was reported in the
26 *Zone G RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1998) that a "white powder residue"
27 (likely calcium hydroxide) was observed on the slopes adjacent to the roads. Figure 1-2 is an
28 aerial photograph of SWMU 11, circa 1997. The current SWMU boundary is based upon
29 historical aerial photographs, and corresponds to the approximate limits of fill.

30 This site is zoned for industrial use.

1 Soil borings taken during initial assessments found sludge at a depth of one foot. A
2 Confirmation Study performed by Geraghty and Miller (1982) indicated that groundwater
3 pH ranged from 6.3 to 7.3, and that calcium and chloride contents and specific
4 conductances were slightly elevated. It was assumed that naturally occurring acidic soils at
5 the site neutralized the relatively high pH of the caustic water infiltrating from the former
6 ponds. A wetland area south of Bainbridge Avenue currently receives surface runoff from
7 drainage culverts leading from the site.

8 As part of the RFI, EnSafe advanced five soil borings, eight soil probes, installed three
9 monitoring wells, and collected two sediment samples near the drainage culvert to assess
10 the presence of soil contamination related to the former holding ponds. Soil samples were
11 collected and analyzed for metals and pH. Additional analyses for semivolatile organic
12 compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) were performed on
13 selected samples. Three groundwater sampling events were conducted at the site, and the
14 samples collected were also analyzed for metals and pH. The findings from the RFI were
15 presented in the *Zone G RFI Report, Revision 0*. Lead was the only chemical of concern (COC)
16 in surface soil identified.

17 Between November 1997 and November 1998, the Environmental Detachment Charleston
18 (DET) performed an interim measure (IM) at SWMU 11. The IM consisted of backhoe
19 trenching, surface water sampling, and limited excavation and disposal of calcium
20 hydroxide sludge and sludge-contaminated soil. Results of the IM were presented in the
21 *Completion Report: Interim/Stabilization Measure for SWMU 11* (DET, 1999). A copy of this
22 report is provided in Appendix A of this RFI Report Addendum.

23 Additional investigations were made by EnSafe as presented in the *Zone G RFI Workplan*
24 *Addendum* (EnSafe, 2000) to delineate inorganic impacts to surface and subsurface soil, and
25 to further evaluate groundwater impacts. In June 2001, CH2M-Jones collected additional
26 soil samples for further investigation of lead in surface soils under an IM Work Plan
27 submitted to the BRAC Cleanup Team (BCT) in May 2001. The results of these additional
28 investigations are presented in this RFI Report Addendum.

29 **1.2 Purpose of the RFI Report Addendum**

30 This RFI Report Addendum provides information about SWMU 11 that documents the
31 conclusions from the *Zone G RFI Report, Revision 0*, provides the results of additional
32 sampling performed after the RFI, re-evaluates the risk assessment using the additional
33 data, and presents a recommendation for No Further Action (NFA).

1 The results of additional investigations subsequent to the RFI are presented to complete the
2 nature and extent investigation for chemicals of potential concern (COPCs) identified in
3 surface soil, subsurface soil, and groundwater.

4 Based on the available data, no COCs were identified for unrestricted land use in surface
5 soil, subsurface soil, or groundwater. The site is zoned for future industrial land use.

6 Prior to changing the status of any site to NFA in the CNC RCRA CA permit, the BCT
7 agreed that the following issues should be considered:

- 8 • Status of the RFI
- 9 • Presence of metals (inorganics) in groundwater
- 10 • Potential linkage to SWMU 37, Investigated Sanitary Sewers at the CNC
- 11 • Potential linkage to Area of Concern (AOC) 699, Investigated Storm Sewers at the CNC
- 12 • Potential linkage of AOC 504, Investigated Railroad Lines at the CNC
- 13 • Potential linkage to surface water bodies (Zone J)
- 14 • Potential contamination associated with oil/water separators (OWSs)
- 15 • Relevance or need for land use controls at the site

16 Information regarding these issues is provided in this RFI Report Addendum to expedite
17 evaluation of the site.

18 Provided that the information presented in this report is adequate to address these site
19 closeout items, it is expected that the BCT will concur that NFA is appropriate for the site,
20 following implementation of the recommended corrective measures study (CMS) at SWMU
21 11. At that time, a Statement of Basis will be prepared that will be made available for public
22 comment in accordance with SCDHEC policy. This will allow for public participation in the
23 final remedy selection.

24 **1.3 Report Organization**

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

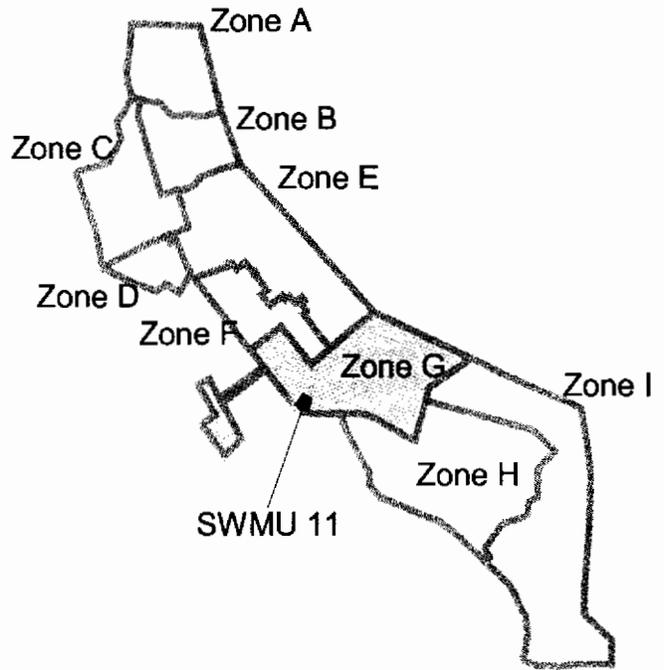
27 **1.0 Introduction** — Presents the purpose of the report and background information relating
28 to the RFI Report Addendum.

29 **2.0 Summary of RFI Conclusions for SWMU 11** — Summarizes the conclusions from the
30 RFI investigations and risk evaluations for SWMU 11.

- 1 **3.0 Summary of Interim Measures at SWMU 11** – Provides a summary of the interim
2 measure (IM) carried out at SWMU 11.
- 3 **4.0 Summary of Additional Investigations** — Summarizes information collected after
4 completion of the *Zone G RFI Report, Revision 0*.
- 5 **5.0 COPC/COC Refinement** – Provides conclusions from the additional investigations
6 performed at the site, and evaluates COPCs based on the previous and additional
7 investigations.
- 8 **6.0 Summary of Information Related to Site Closeout Issues**—Discusses the various issues
9 that the BCT agreed to evaluate prior to site closeout.
- 10 **7.0 Recommendations**—Provides recommendations for proceeding with site closure.
- 11 **8.0 References** — Lists the references used in this document.
- 12 **Appendix A** contains a copy of the *Completion Report: Interim/Stabilization Measure for*
13 *SWMU 11* (DET, 1999).
- 14 **Appendix B** contains analytical data from sampling conducted subsequent to the *Zone G*
15 *RFI Report, Revision 0*.
- 16 **Appendix C** contains validation reports from the data from sampling conducted
17 subsequent to the *Zone G RFI Report, Revision 0*.
- 18 **Appendix D** contains results of the synthetic precipitation leaching procedure (SPLP)
19 metals tests.
- 20 **Appendix E** contains responses to SCDHEC comments on the *Zone G RFI Report, Revision 0*.
- 21 All tables and figures appear at the end of their respective sections.



Zone K



-  SWMU 11
-  Zone Boundary
-  Zone G

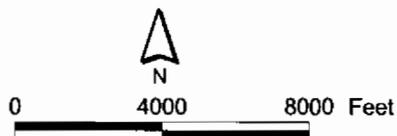


Figure 1-1
SWMU 11 Site Location Map
Zone G
Charleston Naval Complex

NOTE: Aerial Photo Date is 1997



-  Railroads
-  Roads
-  Pavement
-  Zone Boundary
-  Buildings
-  SWMU Boundary

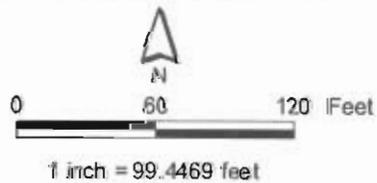


Figure 1-2
Aerial View of SWMU 11
Zone G
Charleston Naval Complex

2.0 Summary of RFI Conclusions for SWMU 11

As part of the Zone G RFI, soil and groundwater investigations were conducted at SWMU 11. During the RFI, five soil borings and eight direct-push technology (DPT) soil probes were advanced for the collection and analysis of surface and subsurface soils in the area of the former holding ponds to determine if there were any impacts from the former acetylene generation activities. Two sediment samples were also collected, one in the southeast corner of SWMU 11 at the entrance to the drainage culvert, which lies underneath Bainbridge Avenue; the other sediment sample was collected at the discharge location of the culvert across Bainbridge Avenue. Three shallow groundwater monitoring wells were installed and sampled three times between November 1996 and September 1997. Figure 2-1 illustrates the site and the RFI sample locations within this area.

RFI sampling results were screened to determine whether each site required no further investigation, further investigation/delineation, or some type of corrective action. Surface soil samples were screened against risk-based criteria based on the U.S. Environmental Protection Agency (EPA) Region III risk-based concentration (RBC) table (1996) using an unrestricted re-use scenario and a hazard index (HI) equal to 0.1, and against a Zone G background reference concentration (BRC) based on random grid samples collected and analyzed for inorganic/naturally occurring analytes.

RFI subsurface soil sample results were screened against leachability-based generic soil-to-groundwater screening levels presented in the *EPA Soil Screening Guidance: Technical Background Document* (1996a). Soil screening levels (SSLs) were either used directly from the SSL table, modified from those presented in the RBC table, or calculated independently using the SSL default dilution attenuation factor (DAF) of 20 from the SSL guidance. Subsurface soil samples were also screened against the Zone G BRCs developed for inorganics in subsurface soils.

RFI groundwater sampling results were screened against the EPA Region III RBC table assuming a target hazard quotient (ThQ) of 1.0, and against Zone G groundwater BRCs developed for inorganics in groundwater. Results were also compared to the maximum contaminant levels (MCLs) presented in the *EPA Drinking Water Regulations and Health Advisories* (1996b).

1 **2.1 Surface Soil**

2 No volatile organic compounds (VOCs) were detected at concentrations above RBCs or
3 SSLs in the RFI surface soil samples. No SVOCs, PCBs, or pesticides were detected in the
4 surface soil samples. Dioxin (2,3,7,8-TCDD TEQ) was detected in the duplicate surface
5 sample below its RBC. Soil pH results were generally neutral to above neutral, ranging from
6 pH 4.9 to 10.0.

7 Lead was detected in RFI surface soil sample 011SB00101 at a concentration of 1,100
8 milligrams per kilogram (mg/kg), exceeding the typical target cleanup level for unrestricted
9 land use of 400 mg/kg, as well as the Zone G surface soil background range maximum
10 value of 275 mg/kg.

11 Eight DPT samples were also collected during the RFI, to attempt to further assess metals
12 and pH in soils. Six of the DPT borings included both surface (0 to 1 foot below land surface
13 [ft bls]) and subsurface (3 to 5 ft bls) soil samples. Two DPT borings included a surface soil
14 sample only. Deeper saturated soil samples were also collected from two of the borings.
15 Surface soil DPT pH results ranged from 4.9 to 9.9.

16 Thallium (surface soil sample 011SP00201) and iron (surface soil samples 011SB00101
17 through 011SB00501) were detected at concentrations slightly exceeding their respective
18 RBCs and/or SSLs. The *Zone G RFI Report, Revision 0* (EnSafe, 1998) indicated that only lead
19 was a COPC in surface soil.

20 **2.2 Subsurface Soil**

21 No VOCs were detected at concentrations above the screening criteria in the RFI subsurface
22 soil samples. No SVOCs, PCBs, or pesticides were detected in the subsurface soil samples.
23 Soil pH results were generally neutral to above neutral. There were also no inorganic
24 analytes detected at concentrations exceeding BRCs or SSLs in the subsurface soil samples.

25 Subsurface soil DPT pH results ranged from 4.6 to 12.6. The two saturated deeper interval
26 samples exhibited pH values of 7.2 and 11.7. Boring location 011SP006, located in the west
27 central portion of the SWMU, displayed the highest pH values of the DPT borings. The
28 subsurface (3 to 5 ft bls) sample pH was 12.6, and the deeper saturated sample in this boring
29 displayed a pH of 11.7.

30 The *Zone G RFI Report, Revision 0* concluded that there were no COPCs for subsurface soil at
31 SWMU 11.

2.3 Sediment

Sediment sample G011M0001 had a mercury concentration (2.1 mg/kg) that exceeded its sediment screening value (SSV) of 0.13 mg/kg, and the pH was above neutral, ranging from 7.83 to 12 mg/kg. The *Zone G RFI Report, Revision 0* did not identify mercury or any other parameters as a COPC in sediment.

2.4 Groundwater

Arsenic slightly exceeded the MCL of 50 micrograms per liter ($\mu\text{g}/\text{L}$) in the third quarter groundwater sample collected from G011GW003. Beryllium was detected but did not exceed its respective MCL ($4 \mu\text{g}/\text{L}$) in any of the samples collected during any sampling event.

Iron concentrations in the three sets of samples collected from well location G011GW003 were above the tap water RBC and MCL, but displayed a decreasing trend. Iron concentrations detected in the second quarter samples collected from G011GW001 and G011GW002 exceeded the tap water RBC and MCL, but decreased to below the MCL ($300 \mu\text{g}/\text{L}$) at G011GW002, and below the tap water RBC ($1,100 \mu\text{g}/\text{L}$) at G011GW001 in the third quarter groundwater samples.

Thallium was detected at a J-flagged concentration exceeding its tap water RBC ($0.29 \mu\text{g}/\text{L}$) and MCL ($2.0 \mu\text{g}/\text{L}$) in the second quarter groundwater sample collected from well G011GW002 ($5.1 \text{ J } \mu\text{g}/\text{L}$). No thallium was detected in the third quarter groundwater samples. No COPCs were identified for groundwater in the *Zone G RFI Report, Revision 0*.

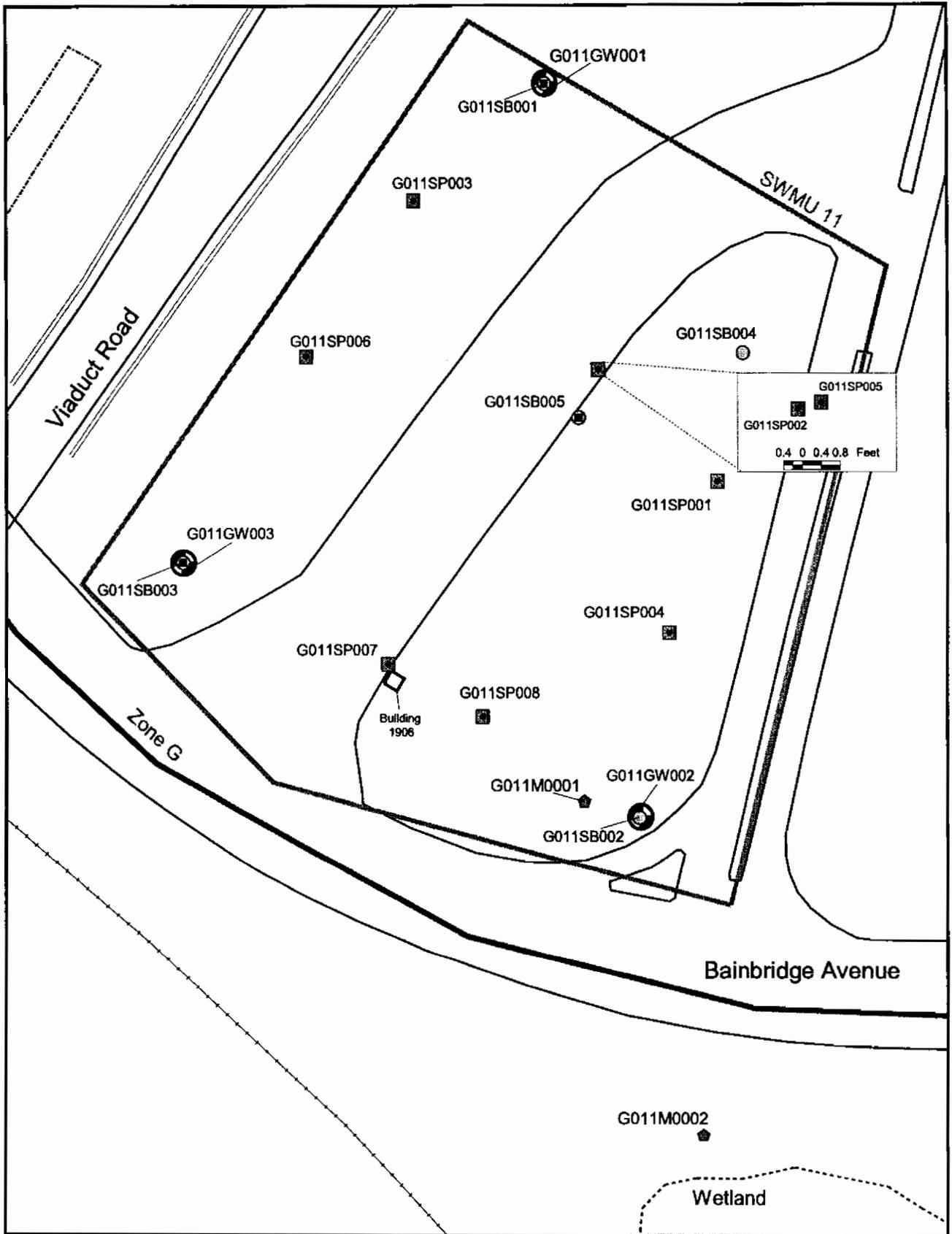
The shallow groundwater flow direction at SWMU 11 is generally to the east-northeast towards the Cooper River; tidal influence is minimal and the horizontal gradient is approximately 0.005, as shown in Figures 10.8-2 and 10.8-3 of the *Zone G RFI Report, Revision 0*.

2.5 Human Health Risk Assessment

As part of the RFI, a human health risk assessment (HHRA) was conducted for the lead concentrations detected in the surface soil at SWMU 11. The HHRA identified lead as a COC in surface soil. No COCs were identified for subsurface soil or shallow groundwater at SWMU 11. The HHRA identified the lead concentrations observed in surface soil sample 011SB00101 as a residential soil pathway COC for SWMU 11. No industrial soil pathway COCs were identified for SWMU 11.

1 **2.6 Conclusions and Recommendations**

- 2 The *Zone G RFI Report, Revision 0* concluded that corrective measures are needed for the
3 surface soil COC (lead) identified at SWMU 11, based on the concentrations detected in the
4 surface sample 011SB00101. No corrective measures were proposed for groundwater.



- | | |
|---------------------------|-----------------|
| ■ Subsurface Soil Samples | ▭ Buildings |
| ⊙ Surface Soil Sample | ▭ Zone Boundary |
| ■ Soil Probe | ▭ SWMU Boundary |
| ⊙ Sediment Sample | ▭ Pavement |
| ⊙ Groundwater Well | ▭ Sidewalk |
| ▭ Roads | ▭ Wetland |

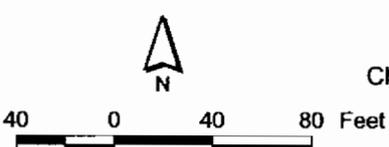


Figure 2-1
RFI Sampling Locations
SWMU 11, Zone G
Charleston Naval Complex

3.0 Summary of Interim Measures at SWMU 11

Between November 1997 and November 1998, the DET performed an IM, which was intended to limit the exposure and spread of the calcium hydroxide prior to completion of the RFI and CMS. At the southeast corner of SWMU 11, calcium hydroxide sludge was observed in the drainage ditch in the area of the culvert entrance and the inside the culvert (that lies beneath Bainbridge Avenue), which drains to the marsh (that is connected to Shipyard Creek) across Bainbridge Avenue. The calcium hydroxide was visible due to erosion of the slopes along the drainage ditch. The *Completion Report: Interim/Stabilization Measure for SWMU 11* (DET, 1999) is presented as Appendix A of this RFI Report Addendum. Figure 1 of the IM Completion Report shows the location of the culvert and excavation in relation to SWMU 11. Figure 2 depicts the locations of IM trenching performed to further delineate the extent of sludge fill, as well as RFI DPT borings installed by EnSafe to attempt to map the extent of calcium hydroxide sludge fill.

3.1 Trenching Operations

EnSafe described a 1 ft-thick layer of calcium hydroxide sludge at depths between 2 and 4 ft bls from their soil probe samples during the RFI. To further delineate the vertical and horizontal extent of the sludge material in the area of the culvert, DET conducted trenching operations that involved the use of a backhoe to trench a 2 ft-wide area, removing approximately 6 inches of soil at a time. The sludge layer was encountered between depths of 2 to 2.5 ft bls (see Figure 2 of the IM Completion Report in Appendix A). The DET also collected surface water samples from several locations along the drainage ditch for field pH measurements. In an area where the sludge material was visible near the culvert, pH measurements ranged from 11.65 (unagitated) to 12.05 (agitated).

3.2 Excavation of Calcium Hydroxide Material

The excavation activities began in November 1997 and were completed in November 1998. An approximate 30 by 20 ft-area along the drainage ditch and culvert was excavated and disposed of in a certified Subtitle D landfill (see Figure 1 of the IM Completion Report). Sandy clay soil interbedded with calcium hydroxide sludge layers was excavated to a depth of 5 ft bls. Groundwater was encountered at 4 ft bls. The excavation was subsequently backfilled with high end sandy clay and topsoil, which was graded and seeded.

1 **3.3 Conclusions**

2 Approximately 260 cubic yards (y³) of calcium hydroxide sludge material and soil was
3 excavated from an area in the southeast corner of SWMU 11. The excavated material was
4 determined to be non-hazardous and was disposed of in a certified Subtitle D landfill. No
5 calcium hydroxide material was visible after completion of the subsequent backfill
6 activities. The area of excavation, as presented in Figure 1 of the IM Completion Report,
7 appears to have also included the excavation of sediment sample G011M0001, effectively
8 addressing any residual sediment contamination at that location.

4.0 Summary of Additional Investigations

During the latter parts of 1997 and 1999, the RFI investigations continued with soil and groundwater sampling under the *Zone G RFI Workplan Addendum* (EnSafe, 2000). Additional soil samples were also collected to delineate metals contamination and to develop site-specific SSLs for metals by analysis of SPLP and total organic carbon (TOC) content of soils. One additional groundwater sampling event was also conducted on December 12, 1997. These planned investigations were to address comments received from SCDHEC on the *Zone G RFI Report, Revision 0* (EnSafe, 1998).

In June 2001, CH2M-Jones collected additional surface soil samples to further investigate the occurrence of lead in surface soil. The data from the additional investigations are summarized in this section; the EnSafe analytical data and validation reports are provided as Appendices B and C, respectively. The CH2M-Jones analytical data summary is presented in Appendix D.

4.1 Soil Sampling and Analysis

During the additional investigation of SWMU 11 under the RFI Workplan Addendum, EnSafe installed six borings in 1999 (G011B006 through G011SB011) in the area of the former holding ponds. Surface (0 to 1 ft bls) and subsurface (3 to 5 ft bls) soil samples were collected from each of these sampling locations. Two additional sediment samples (G011M003 and G011M004) were also collected, approximately 60 ft to the east and west of previous sediment sample location G011M001. These sampling locations are depicted in Figure 4-1.

4.1.1 Surface Soil

EnSafe installed four of the additional soil borings (G011SB008, G011SB009, G011SB010, and G011SB011) adjacent to previous RFI soil boring and probe locations (refer to Figure 2-1 of this RFI Report Addendum). Surface soil samples were collected from these borings and analyzed for metals, SPLP metals, and TOC. Two additional borings (G011SB006 and G011SB007) were installed north and northeast of previous boring location G011SB001, where surface soil lead concentrations were identified as a residential pathway COC. Surface soil samples were collected from these borings for metals analysis. The soil sampling was conducted on December 14, 1999.

1 These surface soil sample results were screened against the Zone G BRCs and Zone G
2 background ranges for metals, and then compared to the EPA generic SSLs (DAF = 10) and
3 Region III residential RBCs (2000). Inorganic analytes that were detected above the Zone G
4 background range were not considered COPCs if the detected concentration was less than
5 the RBCs or SSLs. Calcium and sodium were detected in the sample obtained from
6 G011SB009 above BRCs, but there was no established SSL or RBC for these parameters.
7 There were no inorganic concentrations above the RBCs or SSLs in the surface soil samples
8 collected from the additional investigation. A summary of the detected analytes is
9 presented in Table 4-1.

10 **4.1.2 Subsurface Soil**

11 The results of the analytes detected in the subsurface soil samples from the additional
12 investigation (G011SB006, G011SB007, G011SB008, G011SB009, and G011SB011) are
13 presented in Table 4-2. Subsurface soil inorganic results were screened against the Zone G
14 BRCs and Zone G background ranges for inorganics (metals). Inorganic compounds that
15 were detected with concentrations within the Zone G background range for subsurface soils
16 were eliminated from further consideration. The inorganic analytes detected above the
17 BRCs and Zone G background ranges were then screened against the generic SSLs (using a
18 DAF = 10). Inorganic analytes detected above both the Zone G background range maximum
19 value and SSLs were considered COPCs based on their potential to adversely affect the
20 groundwater quality.

21 Soil concentrations (3.0 to 4.8 mg/kg) for tin were slightly above the background range
22 values (1.1 to 2.9 mg/kg) in four subsurface soil samples. There is no SSL listed for tin in the
23 EPA SSL guidance document, or in EPA Region III RBC tables. Tin is further evaluated as a
24 COPC in Section 5.0 of this RFI Report Addendum.

25 Barium (G011SB011) and selenium (G011SB007, G011SB008, and G011SB011) concentrations
26 in the soil samples were above the Zone G background range, but below the SSL. No other
27 inorganics were detected at concentrations above the Zone G background range.

28 **4.1.3 Sediment Samples**

29 Two sediment samples were collected in the area near previous sampling location
30 G011M001 (refer to Figure 2-1). The results of the analytes detected in the sediment soil
31 samples are presented in Table 4-3. The sample results were screened against Zone G
32 background ranges for surface soil. The analytes detected above the Zone G background
33 range were then screened against the sediment screening values (SSVs) (EPA Region IV
34 Ecological Risk Assessment Bulletin). Concentrations of analytes exceeding both the Zone G

1 background range and the SSVs would then be identified as COPCs. No inorganics detected
2 in sediments exceeded their background ranges.

3 **4.1.4 CH2M-Jones Soil Sampling**

4 In June 2001, CH2M-Jones staff collected soil samples to further investigate lead in surface
5 soils, as outlined in the IM Work Plan which was submitted to the BCT in May 2001. Four
6 surface soil samples were collected from the area immediately adjacent to soil boring
7 G011SB001 near the northern SWMU boundary to further investigate the lead levels
8 detected at that location during the RFI.

9 The four new samples were collected from within a 6 to 8 ft radius of the boring G011SB001
10 location, approximately 90 degrees apart from each other. Figure 4-2 presents the locations
11 of these samples in relation to boring G011SB001 and to the SWMU boundary.

12 The samples were analyzed for lead using EPA Method SW 846-6010, and the results are
13 summarized in Table 4-4. The complete analytical results are presented in Appendix D of
14 this RFI Report Addendum.

15 The results of CH2M-Jones' soil sampling indicate that lead was detected in all four of the
16 surface soil samples near boring G011SB001, but at concentrations well below the typical
17 value considered suitable for unrestricted land use of 400 mg/kg. These results indicate that
18 the isolated occurrence of lead at this location does not constitute a significant soil
19 contamination source area.

TABLE 4-1
 Analytes Detected in Surface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to- Groundwater SSL ^a (DAF=10)	Region III Residential Soil RBC ^b	Zone G Surface Soil Background Range ^d
Aluminum	G011SB006	5,310	=	4,190,000	200,000	2,190 - 17,800
	G011SB007	10,400	=			
	G011SB008	4,710	=			
	G011SB009	7,010	=			
	G011SB010	6,020	=			
	G011SB011	8,030	=			
Antimony	G011SB006	0.66	J	10.7	88	0.79 - 5.7
	G011SB007	0.93	J			
	G011SB008	0.91	J			
	G011SB010	0.51	J			
	G011SB011	1.00	J			
Arsenic	G011SB006	4.6	=	804	3.8	3.1 - 25
	G011SB007	7.1	=			
	G011SB008	3.5	=			
	G011SB009	6.0	J			
	G011SB010	1.3	J			
	G011SB011	5.6	=			
Barium	G011SB006	24.3	=	1,416	14,000	11 - 129
	G011SB007	24.2	=			
	G011SB008	24.8	=			
	G011SB009	24.1	J			
	G011SB010	14.2	J			
	G011SB011	48.6	=			
Beryllium	G011SB006	0.67	=	21.0	410	0.47 - 1.1
	G011SB007	0.86	=			
	G011SB008	0.39	=			
	G011SB010	0.17	J			
	G011SB011	0.47	J			
Cadmium	G011SB006	0.08	J	33.8	100	0.12 - 1.7
Calcium	G011SB006	26,200	J	NL	NL	8,920 - 52,300
	G011SB007	33,200	J			
	G011SB008	5,330	J			
	G011SB009	143,000	J			
	G011SB010	2,550	J			
	G011SB011	5,160	J			
Chromium, Total	G011SB006	14.4	=	5,384	610	7.0 - 39
	G011SB007	23.1	=			

TABLE 4-1
 Analytes Detected in Surface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Region III Residential Soil RBC ^b	Zone G Surface Soil Background Range ^d
Chromium, Total	G011SB008	9.5	=	5,384	610	7.0 - 39
	G011SB009	15.1	=			
	G011SB010	8.2	=			
	G011SB011	21.8	=			
Cobalt	G011SB006	1.4	J	NL	12,000	1.1 - 6.2
	G011SB007	2.7	J			
	G011SB008	1.5	J			
	G011SB009	2.5	J			
	G011SB010	0.95	J			
	G011SB011	1.9	J			
Copper	G011SB006	29.8	=	2,191	8,200	23 - 431
	G011SB007	14.0	=			
	G011SB008	15.2	=			
	G011SB009	6.0	J			
	G011SB010	7.5	=			
	G011SB011	8.8	=			
Iron	G011SB006	6390	=	1,370,000	61,000	4,300 - 32,700
	G011SB007	1,200	=			
	G011SB008	6,930	=			
	G011SB009	9,630	=			
	G011SB010	2,890	=			
	G011SB011	12,700	=			
Lead	G011SB006	148.0	=	333	400 ^c	3.5 - 275
	G011SB007	33.9	=			
	G011SB008	143.0	=			
	G011SB009	18.7	=			
	G011SB010	7.6	=			
	G011SB011	69.9	=			
Magnesium	G011SB006	922	=	NL	NL	766 - 5,280
	G011SB007	2,230	=			
	G011SB008	460	=			
	G011SB009	1,760	J			
	G011SB010	370	J			
	G011SB011	814	=			
Manganese	G011SB006	62.1	=	NL	4,100	39 - 359
	G011SB007	74.4	=			
	G011SB008	43.3	=			
	G011SB009	135.0	=			

TABLE 4-1
 Analytes Detected in Surface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Region III Residential Soil RBC ^b	Zone G Surface Soil Background Range ^d
Manganese	G011SB010	13.8	=	NL	4,100	39 - 359
	G011SB011	28.1	=			
Mercury	G011SB006	0.52	=	36.2	23 ^c	0.060 - 2.0
	G011SB007	0.18	=			
	G011SB008	0.38	=			
	G011SB009	0.04	=			
	G011SB011	0.15	=			
Nickel	G011SB006	5.9	=	1,615	4,100	2.0 - 27
	G011SB007	9.7	=			
	G011SB008	3.7	=			
	G011SB009	4.2	J			
	G011SB010	2.6	J			
	G011SB011	3.6	J			
Potassium	G011SB006	494	=	NL	NL	280 - 1,730
	G011SB007	653	=			
	G011SB008	167	J			
	G011SB009	449	J			
	G011SB010	240	J			
	G011SB011	323	J			
Selenium	G011SB006	0.86	J	252	1,000	0.45 - 1.4
	G011SB007	1.30	=			
	G011SB008	0.76	J			
	G011SB010	0.47	J			
	G011SB011	1.30	=			
Sodium	G011SB006	336.0	J	NL	NL	394 - 1,150
	G011SB007	299.0	J			
	G011SB008	105.0	J			
	G011SB009	1,720.0	J			
	G011SB010	84.1	J			
	G011SB011	202.0	J			
Tin (Sn)	G011SB006	4.2	J	NL	120,000	2.6 - 26
	G011SB007	3.3	J			
	G011SB008	4.0	J			
	G011SB009	5.1	J			
	G011SB010	2.8	J			
	G011SB011	3.5	J			

TABLE 4-1
 Analytes Detected in Surface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Region III Residential Soil RBC ^b	Zone G Surface Soil Background Range ^d
Vanadium	G011SB006	12.7	=	3,000	1,400	7.2 - 57
	G011SB007	28.4	=			
	G011SB008	15.9	=			
	G011SB009	16.0	J			
	G011SB010	10.4	=			
	G011SB011	22.7	=			
Zinc	G011SB006	113.0	J	6,000	61,000	18 - 1,650
	G011SB007	46.4	J			
	G011SB008	52.8	J			
	G011SB009	33.9	J			
	G011SB010	17.0	J			
	G011SB011	67.4	J			

^a Calculated using EPA Generic SSL (DAF=20) value and dividing by 2, obtained from the EPA Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, May 1996.

^b Residential RBCs (HI = 0.1 for non-carcinogens) were obtained from the EPA Region III, RBC Table, October 5, 2000 (<http://www.epa.gov/epahome/search.html>) unless otherwise noted.

^c Residential RBC for lead and mercury were obtained from ingestion values in the EPA Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, May 1996.

^d Surface soil background (grid-based) range is a range of Zone G grid-based sample concentrations.

= chemical detected at concentration shown

DAF dilution attenuation factor

HI hazard index

J chemical detected at concentration below method detection limit

NL not listed

RBC risk-based concentration

SSL soil screening level

TABLE 4-2
 Analytes Detected in Subsurface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Zone G Subsurface Soil Background (Grid-Based) Range ^b
Aluminum	G011SB006	6,760	=	NL	2,630 - 36,800
	G011SB007	15,600	=		
	G011SB008	11,100	=		
	G011SB009	11,100	=		
	G011SB011	18,000	=		
Antimony	G011SB006	0.53	J	2.5	NA
	G011SB007	1.20	J		
	G011SB008	0.86	J		
	G011SB011	0.68	J		
Arsenic	G011SB006	2.9	=	14.5	1.4 - 36
	G011SB007	7.7	=		
	G011SB008	4.7	=		
	G011SB009	2.4	J		
	G011SB011	3.6	=		
Barium	G011SB006	22.3	=	800	7.7 - 63
	G011SB007	26.0	=		
	G011SB008	21.9	=		
	G011SB009	42.7	J		
	G011SB011	73.1	=		
Beryllium	G011SB006	0.60	=	31.5	0.45-2.4
	G011SB007	1.10	=		
	G011SB008	0.30	J		
	G011SB011	0.74	=		
Calcium	G011SB006	6,730	J	NL	6,390 -127,000
	G011SB007	5,580	J		
	G011SB008	2,270	J		
	G011SB009	3,060	J		
	G011SB011	8,070	=		
Chromium, Total	G011SB006	10.5	=	19	7.4 - 65
	G011SB007	30.3	=		
	G011SB008	18.1	=		
	G011SB009	16.0	=		
	G011SB011	33.9	=		
Cobalt	G011SB006	1.0	J	NL	0.90 - 15
	G011SB007	5.6	J		

TABLE 4-2
 Analytes Detected in Subsurface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Zone G Subsurface Soil Background (Grid-Based) Range ^b
Cobalt	G011SB008	1.3	J	NL	0.90 - 15
	G011SB009	2.6	J		
	G011SB011	3.8	J		
Copper	G011SB006	2.40	=	5,500 ^c	1,070 - 3,890
	G011SB007	23.40	=		
	G011SB008	0.89	J		
	G011SB009	1.40	J		
	G011SB011	5.00	=		
Iron	G011SB006	7,530	=	NL	3,110 - 58,100
	G011SB007	19,800	=		
	G011SB008	16,100	=		
	G011SB009	12,300	=		
	G011SB011	14,500	=		
Lead	G011SB006	18.5	=	400	2.4 - 76
	G011SB007	30.6	=		
	G011SB008	17.4	=		
	G011SB009	18.8	=		
	G011SB011	21.3	=		
Magnesium	G011SB006	662	=	NL	1,040 - 7,040
	G011SB007	2,410	=		
	G011SB008	827	=		
	G011SB009	699	J		
	G011SB011	1,750	=		
Manganese	G011SB006	21.5	=	475 ^c	20 - 409
	G011SB007	290.0	=		
	G011SB008	28.2	=		
	G011SB009	44.4	=		
	G011SB011	38.0	=		
Mercury	G011SB006	0.51	=	NL	0.050-0.37
	G011SB007	0.31	=		
	G011SB011	0.24	=		
Nickel	G011SB006	2.6	J	6,500	1.9 - 22
	G011SB007	10.4	=		
	G011SB008	1.7	J		
	G011SB009	3.1	J		
	G011SB011	6.3	=		

TABLE 4-2
 Analytes Detected in Subsurface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL ^a (DAF=10)	Zone G Subsurface Soil Background (Grid-Based) Range ^b
Potassium	G011SB006	221	J	NL	670 - 3,790
	G011SB007	1,190	=		
	G011SB008	329	J		
	G011SB009	185	J		
	G011SB011	1,210	=		
Selenium	G011SB006	0.9	J	2.5	0.54 - 1.0
	G011SB007	2.0	=		
	G011SB008	2.3	=		
	G011SB011	1.3	=		
Sodium	G011SB006	101	J	NL	1,070 - 3,890
	G011SB007	194	J		
	G011SB008	154	J		
	G011SB011	268	J		
Thallium	G011SB011	0.34	J	0.35	1.0 - 1.0
Tin (Sn)	G011SB006	3.0	J	NL	1.1 - 2.9
	G011SB007	4.8	J		
	G011SB008	3.5	J		
	G011SB009	4.8	J		
Vanadium	G011SB006	15.5	=	3,000	5.9 - 112
	G011SB007	49.8	=		
	G011SB008	29.9	=		
	G011SB009	20.8	J		
	G011SB011	37.9	=		
Zinc	G011SB006	14.4	J	6,000	20 - 198
	G011SB007	71.6	J		
	G011SB008	16.3	J		
	G011SB009	14.7	J		
	G011SB011	31.9	=		

Concentrations outlined and in bold text exceed both the Zone G background ranges and the SSL.

^a Calculated using EPA Generic SSL (DAF=20) value, obtained from the EPA Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, May 1996, and dividing by 2 for DAF=10 value.

^b Subsurface soil background (grid-based) reference screening value range is a range of Zone G grid-based sample concentrations.

^c Calculated using EPA Region III RBC Table, October 5, 2000 generic SSL values, DAF=20 and dividing by 2 for DAF=10 value.

= chemical detected at concentration shown

TABLE 4-2
 Analytes Detected in Subsurface Soil
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to- Groundwater SSL ^a (DAF=10)	Zone G Subsurface Soil Background (Grid-Based) Range ^b
DAF	dilution attenuation factor				
J	chemical detected at concentration below method detection limit				
NL	not listed				
RBC	risk-based concentration				
SSL	soil screening level				

TABLE 4-3
 Analytes Detected in Sediment
 RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Sediment Screening Values ^a	Zone G Surface Soil Background Range ^b
Aluminum	G011M0003	1,370	=	NL	2,190 - 17,800
	G011M0004	4,050	=		
Antimony	G011M0003	0.29	J	12	0.79 - 5.7
	G011M0004	0.30	J		
Arsenic	G011M0003	0.32	J	7.24	3.1 - 25
	G011M0004	0.78	J		
Barium	G011M0003	2.50	J	NL	11 - 129
	G011M0004	9.20	J		
Calcium	G011M0003	475	=	NL	8,920 - 52,300
	G011M0004	218	J		
Chromium, Total	G011M0003	2.4	=	52.3	7.0 - 39
	G011M0004	5.0	=		
Cobalt	G011M0003	0.25	J	NL	1.1 - 6.2
	G011M0004	0.51	J		
Copper	G011M0003	0.52	J	18.7	23 - 431
	G011M0004	1.20	J		
Iron	G011M0003	639	=	NL	4,300 - 32,700
	G011M0004	2,070	=		
Lead	G011M0003	3.1	=	20.3	3.5 - 275
	G011M0004	4.7	=		
Magnesium	G011M0003	41.6	J	NL	766-5,280
	G011M0004	122.0	J		
Manganese	G011M0003	6.2	=	NL	39-359
	G011M0004	13.4	=		
Nickel	G011M0003	0.55	J	15.9	2.0-27
	G011M0004	1.50	J		
Potassium	G011M0003	25.3	J	NL	280-1,730
	G011M0004	77.9	J		
Sodium	G011M0004	41.2	J	NL	394-1,150
Vanadium	G011M0003	2.1	J	NL	7.2-57
	G011M0004	5.9	=		
Zinc	G011M0003	2.8	=	124	18-1,650
	G011M0004	6.1	=		

^a Sediment Screening Values were obtained from the EPA Region IV, Waste Management Division - Ecological Risk Assessment Bulletin: Sediment Screening Values for Hazardous Waste Sites, Table 3, updated 8-11-1999.

^b Surface soil BRCs are a range Zone G background grid sample concentrations.

= chemical detected at concentration shown

TABLE 4-3
 Analytes Detected in Sediment
RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

	Parameter	Location	Concentration (mg/kg)	Qualifier	Sediment Screening Values^a	Zone G Surface Soil Background Range^b
DAF	Dilution attenuation factor					
J	chemical detected at concentration below method detection limit					
NL	not listed					
RBC	risk-based concentration					
SSV	sediment screening value					

TABLE 4-4
Lead Concentrations in Surface Soils Near Boring G011SB001
RFI Report Addendum, SWMU 11, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier
Lead	G011SB012	42.2	=
	G011SB013	64	=
	G011SB014	64.7	=
	G011SB015	103	=

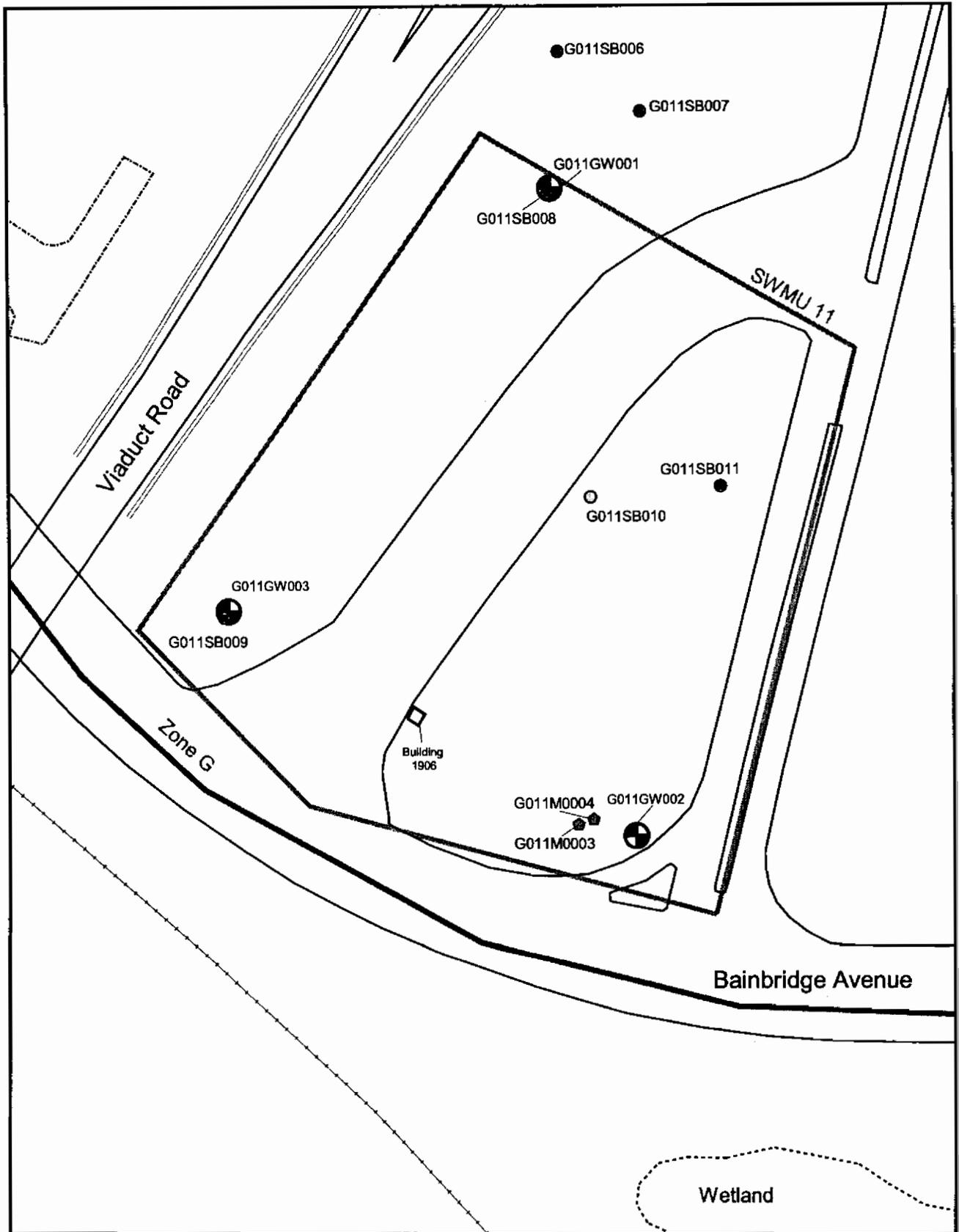
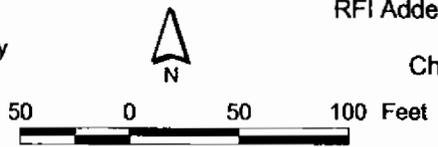
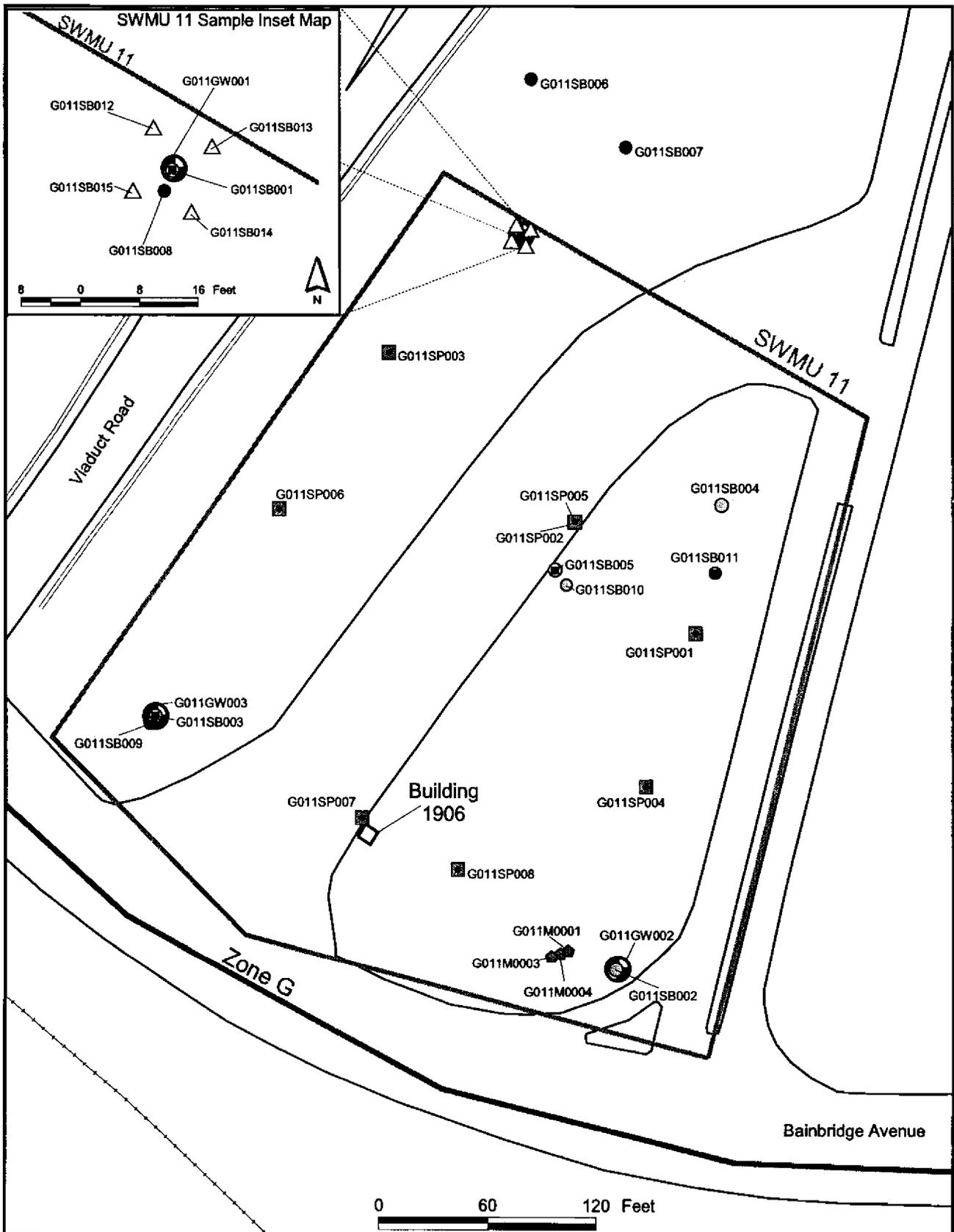


Figure 4-1
RFI Addendum Sample Locations
SWMU 11, Zone G
Charleston Naval Complex

- | | |
|---------------------------|-----------------|
| ● RFI Addendum Samples | □ Buildings |
| ● Sediment Samples | □ Zone Boundary |
| ■ Subsurface Soil Samples | □ SWMU Boundary |
| ⊙ Surface Soil Samples | ∧ Roads |
| ⊕ Groundwater Wells | ∧ Pavement |
| ⋯ Wetland | ∧ Sidewalk |
| ∧ Railroads | |



CH2MHILL



- △ CH2M-Jones Surface Soil Sample Locations
- Subsurface Soil Samples
- ⊙ Surface Soil Sample
- ▣ Soil Probe
- ⊕ Sediment Sample
- ⊗ Groundwater Well

- Roads
- Railroads
- Sidewalk
- ▭ Buildings
- ▭ SWMU Boundary
- ▭ Zone Boundary



Figure 4-2
Soil Sampling Locations
SWMU 11, Zone G
Charleston Naval Complex

CH2MHILL

5.0 COPC/COC Refinement

The Zone G RFI Report, Revision 0 (EnSafe, 1998) identified lead as the only COC in surface soil for an unrestricted land use scenario. No other COCs were identified. Tin was identified as a COPC for subsurface soil in Section 4.0 of this report addendum, based on exceedance of the screening criteria.

5.1 Surface Soil

5.1.1 Lead

The lead concentration in one sample (1,100 mg/kg in boring G011SB001) exceeded the Zone G background range, the typical unrestricted land use target cleanup level of 400 mg/kg, and the typical industrial land use cleanup level of 1,000 mg/kg. None of the four additional soil samples collected by CH2M-Jones surrounding this location exceeded the 400 mg/kg unrestricted use RBC for surface soils. In addition, the lead concentration in the subsurface soil sample at boring G011SB001 (17 mg/kg) was well below criteria, indicating that the leaching of lead is not occurring.

Based on these results, the extent of lead in surface soil exceeding 400 mg/kg at this location is a spot location centered around boring G011SB001. The average lead concentration in samples in this area is 275 mg/kg, which is well below the 400 mg/kg criteria. The monitoring well at this location has also not detected lead, indicating that leaching is not occurring. Based on these considerations, the extent of lead in soil at this site is not sufficient to pose a significant threat to human health or the environment. Lead is not considered a COC at SWMU 11.

5.2 Subsurface Soil

5.2.1 Tin

Soil concentrations (3.0 to 4.8 mg/kg) for tin were slightly above the range found in Zone G grid samples (1.1 to 2.9 mg/kg). The EPA does not list an SSL for tin. Using the base-wide CNC tin background range (0.64 to 24 mg/kg), the soil concentrations observed in the SWMU 11 samples fall within the lower end of this range. In addition, tin did not exceed background levels in any of the original RFI soil samples, indicating that it is not widely

1 present at the site, nor is it a COPC/COC in groundwater. Tin is not considered a COC at
2 SWMU 11.

3 **5.3 Sediment**

4 There were no COPCs identified in the additional sediment samples (G011M003 and
5 G011M004) collected at SWMU 11. However, the RFI identified mercury concentrations (2.1
6 mg/kg) at location G011M001 (at the entrance to drainage culvert) as exceeding the Zone G
7 BRC value and the SSV. The downgradient sediment sample, G011M002 (at the exit of
8 drainage culvert, prior to discharge into wetland), did not display mercury concentrations
9 exceeding the SSV. A re-screening of the results indicated that sediment sample G011M001
10 contained mercury concentrations above the both the Zone G surface soil background
11 ranges and the SSV.

12 Mercury was considered a COPC in the sediment at SWMU 11, because of concentrations
13 exceeding the SSV. However, the IM conducted at the site excavated soils from land surface
14 to 5 ft bls at this location, removing the affected sediment in the area of G011M001 (refer to
15 Section 3.0 of this RFI Report Addendum). Therefore, mercury levels in the sediment at
16 SWMU 11 do not warrant further investigation or action. There were no other COPCs
17 identified in sediment at SWMU 11.

6.0 Summary of Information Related to Site Closeout Issues

6.1 RFI Status

The *Zone G RFI Report, Revision 0* (EnSafe, 1998) addressed SWMUs/AOCs within the CNC, including SWMU 11. At the conclusion of the RFI report, EnSafe did not consider the investigation to be complete for this site, and their subsequent *Zone G RFI Workplan Addendum* (EnSafe, 2000) proposed additional sampling. Reports, comments, and responses made by SCDHEC following the *Zone G RFI Report, Revision 0* confirmed that additional sampling was necessary. A copy of the Navy/EnSafe responses to SCDHEC comments on the *Zone G RFI Report, Revision 0* and the *Zone G RFI Work Plan Addendum* for this site, as well as CH2M-Jones responses to comments on the RFI Report, are provided as Appendix E.

Based upon the original field activities conducted as part of the RFI, and subsequent sampling and analysis as presented in Section 4.0 of this RFI Report Addendum, the RFI is considered complete. In accordance with the RFI completion process, if a determination of no further investigation is made upon completion of the RFI, then a site may proceed to either NFA status or to a CMS.

6.2 Presence of Inorganics in Groundwater

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

According to the RFI and the subsequent additional investigation, there were no inorganic analytes present in the subsurface soil at concentrations above their applicable SSLs. Arsenic and iron were previously detected in groundwater at levels above criteria at SWMU 11. Iron concentrations have decreased, but are still above the screening criteria. Arsenic and thallium levels have decreased to below the MCL, and are within the overall CNC background range. During the RFI, mercury was detected at concentrations below the MCL and RBC, and concentrations have since decreased to below detection limits.

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

SWMU 11 was an acetylene plant, which piped acetylene to the shipyard and pumped the calcium hydroxide enriched water byproduct into adjacent holding ponds. Based upon available information, there do not appear to be any impacts to groundwater from site operations, or to sanitary sewers from groundwater. No COPCs were identified in groundwater during the RFI. Further evaluation of this issue is not warranted.

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

Potential linkage of a SWMU or AOC to a storm sewer refers to the possibility of a groundwater plume at a SWMU or AOC migrating into a storm sewer from which it would subsequently migrate to the water bodies around the CNC, or to the presence of a cross connection between the sanitary sewer and storm sewer. Available information does not indicate that storm sewers are impacting the site, and the IM addressed the mercury detected in ditch sediments at the southeast corner of the SWMU (sample G011M001). Mercury was not detected in the two additional sediment samples collected at this location during the RFI work plan addendum field work. Therefore, further evaluation of this issue is not warranted.

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

The nearest investigated railroad line to SWMU 11 is approximately 120 ft to the southwest. There is no known linkage between SWMU 11 and the investigated railroad lines of AOC 504. Therefore, 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 SWMU 11 is a wetland associated with Shipyard Creek, which lies approximately 160 ft to the southeast. Two potential migration pathways from the site to surface water are overland flow via stormwater runoff, and subsurface flow via groundwater. Mercury was identified as a COPC in sediment soil at the entrance to a drainage culvert that leads to the wetland. Lead was identified as a COPC/COC in surface

1 soils at SWMU 11, but not in sediments. A sediment sample collected at the exit of the
2 drainage culvert into the wetland did not contain lead or any other inorganics above
3 RBCs/SSVs. The surface soils with lead at levels exceeding the screening criteria appear to
4 be isolated, and do not comprise a large enough source to make the overland flow of lead in
5 soils via stormwater a valid exposure pathway.

6 There were no COPCs identified in groundwater. The results of the IM conducted at the site
7 removed the sediment containing the COPC mercury. Therefore, further evaluation of
8 mercury as a COPC/COC in sediments is not warranted.

9 **6.7 Potential Contamination in Oil/Water Separators (OWSs)**

10 The issue of potential contamination of OWSs refers to the possible presence of an OWS that
11 has not yet been investigated at a SWMU or AOC as part of the RCRA or UST process.

12 Neither the RCRA Facility Assessment (RFA) nor the RFI refer to the presence or possible
13 presence of an OWS at SWMU 11. In addition, there is no visual evidence of an OWS at this
14 site. There is also no reference made in the basewide OWS report prepared by the Navy in
15 Y2000 to an OWS at this facility. Therefore, further evaluation of this issue at SWMU 11 is
16 not warranted.

17 **6.8 Land Use Control Management Plan**

18 No COCs were identified for SWMU 11. However, because elevated pH of some residual
19 in-place waste could be a concern during future subsurface construction at the site, CH2M-
20 Jones recommends that land use controls be considered for SWMU 11.

21 The land use controls should be consistent with the proposed industrial future land use,
22 and may include controlling site access to minimize erosion of the existing vegetative cover
23 and recording on the deed of the site condition.

1 **7.0 Recommendations**

2 SWMU 11 was a former acetylene plant that discharged a byproduct of calcium hydroxide
3 saturated water into holding ponds. The holding ponds have been filled and the plant is no
4 longer visible on site. SWMU 11 is currently a grassy area covered with paved roads
5 running through the center of the site and bordering the west, east, and south sides. An IM
6 was completed at the site to stabilize the soil in the drainage swales (DET, 1999).

7 Based upon the original field activities conducted as part of the RFI, and subsequent
8 sampling and analysis as presented in Section 4.0 of this RFI Report Addendum, the RFI is
9 considered complete. No COCs are identified at the site. This site is recommended for NFA.

1 **8.0 References**

- 2 EnSafe Inc. *Zone G RFI Report, NAVBASE Charleston*. Revision 0. February 28, 1998.
- 3 EnSafe Inc. *Zone G RFI Report Workplan Addendum, NAVBASE Charleston*. January 17, 2000.
- 4 Environmental Detachment Charleston, S.C (DET). *Completion Report: Interim/Stabilization*
- 5 *Measure for SWMU 11, NAVBASE Charleston*. February 2, 1999.
- 6 Geraghty and Miller. *Confirmation Study – Assessment of Potential Oil and Hazardous Waste*
- 7 *Contamination of Soil and Groundwater at the Charleston Naval Shipyard*. 1982.
- 8 U.S. Environmental Protection Agency. *EPA Soil Screening Guidance: Technical Background*
- 9 *Document*. 1996a.
- 10 U.S. Environmental Protection Agency. *EPA Drinking Water Regulations and Health*
- 11 *Advisories*. 1996b.
- 12 U. S. Environmental Protection Agency. *Region 4 Ecological Risk Assessment Bulletins –*
- 13 *Supplement to RAGS*. April 20, 2001.



DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, USN
PORTSMOUTH, VIRGINIA, ENVIRONMENTAL DETACHMENT CHARLESTON
1898 NORTH HOBSON AVENUE, BUILDING 38
NORTH CHARLESTON, SOUTH CAROLINA 29405-2106

FEB 02 1990

IN REPLY REFER TO:

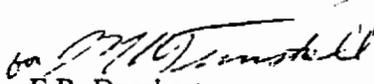
Ser: 079

Mr. G. Randall Thompson, Director
Division of Hazardous and Infectious Waste Management
Bureau of Solid and Hazardous Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia SC 29201

Dear Mr. Thompson:

The enclosed interim measure completion report for Solid Waste Management Unit (SWMU) 11 is submitted to fulfill the requirement of Permit Condition IV.D.6 for Permit Number SCO 170 022 560. If the Department of Health and Environmental Control should have any questions, please contact David Dodds of Southern Division Naval Facilities Engineering Command (NAVFAC) at (803) 820-5578.

Sincerely,


E.R. Dearhart
Director

Encl:
(1) SWMU 11 Completion Report

Copy to:
SCDHEC (Mr. Tapia, Mr. Bergstrand)
USEPA (Mr. Spariosu)
CSO Naval Base Charleston (LCDR Rose)
NAVFAC (Mr. Dodds)
EA&H (Ms. Maddux)

COMPLETION REPORT

Interim/Stabilization Measure for
SWMU 11
Charleston Naval Complex, Charleston, SC

Engineering Branch Head:

J. M. K. Install

Date:

2-7-99

Prepared By:

Weather A. K. Kinsal

Date:

2-7-99

REPORT GENERATED BY:
ENVIRONMENTAL DETACHMENT CHARLESTON
1899 NORTH HOBSON AVENUE
NORTH CHARLESTON, SC 29405



COMPLETION REPORT

INTERIM/STABILIZATION MEASURE FOR

SWMU 11

NAVAL BASE CHARLESTON

CHARLESTON, SC



Prepared for:

DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

CHARLESTON SC



Prepared by:

Supervisor of Shipbuilding, Conversion and Repair,

USN, (SUPSHIP) Portsmouth Va.,

Environmental Detachment Charleston, S.C.

1899 North Hobson Ave.

North Charleston, SC 29405-2106

February 2, 1999

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ACRONYMS, ABBREVIATIONS and SYMBOL

AOC	Area of Concern
BLS	Below Land Surface
CMS	Corrective Measures Study
DERP	Defense Environmental Restoration Program
DET	Environmental Detachment Charleston
DON	Department of the Navy
IM	Interim Measure
IR	Installation Restoration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SUPSHIP	Supervisor of Shipbuilding, Conversion and Repair, USN
SWMU	Solid Waste Management Unit
USN	United States Navy

1. INTRODUCTION

1.1 INSTALLATION RESTORATION PROGRAM The purpose of the Department of the Navy (DON) Installation Restoration (IR) Program is to identify, assess, characterize and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities. The Defense Environmental Restoration Program (DERP) is codified in the Superfund Amendments and Reauthorization Act (SARA) Section 211 (10 USC 2701). The IR Program is a component of DERP.

1.1.1 Naval Base Charleston IR Program At Naval Base Charleston, a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was prepared which divided the Naval Base into zones and identified Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) within each zone. The RFA evaluated each SWMU and AOC and determined which sites required further investigation. Based on the RFA, a RCRA Facility Investigation (RFI) Work Plan has been or is being prepared for each zone containing SWMUs and AOCs requiring further investigation. On completion of the RFI for each Zone, a RFI report will be prepared for that zone. The RFI reports will identify SWMUs and AOCs containing wastes requiring remediation. Eventually, Corrective Measures Studies (CMSs) will be prepared to determine the best means of remediating each site.

1.2 INTERIM MEASURES Interim Measures (IM) performed as part of the IR Program are intended to eliminate sources of environmental contamination or limit the spread of environmental contaminants prior to the completion of the RFI CMS.

1.3 SWMU 11 SWMU 11 is the site of the former caustic pond near the interchange formed by the junction of Bainbridge Avenue and Viaduct Road, located in Zone G of the former Naval Base Charleston. The pond was used between the early 1940's and the early 1970's for the disposal of calcium hydroxide (lime) sludge generated as a byproduct of acetylene gas production. The pond was abandoned rather than closed, and no lime was removed when acetylene production ceased.

The site is an open space landscaped with grass. Calcium hydroxide sludge was visible in the unfilled ditch area of the drainage culvert and in the culvert piping draining to the marsh located in the southwest corner of SWMU 11. See Figure 1 for site location.

Direct Push Technology (DPT) samples taken by Ensafe during the Zone G RCRA Facility Investigation, February 1998, found a layer of calcium hydroxide sludge one foot thick at a depth of 2' to 4'. Groundwater samples collected from monitoring wells installed on site indicated a neutral pH.

To further delineate the vertical and horizontal extent of the former pond, Environmental Detachment Charleston (DET) conducted trenching operations which involved the use of a backhoe to trench a two foot wide area, removing approximately six inches of soil at a time. The average depth at which the lime layer was encountered was 2 – 2 1/2 feet below ground surface. See Figure 2 for locations of trenches and depths the lime layer was encountered. The DET also collected surface water samples from several locations in the ditch that surrounds the perimeter of the site. In the low lying area near the drainage culvert, where the lime sludge is visible, an unagitated water sample indicated a pH of 11.65 and an agitated water sample a pH of 12.05. See Figure 2 for locations of pH readings.

1.4 SWMU 11 INTERIM MEASURE During the interval between the RFI and the completion of the CMS, it was decided by Southern Division Naval Facilities Engineering Command (SOUTHDIV) that an IM would be performed by Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP), United States Navy (USN), Portsmouth Va. Environmental Detachment Charleston (SPORTENVDETCHASN). The scope of IM was limited to excavation and disposal of soil in the area of the ditch and drainage culvert where the calcium hydroxide was visible due to erosion. It was not the intent of this IM to address removal of the entire calcium hydroxide layer. This IM is consistent with the ultimate cleanup of SWMU 11 and is not intended to circumvent the public participation process inherent within environmental cleanup under RCRA authority.

1.4.1 SWMU 11 INTERIM MEASURE EXECUTION SUMMARY The execution of this IM consisted of an excavation at the site. The Work Plan required the excavation of calcium

hydroxide contaminated soil from a 30' x 20' area, ^{to} at a depth of 5'. See Appendix D for site pictures. The excavation began in November of 1997. Soil removed from the site was characterized as non-hazardous and disposed of in a certified Subtitle D landfill. No calcium hydroxide sludge was visible after excavation and subsequent fill.

1.4.2 SWMU 11 INTERIM MEASURE CONCLUSION

This Interim Measure effectively removed contaminated soil from land surface to approximately 5' below land surface (BLS) in the area along the ditch line and culvert where the calcium hydroxide layer was visible. This site will be monitored for visible evidence of calcium hydroxide migration, on a monthly basis, for a period of six months.

2. INTERIM MEASURE EXECUTION

2.1 ACTIONS REQUIRED BY INTERIM MEASURE WORK PLAN

- Removal and disposal of approximately 260 cubic yards of calcium hydroxide contaminated soil at SWMU 11.

2.2 OBSERVATIONS NOTED

2.2.1 Soil Conditions The land surface to approximately 5' below ground surface was made up of fine-grained, sandy clay soils interspersed with calcium hydroxide sludge layers. Some construction debris, i.e., concrete and lumber was present between 2' and 4'.

2.2.2 Groundwater Groundwater was encountered at approximately 4 feet.

2.3 PLAN MODIFICATIONS AND JUSTIFICATION. None.

3. INTERIM MEASURE OUTCOME

3.1 SITE CONDITIONS FOLLOWING COMPLETION OF WORK. Following completion of all site work on 24 November 1998, the DET had removed 260 cubic yards of calcium hydroxide contaminated soil. The site was back-filled with 4'6" of high end sand clay compacted every 6", covered with topsoil to ground level, graded and seeded. Site photographs are included in Appendix D.

4. SAMPLING

4.1 SAMPLING EVOLUTIONS AND RESULTS

4.1.1 Field Sampling No field sampling was performed

4.1.2 Confirmation Sampling No confirmation sampling was performed.

5. WASTE GENERATION

5.1 HAZARDOUS/POTENTIALLY HAZARDOUS WASTE

No hazardous waste was generated during this interim measure.

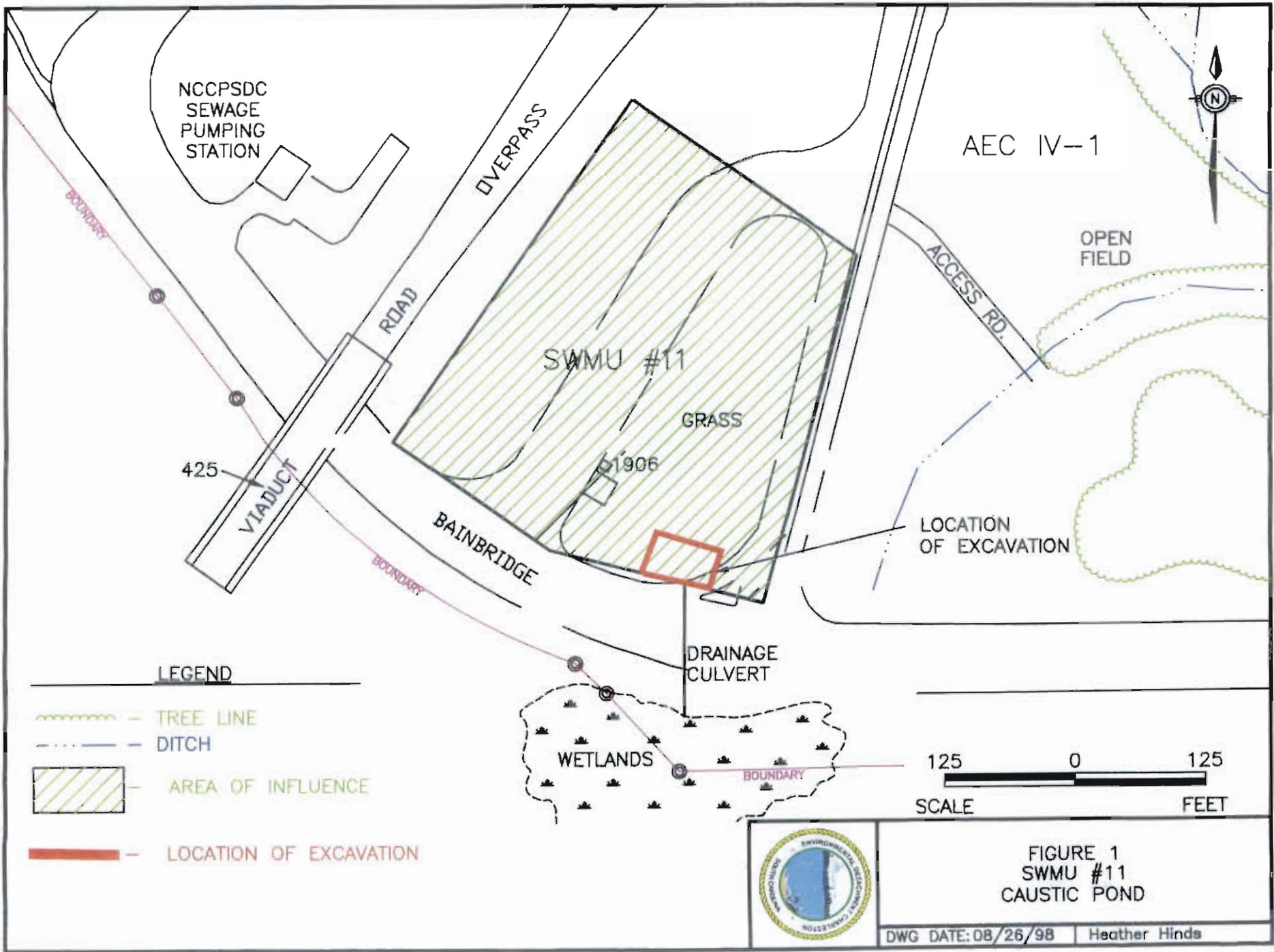
5.2 NON-HAZARDOUS WASTE

A total of 260.27 cubic yards of non-hazardous calcium hydroxide pesticide contaminated soil was disposed of to a Subtitle D landfill permitted to accept special waste.

Waste Manifests are in Appendix E.

APPENDIX A

FIGURES



NCCPSDC
SEWAGE
PUMPING
STATION

AEC IV-1

OPEN
FIELD

SWMU #11

GRASS

425

1906

LOCATION
OF EXCAVATION

BAINBRIDGE

DRAINAGE
CULVERT

WETLANDS

125 0 125
SCALE FEET

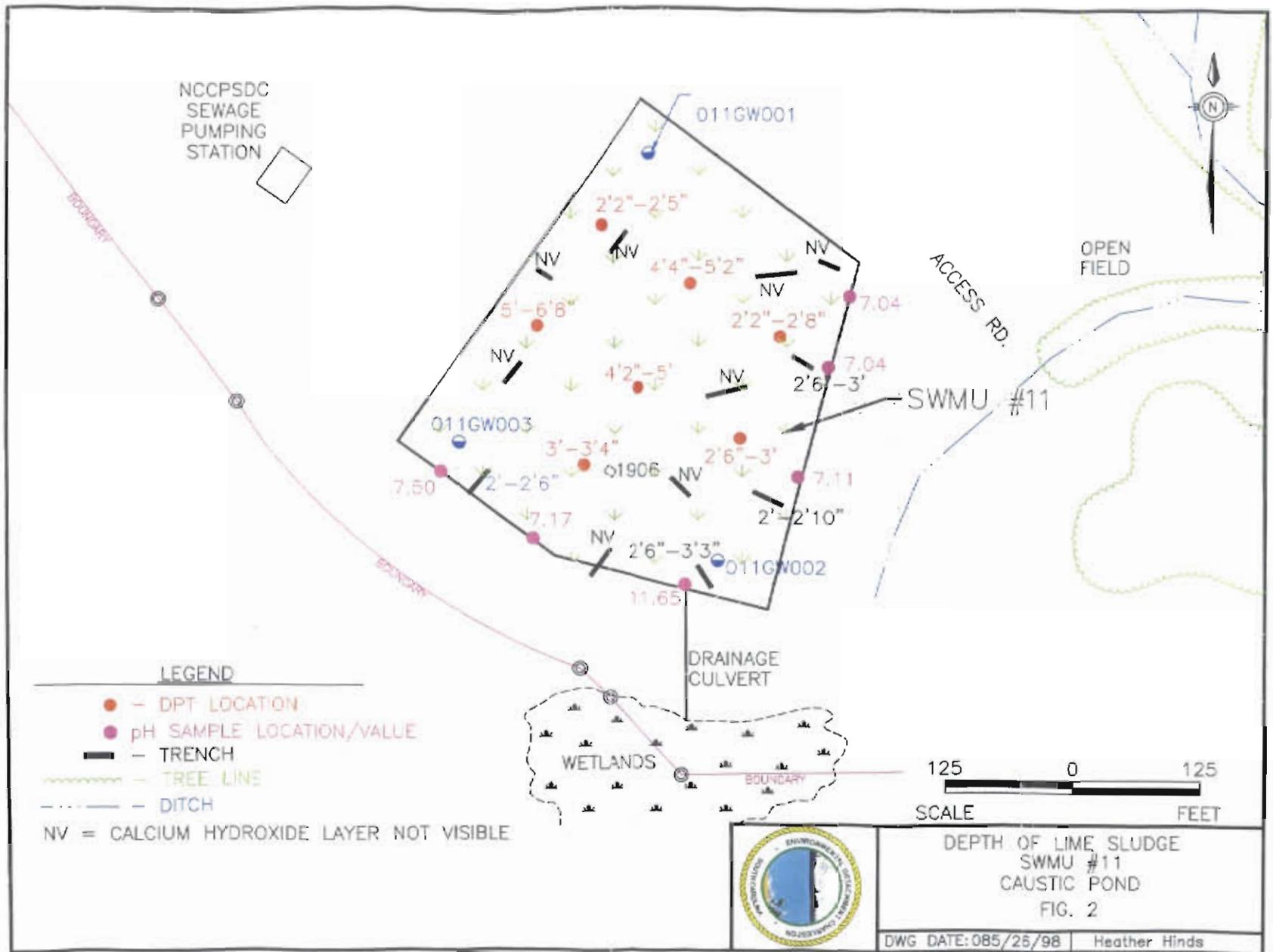
LEGEND

-  TREE LINE
-  DITCH
-  AREA OF INFLUENCE
-  LOCATION OF EXCAVATION



FIGURE 1
SWMU #11
CAUSTIC POND

DWG DATE: 08/26/98 Heather Hinds



NCCPSDC
SEWAGE
PUMPING
STATION

011GW001

OPEN
FIELD

ACCESS RD.

SWMU #11

011GW003

01906

011GW002

DRAINAGE
CULVERT

WETLANDS

BOUNDARY

BOUNDARY

BOUNDARY

NV

2'2"-2'5"

4'4"-5'2"

2'2"-2'8"

7.04

7.04

2'6"-3'

7.11

2'-2'10"

11.65

2'6"-3'3"

7.17

2'-2'6"

7.50

3'-3'4"

5'-6'8"

2'2"-2'5"

4'2"-5'

APPENDIX B

LETTERS

OF

RECORD



2600 Bull Street
Columbia, SC 29201-1708

COMMISSIONER:
Douglas E. Bryant

September 21, 1998

BOARD:
John H. Burriss
Chairman

Henry Shepard II, P.E.
Caretaker Site Office
NAVFACENGCOM, Southern Division
P. O. Box 190010
North Charleston, SC 29419-9010

William M. Hull, Jr., MD
Vice Chairman

Roger Leaks, Jr.
Secretary

Mark B. Kent

Re: Interim Measures Work Plan
for SWMU 11(Caustic Pond)
Dated September 1, 1998
Charleston Naval Complex
SCO 170 022 560

Cyndi C. Mosteller

Brian K. Smith

Rodney L. Grandy

Dear Mr. Shepard:

The South Carolina Department of Health and Environmental Control (Department) has reviewed the above referenced Interim Measures Work Plan according to applicable State and Federal Regulations, and the Charleston Naval Complex Hazardous Waste Permit, effective September 17, 1998. Based on this review and in accordance with Permit condition II.F.1(c) the Department has generated comments that do not preclude the Department from approving the Interim Measures work plan for SWMU 11. The attached comments should be considered during the implementation of work at SWMU 11 and included/considered during the preparation of the IM Report. Based on the above, the Department approves the SWMU 11 IM Work Plan for implementation. The start date for the implementation of work should be considered as September 25, 1998. Thus, in accordance with the schedule included in the work plan the IM Report should be received no later than February 19, 1999.

Should you have any questions regarding this issue, please contact Johnny Tapia at (803) 896-4179 or Paul Bergstrand at (803) 896-4016.

Sincerely,

Joan Hartley
Joan Hartley, Manager
Corrective Action Engineering Section
Bureau of Land & Waste Management

Attachments

- cc: Paul Bergstrand, Hydrogeology
- Rick Richter, Trident EQC
- Tony Hunt, SOUTHNAVFACENGCOM
- Reece Batten, SOUTHNAVFACENGCOM
- Dan Spariosu, EPA Region IV

Post-It™ brand fax transmittal memo 7671 # of pages 1

To	JED HEAMES	From	REECE BATT
Co.	DETACHMENT	Co.	SOUTHDIV
Dept.	743-6777x 123	Phone #	820-5578
Fax #		Fax #	

INTERIM MEASURES WORK PLAN
SWMU 11 (CAUSTIC POND)

Dated September 1, 1998

COMMENTS:

1. Preliminary sampling results indicate that the calcium hydroxide sludge to be removed could have a high Ph value, that could make it characteristically hazardous. Therefore the sludge removed should be characterized in accordance with R.61-79.261.22 previous to disposal. These results should be reported in the IM Report.
2. The work plan indicated the intention to conduct monthly inspections for a six month period. The IM Report should include a schedule for these planned inspections.
3. The Environmental Detachment should prepare IM work plans and reports in accordance with Permit condition II.F. of the RCRA permit effective September 17, 1998.

APPENDIX C

SAMPLING

DOCUMENTATION

APPENDIX A
 PH CALIBRATION & ANALYSIS FORM

OPERATION CHECKLIST

pH meter serial number: 005-365

- 1. No structural damage observed on meter/probe yes
- 2. Probe filled with 3N KCL yes
- 3. Probe rinsed with reagent grade water yes
- 4. Buffer solutions within expiration date yes
- 5. Check for LOW BATTERY prompt on meter yes

CALIBRATION

pH of reagent grade (De-Ionized) water 6.51
 Slope (SLP) reading of pH meter (percent) 101.2%

	TRUE VALUE AT 25°C	OBSERVED VALUE	TEMP °C
pH 4 BUFFER	<u>NA</u>	<u>NA</u>	<u>NA</u>
pH 7 BUFFER	<u>7.00</u>	<u>7.01</u>	<u>20.8°</u>
pH 10 BUFFER	<u>10.00</u>	<u>10.00</u>	<u>20.8°</u>

SAMPLE ANALYSIS

LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE LOCATION	pH 1 MEASURE	pH 2 MEASURE	pH AVERAGE
<u>78FL007-1</u>	<u>4-24-98</u>	<u>1430</u>	<u>SWMU-11 STANDING</u>	<u>11.65</u>	<u>11.65</u>	<u>11.65</u>
<u>78FL007-2</u>	<u>4-24-98</u>	<u>1430</u>	<u>SWMU-11 AGITATED</u>	<u>12.05</u>	<u>12.06</u>	<u>12.05</u>

REMARKS: pH above 10.00 STANDARD. For Info only

ANALYST: [Signature] DATE: 4/24/98 TIME: 1510

REVIEWED BY: W.R. H. [Signature] DATE: 4/24/98 TIME: 1515
 LAB DIRECTOR/SAMPLE COORDINATOR

APPENDIX A
PH CALIBRATION & ANALYSIS FORM

OPERATION CHECKLIST

pH meter serial number: 005865

- 1. No structural damage observed on meter/probe Yes
- 2. Probe filled with 3N KCL Yes
- 3. Probe rinsed with reagent grade water Yes
- 4. Buffer solutions within expiration date Yes
- 5. Check for LOW BATTERY prompt on meter Yes

CALIBRATION

pH of reagent grade (De-ionized) water 6.02
Slope (SLP) reading of pH meter (percent) 100.2%

	TRUE VALUE AT 25°C	OBSERVED VALUE	TEMP °C
pH 4 BUFFER	<u>NA</u>	<u>NA</u>	<u>NA</u>
pH 7 BUFFER	<u>7.00</u>	<u>7.00</u>	<u>24.9°C</u>
pH 10 BUFFER	<u>10.00</u>	<u>10.02</u>	<u>24.5°C</u>

SAMPLE ANALYSIS

LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE LOCATION	pH 1 MEASURE	pH 2 MEASURE	pH AVERAG
<u>98FL0008-1</u>	<u>4/29/98</u>	<u>0930</u>	<u>SWMU-11 #1</u>	<u>7.02</u>	<u>7.03</u>	<u>7.02</u>
<u>98FL0008-2</u>	<u>4/29/98</u>	<u>0930</u>	<u>SWMU-11 #2</u>	<u>7.11</u>	<u>7.11</u>	<u>7.11</u>
<u>98FL0008-3</u>	<u>4/29/98</u>	<u>0930</u>	<u>SWMU-11 #3</u>	<u>7.05</u>	<u>7.04</u>	<u>7.04</u>
<u>98FL0008-4</u>	<u>4/29/98</u>	<u>0940</u>	<u>SWMU-11 #4</u>	<u>7.13</u>	<u>7.16</u>	<u>7.17</u>
<u>98FL0008-5</u>	<u>4/29/98</u>	<u>0940</u>	<u>SWMU-11 #5</u>	<u>7.50</u>	<u>7.50</u>	<u>7.50</u>

REMARKS: FOR INFORMATION ONLY.

ANALYST: Jed B. Anderson DATE: 4/29/98 TIME: 1000

REVIEWED BY: W. R. Harris DATE: 4/29/98 TIME: 1015
LAB DIRECTOR/SAMPLE COORDINATOR



GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
 SUPSHIP-Portsmouth Detachment-Env.
 1899 North Hobson Ave.
 North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: June 02, 1998

Page 1 of 1

Sample ID : SPORT0706-1
 Lab ID : 9806027-01
 Matrix : Soil
 Date Collected : 06/01/98
 Date Received : 06/01/98
 Priority : Urgent
 Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
<i>pH - 2 items</i>											
pH		12.0	0.0100	0.100	SU	1.0	LIB	06/01/98	1747	123280	
pH Temperature		25.5	0.100	0.100	C	1.0					

M = Method	Method-Description
M 1	EPA 9045

Notes:

The qualifiers in this report are defined as follows:

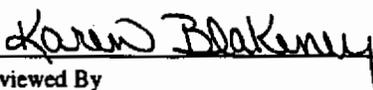
ND indicates that the analyte was not detected at a concentration greater than the detection limit.

J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

U indicates that the analyte was not detected at a concentration greater than the detection limit.

* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.


 Reviewed By





GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: June 02, 1998

Page 1 of 1

Sample ID : SPORT0706-2
Lab ID : 9806027-02
Matrix : Soil
Date Collected : 06/01/98
Date Received : 06/01/98
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
<i>pH - 2 items</i>											
pH		7.12	0.0100	0.100	SU	1.0	LIB	06/01/98	1752	123281	
pH Temperature		25.1	0.100	0.100	C	1.0					

M = Method

Method-Description

M 1 EPA 9045

Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

U indicates that the analyte was not detected at a concentration greater than the detection limit.

* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Reviewed By



QC Summary Report

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Lab. Sample ID: 9806027%

Report Date: June 02, 1998

Page 1 of 1

Sample/Parameter	Type	Batch	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analyst	Date	Time
General Chemistry													
QC511621	9806027-02DUP	123280											
pH				7.12		7.12		0.00			LIB	06/01/98	1753
pH Temperature				25.1		25.1		0.00					
QC511622	LCS	123280											
pH						6.93			99.0	(98.0 - 102.)	LIB	06/01/98	1754

Notes:

The qualifiers in this report are defined as follows:

J indicates presence of analyte < RL (Report Limit)

U indicates presence of analyte < DL (Detect Limit)

∕a indicates that spike recovery limits do not apply when
sample concentration exceeds spike conc by a factor of 4 or more

NF 00197

General Engineering
 2040 Savage Road
 Charleston, South Carolina 29407
 P.O. Box 30712
 Charleston, South Carolina 29417
 (803) 556-8171

CHAIN OF CUSTODY RECORD

9806027

Page 1 of 1

Client Name/Facility Name		SAMPLE ANALYSIS REQUIRED (X) - use remarks area to specify specific compounds or methods													Remarks			
Collected by/Company		# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method requested	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables		PCB's	Cyanide	Coliform - specify type
SAMPLE ID	DATE														TIME			
SPORTEN VDET CHASN																		
SPORTEN VDET CHASN																		
SPORT0706-1	6-1-98	1130					X	1	X									Sludge
SPORT0706-2	6-1-98	1135					X	1	X									Soil
Relinquished by:	Date:	Time:	Received by:						Relinquished by:	Date:	Time:	Received by:						
Weather G. Wind	6-1-98	1205	William Washburn						William Washburn	6/1/98	1545	[Signature]						
Relinquished by:	Date:	Time:	Received by lab by:						Date:	Time:	Remarks:							
[Signature]	6/1/98	1610	Pat Nantz						6-1-98	1610								

01
02

APPENDIX D

PHOTOGRAPHS



SWMU 11 - START OF EXCAVATION



SWMU 11 DURING EXCAVATION



SWMU 11 - EXCAVATION AT 5 FEET



SWMU 11 - DURING FILLING OF EXCAVATION



SWMU 11 - DITCH AND CULVERT AFTER COMPLETION OF INTERIM MEASURE



SWMU 11 - AFTER COMPLETION OF INTERIM MEASURE



SWMU 11 - AFTER COMPLETION OF INTERIM MEASURE

APPENDIX E

SHIPPING

MANIFEST



OAKRIDGE LANDFILL
A WASTE MANAGEMENT COMPANY

SPECIAL WASTE APPROVAL NOTIFICATION

DATE: 21 NOVEMBER 1998
CUSTOMER: ENVIRONMENTAL DETACHMENT CHARLESTON
CONTACT: HEATHER HINES
GENERATOR: ENVIRONMENTAL DETACHMENT CHARLESTON
CONTACT:
DESCRIPTION: CALCIUM HYDROXIDE CONTAMINATED SOIL

The Special Waste Disposal Application you submitted for the Generator referenced above has been approved for a period of 3 months beginning 20 NOVEMBER 1998 for a volume of 200 TONS.

Your approval number is OR 9811015. Please ensure this approval number is on all waste manifests and correspondence regarding this waste stream in order to facilitate proper disposal and documentation. Please sign the manifest and provide a copy to your transporter to accompany each load sent to the landfill for disposal. Your cooperation is appreciated.

Sincerely,

Oakridge Landfill

A handwritten signature in cursive script, appearing to read 'Ronnie L. Culbreth'.

Ronnie L. Culbreth
Special Waste Administrator



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015

Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU H CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-24-98 Truck # 26

Driver Signature: J. B. [Signature]

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82678 Tonnage: 30.47

Received By: [Signature] Date: 11/24/98



SPECIAL WASTE MANIFEST

Approval # OR 9811015
Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777/EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-24-98 Truck # 35

Driver Signature: Mrs. Hamilton

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 821084 Tonnage: 23.98

Received By: W. Carter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015
Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11, 24, 98 Truck # 16

Driver Signature: Boney

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82668 Tonnage: 28.55

Received By: W Carter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015
Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather C. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-24-98 Truck # 35

Driver Signature: Melvin Hamilton

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82656 Tonnage: 28.83

Received By: Carter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015

Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-24-98 Truck # 26

Driver Signature: J. Butler

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82649 Tonnage: 32.26

Received By: W. Carter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015
Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777/EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11/24/98 Truck # 16

Driver Signature: Benny

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 80635 Tonnage: 26.33

Received By: NCarter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015

Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11

CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338

Contact: HEATHER HINES

Generator Signature: Heather C. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11, 24,

Truck # 16

Driver Signature: B...

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82600

Tonnage: 29.05

Received By: Y Carter

Date: 11/24/98



OAKRIDGE LANDFILL
 WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015
 Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-24-98 Truck # 35

Driver Signature: Michael Hamilton

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 821004 Tonnage: 29.91

Received By: NGarter Date: 11/24/98



OAKRIDGE LANDFILL
WASTE MANAGEMENT COMPANY

SPECIAL WASTE MANIFEST

Approval # OR 9811015

Expiration 02/20/99

Generator: ENVIRONMENTAL DETACHMENT CHARLESTON

Account Number: 490-189

Location/Address: SWMU 11 CHARLESTON SC (10)

Tele Number: 843-743-6777, EXT 338 Contact: HEATHER HINES

Generator Signature: Heather A. Hines

***** TO BE COMPLETED BY TRANSPORTER *****

Transporter of Waste: BUTLER WARE TRUCKING

Date: 11-29 Truck # 26

Driver Signature: James Bayard

***** TO BE COMPLETED BY OAKRIDGE LANDFILL *****

Disposal Site: Oakridge Landfill DWP 130

Description of Waste: SOL / CALCIUM HYDROXIDE CONTAMINATED SOIL

Ticket Number: 82607 Tonnage: 30.88

Received By: Yncarter Date: 11/24/98

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB006	G011SB006	G011SB007	G011SB007	G011SB008
SampleID	011SB00601 (0-1ft)	011SB00602 (3-5ft)	011SB00701 (0-1ft)	011SB00702 (3-5ft)	011SB008S1 (0-1ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00
DateAnalyzed	12/17/99	12/17/99	12/17/99	12/17/99	12/21/99
SDGNumber	EN031	EN031	EN031	EN031	EN031
Parameter	Units				
Aluminum, SPLP	ug/L				685 J
Antimony, SPLP	ug/L				2.4 U
Arsenic, SPLP	ug/L				2 U
Barium, SPLP	ug/L				567 =
Beryllium, SPLP	ug/L				0.9 U
Cadmium, SPLP	ug/L				0.3 U
Calcium, SPLP	ug/L				12000 =
Cobalt, SPLP	ug/L				0.5 U
Copper, SPLP	ug/L				3 U
Iron, SPLP	ug/L				661 J
Lead, SPLP	ug/L				26.8 =
Magnesium, SPLP	ug/L				407 J
Manganese, SPLP	ug/L				3.8 J
Mercury, SPLP	ug/L				0.2 U
Nickel, SPLP	ug/L				1.2 J
Potassium, SPLP	ug/L				138 J
Selenium, SPLP	ug/L				1.7 U
Silver, SPLP	ug/L				0.5 UJ
Sodium, SPLP	ug/L				4950 J
Thallium, SPLP	ug/L				2.4 UJ
Tin (Sn), SPLP	ug/L				2.7 U
Vanadium, SPLP	ug/L				2.8 J
Zinc, SPLP	ug/L				17.9 J
Chromium, Total	ug/L				1.2 J
Aluminum	mg/Kg	5310 =	6760 =	10400 =	15600 =
Antimony	mg/Kg	0.66 J	0.53 J	0.93 J	1.2 J
Arsenic	mg/Kg	4.6 =	2.9 =	7.1 =	7.7 =
Barium	mg/Kg	24.3 =	22.3 =	24.2 =	26 =
Beryllium	mg/Kg	0.67 =	0.6 =	0.86 =	1.1 =
Cadmium	mg/Kg	0.08 J	0.03 U	0.03 U	0.04 U
Calcium	mg/Kg	26200 J	6730 J	33200 J	5580 J

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB008	G011SB008	G011SB008	G011SB009	G011SB009		
SampleID	011SB008S2 (3-5ft)	011SB008T1 (0-1ft)	011SB008T2 (3-5ft)	011SB009S1 (0-1ft)	011SB009S2 (3-5ft)		
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00		
DateAnalyzed	12/21/99	12/17/99	12/17/99	12/21/99	12/21/99		
SDGNumber	EN031	EN031	EN031	EN031	EN031		
Parameter	Units						
Aluminum, SPLP	ug/L	5650	J	97.2	J	2990	J
Antimony, SPLP	ug/L	2.4	U	2.4	U	2.4	U
Arsenic, SPLP	ug/L	2	U	2	U	2	U
Barium, SPLP	ug/L	1050	=	98.1	J	896	=
Beryllium, SPLP	ug/L	0.9	U	0.9	U	0.9	U
Cadmium, SPLP	ug/L	0.3	U	0.3	U	0.3	U
Calcium, SPLP	ug/L	11800	=	71500	=	8480	=
Cobalt, SPLP	ug/L	0.5	U	0.5	U	0.5	U
Copper, SPLP	ug/L	41	=	0.9	U	2.7	U
Iron, SPLP	ug/L	5010	J	21.2	UJ	3170	J
Lead, SPLP	ug/L	18.5	=	2.7	U	7.4	U
Magnesium, SPLP	ug/L	1980	J	2800	J	906	J
Manganese, SPLP	ug/L	11.8	J	0.6	U	20.5	=
Mercury, SPLP	ug/L	0.2	U	0.2	U	0.2	U
Nickel, SPLP	ug/L	2.2	J	1.1	U	1.7	J
Potassium, SPLP	ug/L	459	J	249	J	454	J
Selenium, SPLP	ug/L	2.5	J	2.1	J	4	J
Silver, SPLP	ug/L	0.8	J	0.5	UJ	0.5	UJ
Sodium, SPLP	ug/L	6820	=	3420	J	7160	=
Thallium, SPLP	ug/L	2.4	UJ	2.4	UJ	2.4	UJ
Tin (Sn), SPLP	ug/L	2.7	U	2.7	U	2.7	U
Vanadium, SPLP	ug/L	11.3	J	1	J	6.1	J
Zinc, SPLP	ug/L	166	J	12.8	J	119	J
Chromium, Total	ug/L	9	J	0.6	U	5.2	J
Aluminum	mg/Kg			4710	=	11100	=
Antimony	mg/Kg			0.91	J	0.86	J
Arsenic	mg/Kg			3.5	=	4.7	=
Barium	mg/Kg			24.8	=	21.9	=
Beryllium	mg/Kg			0.39	J	0.3	J
Cadmium	mg/Kg			0.03	U	0.03	U
Calcium	mg/Kg			5330	J	2270	J

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB009	G011SB009	G011SB010	G011SB010	G011SB011
SampleID	011SB009T1 (0-1ft)	011SB009T2 (3-5ft)	011SB010S1 (0-1ft)	011SB010T1 (0-1ft)	011SB011S1 (0-1ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00
DateAnalyzed	12/17/99	12/17/99	12/21/99	12/17/99	12/21/99
SDGNumber	EN031	EN031	EN031	EN031	EN031
Parameter	Units				
Aluminum, SPLP	ug/L			2550 J	401 J
Antimony, SPLP	ug/L			2.4 U	2.4 U
Arsenic, SPLP	ug/L			2 U	2 U
Barium, SPLP	ug/L			627 =	254 =
Beryllium, SPLP	ug/L			0.9 U	0.9 U
Cadmium, SPLP	ug/L			0.3 U	0.3 U
Calcium, SPLP	ug/L			11800 =	19300 =
Cobalt, SPLP	ug/L			0.5 U	0.5 U
Copper, SPLP	ug/L			2.2 U	19.3 J
Iron, SPLP	ug/L			605 J	264 J
Lead, SPLP	ug/L			5.5 U	3.3 U
Magnesium, SPLP	ug/L			203 J	1570 J
Manganese, SPLP	ug/L			1.9 U	1 U
Mercury, SPLP	ug/L			0.2 U	0.2 U
Nickel, SPLP	ug/L			1.1 U	1.1 U
Potassium, SPLP	ug/L			184 J	263 J
Selenium, SPLP	ug/L			2.5 J	1.7 J
Silver, SPLP	ug/L			0.5 UJ	0.5 UJ
Sodium, SPLP	ug/L			5160 =	7780 =
Thallium, SPLP	ug/L			2.4 UJ	2.4 UJ
Tin (Sn), SPLP	ug/L			2.7 U	2.7 U
Vanadium, SPLP	ug/L			7.8 J	1.4 J
Zinc, SPLP	ug/L			19.9 J	17.4 J
Chromium, Total	ug/L			2.3 J	0.8 J
Aluminum	mg/Kg	7010 =	11100 =		6020 =
Antimony	mg/Kg	2.2 UJ	2.3 UJ		0.51 J
Arsenic	mg/Kg	6 J	2.4 J		1.3 J
Barium	mg/Kg	24.1 J	42.7 J		14.2 J
Beryllium	mg/Kg	0.82 U	0.86 U		0.17 J
Cadmium	mg/Kg	0.27 U	0.29 U		0.03 U
Calcium	mg/Kg	143000 J	3060 J		2550 J

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB011	G011SB011	G011SB011	G011SB012	G011SB013
SampleID	011SB011S2 (3-5ft)	011SB011T1 (0-1ft)	011SB011T2 (3-5ft)	011SB012 (0-1ft)	011SB013 (0-1ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	06/15/2001 0:00	06/15/2001 0:00
DateAnalyzed	12/23/99	12/17/99	12/27/99	6/19/01	6/19/01
SDGNumber	EN032	EN031	EN032	44127	44127
Parameter	Units				
Aluminum, SPLP	ug/L	121	J		
Antimony, SPLP	ug/L	2.4	U		
Arsenic, SPLP	ug/L	2	U		
Barium, SPLP	ug/L	354	=		
Beryllium, SPLP	ug/L	0.9	UJ		
Cadmium, SPLP	ug/L	0.3	U		
Calcium, SPLP	ug/L	15500	=		
Cobalt, SPLP	ug/L	0.5	UJ		
Copper, SPLP	ug/L	0.6	U		
Iron, SPLP	ug/L	108	J		
Lead, SPLP	ug/L	2.1	U		
Magnesium, SPLP	ug/L	1520	J		
Manganese, SPLP	ug/L	0.3	J		
Mercury, SPLP	ug/L	0.2	U		
Nickel, SPLP	ug/L	1.1	U		
Potassium, SPLP	ug/L	932	J		
Selenium, SPLP	ug/L	1.7	U		
Silver, SPLP	ug/L	0.5	U		
Sodium, SPLP	ug/L	7260	=		
Thallium, SPLP	ug/L	2.4	UJ		
Tin (Sn), SPLP	ug/L	2.7	U		
Vanadium, SPLP	ug/L	1.5	J		
Zinc, SPLP	ug/L	11.3	U		
Chromium, Total	ug/L	0.6	U		
Aluminum	mg/Kg		8030 =	18000 =	
Antimony	mg/Kg		1 J	0.68 J	
Arsenic	mg/Kg		5.6 =	3.6 =	
Barium	mg/Kg		48.6 =	73.1 =	
Beryllium	mg/Kg		0.47 J	0.74 =	
Cadmium	mg/Kg		0.03 U	0.14 U	
Calcium	mg/Kg		5160 J	8070 =	

Analytical Data Summary

08/15/2001 4:38 PM

	StationID	G011SB014	G011SB015
	SampleID	011SB014 (0-1ft)	011SB015 (0-1ft)
	DateCollected	06/15/2001 0:00	06/15/2001 0:00
	DateAnalyzed	6/19/01	6/19/01
	SDGNumber	44127	44127
Parameter	Units		
Aluminum, SPLP	ug/L		
Antimony, SPLP	ug/L		
Arsenic, SPLP	ug/L		
Barium, SPLP	ug/L		
Beryllium, SPLP	ug/L		
Cadmium, SPLP	ug/L		
Calcium, SPLP	ug/L		
Cobalt, SPLP	ug/L		
Copper, SPLP	ug/L		
Iron, SPLP	ug/L		
Lead, SPLP	ug/L		
Magnesium, SPLP	ug/L		
Manganese, SPLP	ug/L		
Mercury, SPLP	ug/L		
Nickel, SPLP	ug/L		
Potassium, SPLP	ug/L		
Selenium, SPLP	ug/L		
Silver, SPLP	ug/L		
Sodium, SPLP	ug/L		
Thallium, SPLP	ug/L		
Tin (Sn), SPLP	ug/L		
Vanadium, SPLP	ug/L		
Zinc, SPLP	ug/L		
Chromium, Total	ug/L		
Aluminum	mg/Kg		
Antimony	mg/Kg		
Arsenic	mg/Kg		
Barium	mg/Kg		
Beryllium	mg/Kg		
Cadmium	mg/Kg		
Calcium	mg/Kg		

Analytical Data Summary

08/15/2001 4:38 PM

	StationID	G011SB006	G011SB006	G011SB007	G011SB007	G011SB008	
	SampleID	011SB00601 (0-1ft)	011SB00602 (3-5ft)	011SB00701 (0-1ft)	011SB00702 (3-5ft)	011SB008S1 (0-1ft)	
	DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	
	DateAnalyzed	12/17/99	12/17/99	12/17/99	12/17/99	12/21/99	
	SDGNumber	EN031	EN031	EN031	EN031	EN031	
Parameter	Units						
Chromium, Total	mg/Kg	14.4 =	10.5 =	23.1 =	30.3 =		
Cobalt	mg/Kg	1.4 J	1 J	2.7 J	5.6 J		
Copper	mg/Kg	29.8 =	2.4 =	14 =	23.4 =		
Iron	mg/Kg	6390 =	7530 =	11200 =	19800 =		
Lead	mg/Kg	148 =	18.5 =	33.9 =	30.6 =		
Magnesium	mg/Kg	922 =	662 =	2230 =	2410 =		
Manganese	mg/Kg	62.1 =	21.5 =	74.4 =	290 =		
Mercury	mg/Kg	0.52 =	0.51 =	0.18 =	0.31 =		
Nickel	mg/Kg	5.9 =	2.6 J	9.7 =	10.4 =		
Potassium	mg/Kg	494 =	221 J	653 =	1190 =		
Selenium	mg/Kg	0.86 J	0.9 J	1.3 =	2 =		
Silver	mg/Kg	0.05 U	0.05 U	0.05 U	0.06 U		
Sodium	mg/Kg	336 J	101 J	299 J	194 J		
Thallium	mg/Kg	0.22 UJ	0.23 UJ	0.24 UJ	0.31 UJ		
Tin (Sn)	mg/Kg	4.2 J	3 J	3.3 J	4.8 J		
Vanadium	mg/Kg	12.7 =	15.5 =	28.4 =	49.8 =		
Zinc	mg/Kg	113 J	14.4 J	46.4 J	71.6 J		

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB008	G011SB008	G011SB008	G011SB009	G011SB009
SampleID	011SB008S2 (3-5ft)	011SB008T1 (0-1ft)	011SB008T2 (3-5ft)	011SB009S1 (0-1ft)	011SB009S2 (3-5ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00
DateAnalyzed	12/21/99	12/17/99	12/17/99	12/21/99	12/21/99
SDGNumber	EN031	EN031	EN031	EN031	EN031
Parameter	Units				
Chromium, Total	mg/Kg	9.5	=	18.1	=
Cobalt	mg/Kg	1.5	J	1.3	J
Copper	mg/Kg	15.2	=	0.89	J
Iron	mg/Kg	6930	=	16100	=
Lead	mg/Kg	143	=	17.4	=
Magnesium	mg/Kg	460	=	827	=
Manganese	mg/Kg	43.3	=	28.2	=
Mercury	mg/Kg	0.38	=	0.05	U
Nickel	mg/Kg	3.7	=	1.7	J
Potassium	mg/Kg	167	J	329	J
Selenium	mg/Kg	0.76	J	2.3	=
Silver	mg/Kg	0.05	U	0.05	U
Sodium	mg/Kg	105	J	154	J
Thallium	mg/Kg	0.22	UJ	0.24	UJ
Tin (Sn)	mg/Kg	4	J	3.5	J
Vanadium	mg/Kg	15.9	=	29.9	=
Zinc	mg/Kg	52.8	J	16.3	J

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB009	G011SB009	G011SB010	G011SB010	G011SB011
SampleID	011SB009T1 (0-1ft)	011SB009T2 (3-5ft)	011SB010S1 (0-1ft)	011SB010T1 (0-1ft)	011SB011S1 (0-1ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00
DateAnalyzed	12/17/99	12/17/99	12/21/99	12/17/99	12/21/99
SDGNumber	EN031	EN031	EN031	EN031	EN031
Parameter	Units				
Chromium, Total	mg/Kg	15.1 =	16 =	8.2 =	
Cobalt	mg/Kg	2.5 J	2.6 J	0.95 J	
Copper	mg/Kg	6 J	1.4 J	7.5 =	
Iron	mg/Kg	9630 =	12300 =	2890 =	
Lead	mg/Kg	18.7 =	18.8 =	7.6 =	
Magnesium	mg/Kg	1760 J	699 J	370 J	
Manganese	mg/Kg	135 =	44.4 =	13.8 =	
Mercury	mg/Kg	0.04 =	0.05 U	0.04 U	
Nickel	mg/Kg	4.2 J	3.1 J	2.6 J	
Potassium	mg/Kg	449 J	185 J	240 J	
Selenium	mg/Kg	1.5 U	1.6 U	0.47 J	
Silver	mg/Kg	0.46 U	0.48 U	0.05 U	
Sodium	mg/Kg	1720 J	368 U	84.1 J	
Thallium	mg/Kg	0.22 UJ	0.23 UJ	0.22 UJ	
Tin (Sn)	mg/Kg	5.1 J	4.8 J	2.8 J	
Vanadium	mg/Kg	16 J	20.8 J	10.4 =	
Zinc	mg/Kg	33.9 J	14.7 J	17 J	

Analytical Data Summary

08/15/2001 4:38 PM

StationID	G011SB011	G011SB011	G011SB011	G011SB012	G011SB013
SampleID	011SB011S2 (3-5ft)	011SB011T1 (0-1ft)	011SB011T2 (3-5ft)	011SB012 (0-1ft)	011SB013 (0-1ft)
DateCollected	12/14/1999 0:00	12/14/1999 0:00	12/14/1999 0:00	06/15/2001 0:00	06/15/2001 0:00
DateAnalyzed	12/23/99	12/17/99	12/27/99	6/19/01	6/19/01
SDGNumber	EN032	EN031	EN032	44127	44127
Parameter	Units				
Chromium, Total	mg/Kg	21.8 =	33.9 =		
Cobalt	mg/Kg	1.9 J	3.8 J		
Copper	mg/Kg	8.8 =	5 =		
Iron	mg/Kg	12700 =	14500 =		
Lead	mg/Kg	69.9 =	21.3 =	42.2 =	64 =
Magnesium	mg/Kg	814 =	1750 =		
Manganese	mg/Kg	28.1 =	38 =		
Mercury	mg/Kg	0.15 =	0.24 =		
Nickel	mg/Kg	3.6 J	6.3 =		
Potassium	mg/Kg	323 J	1210 =		
Selenium	mg/Kg	1.3 =	1.3 =		
Silver	mg/Kg	0.05 U	0.05 U		
Sodium	mg/Kg	202 J	268 J		
Thallium	mg/Kg	0.25 UJ	0.34 J		
Tin (Sn)	mg/Kg	3.5 J	4.1 U		
Vanadium	mg/Kg	22.7 =	37.9 =		
Zinc	mg/Kg	67.4 J	31.9 =		

Analytical Data Summary

08/15/2001 4:38 PM

	StationID	G011SB014	G011SB015
	SampleID	011SB014 (0-1ft)	011SB015 (0-1ft)
	DateCollected	06/15/2001 0:00	06/15/2001 0:00
	DateAnalyzed	6/19/01	6/19/01
	SDGNumber	44127	44127
Parameter	Units		
Chromium, Total	mg/Kg		
Cobalt	mg/Kg		
Copper	mg/Kg		
Iron	mg/Kg		
Lead	mg/Kg	64.7 =	103 =
Magnesium	mg/Kg		
Manganese	mg/Kg		
Mercury	mg/Kg		
Nickel	mg/Kg		
Potassium	mg/Kg		
Selenium	mg/Kg		
Silver	mg/Kg		
Sodium	mg/Kg		
Thallium	mg/Kg		
Tin (Sn)	mg/Kg		
Vanadium	mg/Kg		
Zinc	mg/Kg		



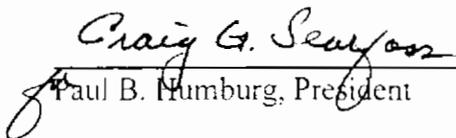
HEARTLAND
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: EN031
Date: January 13, 2000
Client Name: Ensafe
Project/Site Name: Charleston Zone G
Date Sampled: December 13 - 14, 1999
Number of Samples: 22 Non-Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Laucks Testing Laboratories
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data,
February, 1994
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Semivolatiles, Metals, SPLP Metals and Total Organic Carbon

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Paul B. Humburg, President

1-20-00.
Date

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # EN031

A validation was performed on the Semivolatile Data from SDG EN031. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID

COMPOUND ID

DL QL

No qualifications are required.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS (SOILS AND SPLP) AND TOC

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 methods: the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # EN031

A validation was performed on the Metals for soils and SPLP and TOC Data from SDG EN031. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation and calibration blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Copper	1.0 ug/l	all SPLP samples below 5.0 ug/l
Lead	2.1 ug/l	all SPLP samples below 10.5 ug/l
Manganese	0.5 ug/l	all SPLP samples below 2.5 ug/l
Zinc	2.4 ug/l	no impact

The USEPA requires that all sample values below five times the preparation or calibration blank contamination be qualified as non-detect, "U".

The preparation blanks exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Arsenic	-0.24 mg/kg	all soil samples below 2.4 mg/kg
Calcium	-11.5 mg/kg	no impact
Thallium	-0.86 mg/kg	all soil samples below 8.6 mg/kg
Thallium	-2.7 ug/l	all SPLP samples below 27.0 ug/l

This reviewer qualifies all samples results below 10 times the absolute value of the negative blank value.

Matrix Spike Recovery results

The matrix spike recoveries for soils for Antimony (62%) and for SPLP for Aluminum (58%), Iron (63%) and Silver (46%) were below the lower control limits (>30% but <75%). All positive and non-detect results are qualified as estimated, "J" or "UJ".

The matrix spike recovery for soils for Zinc (199%) was above the upper control limits (>125%). All positive results are qualified as estimated, "J".

Matrix Duplicate results

The matrix duplicate RPD results for soils for Calcium (37%) was greater than 35% for waters for Aluminum (83%), Iron (113%) and Zinc (70%) were greater than 20%. All positive results are qualified as estimated, "J". The difference for soils for Mercury was not greater than two times the CRDL and the percent differences for soils for Chromium (33%), Lead (21%), Manganese (21%) and Zinc (26%) were not greater than 35% and therefore are not qualified.

Serial Dilution recovery results

The serial dilution results for SPLPs for Magnesium was greater than 10%. All positive results are qualified as estimated, "J".

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B". Value is below the CRDL but greater than the IDL.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all SPLP samples below 5.0 ug/l	Cu.	+	U
all SPLP samples below 10.5 ug/l	Pb.		
all SPLP samples below 2.5 ug/l	Mn.		
all soil samples below 8.6 mg/kg	Tl.	+/U	J/UJ
all SPLP samples below 2.7 ug/l	Tl.		
all soil samples below 2.4 mg/kg	As.		
all soil samples	Sb.	+/U	J/UJ
all SPLP samples	Al, Fe and Ag.		
all soil samples	Zn.	+	J
all soil samples	Ca.	+	J
all SPLP samples	Al, Fe and Zn.		
all SPLP samples	Mg.	+	J
all "B" results	all analytes	B	J

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011SB01001 SPLP	9912329-14	SPLP
011SB01101 SPLP	9912329-15	SPLP
011SB00801 SPLP	9912329-16	SPLP

Analytical Request Key:

ABN =	Semi-Volatile Organics (8270C)
MET =	TAL Metals + Tin (6010B/7000)
SPLP =	SPLP Metals (1312), TAL Metals + Tin (6010B/7000)
TOC =	Total Organic Carbon (9060)

Sample Receipt Comments:

Several samples received were measured at temperatures which exceeded the temperature control limits of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Approval to run the samples with high temperatures was given by Charlie Vernoy on 12/15/1999. The original COCs were revised to delete the pesticide analysis and to update sample IDs by Charlie Vernoy and Julie Shaffer. The revised COCs were used as the originals in this data package. See the sample receipt logs for documentation.

Sample Identification on Forms:

When completing forms created through the CLP software, every attempt is made to use both your sample IDs as well as the laboratory sample IDs. The forms have varied default sizes to their sample identification fields, and are not amenable to alteration or editing. When it is not possible to use your complete sample ID because of field length limitations, Laucks will usually do one of two things: 1) use as much of your ID as will fit, beginning from the RIGHT hand side of the sample ID number; or 2) select some subset of your sample identifier if it is clearly a discrete number. In addition, all forms will contain our sample IDs, which can be cross-referenced from the table above.

GENERAL REMARKS ON ORGANIC ANALYSES:

The following comments describe general analysis conditions. For remarks specific to the samples reported in this case, see "SPECIFIC REMARKS ON ORGANIC ANALYSIS."

Manual Integration:

One or analytes may have been manually integrated on the data system quantitation reports. The manual integrations have been flagged, initialed and dated by the analyst. A list of the manual integration flags is detailed below.

M	Manual integration due to irregular peak shape
MS	Manual integration due to split peak
MR	Manual integration due to retention time shift

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MI Manual integration of correct isomer
MT Manual integration due to peak tailing
MB Manual integration due to irregular baseline

All GC/MS Fractions:

The computerized printout for sample analysis may tabulate values for target analytes that are not reported on the relevant Form i. In that case, we have manually searched the mass spectral data and have eliminated the compound(s) as reportable based on this search.

Semi-Volatile Fraction:

All soil/sediment extracts are cleaned using Gel Permeation Chromatography (GPC) in accordance with SW-846 Method 3640A.

SPECIFIC REMARKS ON ORGANIC ANALYSES:

Holding Time Compliance:

Following the Contract Laboratory Program (CLP) model, Laucks calculates holding time compliance for organic determinations based on the first injection and/or analysis of an extract or sample. Subsequent analyses (for instance, for the purpose of dilution) are not tabulated.

Semi-Volatile Organic Compounds:

The holding time to extraction is 7 days in water and 14 days in soil calculated from the date of collection. In either case, the holding time from extraction to analysis is 40 days. All samples were extracted and analyzed within holding time.

Semi-Volatile Fraction:

Initial Calibration Standards:

A minimum of five standards is required for the initial calibration analyses in accordance with SW 846. Six standard concentration levels were analyzed for the initial calibration. The standards concentrations were 5, 10, 25, 40, 60 and 80 ng/ μ L injected respectively.

Quality Control Analyses:

MS/MSD analyses were performed on sample 120SB01201. All analyte recoveries and RPDs were in control.

Tentatively Identified Compounds (TICs):

Ten non-target organic compounds of greatest apparent concentrations are reported as TICs. Alkanes were library searched and were reported as part of the 10 TICs.

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Reporting Limits:

All analytes have been "J" flagged down to 1 µg/L for waters and 33 µg/kg for the solids.

GENERAL REMARKS ON INORGANIC ANALYSES:

The following comments describe general analysis conditions. For remarks specific to the samples reported in this case, see "SPECIFIC REMARKS ON INORGANIC ANALYSES."

ICP Metals:

On the first timed and dated page of each ICP run, the data to be reported or rejected will be tabulated for that run.

Mercury:

Laucks purchases a 1000 mg/L Hg stock solution from Inorganic Ventures. The 1.0 mg/L working standard is made by diluting 100 µL to 100 mL with 2% HNO₃. The calibration curve is made by placing 0, 20, 50, 100, 200, 500 and 1000 µL of the working standard in BOD bottles and diluting up to 100 mL. The standard curve is equivalent to 0, 0.2, 0.5, 1.0, 2.0, 5.0 and 10.0 µg/L.

SPECIFIC REMARKS ON INORGANIC ANALYSES:

Holding Time Compliance:

Laucks calculates holding time compliance for inorganic determinations using the date on which reportable data were acquired.

Metals:

The holding time for metals is six months from the date of collection, excepting mercury, which is 28 days. All analyses were performed within holding time.

Miscellaneous:

The following analytes do not have a Contract Laboratory Program holding time. The holding times tabulated below derive from the relevant EPA methods and are applicable when the sample was appropriately preserved and/or cooled. All samples submitted followed the preservation guidelines unless explicitly noted otherwise.

<u>Analyte</u>	<u>Holding Time</u>	<u>Violations</u>
TOC	28 days	None

11111 5
043

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ICP Metals(Soil):

The matrix spike sample percent recoveries of antimony and zinc were outside of the established control limits of 75-125% for sample 120SB01201. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The duplicate sample relative percent differences of calcium, chromium, lead, manganese and zinc were outside the control limits of $\pm 20\%$ for sample 120SB01201. No further corrective action was required. All relevant data have been flagged with an "*" on Forms I and VI.

Mercury(Soil):

The duplicate sample relative percent differences of mercury were outside the control limits of $\pm 20\%$ for samples 120SB01201 and 011SB00601. No further corrective action was required. All relevant data have been flagged with an "*" on Forms I and VI.

Metals (SPLP):

Zinc was present in the SPLP blank. No further corrective action was required per client data quality objectives.

The matrix spike sample percent recoveries of aluminum, iron and silver were outside of the established control limits of 75-125% for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The duplicate sample relative percent differences of aluminum, iron and zinc were outside the control limits of $\pm 20\%$ for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "*" on Forms I and VI.

The serial dilution for magnesium did not agree within 10% of the original determination after correction for dilution for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

Total Organic Carbon:

No comments.



CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 4101-2907 08-40000
 COC NO: _____
 PU NO: 1840
 REL NO: 38
 LAB NAME: Lau CW

300-388-7863
 MEMPHIS, TENNESSEE
 DANIELSON, SC; CONROBERTSON, DALLAS, TX; JACKSON, TX; WYNNVILLE, TX;
 LINDSEY, TX; NASHVILLE, TN; INDIANOLA, MO; PAUCON, LA; PENSACOLA, FL;
 RALEIGH, NC; COLDORE, DENVER

9912247 Amended COC 12/15/99
 EN031

CLIENT: Navy Clean CNC PROJECT MANAGER: T. Haverkost
 LOCATION: Zone G, SWMU 120 TELE/FAX NO.: (843) FFA-0029
 SAMPLERS: (SIGNATURE) William Herrick EES

NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
	SVOC	Metals	SPLP Metals	TOC	Residues	
2	✓	✓				1205B01201
2	✓	✓				1205B01202
2	✓	✓				
2	✓	✓				
2	✓	✓				
2	✓	✓				
3	✓	✓	✓			offset to 001
3	✓	✓	✓			
3	✓	✓	✓	✓	✓	offset to 002
3	✓	✓	✓	✓	✓	
2			✓	✓	✓	offset to 009
2			✓	✓	✓	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
NBCG/1205B01201	12/13/99	1339	S	GLASS/502	ICE	None
NBCG/1205B01202	"	1345	S	"	"	"
NBCG/1205B00701	"	1340	S	"	"	"
NBCG/1205B00702	"	1340	S	"	"	"
NBCG/1205B00901	"	1400	S	"	"	"
NBCG/1205B00902	"	1409	S	"	"	"
NBCG/1205B00901	"	1413	S	"	"	"
NBCG/1205B00902	"	1425	S	"	"	"
NBCG/1205B01001	"	1431	S	"	"	"
NBCG/1205B01002	"	1440	S	"	"	"
NBCG/1205B01101	"	1456	S	"	"	"
NBCG/1205B01102	"	1503	S	"	"	"

RELINQUISHER: <u>Fred Erdmann</u>	DATE: <u>12/14/99</u>	RECEIVER: <u>Chel Chot</u>	DATE: <u>12/14/99</u>	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: <u>Fred Erdmann</u>	TIME: <u>1507</u>	PRINTED: <u>Charles Christensen</u>	TIME: <u>0830</u>	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>EnSate</u>		COMPANY: <u>Lau CW</u>		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp
 SHIPMENT NO.: 812795922670
 SEND RESULTS TO: Charles Verny

COMMENTS: * Cannot do not analyze the pesticide fraction for 1205B01001, 01002 + 1205B01101, 1102



11/15/99 12/15/99

PAGE 1 OF 1 - 05
 PROJECT/JOB NO: 2907-001-08-920
 COC NO: 1540
 PO NO: 38
 REL NO: 38
 LAB NAME: Laurus

CHAIN OF CUSTODY RECORD

Amended COC 12/15/99

OWNER: NAVY CLEAN CNC
 ADDRESS: Zone G / SWM4 11

PROJECT MANAGER: T. Haver-Nuss
 TELE/FAX NO.: (843) 884-0029

CLIENT: NAVY Clean CNC
 LOCATION: Zone G / SWM4 11
 SAMPLERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED										
NO. OF CONTAINERS	Metals	TOC	SALP Metals							REMARKS

	FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	Metals	TOC	SALP Metals								REMARKS
						TEMP.	CHEMICAL												
1	NBCG/0115800601	12/14/99	1301	S	Glass 8oz	Ice	None	2	✓	✓	✓								* Destroy TOC
2	NBCG/0115800602	"	1310	S	"	"	"	2	✓	✓	✓								* Destroy TOC
3	NBCG/0115800701	"	1308	S	"	"	"	2	✓	✓	✓								* Destroy TOC
4	NBCG/0115800702	"	1316	S	"	"	"	2	✓	✓	✓								* Destroy TOC
16, 5	NBCG/0115800801	"	1327	S	"	"	"	3	✓	✓	✓								offered to SB001
11, 6	NBCG/0115800802	"	1335	S	"	"	"	3	✓	✓	✓								
12, 7	NBCG/0115800901	"	1335	S	"	"	"	3	✓	✓	✓								offered to SB001
13, 8	NBCG/0115800902	"	1340	S	"	"	"	3	✓	✓	✓								
14, 9	NBCG/0115801001	"	1350	S	"	"	"	3	✓	✓	✓								near SB005
15, 10	NBCG/0115801101	"	1357	S	"	"	"	3	✓	✓	✓								near SB004
	NBCG/011M000401	"	1415	S	"	"	"	2	✓	✓	✓								* Added TOC
	NBCG/011M000301	"	1420	S	"	"	"	2	✓	✓	✓								* Added TOC
	NBCG/0115801102	"	1403	S	"	"	"	3	✓	✓	✓								

TOTAL NO. OF SAMPLES: <u>20</u>	RELINQUISHING: <u>[Signature]</u>	DATE: <u>12/14/99</u>	RECEIVER: <u>[Signature]</u>	DATE: <u>12/15/99</u>	RELINQUISHING: _____	DATE: _____	RECEIVER: _____
	PRINTED: <u>Fred Erdmann</u>	TIME: _____	PRINTED: <u>Charles-Christensen</u>	TIME: _____	PRINTED: _____	TIME: _____	PRINTED: _____
	COMPANY: <u>Ensafe</u>	TIME: <u>505</u>	COMPANY: <u>Laurus</u>	TIME: <u>0545</u>	COMPANY: _____	TIME: _____	COMPANY: _____
	METHOD OF SHIPMENT: <u>Fed Exp</u>	COMMENTS: <u>* TOC not needed for samples 0115800601 + 0602, and 0115800701 + 0702.</u>					
SI NO. <u>814795922658</u>	* Add TOC to samples 011M000401 + 011M000301						
SEND RESULTS TO: <u>Charles Young</u>							



800-888-7883
MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, MS; KNOXVILLE, TN
LANCASTER, PA; NASHVILLE, TN; HOUSTON, TX; INDIANAPOLIS, IN; PHOENIX, AZ
RAIDING, COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

9912247 Amended COC 12/15/99
ENC 3

PROJECT/JOB NO: 4907-001-08-1000
COC NO: 4907-001-08-1000
PO NO: 1840
REL NO: 38
LAB NAME: LAUCKS

CLIENT: Navy Clean CNC PROJECT MANAGER: T. Haverkost
LOCATION: Zone G, SWMU 120 TELE/FAX NO. (843) 884-0029
SAMPLERS: (SIGNATURE) William Herrick EFG

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED						REMARKS		
					TEMP.	CHEMICAL		SVOC	Metals	SALP Metals	TOC	pesticides	PCBs		DDTs	
1 NBCG/1205B01201	12/13/99	1339	S	Glass/502	ICE	None	2	✓	✓							1205B01201
2 NBCG/1205B01202	"	1345	S	"	"	"	2	✓	✓							1205B01202
3 NBCG/1205B00701	"	1348	S	"	"	"	2	✓	✓							
4 NBCG/1205B00702	"	1348	S	"	"	"	2	✓	✓							
5 NBCG/1205B00801	"	1400	S	"	"	"	2	✓	✓							
6 NBCG/1205B00802	"	1409	S	"	"	"	2	✓	✓							
7 NBCG/1205B00901	"	1413	S	"	"	"	3		✓	✓	✓					offset to 001
8 NBCG/1205B00902	"	1425	S	"	"	"	3		✓	✓	✓					
9 NBCG/1205B01001	"	1431	S	"	"	"	3		✓	✓	✓					offset to 002
10 NBCG/1205B01002	"	1440	S	"	"	"	3		✓	✓	✓					
11 NBCG/1205B01101	"	1456	S	"	"	"	2		✓	✓	✓					offset to 004
12 NBCG/1205B01102	"	1503	S	"	"	"	2		✓	✓	✓					

REF INQUIRY: <u>[Signature]</u>	DATE: 12/14/99	RECEIVER: <u>[Signature]</u>	DATE: 12/14/99	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: Fred Erdmann	TIME: 1507	PRINTED: Charles Christensen	TIME: 0830	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: EnSate		COMPANY: LAUCKS		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp
SHIPMENT NO. 814795922670
SEND RESULTS TO: Charles Vernoy

COMMENTS: * Commu do-not analyze the pesticide fraction for 1205B01001, 01002 + 1205B01101, 1102.

TOTAL PAGES

LAUCKS TESTING LABORATORIES

940 S. Hamey
Seattle, WA 98108

To: Ensafe
Laboratory No. : 9912247, 9912329
SDG No. : EN031
Date of Report: 01/06/2000

SAMPLE RECEIPT, IDENTIFICATION, AND GENERAL COMMENTS:

Sample Receipt and Identification:

The samples submitted under the laboratory number(s) indicated above were identified and analyzed as tabulated below. The samples were collected and received on the dates noted on the enclosed chain-of-custody copies, Attachment A.

<u>Client Sample Identification</u>	<u>Laucks Sample Identification</u>	<u>Testing Analytical Request</u>
120SB01201	9912247-01	ABN/MET
120SB01202	9912247-02	ABN/MET
120SB00701	9912247-03	ABN/MET
120SB00702	9912247-04	ABN/MET
120SB00801	9912247-05	ABN/MET
120SB00802	9912247-06	ABN/MET
120SB00901	9912247-07	MET/TOC
120SB00902	9912247-08	MET/TOC
120SB01001	9912247-09	MET/TOC
120SB01002	9912247-10	MET/TOC
120SB01101	9912247-11	TOC
120SB01102	9912247-12	TOC
120SB00901 SPLP	9912247-13	SPLP
120SB00902 SPLP	9912247-14	SPLP
120SB01001 SPLP	9912247-15	SPLP
120SB01002 SPLP	9912247-16	SPLP
011SB00601	9912329-01	MET
011SB00602	9912329-02	MET
011SB00701	9912329-03	MET
011SB00702	9912329-04	MET
011SB00801	9912329-05	MET/TOC
011SB00802	9912329-06	MET/TOC
011SB00901	9912329-07	MET/TOC
011SB00902	9912329-08	MET/TOC
011SB01001	9912329-09	MET/TOC
011SB01101	9912329-10	MET/TOC
011SB00802 SPLP	9912329-11	SPLP
011SB00901 SPLP	9912329-12	SPLP
011SB00902 SPLP	9912329-13	SPLP

LAUCKS TESTING LABORATORIES

940 S. Harney
Seattle, WA 98108

011SB01001 SPLP	9912329-14	SPLP
011SB01101 SPLP	9912329-15	SPLP
011SB00801 SPLP	9912329-16	SPLP

Analytical Request Key:

ABN =	Semi-Volatile Organics (8270C)
MET =	TAL Metals + Tin (6010B/7000)
SPLP =	SPLP Metals (1312), TAL Metals + Tin (6010B/7000)
TOC =	Total Organic Carbon (9060)

Sample Receipt Comments:

Several samples received were measured at temperatures which exceeded the temperature control limits of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Approval to run the samples with high temperatures was given by Charlie Vernoy on 12/15/1999. The original COCs were revised to delete the pesticide analysis and to update sample IDs by Charlie Vernoy and Julie Shaffer. The revised COCs were used as the originals in this data package. See the sample receipt logs for documentation.

Sample Identification on Forms:

When completing forms created through the CLP software, every attempt is made to use both your sample IDs as well as the laboratory sample IDs. The forms have varied default sizes to their sample identification fields, and are not amenable to alteration or editing. When it is not possible to use your complete sample ID because of field length limitations, Laucks will usually do one of two things: 1) use as much of your ID as will fit, beginning from the RIGHT hand side of the sample ID number; or 2) select some subset of your sample identifier if it is clearly a discrete number. In addition, all forms will contain our sample IDs, which can be cross-referenced from the table above.

GENERAL REMARKS ON ORGANIC ANALYSES:

The following comments describe general analysis conditions. For remarks specific to the samples reported in this case, see "SPECIFIC REMARKS ON ORGANIC ANALYSIS."

Manual Integration:

One or analytes may have been manually integrated on the data system quantitation reports. The manual integrations have been flagged, initialed and dated by the analyst. A list of the manual integration flags is detailed below.

M	Manual integration due to irregular peak shape
MS	Manual integration due to split peak
MR	Manual integration due to retention time shift

LAUCKS TESTING LABORATORIES

940 S. Harney
Seattle, WA 98108

MI Manual integration of correct isomer
MT Manual integration due to peak tailing
MB Manual integration due to irregular baseline

All GC/MS Fractions:

The computerized printout for sample analysis may tabulate values for target analytes that are not reported on the relevant Form I. In that case, we have manually searched the mass spectral data and have eliminated the compound(s) as reportable based on this search.

Semi-Volatile Fraction:

All soil/sediment extracts are cleaned using Gel Permeation Chromatography (GPC) in accordance with SW-846 Method 3640A.

SPECIFIC REMARKS ON ORGANIC ANALYSES:

Holding Time Compliance:

Following the Contract Laboratory Program (CLP) model, Laucks calculates holding time compliance for organic determinations based on the first injection and/or analysis of an extract or sample. Subsequent analyses (for instance, for the purpose of dilution) are not tabulated.

Semi-Volatile Organic Compounds:

The holding time to extraction is 7 days in water and 14 days in soil calculated from the date of collection. In either case, the holding time from extraction to analysis is 40 days. All samples were extracted and analyzed within holding time.

Semi-Volatile Fraction:

Initial Calibration Standards:

A minimum of five standards is required for the initial calibration analyses in accordance with SW 846. Six standard concentration levels were analyzed for the initial calibration. The standards concentrations were 5, 10, 25, 40, 60 and 80 ng/ μ L injected respectively.

Quality Control Analyses:

MS/MSD analyses were performed on sample 120SB01201. All analyte recoveries and RPDs were in control.

Tentatively Identified Compounds (TICs):

Ten non-target organic compounds of greatest apparent concentrations are reported as TICs. Alkanes were library searched and were reported as part of the 10 TICs.

LAUCKS TESTING LABORATORIES

940 S. Harney
Seattle, WA 98108

Reporting Limits:

All analytes have been "J" flagged down to 1 µg/L for waters and 33 µg/kg for the soils.

GENERAL REMARKS ON INORGANIC ANALYSES:

The following comments describe general analysis conditions. For remarks specific to the samples reported in this case, see "SPECIFIC REMARKS ON INORGANIC ANALYSES."

ICP Metals:

On the first timed and dated page of each ICP run, the data to be reported or rejected will be tabulated for that run.

Mercury:

Laucks purchases a 1000 mg/L Hg stock solution from Inorganic Ventures. The 1.0 mg/L working standard is made by diluting 100 µL to 100 mL with 2% HNO₃. The calibration curve is made by placing 0, 20, 50, 100, 200, 500 and 1000 µL of the working standard in BOD bottles and diluting up to 100 mL. The standard curve is equivalent to 0, 0.2, 0.5, 1.0, 2.0, 5.0 and 10.0 µg/L.

SPECIFIC REMARKS ON INORGANIC ANALYSES:

Holding Time Compliance:

Laucks calculates holding time compliance for inorganic determinations using the date on which reportable data were acquired.

Metals:

The holding time for metals is six months from the date of collection, excepting mercury, which is 28 days. All analyses were performed within holding time.

Miscellaneous:

The following analytes do not have a Contract Laboratory Program holding time. The holding times tabulated below derive from the relevant EPA methods and are applicable when the sample was appropriately preserved and/or cooled. All samples submitted followed the preservation guidelines unless explicitly noted otherwise.

<u>Analyte</u>	<u>Holding Time</u>	<u>Violations</u>
TOC	28 days	None

085

LAUCKS TESTING LABORATORIES

940 S. Harney
Seattle, WA 98108

ICP Metals(Soil):

The matrix spike sample percent recoveries of antimony and zinc were outside of the established control limits of 75-125% for sample 120SB01201. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The duplicate sample relative percent differences of calcium, chromium, lead, manganese and zinc were outside the control limits of $\pm 20\%$ for sample 120SB01201. No further corrective action was required. All relevant data have been flagged with an "**" on Forms I and VI.

Mercury(Soil):

The duplicate sample relative percent differences of mercury were outside the control limits of $\pm 20\%$ for samples 120SB01201 and 011SB00601. No further corrective action was required. All relevant data have been flagged with an "**" on Forms I and VI.

Metals (SPLP):

Zinc was present in the SPLP blank. No further corrective action was required per client data quality objectives.

The matrix spike sample percent recoveries of aluminum, iron and silver were outside of the established control limits of 75-125% for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The duplicate sample relative percent differences of aluminum, iron and zinc were outside the control limits of $\pm 20\%$ for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "**" on Forms I and VI.

The serial dilution for magnesium did not agree within 10% of the original determination after correction for dilution for sample 120SB01001. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

Total Organic Carbon:

No comments.

Analytical Data Summary

07/18/2001 4:19 PM

	StationID	G011HA001	G011HA002	G011HA003	G011HA004
	SampleID	G011HA001	G011HA002	G011HA003	G011HA004
	DateCollected	06/15/2001	06/15/2001	06/15/2001	06/15/2001
	DateAnalyzed	06/19/2001	06/19/2001	06/19/2001	06/19/2001
	SDGNumber	44127	44127	44127	44127
Parameter	Units				
Lead	mg/Kg	42.2 =	64 =	64.7 =	103 =

Chain of Custody/ Laboratory Analysis Form

Lab Batch/SDG ID: _____

Laboratory: GEL		Project Name: Charleston Navy Complex		Site Name: Zone G, SWMU 11		# of containers	1 - 8 oz Jar	1 - 500ml Bottle													
Project Number:				TAT: results 3-5 days			Lead (SW6010)	Lead (SW6010)													
Project Managers: Gary Foster/ATL/CCI				Level: Level 3																	
Address: GNV: see 3rd page of COC				JAJ: see 3rd page of COC																	
Send Report To: see 3rd page of COC				EOD: CNC format																	
Sample ID	Station ID	Depth		Date & Time Collected	Matrix	# of containers	Lead (SW6010)	Lead (SW6010)												Comments	
		Begin	End																		
G011HA001		0	1	6/15/01 17:40	SO	1	X														
G011HA002		0	1	6/15/01 17:46	SO	1	X														3-5 Day Turn in required
G011HA003		0	1	6/15/01 18:54	SO	1	X														
G011HA004		0	1	6/15/01 11:05	SO	1	X														
G011EB001L				6/15/01 11:15	WQ	1		X													

4127
 001
 102
 003
 004
 4128
 001

Sampled By: <i>John Adams</i>	Date/Time: 6/15/01 11:00	Relinquished by:	Date/Time:
Additional Samplers:			
Received By Lab: <i>Patricia Daves</i>	Date/Time: 6/15/01 17:00	Relinquished by:	Date/Time:

TOTAL METALS
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

SDG No.: 44127

Method Type: SW-846

Sample ID: 44127001

Client ID: G011HA001

Contract: CH2M00400

Lab Code: GBL

Case No.: GBL

SAS No.:

Matrix: SOIL

Date Received: 6/15/2001

Level: LOW

% Solids: 93.80

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7439-92-1	Lead	42.2	mg/kg			P	0.143	TJA61 Trace ICP2	61901

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

General Engineering Laboratories

TOTAL METALS
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

SDG No.: 44127

Method Type: SW-846

Sample ID: 44127002

Client ID: G011HA002

Contract: CH2M00400

Lab Code: GEL

Case No.: GEL

SAS No.:

Matrix: SOIL

Date Received: 6/15/2001

Level: LOW

% Solids: 81.30

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7439-92-1	Lead	64.0	mg/kg			P	0.180	TJA61 Trace ICP2	61901

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

TOTAL METALS
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

SDG No.: 44127

Method Type: SW-846

Sample ID: 44127003

Client ID: G011HA003

Contract: CH2M00400

Lab Code: GEL

Case No.: GEL

SAS No.:

Matrix: SOIL

Date Received: 6/15/2001

Level: LOW

% Solids: 89.70

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7439-92-1	Lead	64.7	mg/kg			P	0.163	TJA61 Trace ICP2	61901

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

General Engineering Laboratories

TOTAL METALS
- I -
INORGANIC ANALYSIS DATA PACKAGE

SDG No.: 44127

Method Type: SW-846

Sample ID: 44127004

Client ID: G011HA004

Contract: CH2M00400

Lab Code: GEL

Case No.: GEL

SAS No.:

Matrix: SOIL

Date Received: 6/15/2001

Level: LOW

% Solids: 85.20

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7439-92-1	Lead	103	mg/kg			P	0.165	TJA61 Trace ICP2	61901

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

Stacey French Comments

SCDHEC Comment 23:

Section 10.8 SWMU 11 Caustic Pond, Page 10.8.1

This section provides a description of SWMU 11. It is unclear from this section whether the pond is still filled, or if it is dry. Please revise this section to provide this information.

Navy/EnSafe Response 23:

The ponds have been filled and the area of the former Caustic Pond has been reworked. The original outline of the pond berms are no longer discernable as a surface feature. Currently the site is covered with grass and pavement. Text will be revised to include this information.

CH2M-Jones Response 23:

Review of historical aerial photographs indicates that the current SWMU boundary line coincides closely with the locations of the former ponds. Figure 1-2 of the RFI Report Addendum is an aerial photo of SWMU 11. This figure shows the SWMU and its surrounding area and site conditions, which have not changed significantly since the photo was taken in 1997.

SCDHEC Comment 24:

Section 10.8.4.1 Nature of Contamination in Soil, Page 10.8-18, Lines 7-9

This section states that the surface soil sample had a mean pH of "slightly" above neutral and that the mean pH of the subsurface soil samples was "slightly:" below neutral. The word "slightly" is vague and should be clarified. Please include the actual pH instead of using the term slightly.

Navy/EnSafe Response 24:

The text will be revised to include the actual pH. These values are also presented in Table 10.8.3 on page 10.8.9.

CH2M-Jones Response 24:

The soil pH ranges observed in RFI samples are presented in Table 10.8.3 of the EnSafe RFI Report. The pH of samples collected during the RFI is also presented in Section 2.0 of this RFI Report Addendum, which summarizes that work.

Mike Danielson Comments

SCDHEC Comment 2:

AOC 633 Section 10.2.4 Sediment Sampling and Analysis

After reading the report and making a site visit, the areas AOC 633/634/706 and SWMU 11 may all be interrelated with regard to sediment contaminants. The sediment sampling results show that lead and mercury have been found above the RBC. These contaminants are not directly attributable to the known waste at AOC 633/634. The contaminants, however, must be addressed. This could be done as a new SWMU/AOC or under an existing SWMU/AOC. See comment #13 B.

Navy/EnSafe Response 2:

Additional sediment sampling is proposed for AOC 633 in response to Comment #42 (French) to ascertain a potential source for the metals and pesticides. It should be noted that the metals may likely be attributed to storm water runoff that contributes to the wetland associated with these sites.

CH2M-Jones Response 2:

The mercury detected in SWMU 11 sediments could not be directly attributed to site activities. The sediment sample location at the southeast corner of SWMU 11 that exceeded RBCs was excavated during the IM. The only other stormwater converging in this area is from the roads/parking lot at SWMU 11, and from Building 0289 (396), a sewage pumping station approximately 400 feet to the west of SWMU 11. Additional sampling at SWMU 11 during Work Plan Addendum collection did not reveal any new areas of mercury contamination in surface soil or sediment.

SCDHEC Comment 7:

SWMU 11

A) The text states that the purpose of the field investigation is to confirm or deny the presence of contamination. The sampling in this area does not adequately address the presence or absence of contamination in the groundwater. Therefore this medium needs to be further investigated with the addition of monitoring wells and sampling.

B) Additional wells needs to be installed on the eastern edge of the SWMU as well as across the road, to the east, to confirm or deny that the contamination has not migrated in this direction. This will also help to better define the groundwater contamination on the eastern and northeastern side of the SWMU.

Navy/EnSafe Response 7:

A) Groundwater results revealed no analytes which are COPCs at SWMU 11. Only lead, detected in boring 011SB001, exceeded its SSL. Monitoring well 011001 was installed in the same boring location as this soil sample. Lead was not detected in this or other wells at the site.

B) See response in A.

CH2M-Jones Response 7:

SWMU 11 groundwater does not contain any COPCs from site operations in excess of drinking water MCLs. The only analyte that exceeded MCLs was arsenic in one well during one event, which slightly exceeded the 50 µg/L MCL (50.1 µg/L). Arsenic is not known to be site-related, and has been detected in Zone G grid (background) wells in concentrations exceeding the MCL. For these reasons, the three existing SWMU 11 monitoring wells are believed to provide adequate water quality and groundwater flow monitoring at this site.

SCDHEC Comment 8:

SWMU 11 Page 10.8.34 Surface Soil-to-Sediment Cross-Media Transport, lines 22-25

A) The text suggest that additional sampling in this immediate area to resolve the question of the contaminate source or of the engineered effectiveness of the drain. This also supports the need for additional sampling to determine if the contaminants are in a sink and if they are present in the groundwater.

B) This site should remain in RFI status until further investigation has been completed.

Navy/EnSafe Response 8:

A) The analytes of concern in the sediment in the area of 011M0001 are inorganics, specifically mercury. Mercury was detected in three surface and one subsurface soil samples. Given that the site is unpaved and graded to drain into the ditch, the similarities of analytes noted between the soil and sediment support the site as the source. The reviewer should note that monitoring well 011002 is directly downgradient of the sediment sample location and should be able to assess the impact from the mercury on groundwater quality. An evaluation of the effectiveness of the drain is not within the scope of the RFI.

B) The Navy feels that investigation is complete.

CH2M-Jones Response 8:

Additional sediment samples were collected and analyzed during the Work Plan Addendum field work, and the results did not detect any additional areas of elevated mercury in ditch sediments near the culvert. Mercury is not a COPC in site groundwater, and was rarely detected in SWMU 11 groundwater (only at levels less than 0.20 µg/L). Please also refer to Sections 4.1 and 5.3 of this RFI Report Addendum for further discussion of sediment sampling results. CH2M-Jones believes that with the additional sampling work recently conducted, the RFI at SWMU 11 is now complete.